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'Campus, Home, City: Laboratories of Change', the Education or Sustainability Program of the University of a Coruña

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Abstract. The program 'Campus, home, city: laboratories of change', aims to promote the students and citizenship formation in the basic concepts of environmental and social sustainability, responding to the priority challenges for our society such as climate change, waste production, circular economy or sustainable mobility. The proposed service-learning, hands-on activities takes advantage of the housing, the university and the city as places for researching and experimentation. A feature of this program is the use of online ICT tools for fieldwork, in particular the survey and mapping of waste generation and footprint, water use efficiency, transport footprint and consumption of energy. The project has the collaboration of the Alcoa Foundation and is now in its 6th Edition, adding up the participation of more than 11,000 people. In the last two editions, the project has been extended to primary, secondary and vocational training centers in the region of A Mariña.

Keyword:

Environmental Education, University, Schools, Participation, Hands-on Activities

1. Introduction

Sustainability and environmental protection are universal concerns to which universities cannot be oblivious. It has been pointed out that a greater knowledge of environmental problems and challenges and the development of sustainability skills can be key elements to promote more sustainable lifestyles [1,2]. For this reason, it is necessary for

university degrees to improve the training of their graduates in terms of sustainability by offering them basic environmental education. This training must address current sustainability priorities, such as decarbonization, climate change mitigation and adaptation, pollution prevention, biodiversity protection, and preservation and efficient use of resources. Thus, its approach entails the implementation of a transformative education that promotes critical reflection, participation and action from innovative methodologies. In addition, it is very convenient that environmental education in universities is aligned with institutional policies and the demands of the university community [3]. In this way, a transversal program based on a hands-on and service-learning approach can offer advances for the comprehensive sustainability of the university and contribute to the development of more sustainable ways of living, producing and consuming. In addition, it will promote future graduates to make decisions based on fair criteria with the environment and people in their working lives and in society. These are the bases and objectives of the "Education for Sustainability" program of the University of A Coruña (UDC).

1.1. Sustainability at the UDC

The University of Coruña has been developing a continuous improvement program for sustainability including the creation of environmental committees in the centers (Green Campus Program), the development of various sectorial plans (transportation, energy, water, waste), and environmental initiatives: selective collection and waste recycling, composting, energy and water saving, renewable energy, loan of bicycles, biodiversity, control of exotic invasive species, volunteers participation in river monitoring, etc [4]. The international evaluation Green Metric for 2017 to 2022 has placed the UDC among the 100 first most sustainable universities in the world, as well as among the top 5 Spanish. This is a good indicator of the work done in these programs.

The Green Metric ranking assessment pointed out the potential for improvement in different sustainability areas, such as infrastructure and setting, transportation, energy and climate change, water use, and waste management. The position on education and training at UDC was estimated to be good. However, from a perspective close to reality we have identified the need to strengthen the link between education and behavior, seeking to increase the capacity and commitment to more sustainable behavior. This is the reason because a training program on practical, real-life sustainability issues was selected in order to get advances in greenhouse emissions mitigation, resources saving and waste recovering. Participants can experience the practical lessons learned in their own life at home, at the city level and in the place of study or work.

With the development of the Education for Sustainability program, under the subheading of ‘Campus-Home-City: Labs of Change’, the sectoral work lines in water, energy and waste at UDC campus were extended to the area of residence of members of the university community interested in sustainability issues The program takes advantage of the synergies between the actions on campus or center and at home, in the first instance, and finally at the local community level. This approach was developed on the basis of the similarity, total or partial, in energy, water and waste issues between the campus (the university center as a work or study environment) and the domestic environment. This similarity was also the basis for the development of OMA-Emapic tools for the calculation of the carbon footprint of several components such as waste generation and management, energy and water consumption, people transportation and food consumption. Under this idea of ‘Campus-Home-City: Labs of Change’, actions are combined in awareness, training and changes in environmental behavior (and, in some cases, also in the material means used) that

seek to advance more pro-environmental lifestyles.

1.2. UDC and local communities

The area of direct incidence of the UDC is that of the entire northern part of the province of A Coruña and the north of Lugo, a region that includes A Mariña (Fig. 1). In particular the A Coruña-Ferrol metropolitan area, comprising more than 600,000 inhabitants. The university community reached circa 18,600 students and 3000 employees (faculty and staff) in 2023. After four editions on the UDC campus, the program was extended in 2021 to the region of A Mariña, which comprises 15 municipalities and a population of 70,000 people, including approximately 5,000 primary and secondary students and 300 teachers. Directly during the duration of the program, and later for the future action of students in society, the program seeks to be a significant link and contribution to environmental and social sustainability in Galiza.

