Education for Sustainable Development: A Situational Diagnostic and a Case Study at Secondary Technical School level in Hermosillo, Mexico.

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Abstract: Education for sustainable development (ESD) has emerged during last years as a way to promote a better culture of respect, balance and justice for the environment and society. This document aims to describe relevant results of a study conducted in the city of Hermosillo, Mexico, about sustainability programs in secondary technical schools. The study was addressed in two ways: A survey was applied to ten (10) local institutions and a case study was conducted to one of them in order to identify behaviors and beliefs of its faculty members under sustainability approach. Two of the main outcomes are that ESD has not been as effective in the city as it was thought; and that the perceptions and values of the participant institution might be redirected towards a more environmental empathy.

Keywords: education for sustainable development, environment, secondary technical schools.

1. Introduction

One of the agreements reached at the meeting of the Club of Rome in 1968 about environmental problems, was that the behavior of human beings had to be guided and to achieve this task educational processes should be implemented (ZABALA E GARCIA, 2008). From this significant meeting, education takes a leading role to address the ecological crisis, and this has been considered as determinant for the transition to sustainable development as it has the power to enhance capabilities of people and transform their aspirations into realities concerning society (UNESCO, 2005).
This document describes a study aiming to understand the situation of Education for Sustainable Development in the city of Hermosillo, Sonora. The project was addressed in two ways: A survey was applied to local institutions and a case study was conducted to one of them in order to identify behaviors and beliefs of its faculty members under sustainability approach. After the literature review, the methodology, main results and final conclusions are presented.

2. Literature Review

2.1. Background on Education for Sustainable Development (ESD)

Depletion of soil and water resources, deforestation, increasing waste production, changes in the global climate system, unemployment, financial emergencies, social conflicts, and diminishing the quality of life of the population reflect in some way the current environmental crisis (MEZA AGUILAR, 1992; TERRON, 2000; CORRAL, 2010).

One way to face this crisis is through education, since, as stated in Chapter 36 of the Agenda 21 by the United Nations as a result of the UN Conference on Environment & Development,

“Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. [...] To be effective, environment and development education should deal with the dynamics of both the physical/biological and socio-economic environment and human (which may include spiritual) development, should be integrated in all disciplines, and should employ formal and non-formal methods and effective means of communication” (UN, 1992).

At this regard, one of the first statements on Environmental Education (EE) was proposed by Thomas Pritchard in 1948 (GONZÁLEZ, 1993), however, in 1972 the concept was raised at international levels during UN Conference on the Human Environment in Stockholm (ZABALA E GARCIA, 2008), where produced the establishment of the United Nations Environment Programme (UNEP) (ESCHENHAGEN, 2003; EDWARDS, 2005).
The concept of EE has been dynamic; initially it focused on issues such as conservation of natural resources and physical elements, while technological, socio-cultural, political and economic dimensions have been added gradually (ALEA, 2005). Furthermore, the concept of Education for Sustainable Development (ESD) seems to be less popularized than EE among many activists, educators, researchers and policy makers, particularly in developing countries (NOMURA, 2009).

Nevertheless, many ESD initiatives are aimed to change attitudes and values toward the natural environment; education must go further to be more effective by considering contextual and personal factors that may influence people behaviors, regardless they are consistent with expressed attitudes (ARBUTHNOTT, 2009). The fact that developing countries have shown environmental concerns has not been enough to trigger behaviors that are environmentally responsible, since, among other issues, there might be a gap between attitudes (a mental position with regard to a fact or state) and behaviors (the manner of conducting oneself) which lies in the feeling of hopelessness and incapability to turn the interest into actions (ALVAREZ SUÁREZ E VEGA MARCOTE, 2010; MERRIAM-WEBSTER, 2012). In this sense Corral and Pinheiro state that:

“The Sustainable Conduct would be indicated by the set of effective, deliberated and anticipated actions resulting in the preservation of natural resources, including the integrity of the plant and animal species, as well as individual and social well-being of current and future human generations” (CORRAL E PINHEIRO, 2004).

