

Greening in Secondary Education: Guidelines to Consider in a Curriculum Reform

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Abstract: The present exploratory descriptive study refers to the experience of curricular greening in an urban secondary school, an academic initiative that responded to the need to cover with the policies decided by the federal educational authority; it was framed in the Educational Reform (RE) of the Ministry of Public Education [SEP], decreed for Basic Education (BE); however, it was not considered by the Nuevo León educational authorities as a viable alternative for educational innovation, even though it constitutes a contribution to the development of knowledge and practice in this field of study. This project emphasizes the challenges and opportunities of environmental education in teachers, as well as the attitudes and perceptions that motivated the development of critical judgment and creativity of students, among others, their training spaces and school practices that are interrelated and contributed to the development of the students. It is relevant to give continuity to the interinstitutional effort to strengthen environmental transversality in educational programs, that contributes to the analysis, reflection and attention to school problems, trying to support an academic reform based on educational innovation. Therefore, its main contributions represent the impact on a deep knowledge of the reality that is lived in our educational system, its needs and challenges to generate alternative proposals that promote the collective solution of benefits in the school community

Key words: environmental education, teacher training, school curriculum

1. Introduction

Global environmental changes are currently taking place with severe effects on the well-being and security of the world population. In the challenge that society faces to achieve a sustainable world, the education sector has to participate with effective responses to the current interdependent processes of environmental and social change. In this sense, BE teachers face the challenge of tackling complex school processes: educational reforms that are not academic but that are advertised as such, limited school programs, as well as the need to promote content that responds to various social contexts, always accompanied of a demand for environmental teacher training implemented by

professionals in the field, a situation that rarely occurs, and when it happens, it is not always relevant.

In Mexico, the educational reforms in BE implemented by the SEP have been enriched with the presence of environmental content with a holistic approach, just in theory, but unfortunately actual practices in BE do not correspond to that perspective. In the 2016 Educational Reform the learning promoted in its Educational Model (EM), was related to personal and social development, including: intellectual openness, self-knowledge, teamwork, collaboration and sense of responsibility, typical of Environmental Education [1].

In this context, during three school cycles (2016-2019), a Sustainable Community was developed in Technical Secondary 48, a public institution located in the municipality of San Nicolás de los Garza, Nuevo León. It was an inter-institutional and inter-sectoral initiative coordinated by the IIIEPE with the purpose of

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incorporating the EES (Environmental Education for Sustainability) in a transversal way in the curriculum, which prioritized the identification of its reality and potential in secondary education.

2. Secondary Education in Curriculum Reform

In Mexico, basic education comprises preschool, primary and secondary levels - according to its service and support — in four types: federal, state, private and autonomous. They offer the service for the general public, Indigenous and Community modalities, Technical, Telesecundaria, as well as courses aimed to adults.

Secondary Education in Mexico - from 1993 - shows important variations in the size of its schools due to the number of students they receive. An example of this is presented in the Technical modality, in which, in 3 out of 4 secondary schools, attend more than 200 students [2]. In the case of the participating institution in this project, it is important to mention that, during the present study, it maintained a student population of over 300 students, with two or more groups of students per grade.

Secondary education with its curricular and pedagogical proposal, was born in the 19th century [3]. The Technical Secondary Schools, created in 1958, conceive a conceptual curriculum model of technological culture, whose six axes are the components that respond to the subject called technology; In this case study, the following technology areas were selected: Computing, Textile Industry, Crafts and Toy Making, Computer Lab and Air Conditioning and Refrigeration, related to the urban context where the school is located and with the environmental dimension addressed in these school programs.

At the start of the 2016-2017 school year, the SEP started in Nuevo León the implementation of the EM; for secondary education, six cases were integrated to the new model, and for the following cycle, it was

applied in all schools. It is noteworthy that even though the federal educational authority considered the training and improvement of teachers to ensure student learning and emphasized their vital performance to achieve educational purposes, the entity hardly paid attention to this part so substantial to improve the quality of education.