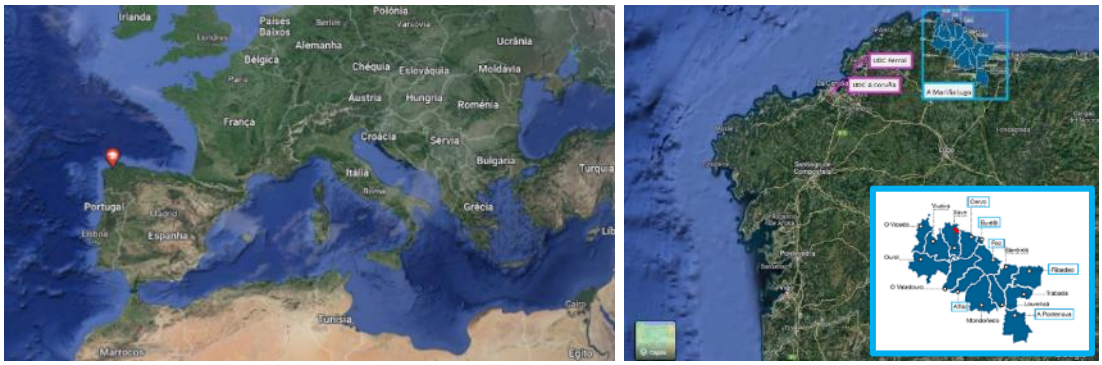

Figure 1. Geographical location of the development sites of the Education for Sustainability project: University of A Coruña (Coruña and Ferrol campuses), and A Mariña region (school centers)

2. The program 'Campus-Home-City: Labs of Change'

'Campus-Home-City: Labs of Change', the Education for Sustainability program of the UDC, is a project that seeks to advance in the formation of the university community and citizenship in the basic concepts of environmental and social sustainability and develop its capacity to act on those issues that are nowadays priorities. Conceived as a multidisciplinary program, it covers a wide range of ages, extending the last calls to children's, primary and secondary education, in addition to the university audience targeted by the previous editions. The target audience are students, but also includes the teachers and people working in educational centers, such as administrative, research, gardening, or dining rooms staff, among others.

Examples of activities at the UDC Campus are shown in Fig. 2. The program includes the 'Environmental March' held each year, an online summer course on 'Ecological footprint and climate emergency: contributions from the UDC', the 'Autumn waste prevention week' as well as specific actions spread throughout the academic course. Throughout the five editions developed until 2022 at UDC, it has reached 10,449 participants with an average dedication time of 2 hours, although a part of them devotes at least the 10 hours required for the recognition of 1 academic credit.

After 2021, the program was extended to A Mariña, being offered to the 50 primary and secondary schools of this region (Fig. 3). In A Mariña, student activities were mainly

concentrated in two or three weeks during the academic year. The first edition in A Mariña reached the participation of 442 students and 29 teachers from six centers, with more than 800 hours of total dedication. In addition, three centers carried out sustainability projects related to waste separation, composting and energy saving, following the experience gained at the UDC campus.

3. Goal, scope and content of the program

The goal of the project is to train the students of the UDC and A Mariña in sustainability and develop the students' capacity to act on basic and priority issues for environmental prevention and social sustainability, such as the following:

a) To promote climate action and reduce CO2 emissions.
b) To reduce the consumption of water and energy.
c) To recovery resources from waste and waste prevention.
d) To reduce the acoustic pollution.
e) To increase awareness about pollution, including microplastics and sea pollution.

Figure 2. Examples of activities of the Education for Sustainability program at the UDC Campus (From the upper left corner to the right and below: promoting the use of bicycles, volunteering for beach cleaning, monitoring composting, growing demonstration garden

The contents of the program seeks to form and activate social intervention groups on

topics such as noise pollution, the use of sustainable management of water and energy, waste management and recovery, as well as the development of sustainability capacities of the future professionals trained in the UDC. Individual education and awareness was strengthened through digital tools that allow the calculation of the personal carbon footprint of waste generation, energy and water consumption, and travel. These tools were developed by the UDC being now fully operational for waste, energy, water and people transportation [5], and in the development phase for food.

Figure 3. Examples of activities of the Education for Sustainability program with A Mariña school centers (From the upper left corner to the right and below: beach cleaning, litter picking up in an urban area, composting and rain water harvesting installation, identification of biodiversity indicators in a compost sample, participatory audit of waste generation and selective collection in the center, visit to a Sustainable urban drainage system at UDC campus)

Education for sustainability program at UDC and A Mariña consists of eminently practical activities in which the students receive the basic skills related to environmental, economic and social sustainability and carry out practical activities both individually and in-group that implies social action in these subjects in the immediate contour. Training and education topics are aimed at the general population, but with pedagogical adaptation to the age of each target group, thus being different in A Mariña and UDC. Practical activities were carried out at both individual and group level, always coordinated by environmental educators. In

addition, in the case of A Mariña, the program also aimed to train teachers, since they must act as agents determining how to develop practical and theoretical activities in their schools.

