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Education with environmental ethics and values to preserve nature

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Abstract: In spite of conservation efforts, the environmental damage has not been stopped, perhaps because we cannot reach awareness and an attitude of respect toward nature. Teaching environmental values from infancy is a way of generating changes in the way the nature is seen and appreciated. We started with an analysis of the fifth grade natural science textbook, with a view to its environmental education contents. Observations were made on the behavior of fifth-grade students in two schools in San Cristobal de las Casas, Chiapas, Mexico. The students were interviewed and asked to answer a questionnaire to identify their perceptions of environmental ethics; we believe that although the program content and execution convey information about environmental issues, it does not effectively promote environmental values such as respect for flora and fauna, responsible management of water and waste into children.
Key words: environmental education, awareness, values, attitudes, behavior.
Resumen: Pese a los esfuerzos por conservar los recursos naturales no se ha podido frenar el deterioro ambiental, debido, posiblemente, a que no logramos tener conciencia y actitud de respeto hacia la naturaleza. La enseñanza de valores ambientales desde la infancia es una forma de generar cambios de visión y de apreciación de la naturaleza. En este trabajo se analiza el contenido del libro de texto de Ciencias Naturales de quinto grado de primaria y realizamos observaciones sobre la conducta de alumnos de este grado en dos escuelas de San Cristóbal de las Casas, Chiapas. Se les entrevistó y pidió que respondieran un cuestionario para identificar si los contenidos del libro de texto ofrecen una enseñanza de valores éticos-ambientales, y verificar si el niño expresa dichos valores. El contenido del programa oficial y sus ejecuciones aportan información valiosa sobre la problemática ambiental; sin embargo, es ineficiente para promover valores ambientales en los niños como el respeto a la flora y fauna, y el manejo responsable del agua y desechos.
Palabras clave: educación ambiental, conciencia, valores, actitudes, conductas.

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Current sociopolitical and economic context of biological conservation[1]

The ongoing environmental crisis is characterized by the appearance of worldwide scale phenomena, such as global warming, greenhouse effect, ozone layer depletion and loss of biodiversity, and other more localized, namely: soil degradation, depletion of underground water, deforestation and desertification, appearance of plagues because of certain agricultural practices, pollution of seas and rivers and the exhaustion of fishing resources (Demo *et al.*, 1999; Mejía, 2006). Although the extinction of living beings is a widely known natural process, nowadays it is taking place at an unusual rate, in multiple species, as a consequence of the activities of human beings (Stuart *et al.*, 2000).

In recent decades these phenomena have acquired great importance in the agendas of all the nations and international organisms, including those of scientists, who warn that the environmental deterioration threatens the survival of numberless species, mankind included (Kinne, 1997; Stuart *et al.*, 2000; Tillman, 2000).

In spite of the conservation efforts, the environmental problems have not decreased; because of this, the topic has become relevant, both for scholars and citizens, coinciding on the pressing importance of this environmental issue (Kinne, 1997). In order to reach this ecological awareness, it is important that local governments become involved and that the programs of basic education are defined on the basis of priorities, particular characteristics and cultural identity of the region (Agnieszka *et al.*, 2005).

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Thus, some new theoretical perspectives that attempt to influence on the actions of all the governments have appeared; distinguishable is the vision of sustainable development, which has as a basic objective to decrease the negative environmental impact and promote human wellbeing. In the Fifth Environment Action Programme of the European Economic Community (EEC), the concept of sustainable development is retaken, which is found in Brundtland Report (1988), and it is defined as that which satisfies the needs of the present generation without compromising the capabilities of future generations to satisfy their own needs (Bermejo, 1995).

Nevertheless, it is unavoidable to add new debate topics, such as the presence of a "crisis in the civilization", where one finds an ecologic crisis at a global scale, which should make us rethink and reflect critically, change our attitude and generate a different thinking in mankind, recognizing a species awareness with identity beyond race, nationality, socio-economic stratum, religion, culture and ideology (Kinne, 1997; Novo, 1997; Sosa, 1997; Toledo, 1997; Leff, 2000a; Rozzi, 2001; Foladori, 2002; Reyes, 2003; Mejía, 2006).

Ethics and values in education

Observing the markets, streets, parks and schools, one cannot but wonder: what to do to become aware of the respect nature deserves? How to foment values that were part of ancient civilizations where respect and admiration for natural elements prevailed? Among others, one can mention the deepest recognition of the codependence on nature, respect to life in any of its manifestations, admiration for the generosity of planet Earth, the benevolence of plants and animals, fascination for the ecologic diversity and humility before the majesty of landscapes and natural resources.

The notion natives possess about ecological resources in the environment are part of the implicit ecologic knowledge located in a social and familiar context, transmitted along generations by means of socialization (Chantita and Leimer, 2007; Shepardson *et al.*, 2007). What is more, this traditional ecologic knowledge, by definition, is located in a determinate environmental surrounding; therefore, it might alleviate some negative effects of globalization (Shaileshkumar and Gardner, undated). There is evidence that several indigenous peoples are interested in learning the causes of environmental deterioration and the consequences which threaten their way of life, thereby their culture (Turner *et al.*, 2001).

Environmental ethics concerns human societies conditioning their relation with nature and the impact on it, and seeks the wellbeing of both; likewise, this ethic states that the environmental crisis demands challenging the ways we inhabit and learn the world (Rozzi, 2001). To solve this crisis, we try to preserve biological species and at the same time, foster processes of mechanisms that satisfy human needs (Kinne, 1997).

In 2002, in the forum held in Lyon, France, "Globalisation Sustainable Development: Is Ethics the Missing Link?" (Earth Dialogues. Dialogues Pour la Terre, 2002), an overwhelming conclusion was distinguished: it is indispensable to foster ethics, and human values, such as justice, environmental protection, tolerance, unity, peace and human rights.