3. Environmental Education and the Curriculum

Environmental Education for Sustainability, as a process focused on solving specific environmental problems, is aimed at training children, youth and adults as participative and committed citizens through the development of educational programs surrounded by knowledge and values of respect, in addition to an adequate pedagogical practice to strengthen the current curriculum; for this reason, this subject is relevant for learning to make decisions in favor of a balance and integration between human beings and their environment.

In its development, the EES considers the areas related to the economy, society, biodiversity, cultures and present and future well-being, at a personal, community and social levels; at the local, national and international scales. Furthermore, it takes into account ethical, social, political, economic and ecological elements that are considered the most appropriate option to generate alternatives that promote new orientations in school practices with curricular proposals that contribute to the formation of attitudes and values. towards the environment, which require the organization of the school system to be linked to the educational opportunities for the students. The diversity of training represents the challenge to promote environmental culture in the school community that favors interdisciplinarity in the curriculum, as well as the integration of pedagogical practices and professional development that lead to the implementation of sustainable practices that contribute to the improvement of the environment.

In the Sustainable Community, two relevant elements that evolved stood out: the reconceptualization of the environmental dimension applied to pedagogical practices and an alternative for its mainstreaming in school secondary education programs. Existing initiatives and academic needs were identified and understood. Also, contextualized viable methodologies that took advantage of teaching knowledge and experiences were applied, in addition, environmental training was provided, among others.

4. Identification of Initiatives and Needs

The integration of this proposal into the school curriculum represents an interdisciplinary axis of articulation that favors pedagogical innovation and teacher-student interaction in learning academic content through environmental content. In the opinion of specialists, it is necessary that the academic knowledge changes to transform it into another one with greater interaction and collaboration based on the entire community [4].

In Technique School 48, a participatory process was carried out when planning a Sustainable Community. Firstly, their initiatives and needs were identified (administrative management, executive leadership, and academic practices, among others). In the analysis period, the population was made up of 29 teachers with a variation of less than one in the third cycle, while the number of students had a decrease of 15% in the same period.

To generate initiatives, an approach to school practices was made, through documentary analysis, observation, interviews and questionnaires.

Documentary analysis [5] was performed to search, select, organize and analyze the conceptual references of the secondary education curriculum and to process the data, specifically in EES content. Likewise, possible gaps were found in the basic theoretical-conceptual conceptions, considered key axes to address in the generation of action strategies.

Observation was the most important procedure throughout the study period. Allusions to participation and individual work, their ability to reflect, their team and group work were extracted from the record of notes on educational practices. The importance lays in the hierarchy, purification and selection of aspects related to the subject of this study.

A semi-structured interview was carried out with directors and with some teachers. It was applied during the development of some activities in which they expressed verbal opinions.

The questionnaire [6] was the appropriate technique for obtaining data from the projects generated within the Sustainable Community. An opinions and attitudes scale was used to analyze what the participants really felt and judged, using five closed instruments which were applied in different periods, two of them are described for this work.

The first was applied at the beginning of the 2016-2017 school year to have an approach with the total of 29 participants; to identify the conceptions of the teachers participating in this program that would allow them to adapt to the characteristics, conditions and needs of the school context and to study their progress in responsible behavior towards the environment. There were 5 open-ended questions to try to infer ideas that would explain their vision of EES issues. From the answers provided, the second instrument was divided into 6 sections: the first 5 with 11 items and the last with 9, to assess their knowledge about educational programs and their participation in the actions of this curriculum proposal. Likewise, the aspects of subject programs and pedagogical practice were considered, as well as the link with the Sustainable Community.

5. Knowledge and Teaching Experiences

If it is stated that a professional is in a social, work and educational context, this professional necessarily requires specific training in various capacities and

work situations so he can perform his task in a suitable way [7].

In the case of teachers, they require training in environmental education, which implies the critical and selective appropriation of information, it means knowing what you want and how to take advantage of this knowledge in solving contextual problems. Thus, vocational training must be fully identified in this process [8].

For this reason, it was crucial to identify the contextualization of school practices, since an initial and important information on what the most widespread lines of thought around EES are, is crucial when theorists of this subject design or carry out the specific tasks, based on, among other issues, an adequate characterization of this situated problem [9].

