

# Ecoliteracy and Pedagogical Praxis in the Multidisciplinary University Greenhouse toward the Food Security Strengthening

Citlali Aguilera Lira, David Lynch Steinicke, Andrea León García

**Abstract**—One of the challenges that higher education faces is to find how to approach the sustainability in an inclusive way to the student within all the different academic areas, how to move the sustainable development from the abstract field to the operational field. This research comes from the ecoliteracy and the pedagogical praxis as tools for rebuilding the teaching processes inside of universities. The purpose is to determine and describe which are the factors involved in the process of learning particularly in the Greenhouse-School Siembra UV.

In the Greenhouse-School Siembra UV, of the University of Veracruz, are cultivated vegetables, medicinal plants and small cornfields under the usage of eco-technologies such as hydroponics, Wickingbed and Hugelkultur, which main purpose is the saving of space, labor and natural resources, as well as function as agricultural production alternatives in the urban and periurban zones.

The sample was formed with students from different academic areas and who are actively involved in the greenhouse, as well as institutes from the University of Veracruz and governmental and non-governmental departments.

This project comes from a pedagogic praxis approach, from filling the needs that the different professional profiles of the university students have. All this with the purpose of generate a pragmatic dialogue with the sustainability. It also comes from the necessity to understand the factors that intervene in the students' praxis. In this manner is how the students are the fundamental unit in the sphere of sustainability.

As a result, it is observed that those University of Veracruz students who are involved in the Greenhouse-school, Siembra UV, have enriched in different levels the sense of urban and periurban agriculture because of the diverse academic approaches they have and the interaction between them. It is concluded that the eco-technologies act as fundamental tools for ecoliteracy in society, where it is strengthen the nutritional and food security from a sustainable development approach.

**Keywords**—Farming eco-technologies, food security, multidisciplinary, pedagogical praxis.

## I. INTRODUCTION

**I**N the Greenhouse-School Siembra UV, of the University of Veracruz, vegetables, medicinal plants and small cornfields are cultivated under the usage of ecotechnologies such as hydroponics, wicking bed and hugelkultur, which main function is the saving of space, labor and natural resources, as well as being agricultural production alternatives in urban and periurban zones.

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The approach of the project comes from the pedagogical praxis. Currently, it is a priority to strengthen the food security through education, not only from an epistemological view but also from the creation of learning knowledge spaces that allow the strengthening of the food security by practicing, participating and researching, thus would be reflected on the creation of urban and periurban farms.

This project strengthens the institutional and university community capacities towards rational and taking-action mindsets which increase the commitment to the environmental sustainability, not only to produce and transfer knowledge, techniques and ecotechnologies but also to have an impact in society with a particular approach focusing on environmental problems which may affect the quality of diet and the quality of life.

The group of volunteers of Siembra UV, known as "Voluntariado" belongs to the program "Ven a la Cultura" from a directorate in charge of the academic developing and innovative education called "Dirección General de Desarrollo Académico e Innovación Educativa" which main objective is to develop strategic programs to the permanent training of the academic personnel and to seek support that enhance their academic career. The voluntariado also belongs to the department called "Departamento de Apoyo a la Formación Integral del Estudiante" (Department to support the comprehensive training of the student)

It is important to mention that in July 2015, after the completion of the AFEL "Técnicas de Agricultura Sustentable" (Techniques for Sustainable Agriculture) which is an elective subject that students should choice for their integral education, the "Voluntariado" was created as a proposal of BA student's in order to continue learning in the Greenhouse-school facilities.

University students make up the Siembra UV "Voluntariado" from different academic areas of knowledge of the University of Veracruz. These students perform collaborative and informational activities on their own and free choice to the benefit of the community, the environment, and the University.

Students from different majors such as Law, Nutrition, Agricultural Sciences, Dance, Biology, International Business Administration, Anthropology, English Language, Pedagogy, Psychology, Environmental Engineering, and Hispanic Language and Literature have formed the "Voluntariado".