According to King (2009), another issue is that although education and training raise awareness of sustainable development, the sustainability of the systems of education and training themselves is sometimes neglected. In this sense, quality learning through provision of curriculum content, approaches to pedagogy, assessment frameworks and learning environments can provide individuals skills and knowledge to deal with
uncertainty and rapid environmental, economic and political change (BANGAY E BLUM, 2010). Therefore, educators and learners need to think deeply on their communities as well as reconsider elements that are creating conflicts between values and goals (KHATAYBEH, SUBBARINI, et al., 2010).

ESD may introduce new and innovative learning and teaching approaches (BARTH E RIECKMANN, 2012), education through a cross-disciplinary vision provides students with a broader social and ecological perception (FLINT, MCCARTER, et al., 2000). For instance, climate change is a very complex phenomenon which needs an interdisciplinary perspective to be addressed; and one of the factors playing a critical role in its response will be education in its broadest sense (BANGAY E BLUM, 2010).

The different disciplines that come into the ESD can generate a useful influence on students, their families, their teachers and the community at large by, for instance, having healthier students, improvement of their skills, absenteeism reduction, better morale, increased community support, increased faculty retention and a positive impact on the environment (HOFFMAN, 2009). But, to be more efficient on developing pro-environmental attitudes between students, education needs to include more experimental didactic strategies rather than having only the expositive methodologies as concluded Alvarez and Vega in one study (ALVAREZ SUÁREZ E VEGA MARCOTE, 2010).

Due to the necessities to strengthen worldwide education with the new sustainability paradigm, the General Assembly of the United Nations adopted in December 2002 a resolution to declare 2005-2014 as the UN Decade of Education for Sustainable Development (DESD). The objectives of this program are to encourage governments to consider measures to implement the DESD in their educational systems as well as in their strategic planning in national development (DIELEMAN E JUÁREZ, 2008; UNESCO, 2011).
For UNESCO, ESD is integrated by ten emerging fields, which provide a new multidimensional and multifaceted scope, consistent with the profiles of the modern times; this has been considered as a simple strategy, but effective. These fields are: poverty reduction, gender equity, health promotion, conservation and environmental protection, rural transformation, human rights, intercultural understanding and peace, sustainable production and consumption, cultural diversity, and Information and communications technology (GONZÁLEZ E ARIAS, 2009).

Finally, Curren (2009) suggests that an effective ESD implementation would be through teacher preparation and opportunities to collaborate. This author also provides the following recommendations to be considered into ESD:

1. respect children's right to know, think for themselves and live responsibly and well by their own lights. Respect teachers' professional judgment and provide them the opportunity to learn what they will need to know and acknowledgement for success in providing innovative instruction;
2. teach environmental studies more systematically;
3. integrate this with honest history and prehistory;
4. integrate economics with these environmental studies;
5. encourage resourcefulness, inventiveness, and adaptability;
6. encourage the enjoyment of environmentally friendly activities as a basis for flourishing lives;
7. de-commercialize schools;
8. teach critical thinking and enable children to distinguish the truth from propaganda;
9. encourage critical self-reflection and creative living through literature and the arts;
10. use collaborative, civic and project-based learning;
11. prepare children for global cooperation;
12. prepare everyone for a world with lower fertility rates and the prospect of fewer human beings.

2.2. Education under the Mexican context

Secondary education in Mexico is defined as the final stage of mandatory basic education, which consists of pre-school (3-5 year-old), primary (6-11 year-old) and secondary (12-15 year-old) (ZORRILLA, 2004). Currently, there are more than 6 million students studying secondary education and are distributed on 34,380 campuses (SEP, 2009). According to the Secretariat of Public Education (SEP), secondary school is aimed at ensuring adolescents acquire tools to learn throughout their lives, and satisfy different learning needs related to, among others, the capacity for reflection and analysis, and critical care for environment and health (SEP, 2006). Thus, for the government it is essential that basic education graduates:

“Understand the joint evolution and interaction of humans with nature, from a vision that allows them to be assumed as part of the environment, and appreciate the consequences of their activities at the local, national and global levels.