The characteristics and important features of the environmental component in the curriculum were a concrete basis to analyze its contextual agreement with the source of spontaneous opinions, which according to Pérez-Serrano (2007, p. 5) [10] “were basic to present the characteristics observed in school practice” and besides the words and thoughts presented during unstructured interviews with managers, allowed us to record situations, frames of reference and those events without detaching them from the reality in which they take place.

When analyzing the data obtained from the questionnaires, emphasis was placed on issues related to the attitudes, perceptions, opportunities and challenges of EES in teachers, which motivated the development of critical judgment and creativity of students, among others, their spaces for professional development and school practices.

With the first instrument, analysis units were sought with the teaching community to collect data on the subject of study: knowledge about the terms Environmental Education, Ecology, Sustainable Development and the priority environmental problem to be addressed in Nuevo León.

In this matter, it is important to highlight that the majority of the respondents had high expectations related to obtaining strategies to take care of the environment.

When doing a survey on their academic profile, it was found that 16 teachers had as their main area of study, the Educational Sciences or something related. It is worth mentioning that the remaining 11 had majors related to Agronomy, Computer Science, Informatics, Law, Mechanics, and Sports Organization.

In this context, it was surprising to observe that in pedagogical practice, the students’ choice to approach conflict situations and to solve them was manifested, and teachers then made the student see the insufficiencies of their own conceptions. In this framework, they coincide with Ref. [11] in the approach of teaching through cognitive conflict. This coincided with their stated responses, around two groups of terms: awareness/reflection/understanding and teaching/learning/knowledge, and as the biggest environmental problem they identify in the town, air pollution stands out, a situation that reflects reality current.

To the teachers participating in this program, the 5 item questionnaire was presented was presented with the 5 item quantity, using an attitude scale, on Environmental Education, sustainable development and their teaching practice, in which they were presented with statements to select three that would answer each of the questions, considering a scale from 1 to 3, where 1 is the highest rated and 3 with the lowest value.

Thus, regarding the definition of environmental education (Fig. 1), there was a preference in three: teaching of environmental values (42%), protection of the environment (33%) and formation of environmental culture (25%).

On the conception of Ecology, all placed the interrelationships of living beings with their environment or living beings with ecosystems. Regarding the approach they have with the term

Sustainable Development, 100% of the participants referred only to the adequate use of resources.

Likewise, the approach analyzed in the second instrument, was applied to 22 teachers and was divided into 6 sections: 5 with 11 items and the last with 9. Their objective was to assess their knowledge of educational programs and participation in the actions of EES curriculum.

From its application, the direct observation of school practices and the approach maintained with the participants in this study, some needs for environmental training were appreciated. Below are some of the answers about academic aspects in the development of school programs and their pedagogical practice.

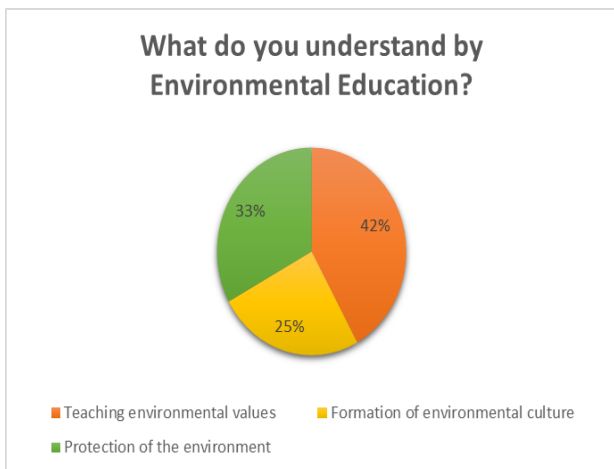


Fig. 1 What do you understand by environmental education?