Environmental ethics has two different philosophical nuances in the way it relates to nature, some in clear opposition, which comes to show the existence of more than one "ethics" which rules everyone alike.

The laissez-faire attitude (let one do whatever one wants) is based on the conception of unlimited natural resources at mankind disposition; it was spread via conquistadores and European colonizers, and at the same time, it strengthened with the establishment of private property, which privileges individual interest over collective interest, and it widely prevailed up to the end of XIX century (Rozzi, 2001; Turner *et al.*, 2001). This conception of the unlimited use of nature brought along irrational exploitation of natural resources, generating a fast and extensive environmental deterioration, so this way of taking what is needed with no restrictions was apparently replaced by other approaches.

The anthropocentric vision deals with the rational management of natural resources by a larger number of people for the longest possible time; the value is centered on human beings. Therefore, nature is seen as a good production for consumption, a reservoir of resources at the service of man with utilitarian value as from the end of XIX century. This vision can be partially seen in what Brundtland Report (1988) points out as a notion of sustainable development (Kinne, 1997; Rozzi, 2001; Turner *et al.*, 2001; Kostas *et al.*, 2003; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007).

Bio-centric ethics states that biodiversity has an intrinsic value, that is why the biological species are privileged and human is excluded from many natural areas (Rozzi, 2001; Turner *et al.*, 2001).

Conversely, the eco-centric vision deems human beings as components of the ecosystems and grants moral values to the species that compose the biological communities, including homo sapiens; this ethics grew in strength as from the mid XX century, with the land ethics championed by Aldo Leopold (1949), who invites to establish a new way to relate to nature. Instead of seeing the planet as an asset we own, we should think of the Earth as a community which we belong to (Kinne, 1997; Rozzi, 2001; Turner *et al.*, 2001, Kostas *et al.*, 2003; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007).

Finally, it is worth mentioning the eco-social or bio-cultural approach, as it integrates social welfare and the conservation of the biological and cultural diversity; it is a very similar perspective to that the Native Americans have had for thousands of years and is still rooted in their cultures (Rozzi, 2001; Turner *et al.*, 2001).

In this discussion it is also important to remember philosophers such as Passmore, Frankena and Shrader-Frechette, who reflect on a primordial point, rather than requiring a new ethic, the problem is the insufficient number of people who live according to ethical principles (Kinne, 1997; Callicot, 1998).

Environmental ethics is based on elements such as respect and unity, conceiving earth as a vital space we have to share responsibly to preserve it (Kinne, 1997; Agnieszka *et al.*, 2005; Mejía, 2006). Reflecting on this ethics implies thinking the problem not in terms of "man-nature", but in terms of "human being in nature". With this ethical perspective we have to revise the direction and sense of human activities, from scientific and technologic orientations, such as marketing, economic and socio-cultural, which supposes examining out preference hierarchies, including the moral ones (Kinne, 1997; Sosa, 1997). Environmental ethic and ecological awareness start when we, human beings, recognize ourselves as a species, part of nature, and become aware that our actions have an effect on other species (Kinne, 1997; Agnieszka *et al.*, 2005; Mejía, 2006). The contents and forms of approaching education unavoidably have a set of characteristic ethical principia (Fernández, 1998). We who are devoted to teaching wonder to ourselves, why do we educate for? We educate to satisfy a demand that responds to personal and social stereotypes which are handed down to future

generations, as well as to provoke and develop in the children a number of physical, intellectual and moral states, which society and the specific environment they are destined for demand (Durkheim in Savater, 2000). The educational institution is recognized as a transformer of values in society, and in the like of family, influences the reproduction or transformation of attitudes, convictions, moral beliefs and behaviors (Hart, 1978; Apple in González, 1993; Kinne, 1997; Savater, 2000; Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007).

The one who attempts being an educator shall be, above all, critical, revise and analyze the contents, knowledge and opinions they receive in their academic and social environment (Savater, 2000; Fernández-Manzanal *et al.*, 2007). Nonetheless, one has to ask: How much does the teacher has to take a critical attitude, if they themselves are product of the educative system? Jean Piaget stated that ethics cannot be taught as another subject, but it shall be approached from any of the fields of knowledge they teach; and it would be expected to have it backed with the attitudes of the teachers and their relation with the students (Savater, 2000; Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007). According to this, it is deduced that not only kids are involved in learning ethics, but also the very references and attitudes of the teachers are determining in this educational process.

In order to express and support values that generate new attitudes of human beings toward nature, it is necessary that every person: 1) shows solidarity to the planet; 2) seeks the common good founded on the collective management of humanity common goods, i.e., to privilege collective rights before private; and 3) considers the sense of being before the value of having (Kinne, 1997; Leff, 2000b; Agnieszka *et al.*, 2005; Mejía, 2006).

In the environmental ethical analysis it is imperative to recognize ancestral knowledge in the relation and use of the environment; unfortunately, this knowledge is being lost, which means that the collective memory is inexorably eroded by ignorance or contempt (Reyes, 2003). In the same way, it is illustrative to spread the positive attitudes toward the environment of indigenous, peasant and urban societies, as this may favor social wellbeing and the preservation of biological and cultural biodiversity (Rozzi, 2001; Shaileshkumar and Gardner, undated).

It is not possible to refer to "nature" simply as a reservoir of "natural resources", for human beings are not the only consumers of resources, nor can we have an exclusively utilitarian vision of other living beings (Kinne, 1997). This means that besides human beings there are thousands of species of the vegetal and animal kingdoms which live, share and depend on nature to survive in time (Kinne, 1997; Turner *et al.*, 2001; Agnieszka *et al.*, 2005; Mejía, 2006).