Understand that respectful behavior, responsible consumption and the joint participation contribute to maintaining or restoring balance in the environment, and promote their quality of life and future” (SEP, 2006).

The secondary technical education is one of the main forms of basic education in Mexico and is expected it provides elements of training for work; students graduate with a secondary school diploma, and also obtain a diploma of technical assistant in a particular specialty (PIECK GOCHICOA, 2005). Among its main objectives, the secondary technical education shall provide students the fundamentals that allow their pre-admission to work and link them with the reality of their region through productive activities (SEP, 1982).

González (1993) notes that in Mexico, conservation education dates back to the thirties, and the problem with this approach is not the protection of nature, but in what has
been called the extreme conservatism or intolerant conservatism that argues the importance of conservation in itself. Currently, the EE in Mexico is taught formally by the SEP (GONZÁLEZ, 1993), where local customs and cultures should be taken into account, as well as linking experiential situations or coordination of other sectors to promote activities for the environment (FUENTES, CALDERA, et al., 2007). One feature of EE in Mexico is that institutionally has been located within the environmental sector rather than within the education sector (BRAVO MERCADO, 2008).

In this context, Mexico subscribes into the commitment of the DESD on March 11, 2005, through the Secretariat of the Environment and Natural Resources (SEMARNAT) and SEP and is intended to build an educational process that, among other things, generate the attitudes and skills necessary to configure an informed social action, which affects the prevention and solution of the problems of each group, as well as contribute to the realization of sustainable development in the country (SEMARNAT E SEP, 2005).

Particularly, for the State of Sonora, within the SEMARNAT’s State Plans of Environmental Education, Training and Communication, EE should consider a set of universal values in the society-nature relationship conducive to building sustainable development, and every plan and project related to environmental education should be close to local (municipal or regional) realities, and give meaning to the work of environmental educators from a conceptual, theoretical, historical, and critical basis (SEMARNAT, 2005).

Finally, despite the many efforts, in 2009, researchers at the University of Sonora conducted a study to determine the situation on ESD in the city of Hermosillo, Sonora, in elementary schools at primary level which highlights that almost 70% of the surveyed institutions in the city do not have an environmental or sustainability education program incorporated into their curricula (ESQUER, et al., 2009). From the results of such study
arise the question of whether in schools of secondary level there is a strategy for ESD within the same city, which triggered the project described in this document.

3. Methodology

In Hermosillo, which is the capital city of Sonora and is located at northwestern Mexico, the University of Sonora (UNISON) through the postgraduate program of Sustainable Development Certificate conducted an exploratory study developed in two ways, within the scope of Education for Sustainable Development (ESD): a situational diagnosis and a case study.

3.1. Situational Diagnosis

Firstly, a situational diagnosis was conducted for better understanding of the current general conditions of ESD in secondary technical schools, which are considered into basic level education. In March 2011, a list of registered institutions on the official website of the Sonora's Secretariat of Education and Culture (SEC, 2011) was obtained, with a total of 64 schools within the urban area of the city, of which 10 schools were considered as technical level. A survey on environmental and sustainability programs in basic education adapted from Esquer et al. (2009) was applied to all of these technical education institutions and data were analyzed with SPSS 15 (IBM, 2006).

3.2. Case Study

For the Case Study, an intervention was conducted into a particular secondary technical school through a Program on Education for Sustainable Development, faculty-oriented. The director of that institution showed high interest in taking part of the study and a cooperation agreement between the UNISON and the participant school was signed. The intervention consisted mainly in a workshop directed to the faculty from October to December 2011, which included a pre-test, training, and a post-test. Both tests are based on
the following instruments: The General Measure of Ecological Behavior and The New Environmental Paradigm (NEP) Scale.

The General Measure of Ecological Behavior, by Kaiser (1998), aims to measure the behavior of the individual with effects either pro-ecologic or with negative environmental impacts (CORRAL, 2010). For the purpose of this study, a short version (see Table 1) was used and it consists of 16 statements, based on conducts, intended to measure their frequency of occurrence through a Likert scale of 4 options that include the following range of responses: "never," "almost never," "almost always," and "always".