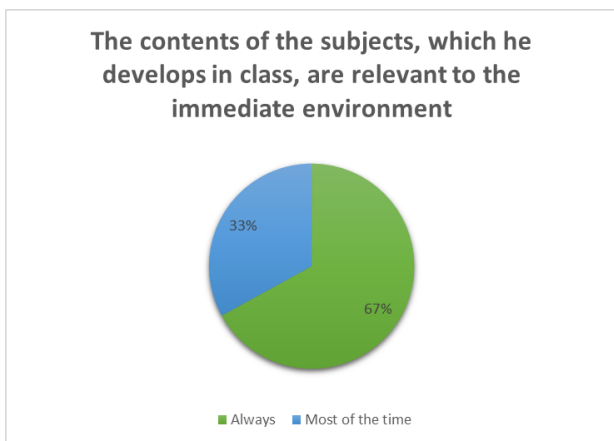


Fig. 2 67% of the thematic contents developed in class are always relevant to the immediate environment, while 33% answered that they are almost always relevant.

Same situation that coincided with the practice of the institution, where they expressed the existence of projects: always, 72%; almost always, 11%; sometimes 17% (Fig. 3). It was also significant that teachers recognized environmental issues in their subjects always, 55%; almost always 39%; sometimes 6% (Fig. 4).

Regarding the above, the respondents revealed their professional knowledge by showing a complete understanding of the content of the subjects they teach and their teaching. Likewise, they agreed on the environmental issues present in the following programs of the three grades (Fig. 5).

The documentary analysis of the school programs corroborated that the subjects above indicated,

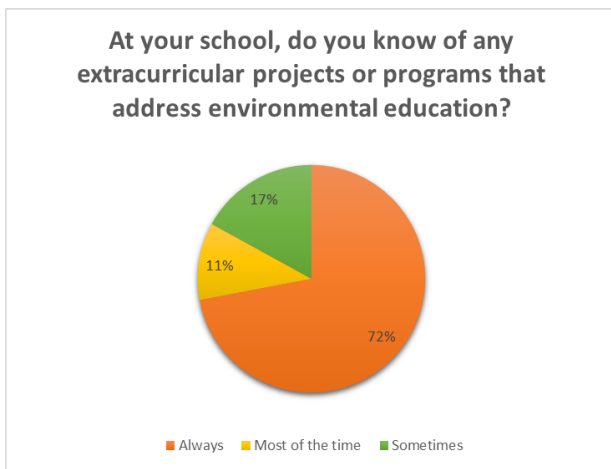


Fig. 3 Do you know of any extracurricular projects or programs that address environmental education.

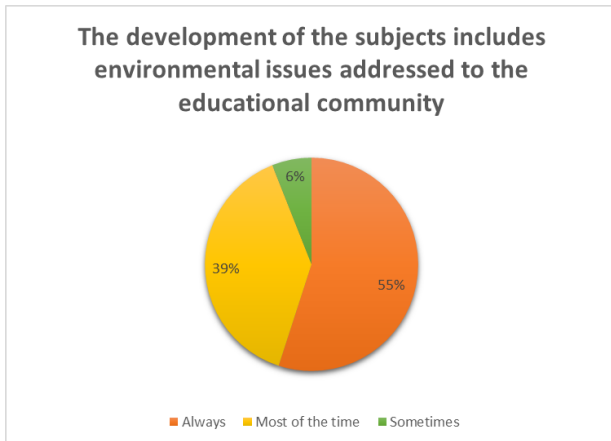


Fig. 4 The development of the subjects includes environmental issues addressed to the educational community.

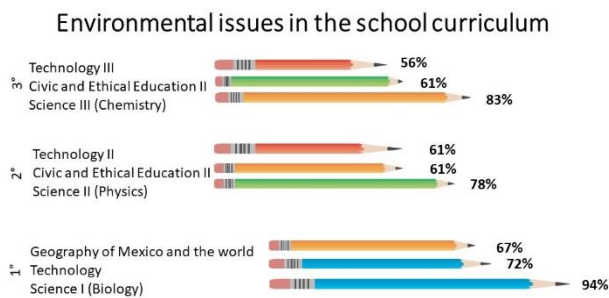


Fig. 5 Environmental issues in the school curriculum.

corresponded to what was expressed by the majority of the participants; Thus, they stated that in the first school year, the Sustainable Community favored the participation of the school community in addressing environmental problems to improve the environment, since 76% answered always, while 24% almost always. There was a total coincidence when stating that for this, its implementation required interdisciplinary work.

