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THE SERVICE-LEARNING APPROACH AS A TOOL TO IMPROVE SUSTAINABILITY IN HOUSES OF A MAYAN COMMUNITY

Teresa E. RAMÍREZ ORTEGÓN[1*] , José H. LORÍA ARCILA[2] , Mirna LÓPEZ-PACHECO[3] , Norma PAVÍA RUZ[4] , Ph.D. Pablo MANRIQUE-SAIDE[5]

*[*1]Professor, Master in Engineering, Construction Program, Facultad de Ingeniería de la Universidad Autónoma de Yucatán (UADY), Av. Industrias no Contaminantes, P.O. Box 150 Cordemex, Mérida, Yucatán., México*

[2]Professor, Ph. D, Construction Program, Facultad de Ingeniería de la Universidad Autónoma de Yucatán (UADY), Av. Industrias no Contaminantes, P.O. Box 150 Cordemex, Mérida, Yucatán., México Email: jose.loria@uady.mx, PH 52+(999) 9300560

[3]Professor, Master in Engineering, Facultad de Ingeniería de la Universidad Autónoma de Yucatán (UADY), Av. Industrias no Contaminantes, P.O. Box 150 Cordemex, Mérida, Yucatán., México. Email: irna.lopez@correo.uady.mx, PH 52+ (999) 9300550 Ext. 1086

[4]Investigator, Master in Science, Centro de Investigaciones Regional de la Universidad Autónoma de Yucatán (UADY), Avenida Itzaes No. 490 Mérida, Yucatán., México. Email: norma_pavia_ruz@hotmail.com. , PH 52+ (999) 9245809

[5]Professor, Ph.D., M.Sc. Medical Entomology, Campus de Ciencias Biológicas y Agropecuarias de la Universidad Autónoma de Yucatán (UADY), Km. 15.5 Carr. Mérida-Xmatkuil s.n., Mérida, Yucatán, México. Email: pablo_manrique2000@hotmail.com. , PH 52+ (999)9423200

Corresponding Author:-
Email:teresa.ramirez@uady.mx, PH 52+ (999) 9300550 Cell Phone: 52+ (999) 1757368

Abstract:-

Service-learning is a hands-on educational approach where students apply the knowledge they acquire in the classroom, while serving in a community. This paper reports the results of applying this approach at the University of Yucatán. During 2014, a "Social Project" was developed in the community of Yaxunah ("Green house", in Mayan language), Yucatán. Students from several disciplines (engineering, architecture, medicine, biology, social service and agro-ecology) followed an ecosystem approach to improve the health and the environment of the community. The specific goal was to improve the backyards (here after referred as patios) of the houses in the community. In the Mayan culture, the patio is the family's reunion center, since it has several purposes. In this space are located: the kitchen, bathroom, garden, pet area, and, in many instances, livestock. Faculty, students and community partners worked closely together over six months, finding the best ways to improve their patios and houses using local materials, and their own labor, while taking care of the environment. After the project's completion, members of the community reported their experiences as a very productive one, helping them to maintain the patios' sustainability and family health. Participating students answered a questionnaire, reporting that their learning experience was very rewarding.

INTRODUCTION

Engineering is often seen as an exact science, and its application is very practical in many ways. The teaching-learning process is a very challenging task, and engineering is not the exception, particularly when it comes to involving students in how to apply theories to serve in a community. In this particular example, the service-learning approach includes helping the students to participate with the community, learn their customs and work closely with its members. The learning process is even more challenging when students from other disciplines participate. Integrating a team that can work for several months in a community was a totally different experience than working numbers and equations in the classroom. This Community work was a rewarding experience for everybody, and some of the concepts applied in this exercise are here explained.

Service-Learning

Service-learning is a hands-on educational approach where students apply the knowledge they acquire in the classroom, while serving in a community. Sometimes this type of learning is mistaken with volunteerism, community service, internship, social assistance and other programs (Luo, 2014). Service-learning contributes to students' social responsibility and encourages them to develop their skills while serving in a community (Furco, 1996). In this type of learning, students get immersed with the community and support its members to improve their life by applying their knowledge in a practical way, while respecting the traditions of the community and their own way to solve problems, though working together.

The service-learning approach was applied in a "Social Project" during the whole year 2014 and the first semester of 2015. The students involved in the project were from different Schools at the University of Yucatan: Engineering, Architecture, Medicine, Veterinarian and Nursing. This mixture of disciplines brought a very interesting diversity to the experience of learning while serving in a community.

Sustainability and Ecohealth

Nowadays, sustainability is a goal for most people, regardless of living in a large city or in a small community. It is important to consider that to "achieve sustainable and equitable change in people's health, interactions with the environment need to be improved" (Charron, 2012). When sustainability and health are brought to the table, Ecohealth approach will be an answer to improve the environment.