## II. JUSTIFICATION

One of the substantive functions of higher education is teaching, because of this the higher education has a fundamental role when seeking new forms of linking between the members of society and the environment. On the one side, it may help to find solutions for solving the problems that affects the entire society, and on the other side, it may reach the comprehensive training of professionals, by providing them with knowledge, competences, values, and aptitudes so as they can act as responsible and committed citizens.

The Siembra UV project is closely related to the “Plan Maestro para la Sustentabilidad” of the University of Veracruz regarding the construction of a sustainable, healthy, and environmentally literate student community. In addition, the project is related to the objectives of the EVEA, Estrategia Veracruzana de Educación Ambiental, (Strategy for environmental education of Veracruz) in a higher education level.

## III. THEORETICAL FRAMEWORK

### A. Pedagogy and Praxis

On the one hand, pedagogy is a field of knowledge whose reference framework is the existence of the known “open society”. On the other hand, praxis is defined as the action of making or developing something towards the agent itself or the existence of a goal that goes beyond the agent itself. Then, the approach is situational. It could be said that in the sphere of praxis there is not existence of absolute certainty because human acts are always considered as free and responsible acts [1].

Reference [1] mentioned that if pedagogy, as a praxis science, is transformed, it may become a technology or a technical discipline. Then, praxeology is the relation between theory, researching, and praxis guided in a practical way. Pedagogy approached to praxeology must be in condition to think and make practical guidance regarding the educational praxis.

New generations are helped to survive–socializing, educating, and providing education- in society by means of the education or the educational praxis. This education is regulated in micro and macro social terms not only in the process of change and generational replacement but also in the process of cultural updating of individuals, enduring the existence of society.

### B. Ecoliteracy

The concept of ecoliteracy states that human being interconnections, environment, and physical processes of the planet are not mere exclusive constructions of the classrooms, but generate and build a daily reality where the human being develops survival activities.

In The Web of Life, [2] being ecoliterate means to understand the organization principles of the ecological communities and these principles may be used for creating sustainable human communities.

The university may contribute in both the creation of new

ways of perceiving the world from a scientific approach and the education training of students, so that they can imagine and fundament a sustainable and coherent way of life to the natural world.

### C. Environmental Education towards Sustainability

The Environmental Education is understood as a tool to acquire knowledge, internalize attitudes, modify behaviors, and awaken a critical consciousness to make the most of the natural resources, to solve environmental problems, and to build up different societies [3]-[5].

Recently, it has been adopted the notion of Environmental Education towards Sustainability because “Sustainability” is a broader concept that allows to work with the idea of sustainable development, and it can be re-built from the Latin-American context. Sustainability is thought as a project of future under construction, which must focuses on the environmental values in order to reinforce its own process. Sustainability, then, is more a process and a way of life than a purpose [6].

Reference [7] mentions that Environmental Education can not only focus on educating for “conserve nature”, “make people aware”, or “change behaviors”, but also on educating to change the society through a deep and committed task such as raising awareness towards a simultaneous human development which function as cause and consequence of sustainability and overall responsibility. Thus, from an operational point of view, environmental education involves the critical analysis of the socioeconomic framework, which has determined the current unsustainable trends (information), and the strengthening of human capacities (action), giving large importance to the citizenry capacities and responsibility to make decisions. To make this possible, the environmental education must elaborate strategies that reach and have an impact in the places where the application is intended, by means of the design of environmental educational strategies [8].

### D. Environmental Education Strategies

Reference [9] says that strategy means to make a guide to action, which can be modified and adjusted depending on new incoming information, depending on the surprising element. The strategy may be modified in the last moment.

A strategy of Environmental Education is a set of coherently designed actions that gathers endeavors of a great ensemble of social actors in order to improve or change a socio-environmental reality, in a particular geographical context.

There have been proposed many definitions to conceptualize the “learning strategies”. References [10]-[12] consider that the Environmental Education strategies must include the following characteristics: to aim at sustainable development, to be contextualized, to be coherent, to have a socio-environmental view, to have participation and cooperation, and to be theoretical-practical.