In this context, the declaration on the viability of the program was important, since 89% of the respondents agreed on the consistency of its purpose towards the strengthening of attitudes and values. Furthermore, according to their answers: always, 89% and almost always, 11%, promotes learning of a transversal nature, identifiable in the programs of one or more subjects.

When asked about the impact of the Sustainable Community with its subject programs, they were exactly accurate in their responses. In this way, it is mentioned that the information collected allowed to approach the teaching experience in the educational service and professional training, among others. Although the surveyed population stated that they generally know environmental problems and environmental issues in school programs. In practice it was possible to appreciate that there is more information on extracurricular activities, such as the planting of small trees and the recovery of recyclable materials, and less on energy and biodiversity.

In this sense, it was essential to start from what they think and do in their pedagogical practices. Therefore, the expectations, practices and ideas, positions and their points of view, which give meaning to the teaching process of environmental education, were

considered, which led to assessing the importance of the coexistence of learning and teaching, the culture of the context and the development of the capacity of interaction of each person with the rest of the group, with their peers and with the community that frames education.

6. The Importance of Environmental Teacher Training

Currently, changes in the forms of social organization, the complexity of knowledge and the environmental situation have prompted new requirements in formal education. In the context of BE school practices, teachers, as explained [12], face real challenges to meet the demand for a specialized service to implement critical, open and contextualized curricula in teaching practice, transformers of reality.

One of the teaching challenges is tackling different school problems, as well as strengthening various skills, according to the current contexts in which they carry out their professional practice. This task becomes more complex in secondary education, because in addition to possessing the set of knowledge specific to the subject, a teacher must understand the approaches of the curriculum, his profession and himself, as well as the knowledge of the modern adolescent profile.

In addition, the challenges are related to the modalities that teachers assume in the teaching and learning processes to make their pedagogical practice more efficient and other aspects related to curricular planning, the elaboration of didactic materials, as well as the optimization of resources to raise the quality of his own professional development.

In this framework, environmental teacher training is considered relevant. It is considered as the updating process that favors professional improvement, including the academic and personal aspects of the participants, to project a school that supports educational processes for social coexistence, the exercise of autonomy and freedom. Responsible social and environmental participation implies assuming a

profound process of cultural transformation [13].

In the 2021 Educational Goals, the strengthening of the teaching profession is promoted, pointing out the need to ensure the acquisition of the basic skills that they will need to carry out their work because society requires good teachers, whose professional practice seeks professional standards of quality [14].

In this sense, the teaching function demands a systemic approach that is still a pending task in Mexico, and has been reflected in various academic forums and documents [15]. For this reason, its anchoring in any curricular reform is a priority, since it plays a fundamental role in the comprehensive training of secondary education teachers.

It should be noted that an area of significant opportunity in Technique School # 48 was represented by the teachers' employment situation: during the 2016-2017 school year, the total was 29 teachers, and only 5 of them had full-time positions. And it is that, as in many local schools, contract teachers work through a written agreement to establish the obligations and services agreed between the contracting work center and the service provider. In the Sustainable Community, 24 teachers were in this situation, it remained almost the same in the following two cycles. This common scenario of the educational system, where the granting of teaching positions predominates due to its bureaucratic criteria over the professional profile to perform the academic function, weakened school practices, the planning and the programmed sequence of teaching and learning processes; although it was very valuable in the professional development provided in short courses in which they manifested the gradual and progressive construction of a conscious and balanced vision of the human-nature relationship.

7. The Development of Pedagogical Practices

This section describes some of the findings of the Sustainable Community during the process, in which great importance was given to the reality of teaching practices in a flexible way, as it is lived and perceived,

where models of behavior and cultural and social phenomena were susceptible to the description.

In order to promote a change in the forms of action of teachers in relation to environmental education, it was pertinent to consider two important aspects: the basic characteristics of their professional profile and their managerial leadership. The experience of both cases formed a solid basis for their role. At the beginning of the 2016-2017 school year it was considered that the variety of their professions (not all of them had teacher's education) would be an area of opportunity, in addition to the assumption that they were unexperienced in pedagogical knowledge. This situation was soon dismissed as it represented a strength for the development of the initiatives undertaken.