International environmental educational policies and their influence in Mexico

In 1948 UNESCO analyzes the content of environmental topics in the school sphere; as from the end of the 1960's, these experiences start with a heavy conservationist bias, boosted by the growing awareness on environmental deterioration. United Kingdom, Scandinavia and France are the pioneers of this movement; the innovations were field trips and other activities that propitiated contact with nature. This movement made room for institutional organisms such as the Council for Environmental Education in the UK., which tries to coordinate the activities; in the Nordic countries, the environment topic focuses on the physical, social, economic and cultural aspects, and the study of the environment begins with the immediate surroundings (González, 1996).

In Mexico, national policies retake the environmental intentions of the UN Conference held in Stockholm, Sweden, in 1972, where education is emphasized as the basis of environmental policies, and the Tbilisi Postulations, Georgia, USSR in 1977, which established patterns of action and priorities for the future. The International Symposium on Environmental Education held in Munich and the Moscow International Conference in 1987 became the proposition for the 1990 decade, which conceives environmental education as:

> A permanent process where the individuals and the collectivity become aware of their surroundings, acquire knowledge, values, competences, experience and will that enable them to act, individually or collectively, to solve the current and future environmental problems (Moscow International Congress in Rico, 1992: 9).

In 1989, in Frankfurt the European Letter on Environment and Health is published, which includes topics of general politics and civil action; in the latter, attitudes and values are underscored (Rico, 1992).

The declaration of Dublin and the Council of Education Ministers of the European Community in 1992 recommend an interdisciplinary perspective and to link the educating centers with the local community, the diversity of particularities of the region (González, 1996). That same year in Rio Summit and the Global Forum, once again adopting new collective and individual environmental attitudes and behaviors is underscored. In the Treaty of Environmental Education for Sustainable and Responsible Societies states that environmental education:

> is a permanent learning process based on respect to every living thing […] said education fosters values and actions that contribute to human and social transformation and ecological conservation. It stimulates the formation of socially just and ecologically balanced societies, which have with one another an interdependent and diverse relation (González, 1996: 27).

By the end of 1992 the Ibero-American Congress on Environmental Education held in Guadalajara, Mexico, an important balance is made on many experiences and achievements in these nations; during said decade, in general, projects oriented to strengthen the environmental aspects in the official curricula are developed in the country (González, 1993; González, 1996).

In recent years, one of the characteristics that environmental education has acquired in Europe, U.S., Canada and Australia is to have an approach too centered on nature preservation (*green environment*) where the division between ecology and the socio-cultural dimension is established. This perspective is echoing in Mexico and it makes it difficult for environmental education to have an approach articulated with the local economic problems and socio-cultural patterns. An objective of environmental education is to transmit knowledge, enable and foment civil actions to protect the environment, this education must go beyond theoretical information, however, it is necessary to boost attitude changes and promote in the student awareness on the topic (Hart, 1978; Kostas *et al.*, 2003; Aivazidis *et al.*, 2006; Sirmo *et al.*, 2006;

Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007). For this end there are several values that should be taught, such as: recognizing we are part of and codependent on nature (Kinne, 1997), and that it is necessary to respect flora and fauna. It is not enough to admire nature, it is unavoidable to be benevolent, fascinated and humble, and why not? Even offering our reverence to nature.

Society must have sufficient information to understand the problem and at the same time collaborate with the professionals to apply the solutions, "understanding the problem implies the acquisition of knowledge on ecology, not only on wildfires […] and potentiate knowledge about nature from a more realistic viewpoint, not so idyllic" (Galán *et al.*, 2003:1). This detailed information on ecology might contribute to a possible solution of the problem, particularly at local level (Agnieszka *et al.*, 2005).

The literature suggests a moderate-heavy correlation between environmental knowledge and the attitudes of the students who participate in environmental education programs for some weeks. Multiple researches state that if these educational programs are applied from an early age, they favor the increase of positive attitudes, thereby the behavior toward the environment (Hart, 1978; González, 1996; González and da Silveira, 1997; Vijaya *et al.*, 1997; Galán *et al.*, 2003; Kostas *et al.*, 2003; Agnieska *et al.*, 2005; Aivazidis *et al.*, 2006; Sirmo *et al.*, 2006; Chantita and Leimer, 2007; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007; Strain, 2008). However, the development of environmental education would be possible if there is a deep change in the official educative system, which "restates from contents to aims, as well as the methodologies of its teachings; a creative interaction that redefines the sort of people we want to produce and the future scenarios we want for mankind" (González, 1996: 14).

In the present research we try to answer the question: how effective has environmental education been in the sphere of elementary education in fomenting environmental values? To answer it we analyzed and categorized the values contained in fifth-grade Natural Sciences textbook, and from the activities proposed in the teacher's book, printed by the Secretariat of Public Education. Later on, two elementary schools in San Cristobal de las Casas, Chiapas, Mexico, were chosen, one under state administration and the other under federal administration. In each one, we observed the behavior

of one of the fifth-grade groups (González and da Silveira, 1997; Kostas *et al.*, 2003; Sirmo *et al.*, 2006), besides, the children were asked to answer some questions that allowed revealing the environmental ethical values which they have been taught at school and at their households.

Methodology

Limits of the universe of study

The present work was developed in San Cristobal de las Casas, Chiapas, Mexico, one of the most important cities in the state, because of the relevance the indigenous presence has and because of its importance during the Colony. It is the municipal head and provides services, mainly touristic, in the Altos Region.

Moreover, the social and religious conflicts of the state have had as a consequence a marked tendency to demographic growth. The ecologic problems which appear in this city are the same as in most of Mexican cities: scarcity and pollution of water, solid and organic waste generation in worrying amounts, and without prevision of their handling, urban sprawl growth, continual loss of forested or natural areas, among others (Chanona, 1997); which suggests a lack of ecological awareness among the citizenry.