### E. Plans and Programs of Environmental Education in Mexico

The Plan Nacional de Desarrollo 2013-2018 (PND) (National Plan for Development 2013-2018) in its fourth national goal “Un México Próspero” (A Prosperous Mexico) in the strategies number 4.4.1, 4.4.3, 4.4.4 and 4.10.4 marks three action lines. The first is to promote the use and the consumption of clean and efficient technologies; the second is to continue with the incorporation of sustainability criteria and environmental education; and the third is to strengthen the environmental education in strategic sectors.

In a state level, the Plan Estatal Veracruzano (State Plan of Veracruz) 2011 – 2016 in its five chapter, “Un Veracruz Sustentable” (A Sustainable Veracruz), it is emphasized that, no matter the size of the actions, all actions toward the Environmental Education must contribute to the acquisition of knowledge – corresponding and significant knowledge –. As well as educating to learn – competences, abilities, aptitudes – values and attitudes with the purpose of having the minimal indispensable elements to influence the changing on the behavior.

La Ley General del Equilibrio y Medio Ambiente LEGEEPA (The General Law for Equilibrium and Environment) defines Environmental Education as the training process for society, in both the inside-of-school training and the out-of-school training in order to facilitate the comprehensive perception of the environment and generate rational behaviors in favor of social and environmental development. The Environmental Education includes the assimilation of knowledge, the formation of values, the development of competences and conducts to guarantee life conservation.

### F. Ecotechnology

Reference [13] defines ecotechnology as the group of goods, services, methods and processes that help to reduce socio-ecological impacts associated with the production and the use of technology in order to face the ecological crisis and to promote the sustainable development.

Technologies play a crucial role in the processes of social change. They delimit positions and behaviors of social actors; determine the social distribution structures, the production costs, the access to goods and services; they also generate social and environmental problems and at the time, they allow or complicate the solution for those problems.

Reference [14] says that the appropriate technology is the technology designed with especial attention to the environmental, ethic, cultural, social and economic aspects of the community. It is characterized by demanding fewer resources, its low-cost maintenance and its low impact in the environment. The very appropriate technology is the technology that common people can use for its own benefit and for its community benefit; it is also that technology whose system does not cause out-of-control dependence in people.

## IV. OBJECTIVE

The main objective of the present work is to understand the

factors involved in the learning process developed in the Greenhouse-School, which has resulted in the implementation of ecoagricultural technologies within family, professional and leisure contexts by some members of the university and civil society.

## V. METHODOLOGY

This work has a descriptive approach. The data were collected from 2012 to 2014. They are a sample group formed by undergraduate university students from different academic areas and who have been involved in the activities of the greenhouse-school which belongs to the Siembra UV project.

The sample was formed by 105 students from the next academic areas: Biological, Agricultural, Health Sciences, Humanities, Arts, Economic-administrative and Exact Sciences areas. These students have been actively involved in the greenhouse-school as part of the subject “Técnicas de Agricultura Sustentable” (Sustainable Agriculture Techniques), the social service, the research for grade paper, and the volunteering group. Other institutes from the University of Veracruz; governmental and non-governmental departments have been making links with the project.

## VI. FINDINGS

Two main findings were generated. First, as the students of the University of Veracruz that are involved in the greenhouse-school Siembra UV come from different academic areas, the student relationships were strengthened, due to the different approaches the Siembra UV project involves. Second, it was seen that the strengthening of the food security was enhanced by the positive response that students had to the agricultural ecotechnologies that Siembra UV manage.