Table 1. Statements of the short version of the General Measure of Ecological Behavior by Kaiser.

<table>
<thead>
<tr>
<th>Statement</th>
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<tbody>
<tr>
<td>S1. – I wait until I have a full load before doing my laundry.</td>
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<tr>
<td>S2. – I usually drive on freeways at speeds under 100 kph.</td>
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<tr>
<td>S3. – I collect and recycle used paper.</td>
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<tr>
<td>S4. – I bring empty bottles to a recycling bin.</td>
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<td>S5. – In the past, I have pointed out to someone his or her un-ecological behavior.</td>
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<tr>
<td>S6. – I buy prepared foods. *</td>
<td></td>
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<tr>
<td>S7. – I buy products in packaging that can be reused.</td>
<td></td>
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<tr>
<td>S8. – I buy seasonal products (fruits and vegetables).</td>
<td></td>
</tr>
<tr>
<td>S9. – I use clothes dryer (electric or gas). *</td>
<td></td>
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<tr>
<td>S10. – I read about environmental issues.</td>
<td></td>
</tr>
<tr>
<td>S11. – I often talk with friends about problems related to the environment.</td>
<td></td>
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<tr>
<td>S12. – I use chemical insecticide. *</td>
<td></td>
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<tr>
<td>S13. – In summer, I turn off the air conditioning when leaving my home for more than four hours.</td>
<td></td>
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<tr>
<td>S14. – I seek ways to reuse things.</td>
<td></td>
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<tr>
<td>S15. – I encourage my friends and family to recycle.</td>
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<tr>
<td>S16. – I save gasoline by walking or riding a bike.</td>
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</table>

* Negatively formulated items

Source: (KAISER, 1998; CORRAL, 2010).

The New Environmental Paradigm (NEP) Scale, by Dunlap et al. (2000), aims to identify the environmental belief system and consists of 15 items (see Table 2) covering exhaustively the various facets of a more ecological world (CORRAL, 2010). A Likert
scale of 5 options is used and includes the following range of responses: "strongly agree," "moderately agree," "indifferent," "moderately disagree" and "strongly disagree".

Table 2. Statements of the New Environmental Paradigm (NEP) Scale, by Dunlap et al.

<table>
<thead>
<tr>
<th>Statement</th>
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<tr>
<td>S1. We are approaching the limit of the number of people the earth can support.</td>
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<tr>
<td>S2. Humans have the right to modify the natural environment to suit their needs. *</td>
<td></td>
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<tr>
<td>S3. When humans interfere with nature it often produces disastrous consequences.</td>
<td></td>
</tr>
<tr>
<td>S4. Human ingenuity will insure that we do not make the earth unlivable. *</td>
<td></td>
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<tr>
<td>S5. Humans are severely abusing the environment.</td>
<td></td>
</tr>
<tr>
<td>S6. The earth has plenty of natural resources if we just learn how to develop them. *</td>
<td></td>
</tr>
<tr>
<td>S7. Plants and animals have as much right as humans to exist.</td>
<td></td>
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<tr>
<td>S8. The balance of nature is strong enough to cope with the impacts of modern industrial nations. *</td>
<td></td>
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<tr>
<td>S9. Despite our special abilities humans are still subject to the laws of nature.</td>
<td></td>
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<tr>
<td>S10. The so-called “ecological crisis” facing humankind has been greatly exaggerated. *</td>
<td></td>
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<tr>
<td>S11. The earth is like a spaceship with very limited room and resources.</td>
<td></td>
</tr>
<tr>
<td>S12. Humans were meant to rule over the rest of nature. *</td>
<td></td>
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<tr>
<td>S13. The balance of nature is very delicate and easily upset.</td>
<td></td>
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<tr>
<td>S14. Humans will eventually learn enough about how nature works to be able to control it. *</td>
<td></td>
</tr>
<tr>
<td>S15. If things continue on their present course, we will soon experience a major ecological catastrophe. *</td>
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* Negatively formulated items: disagreement with the seven even-numbered items indicate pro-NEP responses.