In San Cristobal there is an average of 127 federal and state elementary schools (Sirmo *et al.*, 2006); after visiting the urban area and observing that the educative patterns are, by and large, repeated, we decided to select two public schools, one state and the other federal, as samples for the processes of local teaching-learning and representative of the educational system in the state; because of this, the information gathered in said schools by means of surveys and interviews allows answering the research question: how effective has environmental education been in the sphere of elementary education in fomenting environmental values? The two schools are located in neighborhoods far from downtown, relatively close to each other and work in the morning shift. We chose to work with students, 11 years of age on average, who course fifth grade, because in this grade their cognitive capabilities are in full development (Vijaya *et al.*, 1997; Galán *et al.*, 2003; Chantita and Leimer, 2007; Kostas *et al.*, 2003; Sirmo *et al.*, 2006), and have information baggage as a result of the previously coursed grades which, at the time, will provide them with the bases to go on to secondary education.

Three means were established to obtain information on what is taught on environmental education and the attitudes learnt at schools; the means were:

1) *Observation in the classroom*; it consisted in paying attention in Natural Sciences lessons, to recognize the emphasis placed on environmental education. The observation was carried out for eight weeks and was recorded in a field diary, so that with these materials the basic contractions that may appear between the discourse, educative plans and programs and the attitudes of the children could be analyzed.

2) *Observation in open school space*; it is a sphere where students, teachers, parents, sellers and visitors interact everyday. In this space, we examined the behavior related to the management of waste, water, green areas and the messages on environmental cares the students are exposed to. In general terms, we observed the social space and the environment that surrounds the school and the actors who in it interact.

These data helped obtain information to infer the vision or the environmental ethical values the children display in a relatively free environment.

3) *Interviews*; another approach to knowledge and environmental ethical values of the children was through semi-structured interviews. The questions were designed to learn what they understand and their opinion about the environmental deterioration of the planet and their locality, the methodologies at school and their reflections on their attitudes or behaviors in their interactions. We interviewed all of the students privately and individually, trying to be at a cordial environment to increase the reliability of the gathered information (Vela, 2001).

A similar interview was especially designed for the teachers, in views of learning their points of view on the formal education in Chiapas, and the pertinence of fostering ecological education with an ethical and value perspective inside the schools.

4) *Surveys*; we applied a closed survey to the students to verify their knowledge and opinions on environmental education at school, learn their preferences on animals, their criticisms and doubts about the contents and methodology, and distinguish the transmission of values reflected at the school, households, neighborhood and other places they visit (Fraser, 1983; González and Da Silveira, 1997; Kostas *et al.*, 2003).

Documentary sources (textbook and teacher's book)

We analyzed the teacher's book with its sections and methodologies, and the natural sciences textbook as well, where the most recurrent words were identified in the texts, we counted the times they were repeated in order to learn in the school curriculum what the most important topics taught to the children are (Fraser, 1983; Sirmo *et al.*, 2006).

Results and discussion

The perceptions and attitudes of the population toward environmental ethical values were obtained from 72 boys and girls, 33 from the federal school "section VII" and 39 from the state school "Vicente Guerrero". Most of the surveyed students in the federal school were born in San Cristobal de las Casas, and in some rural places located near the city. The state school has a revealing scenario as for the origins of the students, 58% was born in rural areas in Los Altos; it was also interesting to observe that more than a half of the students speaks, in addition to Spanish, Tzoltzil o Tzeltal (or both). The students at both schools expressed similar recreational and leisure activities; although some practice a sport, most prefer videogames. The students watch TV on average from three to five hours and mostly watch cartoons or soap operas. They assimilate the information they receive from the media as advice or recommendations for their behavior, as some testimonials demonstrate so. This phenomenon is common in other countries such as Uruguay (González and da Silveira, 1997), the United States (Shepardson *et al.*, 2007) and Greece (Sirmo *et al.*, 2006); besides, depending on the veracity of the references from the media, it may strengthen or dilute the discourse offered at school. The heavy influence television has is known, mainly as an important source of information among less educated population (González and da Silveira, 1997). Generally, television emphatically broadcasts world ecological occurrences, which become weighty in the schemata of the students; however it may exclude the rise of ecological awareness on local environmental issues (Sirmo *et al.*, 2006; Strain, 2008). There is a tendency to watch children's shows, mainly produced abroad, which portrait customs and ideas different from our cultural manifestations, and they generate determinate physical, intellectual and moral states (Durkheim in Savater, 2000).

Television also definitely influences the habits of family consumption, alimentation and insecticide use mainly, and even the image of environmental problems, many times alien to their immediate natural and social surrounding. On numberless occasions, these television messages contain errors, omissions and misleading information, instead of underscoring precise information of environmental concepts and processes (González and da Silveira, 1997; Agnieska *et al.*, 2005; Sirmo *et al.*, 2006; Shepardson *et al.*, 2007).

Another source of primordial data is their very family (Strain, 2008); in this study there were several comments that suggest that the perception of nature in the children starts with home education. As a matter of fact "the composition inside the household has significant implications in the transmission of knowledge and values to the children (Chantita *et al.*, 2007: 2)". Nonetheless, under some circumstances what has been learnt can go against a vision of nature respect, for instance, some people declared having used insecticides at the household to eradicate noxious fauna, such as cockroaches, flies, mosquitoes, in spite of the imminent risk for family health, pets and other wild species.

Independently from their ethnical background and socioeconomic stratum, the children still have access to natural landscapes, yet almost half of them also observes nature frequently on visual media, such as magazines, books, television or more recently internet (González and da Silveira, 1997; Turner *et al.*, 2003; Aivazidis *et al.*, 2006; Sirmo *et al.*, 2006; Shepardson *et al.*, 2007).