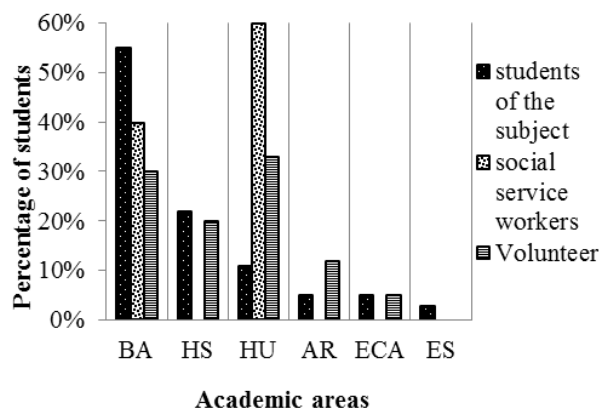


Fig. 1 University Students Involved in the Siembra UV Project and the Greenhouse-School 2012 – 2014. Annotations: Academic areas (BA) Biological-Agricultural, (HS) Health Sciences, (HU) Humanities, (AR) Arts, (ECA) Economic-administrative, and (ES) Exact Science

Fig. 1 shows the students involved in the SiembraUV project and the greenhouse-school. 55% of the students of the subject “Técnicas de Agricultura Sustentable” (Sustainable Agriculture Techniques) belong to the biological-agricultural

area, 40% of the students come from the humanities area and in third place, those from health sciences area.

Regarding undergraduates that have made social service in the Siembra UV project within the greenhouse-school, 60% are from humanities academic areas (Historical Anthropology, Languages and Hispanic Literature). While 40% have been students from agricultural sciences belonging to biological-agricultural sciences.

In the case of the students that have participated as volunteers in the Siembra UV, or that have functioned as providers of agricultural ecotechnologies and sustainability by giving workshops, guided tours through the greenhouse, among other activities, the 33% are from humanities area (mainly pedagogy students), the 30% belong to biological-agricultural sciences and the 20% to the Health Sciences area (all of them come from Nutrition major).

It is important to say that, on the one hand, the approach to the Siembra UV project and to the greenhouse-school that the students have had is mainly due to the subject “Técnicas de Agricultura Sustentable” (Sustainable Agricultural Techniques). By studying this subject, the students have been motivated to join to the volunteer group. On the other hand, none of the students who make their social service in the Siembra UV project have studied the subject “Técnicas de Agricultura Sustentable”. There were other reasons for doing it, for example: social networks and institutional media, or because a piece of advice from classmates who had previously taken the subject.

As can be seen in Fig. 2, among all the students who have participated or have had some relation with the Siembra UV project, the students who stand out are from humanities. The 60% of the total are from the humanities area, these students have taken environmental education, agriculture, and food security actions: the 32% within the school environment, the 15.5% within work environment, and 13% within family.

Secondly the students from biological-agricultural area. The greatest impact among these students have been in the school environment with 27%, followed by the work environment with 17%, and family environment with 4%.

It is important to emphasize those students from the arts and economical-administrative area have only taken actions within family environment (38% economical-administrative and 19% arts).

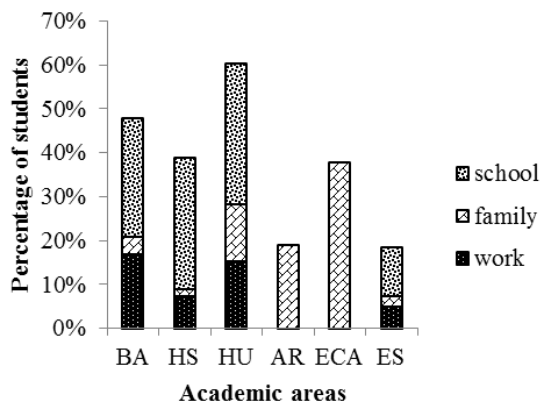


Fig. 2 Students Who Have Taken Environmental Education, Agriculture and Food Security Actions in the Different Fields of Their Lives 2012 – 2014, Annotations: Academic areas (BA) Biological-Agricultural, (HS) Health Sciences, (HU) Humanities, (AR) Arts, (ECA) Economic-administrative, and (ES) Exact Science. School: homework, project, preliminary draft of some of the ecotechnologies. Family: Implementation agricultural ecotechnologies in the family context involving relatives and acquaintances. Work: Environmental education activities about agriculture, food security, ecoliteracy, or implementation of agricultural ecotechnologies in the work environment

