Service-Learning Projects in University Degrees

Service-Learning (SL) is a methodology in which the students achieve academic and transversal competences related to a subject while carrying out a service for community benefit. This methodology can be used as a tool to incorporate contents in the lecture sessions and to teach the students about sustainability or to start collaborations about sustainability issues between community partners, local governments and associations.

1. Introduction

Service-Learning (SL) is an educational proposal that allows to train in skills and values, promoting an inclusive, active, participatory, and committed education, through a practical experience in a real environment with specific needs, which promotes relationships with community and contributes to the education for citizenship[1][2].

We present four SL experiences developed in two degrees of University of A Coruña (UDC): the Bachelor's Degree of Engineering in Industrial Design and Product Development and the Master's Degree in Professorship of High School. The services have been developed in collaboration with organizations serving disadvantaged collectives with special needs, like people either with Down syndrome, autism spectrum disorders, elderly with Alzheimer's disease, or people with mental illnesses (mainly schizophrenia). We have considered that the fact of working with nearby entities has important advantages not only in terms of organization but also as contribution to a better surrounding community. On the other hand, the fact of involving two university degrees and four entities provides a global vision because we have the opportunity of comparing data obtained from different scenarios. Moreover, we have included several groups of people with mental illness and other special needs, belonging to our surrounding community, which also is an important contribution of our work since, according to our knowledge, no work in recent literature includes these types of projects working with sustainability issues. In addition, it is an opportunity for our students to learn from those who are different and gain a deep insight about problems of social justice simultaneously working on the subjects' contents related to sustainability.

In this work, we show our experience on developing SL projects based on sustainability to train students in foundations of science and technologies while they acquire professional and personal skills, including sustainability as a part of their curricula[3][4][5]. The authors of this work have transformed the methodology of mentored work and oral defense to SL experiences related with various themes about science and engineering through the construction of objects using different types of recycled materials. In addition, the SL projects fit into Sustainable Development Goals (SDGs) numbers 4 and 17 that are quality education and partnership for sustainable development, respectively. In this work, the development of recycling projects on communities of disadvantaged people, contributes besides to goals numbers 10 (reducing inequalities) and 12 (responsible consumption and production).

The projects have been developed considering important aspects of SL: to guarantee the acquisition of specific competences defined in different subjects of degrees in University of A Coruña; (2) to adapt the service to specific needs of people with functional and cognitive diversity; (3) to make the students conscious about those community needs; (4) to eliminate communication barriers; (5) to facilitate the integration of disfavored groups, and (6) achieve an academic, civic and emotional student's engagement and, in short, educate not only in contents but also in values. The idea of including SDGs is that the students acquire knowledge, skills and motivation on these SDGs for their future working life. Therefore, we expect the students to make a lifelong commitment to the environment.

2. SL projects

Figure shows a diagram of the six phases of our SL projects. The SL projects are being developed from the 2015/2016 academic year in the subject of Physics Fundamentals and only in the 2019/2020 academic year in the subject of Technology for Professorship of High School.

Identification of specific needs

The specific needs of each entity are identified by the professors and, subsequently, the students are invited to participate in the SL activities. It is important to highlight that the SL activity is not compulsory, since the students can choose between SL or traditional projects related to some subject topics. These needs are explained to the students and an initial assessment on their concerns is answered. Moreover, since the acquisition of environmental competences is one of the goals of our experience, an initial assessment survey is carried out dealing with various aspects related to sustainability.

Visit to entities and service design

For service design, it is necessary to analyze several aspects: 1) to evaluate the best place to develop the service (in general, entity or university); 2) to determine if the final users will work in groups or individually; 3) to define ways to stablish a correct interaction between the students and the users (for example, use of oral and/or written communication, use of pictograms, etc.), and 4) to determine the number of sessions and their duration.

The professors visit the entities and, if the conditions make it possible, also the students group. The main objective of these talks is to establish a first contact between all the agents from the university and the entities and to learn more about the functional diversity suffered by each user or users group, observing their skills and their way of working. In addition, the entity staff gives some recommendations to elaborate the support materials adapted to such features.