Natural Sciences textbook

The main environmental topics, or in any case related to biologic sciences the 5th grade textbook includes, are mainly oriented to raise awareness on disease prevention, study the human body and develop habits and attitudes to be healthy. Love, respect, comprehension, tolerance and acceptance of the other, solidarity and equality between men and women are the most frequently mentioned values; this is to say, values related to human coexistence, those related to respect for others and bodily cares. No environmental values were detected, such as respect to other species or beings, and not only for mankind. The book proposes several didactic

strategies, even field trips as supportive activities; even so, there were few references to environmental ethical values (for instance, help deduce which our function in an ecosystem is). These values are not thoroughly dealt with, and no instruments are generated to estimate the degree of appropriation (Kostas *et al.*, 2003).

The texts refer to the species in rather utilitarian terms and their benefits for mankind, the technological is fundamentally underlined. Values such as respect for living things are not approached, nor is it recognized that our individual and group activities cause environmental problems (Kinne, 1997); the word responsibility is only read two times, alluding to Brundtland Report (1998). This utilitarian vision imbued in the children through official textbooks is not exclusive to Mexico, similar results were found in a study carried out on Greek textbooks (Kostas *et al.*, 2003). The development of a utilitarian vision of natural resources does not favor an attitude change reflected on a behavior consistent with the efforts to preserve the local, regional or global biodiversity (Kinne, 1997).

The 10 concepts related to biology which are mostly repeated along the textbook are: cells (79), pollution (55), ecosystems (43), human body (39), plants, flora or vegetal species (33), urban community or city (30), animals or fauna (28), cultivations (26), bacteria (22) and living beings (22). It is noticeable the figure word pollution reached, which includes air, soil and water pollution; preventive and corrective measures are put forward, such as the schema for the management of solid waste: reduce, reuse and recycle. Conversely, words or expressions that generate reflection or environmental values toward other living things, namely, poaching, taking part in ecological campaigns (reforestation, cleaning rivers and beaches, etc.), closed season, do not hurt flora or fauna, and human neglecting are barely mentioned.

The fifth-grade Natural Sciences textbook assumes the vision of Brundtland Report (1988), which has a utilitarian approach to nature and disregards the importance to expose, explain, and spread environmental values such as respect or cooperation; neither does it emphasize the need to show realistic, accurate and relevant ecologic information on the children's immediate environment (Kinne, 1997; Kostas *et al.*, 2003; Agnieszka *et al.*, 2005). Without this information the children will hardly have elements to learn, reflect and deepen into topics of environmental ethics and the

responsibility of mankind for actions such as pollution; without these contents it is not possible to expect the children to learn, respect and generate attitude changes and behaviors favorable to nature from schooling (González, 1996; González and da Silveira, 1997; Vijaya *et al.*, 1997; Galán *et al.*, 2003; Kostas *et al.*, 2003; Agnieska *et al.*, 2005; Aivazidis *et al.*, 2006; Sirmo *et al.*, 2006; Chantita, 2007; Strain, 2008).

Opinions of students and teachers on the textbook

Teachers and students, at both schools, coincided on the preference of topics, which in descending order were: animals, plants, human body, energy and environmental problems; other distinguished activities which they find amusing, such as reading, drawing, playing, experimenting, writing and researching, working in teams and making models. Undoubtedly, these abilities may be incorporated into the teaching methods and techniques of some environmental topics and values.

Although virtually there are no objections to the book information, in the federal school it is regarded as insufficient; both teachers and students suggest having more lessons, attention, support and explanations, in particular on the Chiapas occurrences. Speaking more of threatened fauna, sea life, forests and rivers are recurrent suggestions; this result shows the interest of the students in learning about specific ecologic issues. Patricio, for instance, ask for more information according to the socio-cultural context wherein he lives and demands:

> More enquires on things from every place; add not kill the little animals, squirrels, little rabbits, they are cute and they start to kill them to eat them. Also deer, humans are killing it, don't kill them, and if they catch it, if there are children leave them in the mountain (13/Tze/Sp/State school).

Concha comments on this, the scarcity of information about Chiapas "More teachings about our state, for us the most important is the state of Chiapas, as in other states please, talk on plants and trees" (10/Sp/Tzo/Tze/federal school). Moreover, the teachers express that because of the lack of adequate libraries and little time for the topics, they are forced to review superficial and technical books, losing other viewpoints from sight, which remit to a deeper analysis of the social, political and cultural reasons that cause ecological unbalance (Reyes, 2003; Sirmo *et al.*, 2006).

There are differences between schools in the years of professional experience of the teachers, however at both there is genuine interest in reaching respect and equality among their groups, and they are concerned by the personal matters of the students reflected on their behavior and academic performance. They coincided that three hours officially devoted to the subject of Natural Sciences are insufficient, and the lesson as well, and even the scarce formation and training on environmental issues. The teachers agreed that the main educational challenge they face is to stimulate the students associating the contents to their own local surrounding so that what is learnt becomes part of their quotidian life and significant (Kostas *et al.*, 2003; Aivazidis *et al.*, 2006; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007). They take as references the characteristics of the current natural surroundings to teach; a professor from "Sección VII" explains:

> I have always procured to locate myself in time and space as a starting point. I start from making comments on how it was like yesterday and how they think it will be like tomorrow, when they are adults; let them know the protected areas, identify them and compare a natural ecosystem where everyone has access to these areas.

To motivate and raise awareness in the students on the care of nature, teachers talk about the environmental issue so that they can correlate it with their culture; and when they achieve impact, according to them, there is a connection that allows said awareness. The teacher from "Vicente Guerrero" exclaims:

> In fact, that is the beginning of the lesson, to see it from the outside! The lesson starts from the students' previous knowledge taking into account their social sphere, they write the comments on the blackboard, relate it to the text and all together see how much we agree…

The activities which the teachers promote to raise awareness in the group and family are oriented to cleaning campaigns and sorting waste, promotion of plants, appropriate use of water and field trips to green areas.