TABLE I  
IMPACT OF THE DISSEMINATION OF ENVIRONMENTAL ACTIVITIES

Dissemination of Environmental Activities	Number of activities and actions done by the “voluntariado”	Estimated number of the audience	Governmental Department and university NGO links
Food Security and Nutrition Workshops	21	1,239	7
Ecotechnology and Agriculture workshops	13	754	4
Environmental Subjects (agriculture and sustainability) workshops	5	205	3
Guided tours in the Greenhouse-school	17	342	17

The students who belong to the volunteer group of Siembra UV, “Voluntariado”, often give workshops about food security, nutrition, agriculture, environmental subjects, and construction of ecotechnologies for agriculture - hydroponics, wicking beds, among others-. In addition, they act as guides in the greenhouse-school tours where they show and explain the basic, the maintenance, as well as the environmental, social and economic advantages of the ecotechnologies. These ecotechnologies include hydroponics, wicking bed, hugelkultur, composting, germination and its space, as well as the ecological architecture that the greenhouse-school has.

In every activity held at the greenhouse-school, the students

have to interact with other students from different areas of knowledge and different academic profiles. At the same time, the students from the “voluntariado” have had a variety of audience, from children to higher-level students, homemakers, third-age persons, professors, among others.

A. Factors that Intervene in the Students Praxis

1. Academic Area Approach

The students from the Biological-agriculture area and the students from humanities –mainly pedagogy students- were the people who showed more interest and who took actions in their school and work environment. On the one hand, the

students from Biological-agriculture area considered the activities in the project and the subject as relevant and closely related to their career, biology and agronomy. On the other hand, the students from pedagogy involved in the Siembra UV project consider the project as an element to complement their careers. Furthermore, as the students were in the terminal phase of their careers, the project functioned as a tool to complement their dissertations, which were in the same area of knowledge.

The students from economic-administrative and arts areas showed a personal interest. Those students implemented one or some agricultural ecotechnologies in the family environment, in a minor scale, and for personal consumption.

## 2. Family Support

An essential factor for implementing ecotechnologies was the support of the family. There were some parents, who considered the acquisition of technologies for cultivation in cities as an important tool; because of this reason, the students were supported to study the subject and specially to implement the ecotechnologies in their houses.

In some cases, the students who were volunteers in the Siembra UV project, or who make their social service, regularly and positively commented with their relatives about the activities carried out in the greenhouse-school and in the university project. This led to the enthusiasm of the members of the family. In this way, the members of the family were involved in the different processes that an ecotechnology has like maintenance, cultivation and harvest.

## 3. Semester of Enrollment

The 75% of the university students involved in the Siembra UV project had their first approach through the subject "Técnicas de Agricultura Sustentable" (Environmental agriculture techniques) which is offered as a free elective subject, which means that all students can study it.

The students who were in the last semesters were the students who made their social service within Siembra UV project.

The students interested in the project, get involved through the "voluntariado". All of them belong to different semester levels, especially to the first semesters.

## VII. CONCLUSIONS

The ecotechnologies are ecoliterate tools of the university community that helps the society to strengthen the food security and nutrition, with a sustainable development frame based on praxis.

The factors involved in the praxis of the student are: first, the relation between their professional profile and the environmental topics like agriculture ecotechnologies, nutrition and food security; Secondly, the family involvement in the processes, and finally the current enrolled semester of the students. This type of praxiological projects allows the relations among university students, which may be from different academic areas. Cooperative axiological values and otherness from students are required so as all the elements of

the system could learn from others and to make every activity a process of learning by doing.

The greenhouse-school and the Siembra UV project have been a space for dissemination and linking with other entities where the main actors are the university students, follow by the university departments, civil society, NGOs, and governmental departments. This way is how Siembra UV contributes to the community strengthening walking towards sustainable ways of life.

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