This was reflected in the development of the activities assumed in two approaches [16]:

- As a complementary activity. These were activities that apparently were outside the school programs, based on the volunteerism of the coordinators. (This option is uncertain)
- As a continuous punctual activity. During a certain time (a two-month period), in the different subjects of the curriculum, they addressed the environmental theme with the Monarch butterfly as their learning object, which interested the students and favored educational resources.

With the programmed activities, it was sought that the students obtain a perception of reality, seeking interdisciplinarity through the development of skills that allow the performance of environmental projects and their possible modification and transfer to various contexts, going beyond the memorization of information.

According to the specialists, when principals, as part of their functions, carry out pedagogical practices together, they favor a positive impact on learning. This experience, as well as collaborative work, was substantial in involving teachers in decision making,

expression of opinions and commitment to democratically reached decisions.

The *sui generis* situation in the school practice of the town stands out: through the planning of directive strategies, extraordinary meetings of the Technical Council were designed and carried out, while the students developed activities coordinated by specialists and heads of civil and governmental organizations that collaborated throughout the intervention process.

In this way, the design of the short EES workshops sought to integrate the values and principles of sustainability in learning environments and to analyze the possibilities of its curricular transversality, the development of which was provided by teachers, placing the experience in the learning community's framework, as spaces that promote reflective practice.

Some of the advantages of a Sustainable Community were mainly expressed in the following practices:

- Didactic Planning. One of the teaching tasks is the periodic planning in which the didactic activities for the expected learning or programmatic content were arranged, according to their subject and with the transversal approach of environmental Education in their daily practice.
- Intra-teaching bonding. - The surveyed teachers recognized the importance of the interrelation among the subjects, since it improves critical intent, theoretical and practical anchorage in students. On the other hand, more than half considered that the environmental thematic contents promote teamwork, also stating that these topics can be identified in any subject through their explanation and pragmatism. However, in practice only 17% acknowledged collaborating with other colleagues in the selection of student content and activities.
- Intersectoral linkage. Some claimed to encourage their students to develop academic initiatives, however, and despite the fact that more than half considered that the developed projects had the possibility of being applied in everyday life, collaboration with professionals from various fields, found ignorance of the environmental services offered by government agencies.
- Evaluation. The majority of the participants assured that their pedagogical practice fosters cooperative learning, reflection and the evaluation of error in the students through the use of evaluation strategies directed towards feedback, which they consider should be objective, positive and constructive. In relation to this, the teachers shared that after reviewing a task, they explained to their students how to solve the mistakes made, considering that dialog is substantial to agree on their needs and support them in learning, as well as to strengthen their self-esteem.
- Reflection. During the short workshops, and after answering one of the questionnaires, the majority rediscovered that in their pedagogical practices they developed principles of environmental education, without first having distinguished that some conceptions were applied in their daily school life.
- Active role of the students. They demonstrated, during the progress of school environmental projects, the potential that reflection, active participation, individually and collectively, as well as the proposed approach to the dilemmas presented in the practices, represent a sample understanding of their environment and participation in public life.

In terms of prospective, it is appropriate to point out in the development of the Sustainable Community strategies, some of the weaknesses located mainly in school management:

- Limited material conditions, space and time for the progress of the initiatives. There is a need to improve the conditions if we want to have quality when planning and designing

improvement strategies that underpin pedagogical practices, since as it stated by UNESCO [17] they influence the academic results of the students and their learning conditions.

- **Objections.** In the context of the secondary school, the practices performed were many times decontextualized to the indications given by the responsible body of researchers.

The institutional educational project is a permanent process of reflection and collective construction. It is an instrument of strategic planning and management that requires the commitment of all members of an educational community. This project allows, in a systematic way, to make the mission of an establishment viable, but requires programming strategies to improve the management of its resources and the quality of its processes, based on the improvement of learning, however, it is necessary to provide opportunities for teacher participation in decision-making, because it involves changes in their pedagogical actions.