The teachers recommend reducing the lessons and retaking field trips to instruct and raise ecological awareness in the students. A similar suggestion has been observed in other studies (Galán *et al.*, 2003; Fernández-Manzanal *et al.*, 2007; Strain, 2008). They accept that it is necessary to receive support from trained personnel, which means a back-up and not an additional workload. What is more, they acknowledge that the way in which they have been instructed will be transmitted to their students. If they have scant understanding of the concepts or if they have difficulties to distinguish between the causes and consequences of diverse environmental issues, it is likely that this ignorance will be reflected on their lessons (Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007). Nevertheless, not only is task and responsibility of the teachers in the classroom, it is urgent that educative policies are attentive to this lack of formation and information in environmental education the teachers suffer from. Supporting environmental education with training, seminars, congresses and interchanges would allow the teachers, in the first place, to learn and value their own experiences and those of others to teach natural sciences (Vijaya *et al.*, 1997). In the second place, it has been verified that when the teachers become involved and appropriate a determinate project, which might be environmental, commitment, positive attitudes and actions may be fostered in them, which would become favorable to the learning of their students (Hart, 1978; González, 1996; González and da Silveira, 1997; Vijaya *et al.*, 1997; Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007).

Perceptions and attitudes of the students

Nature

All of the students agree on the importance of taking care of nature, and most said it was because of the oxygen it provides (figure 1B), which is decisive in human beings. Another relevant issue was the inherent beauty and aesthetic of nature; 70% of the children has contact with nature in open spaces and usually goes to the countryside with family and friends. There were some who establish the link by means of readings and only a minute percentage appreciates nature on television.

In spite of enjoying the nature, there is scarce knowledge on the existence and functions of the Protected Natural Areas of the state; 80% ignores the topic. Some students mention Lacandón Jungle in Montes Azules Biosphere Reserve, the Sumidero Canyon, Montebello, Rancho Nuevo and the waterfalls of Misol-Ha, but few have the opportunity to visit them. Only three students mentioned a reserve in San Cristobal de las Casas called "Moxviquil", an interesting datum, mainly because it is not mentioned in the textbook and the diffusion of the existence of said area is relatively scarce. The field trips to these areas depend, logically, on familial decisions and motivations. Adán verifies his knowledge and tells us who had the idea of going to Montes Azules:

> From dad, his friends suggested him going on a trip and everyone went, they are teachers at an indigenous rural school. If it wasn't protected, they would be cutting down the trees, hunting animals. The trees like the cedars, pines about to disappear and the animals like the jaguar, the guan, the spider monkey are already disappearing. They have to ban hunters, that's why they are protecting these areas […] visit the protected areas, go and don't take slingshots, rifles, and don't make bonfires because you can cause a wildfire (11/Tzo/Tze/federal school).

Most had problems to recognize global environmental problems such as garbage, deforestation, bonfires, pollution of water such as rivers, lakes and the sea, the ozone layer and the icecap melting. However, they stated that the local problems are identical to the globlal; they recognized that solid waste generation is the main problem that affects San Cristobal and the world. This result suggests that children receive information, but a few retain it and fewer are those who reflect or question said data; the children refer to the problems mentioned in the textbook, however they find it difficult to connect that information with their immediate environment.

According to the children, ignorance, lack of education, slothfulness and imitation of bad habits are determining factors; for instance, they say they had seen other people littering anywhere; some also recognize possible local consequences of an inappropriate management of garbage. Josué tells in his own words: "the sewer clogs when it rains and the flies come and one smells dead animals, like horses. In the waterhole there was one knocked, they smelt it reeked and just pulled in into the river" (13/Tzo/Sp/state school).

By and large, the students recognize the planetary environmental problem; sometimes however, they overlook or minimize the environmental events in the city, save those referring to water and solid wastes. These are reiteratively mentioned in the textbook and are also frequently shown in the media; this allows the children to have this information at reach and grasp it easily, at least this topic, thus generating ecological awareness (Aivazidis *et al.*, 2006). Nevertheless, it is necessary that these texts are exposed with local instances so that they become fully appreciated in their environment and acquire significant knowledge as individuals (Galán *et al.*, 2003).

The biological criterion to preserve nature stated in the textbook is, undoubtedly, that which the students have assimilated within a limited teaching conventional system, from our perspective; however, in order to achieve an attitude change toward nature it is necessary for them to recognize and analyze their responsibility as generators of environmental problems. It is noticed that most are unaware that their quotidian actions might have an effect on ecological balance; what is more, before the lack of information on the local biodiversity, how can they be asked to appreciate and respect a landscape or state protected areas? It is indispensable that the educational system readjusts the approach or vision to transmit knowledge on the environment, management and conservation of natural resources, changes that must directly become a respectful and harmonious relation with nature (Kinne, 1997; González, 1996; González and da Silveira, 1997; Kinne, 1997; Vijaya *et al.*,1997; Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007). If these values are not taught, it is almost impossible that children recognize other criterion than the utilitarian (Kinne, 1997), only studying by the curricula (Sirmo *et al.*, 2006), or notice the aesthetics and beauty proper to nature, even if they ratify being closely in touch with it, as it was verified in the interviews and surveys.