Project design and mentoring

The objective is to develop a service adapted to specific collectives that elaborate objects using recycled material encouraging critical thinking about the environmental impact of some technological advances so this service can contribute to the Environmental Education (EE) of both, the students and the end-beneficiaries. Since each project has been developed considering the user skills, we will show one example of each one of them:

- **Construction of a car with windmill:** The project has been developed for a group of people suffering from the Asperger syndrome. This activity is part of the project called "Technology and Society", which seeks to highlight the impact of technology on the life of society today. The project has been carried out with materials very easy to get at home: bottles, caps, elastic bands, toothpicks and straws.
- **Box design from different types of commodity plastics:** This SL activity has been developed with an entity dedicated to people with Down syndrome. The activity is part of a great entity project called "Put yourself in my shoes" to raise awareness on the general population about the problems that this group must face in their day to day.
- **Designing jewellery and learning Physics with recycled materials:** The SL project has been carried out for people with mental illnesses, mainly schizophrenia. The objective of this project is, first of all, to promote social relationships between users and outsiders. On the other hand, since most of people with mental illness acquired the disease at an

adult age after finished their studies, such a scientific fair motivates them more than other tasks usually carried out at the entity location.

- **Construction of pots to grow vegetables:** The project has been developed for a collective with Alzheimer's disease. The activity has been performed throughout three sessions. In the first one, the students have explained to the users the problems of using plastic nowadays and the benefits of reducing, reusing and recycling. The use of games like riddles or bingo, also designed by the students, favours the active participation of the users.

Work service

The service is performed following the guidelines established in the design of the SL activities. The students must mentor their projects trying to empathize with the users, while the professors and the entity staff have to be alert to situations that may alter the proper course of the activity. Table summarizes the SL projects developed from February 2019 to January 2020.

Users	Students	Service description
5 people with Asperger syndrome.	10 students of the Technology for Professorship of High School subject.	They design projects based on constructing an everyday object, in the framework of the overall project entitled "Technology and Society", using simple mechanisms.
60 people with Down syndrome.	11 students of the Physics Fundamentals subject.	They design boxes with recycled materials for a project called "Put yourself in my shoes".
36 people with mental illnesses (mainly schizophrenia).	12 students of the Physics Fundamentals subject.	They organize a scientific fair with three stands based on Physics for daily life and three stands based on recycling and reusing,
36 elderly with Alzheimer's disease.	12 students of the Physics Fundamentals subject.	They develop "Construction of pots to grow vegetable" projects.

Evaluation

The SL projects, as any other teaching activity, must be qualitatively and quantitatively analyzed, including all the participants, in order to identify possible improvements and to know results and performances achieved with this activity. However, it is clear that, when the SL methodology is applied, it is an educational challenge to find reliable quality indicators for its assessment.

The combination of qualitative and quantitative metrics makes possible to cross reference and collect various perspectives from the participants, which are necessary to make data more reliable. Regarding qualitative analysis, in a first phase, the student reflections have been obtained from the surveys and from the students' diaries presented in the on-line space of the subject (Moodle platform). Then the sources have been explored and the information considered as relevant has been coded according to its content, establishing categories and subcategories by means of an inductive method. Some categories have been previously established from research although most of them have emerged throughout the data analysis. To make easier the analysis, the webQDA software[6] has been used. This software allows the researchers to carry out the process of reduction, categorization and coding. For the reduction of the bias' risk, two or three professors have been involved in the analytic process. All the interpretations have been based on quotations.

The quantitative analysis of the results is obtained with initial surveys[7]. The satisfaction of the involved agents has been evaluated with a first question in surveys for users, students and entity staff.

3. Conclusions

Students participating in our project have achieved the academic skills related with the subjects but also other practical and civic skills. From the point of view of the first ones, they have been able to work in groups performing collaborative and cooperative work, preparing a project by themselves and improving their communication skills. Moreover, these students have also achieved other social skills, like empathy, tolerance and lack of prejudice, and general sills, like those related to problem solving or to the learning from those who are different.

During the SL activities, the analysis of both the student's diary and the student's survey indicates that students have acquired all the skills above mentioned. From the environmental point of view, the students of Physics Fundamentals are conscious about their role as designers and engineers to choose the greenest options (eco-designs) in the creation of new products, buildings, machines, etc., and to adapt them to the different needs of disadvantaged people. On the other hand, in the subject of Technology for Professorship of High School they are conscious about the importance of working these skills at the school from very early ages. Moreover, they learn about the importance of educating children in diversity. For example, the students claims for the need of pre-processing of some partial components in the Asperger project or, in general, more time to complete the projects. In the entity's survey, all the entities that have participated in this SL experience met their expectations and, in the user's survey, the users have provided very positive opinions about it. It is important to highlight that these users will be in charge of raising awareness of environmental problems in their families, which will allow the network of people concerned about the environment to be expanded.

As a result, the students will arrive to their professional life knowing much more about sustainability and they will be conscious about SDGs and the importance of taking into account the diversity and the social justice for the overall society development. This represents a novelty, with respect to previous literature, and can be an example for other universities who want teach their students in sustainability and social responsibility with disadvantaged people in the nearby community.

References

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