Source: (DUNLAP, VAN LIERE et al., 2000; CORRAL, 2010).

4. Results and Discussion

In congruence to the methodology, in the first place the results of the situational diagnosis are presented followed by the ones on the case study. Due to limitation of space, only the most relevant findings are described along this section.

4.1. Situational Diagnosis

Below are the results of the 10 secondary technical schools surveyed. It is noteworthy that those who responded to the surveys were mostly the directors of the institutions or teachers responsible for science subjects. The outcomes are grouped into three categories: general sustainability issues, environmental and/or sustainability programs, and general health risk issues.
Regarding to general sustainability issues, Figure 1 illustrates that all the respondents are familiar with the term of sustainability or sustainable development but only 60% of them know the adoption of the Decade for Education for Sustainable Development (DESD) declared by UNESCO for the period 2005-2014, which is nearly to become finished. This happens despite the fact that the Mexican agenda had a formal commitment by government agencies to promote this type of education, which apparently has not been effectively disseminated at least in Secondary Technical Schools at Hermosillo.

![General sustainability issues](source)

Q1. Interviewees have heard about the terms of "sustainability" or "sustainable development".
Q2. Interviewees are aware that UNESCO has declared the UN Decade of Education for Sustainable Development (2005-2014).

For the sustainability programs, as shown in Figure 2, all the participants say they have food safety initiatives, 70% reported having programs for reforestation and for recycling or reuse of paper. 60% of schools noted that they have implemented programs of
efficient use of water and for recycling or reuse of plastic. At this point, it is important to emphasize that the city of Hermosillo is located in a desert region with increasing problems of water supply (REZA, 2010), thus that actions in this regard would be assumed at highest priorities, and conversely, according to the results, it does not appear to be in this way. In addition, 50% of the respondents say they have an occupational health program while only 30% have one for efficient use of electricity. Half of the institutions claim to have defined formally their programs, where some of the activities involved come from individuals or isolated initiatives by teachers interested on caring about sustainability and promoting this culture to children and adolescents.

Figure 2. Environmental and/or sustainability programs.
Source: Designed by the authors.
Concerning on general health risk issues, Figure 3 reveals that mostly of the institutions, 90%, have fire extinguishers and first aid kits, 70% have reunion places for emergencies, and 50% have a special place for hazardous substances. In contrast, only 30% of them have a mechanism to promote proper handling of hazardous substances, and almost none of them, 20%, have fire hydrants, have conducted simulation exercises for civil protection, or have been visited by the fire department or by civil protection agencies.

Figure 3. General health risk issues.
Source: Designed by the authors.

4.2. Case Study
The case study was conducted in a technical secondary school of Hermosillo, located at the northern center of the city. It has 138 workers including teachers, administrative staff, and janitors; as well as 1,700 students in two shifts. A working group with 11 professors of different subjects was arranged since they had a good will to participate in the project.

4.2.1. The pre-test

During the first working session with the participant faculty, on October 28, 2011, preliminary issues were addressed and the purpose of the workshop on Education for Sustainable Development (ESD) was that professors might have the knowledge and tools to develop and implement more sustainable activities in the school.

In the same session, a pre-test based on both the General Measure of Ecological Behavior and the New Environmental Paradigm Scale was applied to the eleven (11) participants. The results of the two instruments were obtained by the classification of these with the process of additive scale (Hernández Sampieri, Fernández Collado et al., 2010), where the values obtained for each phrase are summed up, generating a specific weight for each of these. The result is averaged with the number of workshop participants. The results for each of the instruments are showed below.

a) Identification of pro-ecologic behaviors in pre-test (Figure 4).