Ecohealth is a growing international field of research, education, and practice which is dealing with the challenge of improving people's health, and environmental sustainability in resilient communities. Ecosystem is a comprehensive approach that has been defined by many authors and relates humans, animals, vegetation and housing as a whole, so it is very important to consider this approach when we deal with humans and their environment (Lebel, 2003).

For a better comprehension of the Ecosystem approach Figure 1 shows that this concept integrates three elements and their interactions.

Figure 1. Ecosystem Approach

The aim of the service-learning project was to improve sustainability of back yards, *patios*, of the families who participated. For the students, the main purpose was to apply their knowledge and learn how to work together with other disciplines while serving the community.

Figure 2 shows the Ecosystem approach that was used in the activities to improve the *patios* of some families who live in a Mayan community.

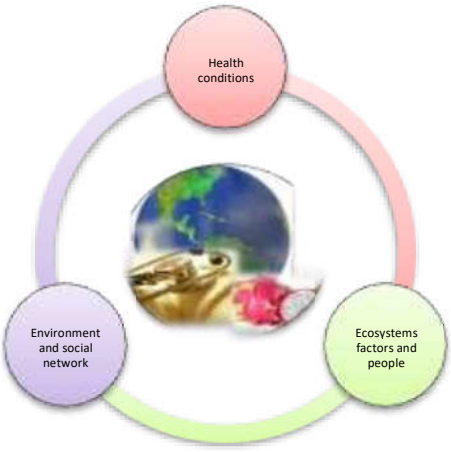


Figure 2. Ecohealth in an ecosystem approach

Learning Community and the Mayan Backyard

The State of Yucatan is located in the Yucatan Peninsula, known for its own culture: the Mayan culture. A village named *Yaxunah* ("Green house" in Mayan language) is located in Yucatan, the learning community where the Social Project was developed. Fulton (1999) defines: "a learning community is a group of people who are interested in a common topic or area and engage in collaborative knowledge sharing as well as values and activities."

Mayans have particular traditions, for instance the *patios* are a special place for them, since they are an essential part of their lives. They use their *patios* for three main purposes: living, work and entertainment. In that space they include the kitchen, bathroom, garden, pet area, and, in many instances, livestock. Many people live on what the *patio* produces, at least for self-feeding. The *patio* is their tradition, their inheritance and the answer for many of their needs. An example of the Mayan patio is showed in Figure 3.

In this environment students learned how to apply their knowledge serving a community and its inhabitants.

Figure 3. Mayan *patio* (Cabrera Pacheco, 2014)

Methodology

A Social Project was developed in 2014 in the community of *Yaxunah*. From August 2014 to March 2015, students of different schools (engineering, architecture, medicine, biology, nursing and agro-ecology) worked together with the community in a workshop named "*El patio que yo quiero*" (The Backyard I want), whose goal was to improve inhabitant's health making their *patios* more sustainable. At the end of the Project a questionnaire with 8 items was applied in order discover when the students believed they applied their knowledge. The results of the service learning experience were also questioned to find out the level of satisfaction on the activities performed.

Activities involved in t Service Learning

Faculty, students and community members worked together in different activities to pursue the goal. Those activities were the following:

Workshops

In September 2014 two workshops were conducted, the first of which shared with the community the ideas of the students about how to improve their *patios*. Students worked together with faculty presenting to the community how they would arrange or improve a *patio*, taking into account all the elements included in it: garden, compost, recycle items, pets, livestock, and existing spaces, such as kitchen and bathroom. The purpose was mainly to show the community their point of view without enforcing the proposal as definitive.

The second meeting was to work with the community in a practical way. Students, faculty, and members of the community worked as a team to prepare scale models of *patios*. Every working team presented its work to the rest of group.

These workshops allowed the group to determine which ideas of the faculty and students could fit best the customs and ideas of the community members.

Table 1. Workshop in action

Workshop at Yaxunah Cultural Center	Faculty and students sharing with the Community
	

Compost

During the learning period three types of compost were proposed: 1) compost for organic products, 2) dry leaves compost, and 3) compost with animal manure, leaves and soil. Community members chose which type they would like to carry out in their *patios*, and students helped them with the location and design.

Table 2. Compost preparation

Making compost	Compost from one family
	

Pet living area

At the same time, some of the students of the School of Engineering helped the community members with the design of the pet living area. This was done with materials they had in their *patios* (no extra money was invested at all). The aim here was to find the best place for pets, and at the same time separate them from human living areas. The purpose was threefold to improve health, hygiene and space.

Table 3. Pet living area design

Making a model	Some results
	

Family Garden

A group of students from eco-agriculture shared information with the community regarding how to plant fruit trees and how to make grafts to improve them. Community members shared their knowledge with the students and faculty, to show them where they would plant the trees in their *patios*.