Fauna

Circa 60% of the students prefers to see fauna free, the rest in captivity, as in zoos, and only a few in circuses, on a leash or captive (figure 1A). Several attribute their parents, siblings and other relatives their attitudes of respect or destruction to living beings; family and socio-cultural references are the first referent for any ethical value and general behavior (Chantita, 2007;

Strain, 2008; Shaileshkumar and Gardner, undated). The family influences the formation of personality, transmits their own principles and prejudices, such as treatment or fear of animals (Tadesco in Savater, 2000; Chantita *et al.*, 2007; Fernández-Manzanal *et al.*, 2007; Strain *et al.*, 2008; Shaileshkumar and Gardner, undated). These references have manifested perhaps in the way of appreciating pets and the use of slingshots to harm wild or domestic animals (lizards, dogs, cats, birds) in the children of the schools considered for this study. In "Vicente Guerrero" State School, 92% is in favor of respect and 87% is in "Section VII" Federal School; in the latter 13% recognized the habit of hitting pets when they do not obey. The children in the state school are, mostly, indigenous and do not use slingshots frequently; however, 35% accepted they kill birds with advantage. The converse takes place at the federal school, where almost 50% states they use slingshots to hurt animals for fun.

In general, they have an acceptable knowledge on the local fauna, but they also mistaken some animals from other continents; they largely named mammals, birds and reptiles, however no one mentioned arthropods or sea animals. The children are aware of the threatened fauna from Chiapas; in the school tasks, drawings and notice boards jaguar, deer, macaw, tapir, spider monkey, quetzal, toucan, parrots and birds of prey are documented; they highlighted other exotic animals, nevertheless, sea fauna was virtually ignored. This learning may be due to the fact that the textbook contents speak more of fauna than flora, given the children's interest in animals and contacting directly with nature.

Flora

Half of the students at both schools considered that trees provide oxygen and, in the second place, they give firewood, charcoal and shade, giving greater emphasis to the ecological than the alimentary (fig 1B). As for the forest, there were some children who only recognized aesthetical and ornamental attributes, and other only its utilitarian value (they mentioned that because of logging or money timber is extracted). Their perception on flora seems to coincide with the customs proper to these ethnias (Chantita and Leimer, 2007; Shaileshkumar and Gardner, undated).

In an interview, Yesenia accepts that "sometimes money is necessary to make furniture, but nature also needs trees and water, and there is no need to pollute more the water" (11/Sp/federal school).

Most stated that cutting down trees causes environmental deterioration to water or air; because of this, they prefer to acquire ornamental plants in greenhouses or authorized shops. They manifested the demand of asking for a permission to place sings, to denounce and apply sanctions to loggers who do not fulfill their forestal obligations. They opined that the trees shall not be taken from the forests, and in the case of doing it, more must be planted. Sandra suggests that instead of logging:

> In any case, one wants to embellish their house but not cutting plants, embellish may be with drawings, paintings, planting flowers, but in vases, not cut and put somewhere else, because that would make plants wither and the grass dry (11/Sp/federal school).

Ixchel pinpoints once again the weight of family:

> I would like to have a little tree but not real. My mom doesn't like buying trees in Christmas, because she doesn't like them to cut the trees, then my mom, my family, does not want to have Christmas trees, perhaps I would adorn the house but not with Christmas trees (10/Sp/Tzo/Tze/federal school).

At the households, 70% of the students keeps a garden leisurely, they provide aesthetical reasons and coincided on beauty of the households with a garden; in respect to biological criterion, they stated that plants supply oxygen for the humans to live and grow. It is interesting that their taste for flowers allows them to easily remember the species they plant in their gardens. This knowledge indubitably comes from the family (Chantita and Leimer, 2007).

Even if they demonstrated to know the names of the cultivated plants, their ignorance is noticeable in the case of native flora; contact with nature by means of field trips or excursions to protected natural areas may reduce the informative gap on the native flora in its function as ecological niches for other beings.

Solid waste management

Among the students the unanimous assumption of garbage as the main problem that affects the city conspicuous, and only some remarked the dead animals which are dropped on the streets and rivers. 60% of the students in "Sección VII" federal school thinks that it is best to separate organic and inorganic waste; in "Vicente Guerrero" state school there was a different tendency, 56.4% recommends the use of dropping sites. Only three students think the key is not to generate it (fig 1C). Such is the dependence on these deposits that in the face of their absence Martin accepted: "we didn't know where to put it, where we would drop it" (11/Tzo/Sp/state school). It was frequent to listen to the kids using expressions they heard in the media, such as television and advertising campaigns: "drop garbage in its right place" or "keep the city clean" (González and da Silveira, 1997; Agnieska *et al.*, 2005; Sirmo *et al.*, 2006; Shepardson *et al.*, 2007); other opined that with more dropping sites or using the collection service garbage disappears, and the problem as well. The students suggested placing enough dustbins on the street and if they chanced to be full to find some other; perhaps the essential modification to be done would be to have as an objective to make the children become aware (Galán, 2003; Mejía, 2006) not only about the problems derived from garbage, but how to reduce its production.

It was worth mentioning that talking to their peers or acting with examples are other options, as Walter refers: "I was in the park with my parents and we saw a lady litter near a tree there, I told her not to do so and to put her garbage into a dust bin, and she thanked me for telling her" (11/Sp/federal school).

Virtually a hundred percent of the children admitted eating frequently snacks or "junk food" at their house and school and they observed that plastic bags are to be seen all around. Anaís accepts it:

> When I go in the car I don't litter, when I eat chips or drink a soda, I'd better put them into a plastic bag and when we arrive to the place we go, where there is a dustbin I put it there […] mi dad one day told me: look, put it there, there in the field; then I told him, and mom said: why do you think the girl is going to litter. And I said: how am I dropping it there if it is clean and I am going to pollute this place (10/Sp/federal school).

Everyone is convinced that it is relevant to instruct, sanction or setting the example, thus reinforcing a responsible attitude and fomenting the teaching of environmental values as their own responsibility; this will promote changes in their attitudes toward nature (Hart, 1978; González, 1996; González y da Silveira, 1997; Vijaya *et al.*, 1997; Kostas *et al.*, 2003; Sirmo *et al.*, 2006; Fernández-Manzanal *et al.*, 2007; Shepardson *et al.*, 2007).