The graph shows the scores obtained for General Measure of Ecological Behavior, it include the statements, where the closer to "always", the more positive impact on the environment has; except for the negatively formulated items, where the closer to "never", the more positive impact on the environment has; therefore, they are presented separately on the same figure.
The five statements with largest scores are S13, which refers to turning off the air conditioning when leaving home for more than four hours; S8 on buying seasonal products (fruits and vegetables); S1 on waiting until having a full load before doing laundry; S14 on seeking ways to reuse things; and S4 on bringing empty bottles to a recycling bin. Regarding to negatively formulated items, the behaviors having negative impact with score closer to “never” were S9 on using clothes dryer (electric or gas) and S12 on using chemical insecticide, followed by S6 on buying prepared foods.

![Graph showing outcomes from pre-test on General Measure of Ecological Behavior.](image)

Figure 4. Outcomes from pre-test on General Measure of Ecological Behavior.
Source: Designed by the authors.
Note: Negatively formulated items have been placed on the right side.

**b) Identification of beliefs in pre-test (Figure 5).**

The five higher scores for the New Environmental Paradigm (NEP) Scale closer to “strongly agree” correspond to the statements S15 on “if things continue on their present course, we will soon experience a major ecological catastrophe;” S5 on “Humans are severely abusing the environment;” S9 on “Despite our special abilities humans are still subject to the laws of nature;” S7 on “Plants and animals have as much right as humans to
exist;” and S3 on “When humans interfere with nature it often produces disastrous consequences”.

Regarding to negatively formulated items, the five statements referring the negative impact with score closer to “never”, indicating pro-NEP beliefs, were S12 on “Humans were meant to rule over the rest of nature;” S8 on “The balance of nature is strong enough to cope with the impacts of modern industrial nations;” S2 on “Humans have the right to modify the natural environment to suit their needs;” S4 on “Human ingenuity will insure that we do not make the earth unlivable;” and S10 on “The so-called “ecological crisis” facing humankind has been greatly exaggerated”.

Figure 5. Outcomes from pre-test on New Ecological Paradigm. 
Source: Designed by the authors. 
Note: Negatively formulated items have been placed on the right side. 

### 4.2.2. The Workshop
Based on the results of the pre-test applied to professors during the first session, a workshop on Education for Sustainable Development (ESD) was designed. The sessions were once a week and during the training, some of the issues addressed were background of sustainable development, the Decade for Education for Sustainable Development (DESD), climate change and other environmental problems, culture of recycling, and occupational health and safety.

In addition, environmental-related risks within the institution were identified from the direct reference of the workshop participants according to their own perception. For instance, on water, the school has water dispenser for students, a recurring problem is that they broke the faucets having water spills as a consequence; also water tanks and cisterns sometimes are damaged. On energy, the hallways have lamps installed always turned on since they were connected along with the classrooms power supply, therefore these are activated more than 15 hours per day. Sometimes professors leave the classrooms without turning off the lights or they keep the doors open when the air conditioning is running. On non-hazardous waste, students generate a lot of garbage including mainly paper and water or juice bottles. On hazardous waste, some of the substances found in school laboratories are already outdated, unidentified, or contained inappropriately.

The performance of teachers was participative and enthusiastic, proposing ideas and opinions from the beginning of the workshop, always sought to transfer the information received to the school context, for their classes and the school community at large. Since the first sessions of the workshop, professors started to apply some elements on ESD in their classes. Some of them are the following: teachers ask written homework printed on both sides of the paper; they also motivate their students to limit buying water bottles by taking one for the entire week and re-fill them in their home; some of the workshop participants have placed containers for collecting paper and plastic in some classrooms.
where they teach classes and have teams of students responsible for each of them; teachers and students are committed to watch the proper use of air conditioning equipment and lighting of the classrooms; they also proposed to collect used notebooks with clean sheets, pencils, pens, colors and backpacks for donation to needy children.

4.2.3. The post-test

In order to evaluate the impact of the training, at the last session, on December 8, 2011, a post-test consisting of the two instruments described before was applied to eight (8) professors who completed the workshop, compared to the eleven who started it. The results for each of the instruments are showed below.

a) Identification of pro-ecologic behaviors in post-test (Figure 6).