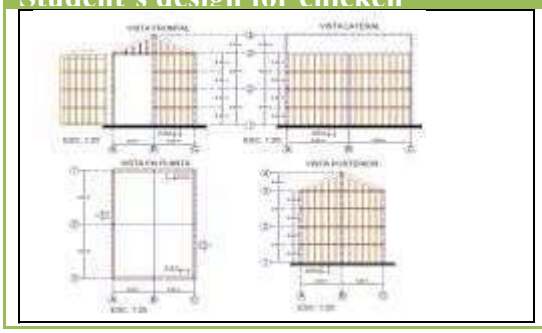
Table 4. Garden activities

Student's sharing with Community	Community and students working together
	

Livestock area

In the backyard, people had several kind of animals: pigs, chickens, turkeys and in some cases cows and horses. Faculty and students shared different designs for chicken houses or turkey houses. Inhabitants of the community shared how they distributed their *patios* for each kind of animals. The focus here was to decide where to make the chicken coop, the pig pen and so on, with the purpose to have the *patio* better laid out.

Table 5. Chicken coop

Student's design for chicken	Chicken house (six months later)
	

Rock walls

Most civil engineering students take various courses related to structural analysis and materials properties; one of the specific objectives of the activities involved in Service-Learning was how to use local materials. In the Yucatan Peninsula lime stone is a very abundant natural resource and is used quite often to build walls and houses. In rural communities it is very common to build walls called "*albarradas*" These rock walls can stand a hurricane without falling. Community and students learned how to make this type of wall.

Table 6. Building traditional stone walls

Community members showing the technique	Students and Community working together
	

Recycling Bottles

The community of *Yaxhunah* has a youth group that every month carries out a thorough cleaning of the whole town, picking up trash and bottles. During the workshop, faculty members shared with the community how to recycle P.E.T. according to the number stamped on the plastic bottles. After this, inhabitants were able to divide plastic bottles that could be recycled and those which should be thrown away. Community members also selected a specific place in their *patios* to separate the bottles for recycling.

Table 7. How to recycle plastic bottles

Sharing the way to recycle	A model of backyard
	

Mosquito screens (miriñaques)

Mosquitos are a common worry and a current concern because of on-going dengue and chikungunya outbreaks in Yucatan. The prevention of mosquito bites inside the houses is an important issue (Quintero et al. 2014, Jones et al. 2014) and commercial household insecticide products are many times inhabitants' first choice however, those represent a significant expenditure and an unsustainable practice. "Mosquito-proofing" houses have been employed historically in places where mosquito nuisance and mosquito-borne disease transmission are problems. This practice has shown excellent reductions in the presence and abundance of indoor-mosquitos, including *Aedes aegypti,* the dengue and chikungunya vector in Mexico (Manrique-Saide et al. 2014, Manrique-Saide et al. 2015, Che-Mendoza et al. 2015). Faculty and students worked together with the community fixing mosquito screens (known as "*miriñaques*" in Yucatan) to protect their windows and doors. The aim of this activity was to help the community to protect themselves from mosquitos and improve their health.

Table 8. How to fix and install screens (miriñaques)

Sharing the way to make windows and doors protection	Students and community members working in a house
	

Learning results

When all the activities in the project were finished, a questionnaire was given to 21 students to assess their experience. The aim was to determine if the Service-Learning approach was productive and beneficial to them. All the students responded that it was a good experience and that they applied some of the knowledge they had acquired in the classroom.

The students reported that they learned how to listen to mayan people and take their ancient knowledge and relate it to their theoretical knowledge.

Another result was the good interaction between students of different schools. The students reported that it was very important to them to work together with other disciplines. They learned the diverse points of view between engineers and other students.

During the workshops students were working as a team with community members. This provided to them a practical experience of serving and sharing knowledge. When the work ended the students were satisfied and eager to serve in future opportunities.

Faculty members had a positive experience working with students, and community members in an interdisciplinary project, which brought good results to the entire team.

Community members reported that the work was needed and that they learned from faculty and students. The most important issue for them was to share their cultural knowledge while working in community with the university. The need was felt for more time to discuss and explain the activities with the community, before engaging in the actual work.

Conclusion

Upon Project's completion the results of service-learning were known through the opinions of Community members and from the physical improvements of the *patios.* Faculty, students and members of the community worked together in 30 *patios* in a six month period ending January 2015.

Faculty and some of the students who participated in the project visited the community in August 2015. It was a very gratifying experience to witness how the community continued working in their *patios,* even though the university was no longer involved in the project. Some of the pictures in this paper were taken during the visit in August.

The work has not finished, now is in the hands of the community to keep improving its way of living and its health, applying the knowledge shared and acquired from the activities described in this paper.

Service-Learning is a relatively new way to teach students, but it is very useful to help them understand how their theoretical knowledge could be put into practice, and more particularly, how their knowledge can support a community and help to improve its living in several aspects.

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