Water management

The children stated that their families afford the service of water at their households, and they say they close the taps tightly because they consider it is indispensable (90% of the children). Several children recognize they lack water, even so they say they play with water-filled balloons or forget to close the taps; as for the use of the toilet the pattern changes, for although many of them check that the flush lever returns to its initial postion, 30% does not.

As for potable water, more than 90 percent avoids wasting it; they deem it beneficial for life and health, in addition to quench thirst and supply energy. They consider the possibility that, inevitably, water suitable for human consumption and sea life will be ruined by the pollution of aquifers with bleach or oil. The suggestions include measures to save water during personal hygiene, notices, got to radio stations and speak out against those who litter. These suggestions are important and some of them are acquired from the media, the challenge is to take them up and behave accordingly (González and da Silveira, 1997; Vijaya *et al.*, 1997; Galán *et al.*, 2003; Agnieszka *et al.*, 2005; Chantita *et al.*, 2007), so that there is an evident saving of water and actual ecological actions.

Promote ecological awareness in children and in any citizen is a determining factor for the success of the actions related to environmental protection. Any program to preserve biodiversity must ensure a sense of belonging and active participation of the children and community (Kinne, 1997).

The involvement of elementary school teachers in the development and innovation of educational programs related to nature aspects must be fostered as well (Vijaya *et al.*, 1997). There is need for a work that recovers successful experiences in environmental education in order to value their

generalized use in the official textbooks (González, 1996). The effect of environmental knowledge on the behaviors and attitudes of the children is not direct, and besides there are some factors that might be simultaneously researched with those which appear at the school (Aivazidis *et al.*, 2006); the influence of municipal environmental campaigns and through the mass media can be mentioned. Another component may be to acknowledge what the adult or any citizen perceives as an environmental problem (Shepardson *et al.*, 2007) and how that vision is related to that of the children (González and Silveira, 1997).

Conclusions

The study shows that fifth-grade elementary students are taught limited ethical environmental values. Environmental education is circumscribed to the knowledge on global problems, such as pollution (of water and soil), deforestation and rational use of water; nonetheless, the children have difficulties to recognize or apply the information they receive in their immediate surroundings. There were but few instances that during schooling the children were taught ethical values, such as respect to nature and the individual awareness of being problem generators, among other. The influence of the family and media is noticeable in the way the children appreciate and perceive nature; by and large, the prevailing vision is the utilitarian, which may go against the vision of preservation and rational management of natural resources.

The children receive general biological information which they appropriate to different extents There is need, however, that the curricula consider local examples or situations the children know; hence, what they learn will become significant and, consequently, they will be able to reflect and become aware of their environment.

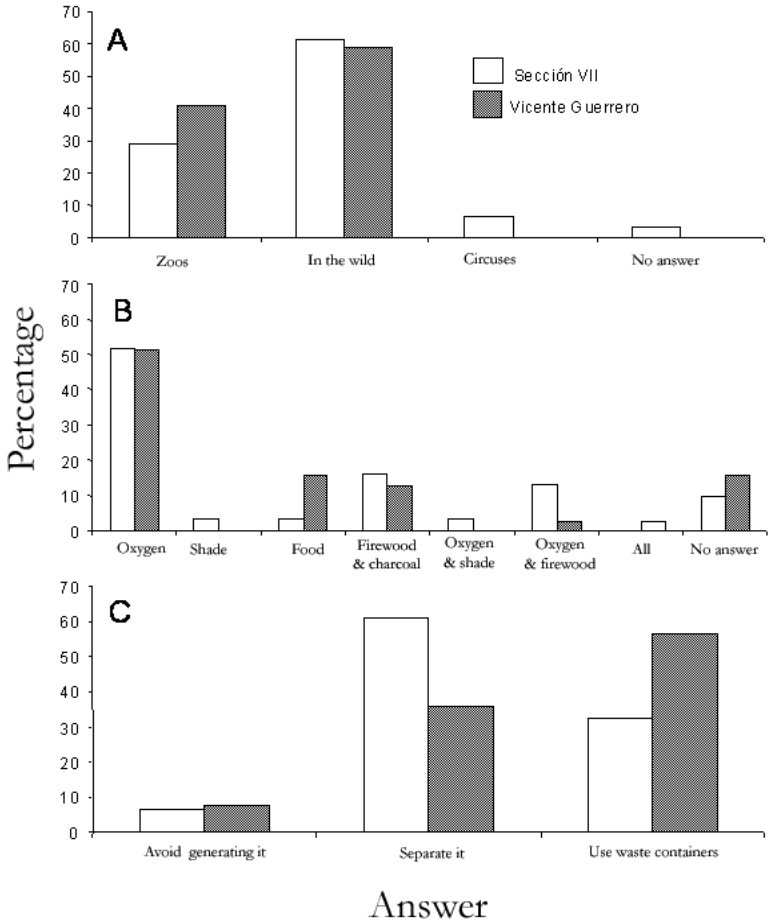
Finally, it is important to underscore the necessity of fostering in the children love, respect and why not, reverence for nature, so that together with the biological knowledge they receive at school they are able, in the future, to propose and carry out actions to exploit and preserve natural resources with a perspective of environmental ethics and generation of ecological awareness, independently from their future professions. It is indispensable to assume in the curricula that the children of today are the

adults of tomorrow; consequently, they must be given attention and educated in a respectful and responsible coexistence with their environment from childhood. Thus, in the future this will be reflected in the way mankind uses the still existing natural resources.

Annex

Figure 1

Percentage of answers of the students from two elementary schools in San Cristobal de las Casas, Chiapas, Mexico, to the questions: A. Would you like to see animals in...? B. Which elements de we receive from trees...? C. What do you suggest to manage waste?



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