According to the same idea than the pre-test for General Measure of Ecological Behavior, the order of the first three statements with largest scores are the same as the pre-test, followed by S4 on bringing empty bottles to a recycling bin; and S15 on encouraging friends and family to recycle. Regarding to negatively formulated items, the order of behaviors having negative impact with score closer to “never” were exactly the same as the pre-test.

Although the order of the statements did not suffer a radical change, the general specific weights showed that all of the faculty responses are now more intense towards a more ecological behavior in all the cases, either closer to “always” or, for negatively formulated items, closer to “never.”
Figure 6. Outcomes from post-test compared to pre-test on General Measure of Ecological Behavior. Source: Designed by the authors. Note: Negatively formulated items have been placed on the right side.

b) Identification of beliefs in post-test (Figure 7).

The first two and the fifth higher scores for the New Environmental Paradigm (NEP) Scale closer to “strongly agree” are the same statements as the pre-test, the third and fourth are now S7 on “Plants and animals have as much right as humans to exist;” and S3 on “When humans interfere with nature it often produces disastrous consequences”.

For the negatively formulated items, the five statements referring the negative impact with score closer to “strongly disagree”, indicating pro-NEP beliefs, are S8 on “The balance of nature is strong enough to cope with the impacts of modern industrial nations”; S10 on “The so-called “ecological crisis” facing humankind has been greatly exaggerated”; S12 on “Humans were meant to rule over the rest of nature”; S2 on “Humans have the right to modify the natural environment to suit their needs”; and S4 on “Human ingenuity will insure that we do not make the earth unlivable”.

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In contrast to the General Measure of Ecological Behavior, the changes on the NEP Scale were not as notorious. The general specific weights showed that most of the faculty responses are now more intense towards a more ecological behavior in all the cases, with the exception of S9, S11, S2, S4, and S14, which decreased towards less environmentally oriented.

Positive changes from pre-test to post-test for the General Measure of Ecological Behavior can be assumed as a result of the training provided to professors; however, this is not as clear for the New Environmental Paradigm (NEP) Scale, where the results vary not uniformly.

![Graph showing changes in specific weights from pre-test to post-test for the NEP Scale.](Figure 7. Outcomes from post-test compared to pre-test on New Ecological Paradigm. Source: Designed by the authors. Note: Negatively formulated items have been placed on the right side.)

**5. Conclusions**

The Decade for Education in Sustainable Development (DESD) is about to end and the actions for fulfilling its goals in basic level schools have not been that evident, at least
in secondary technical schools in the city of Hermosillo. In one hand, the Situational Diagnosis shows that most secondary technical schools of the city are aware on general sustainability issues; particularly on DESD; regarding to environmental and/or sustainability programs, at least 70% of schools have initiatives mainly on food safety, reforestation, and paper recycling or reuse; 60% or less of them have initiatives on efficient use of water, plastic recycling or reuse, and occupational health; and only 30% have programs on efficient use of electricity. As for health risk issues, at least 70% of schools have fire extinguishers, first aid kits, and reunion places for emergencies; only 50% or less of them have fire extinguishers, and a special place to store dangerous substances; and hardly 30% or less have a mechanism to promote proper handling of hazardous substances, fire hydrants, simulation exercises for civil protection, or have received visits by representatives of civil protection.

On the other hand, the case study shows that, through training for professors on the school, the outcomes from on General Measure of Ecological Behavior have an improvement on their pro-ecologic behavior in practically all the items. This does not necessarily happened with the New Environmental Paradigm (NEP) Scale, where the results show that environmental beliefs of the participants did not have significant changes in most items.

While the whole study shows that many of these institutions have some environmental or sustainability programs, this does not necessarily reflect a systemic and formal method that could enhance the multiple benefits of integrating the different areas of sustainability, such as the environment, society and economy. Finally, these programs offer useful tools to promote early behaviors and skills to awaken consciences for being more sensitive to the complex situation of the community of Hermosillo.

“Education should prepare children for the risks and challenges associated with
the fact that the unsustainable trajectory of human existence will in one way or another be reconciled with Earth’s limited capacity to sustain life” (CURREN, 2009).

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