8. The Implications for the Environmental Education Curriculum Elements for Discussion

The generalized Educational Reform favored the opportunity to promote a Sustainable Community, an experience that deserves to remain, as a relevant pedagogical tool, to facilitate learning processes in secondary schools.

Among the main achievements, the generation and use of educational resources stood out, as well as the development of inter-institutional research projects. The positive impact was reflected in the contributions of participants. Some of the actions that proved to be vital in making cross-culturalism possible, were collegiate meetings with participating principals and teachers in order to promote the systematization of actions: their own school strategies and collaboration in derived projects, strengthened by the leadership and

interest of school authorities.

Likewise, for its implementation, it generated the teacher environmental training strategy through short courses, carried out with the support of educational materials, a situation that favored, among other things, the synergy achieved in school practices as an incipient transversal scope. The pedagogical work always showed an attitude of interest in the students about the social and cultural problems of the school, which was reflected in the achievements in social coexistence, reaching an improvement in the communication of some students, which enabled them to talk and develop without fear of being punished.

Some of the weaknesses expressed in the strategy showed that at the beginning, teachers needed theoretical-conceptual elements to address the transversality of Environmental Education for Sustainability. This was reflected in the identification of their predominant approach, in the detection of their environmental training needs, the development of the school program studied, as well as the pedagogical practices and didactic resources used. Likewise, the need to strengthen public policies and educational management to provide school autonomy and self-management in a theoretical way was identified in most of the announced educational reforms.

In this context, it is pertinent to establish mechanisms of communication and understanding that allow for constructive reflection and contrast, particularly the necessary collaboration in projects. In some situations, conflict and disagreement were present, precisely because the starting point was a common understanding of education and human communication as a process open to diversity and creation, an ethical commitment to the plurality of forms of understanding of individual and social reality.

9. Results and Discussion

When analyzing the current environmental problems and the theoretical, methodological and political trends, in this matter, a good intention is appreciated from the

Ministry of Public Education, but to promote a change, any educational reform must provide a pertinent environmental training, in order to enable teachers to carry out actions focused on the solution of concrete problems of the school community.

The Mexican education system seeks to favor actions aimed at forging sustainable development, by developing academic programs for the various educational levels that bring together knowledge, skills, attitudes and values that favor sustainability. In this experience it was possible to combine school autonomy, management leadership, teachers with specialized attitudes and skills, and external advice, but with limited economic resources, such as restricted spaces and schedules to support initiatives with the potential to become academic innovation.

In secondary education it is pertinent to generate and/or strengthen significant actions and tasks in the development of school programs where the environmental dimension is present, since one of the main areas of opportunity is found in the contents of a transversal nature, as pillars for the consolidation of environmental pedagogy. Such approaches were addressed in the Sustainable Community, during the three school cycles that the strategy lasted.

It is concluded that the present experience is not enough to guarantee the adequate understanding of the environmental dimension in the pedagogical practice, since the current environmental complexity presents diverse multidimensional edges in the school activities.

Five essential functions that should be considered in the future are recognized:

- Academic: To give, extend, clarify and explain the contents of the course, to supervise the progress of the participants. Also, to solve possible doubts that may arise when reading the suggested materials or when carrying out the activities, as well as to report the results and evaluations achieved, based on the understanding.
- Social: To facilitate the creation of work groups, to encourage and stimulate participation to take charge of creating a social environment favorable to learning.
- Organizational: to discuss the rules of functioning and organization of work, as well as the scheduling of activities according to the school administration.
- Orientation: to facilitate intellectual work techniques for the study of projects, to guide participants in some parts of the content of the program, indicating support resources, among others, for the carrying out of activities.
- Technician: Responsible for the management of the technical and functional infrastructure of the EAS (resources external to the school), as well as the management of the different spaces of the course, and all the available resources.

This would help to facilitate the relationship among subjects and also to incorporate Environmental Education in the school curriculum. Therefore, it is necessary to disseminate the impact of the present experience lived in the educational system, as an alternative to promote this subject in the school community in a transversal way.

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