The activities were selected among the following: calculation of the carbon footprint, maps of noise and water consumption, eco-auditing of water and energy, waste management and recycling in the center and at home, local composting, river inspection, plogging at urban and natural sites (garbage cleaning in parks, forests and beaches), sustainable mobility and the impact of transport, and others.

These practical activities combine in an appropriate way the incidence at three levels: personal-family (home), university/school (campus/center), and local community levels. The program combines activities organized with the participation of responsible teachers and other activities organized through volunteer calls. Students and teachers from the A Mariña centers were also invited to make proposals for sustainability projects that were evaluated and funded in part or in full within the framework of the program.

4. The main program resources

Among the resources used were UDC's own professors and researchers, geographic information system tools and online forms developed by UDC, analysis of facilities and equipment for the use of water, energy and waste in both UDC and primary and secondary schools, environmental infrastructures in the UDC (water, energy, waste), sustainable drainage systems, composting areas, urban gardens. It also included the participation of environmental and social NGOs.

Improving waste, water, transport and energy infrastructure is another of the program's objectives, as well as moving towards better management practices in the UDC and A Mariña centers. Thus, environmental equipment and infrastructure are both a goal and a tool. We refer here to low-cost infrastructures and technologies, but whose improvement allows a great improvement in the environmental and educational result. Increasing energy and water efficiency requires de combination of efficient infrastructures and equipment (low energy consumption lamps, presence detectors, light level detectors and natural light, thermostatic and sectorial control of heating, faucet and toilet devices for efficient water use, etc.) and user involvement in saving practices. The results of water/lighting audits were used to communicate measures aiming to better resource use.

Waste collection systems in A Mariña centers were audited regarding the requirements of current municipal solid waste management plans. The practice in the centers of the UDC was the reference, as current collection systems include areas of contribution wit bins for waste paper and cardboard, glass, used vegetable oil, waste from electrical and electronic devices, batteries and printing cartridges, as well as for food waste and organic waste from canteens. Additionally, organic waste (bio-waste) are being collected separately in several UDC centers. Sorting organic waste made possible to recover large amounts of packaging waste, including aluminum materials.

5. Encouraging involvement in the program

The goal for at least 5 to 8 A Mariña centers to participate in the program was fulfilled in both editions, reaching the participation of 6 centers in 2022 and 10 centers in 2023. Students engagement in A Mariña centers were compromised by participating centers. Direct dissemination of the program was carried out to the centers via e-mail and online forms.

Along with a general description of the program, explanatory sheets were made available to the centers for each of the themes and sustainability projects. The offer of the implementation of the two best projects in the schools of A Mariña favored their participation.

Student engagement in the UDC was generally voluntary, although some activities were eventually offered as part of regulated subjects. For this, a communication strategy was designed in order to guarantee the success for the start of each course activity, attending different levels, such as university level, center level (particularly related to Green Campus committee at UDC centers), social networks managed by the Office for the Environment, and direct communication at personal level through university community email lists. In addition, the dedication carried out by each student might be certified and made accountable for the student curricula, according to the UDC regulation of recognition of credits for undergraduate students.

6. Program success indicators

Two types of indicators were used to assess the overall results of this program:

a) Indicators related to the progress in environmental issues: impact on energy and water consumption, amounts of waste recovered or composted or progress in the quality of waste sorting.
b) Indicators related to the progress of the program tasks

Because of the dual goal of the program of improving sustainability behavior at the campus/center and at home, indicators related to the progress in environmental issues are composed of two different contributions: that pertaining to the UDC and A Mariña school centers and that pertaining to the home and individual level. Direct impact on university and school centers were measured for some components (water and energy saving, materials recovered from waste, etc.) whilst impact at home/individual level was inferred from qualitative assessment. The impact in the domestic and municipal sphere is considered related to the field training activities of the participants, the results of which were partly monitored through online questionnaires and georeferencing tools, as well as from the results of the eco-audits.

Anonymous online forms were used for participant evaluation. Using a five-level scale to assess the quality of the program (bad, fair, normal, good and very good), the answers obtained indicated good (38.2) or very good (61.8) quality (n=55, 2022 edition). In addition, the evaluation questionnaire contained questions for the analysis of the impact of the program on people knowledge and interest in sustainability, before and after having participated in the training modules. The results reflect that despite the fact that 44% of the respondents claimed to have no or little prior knowledge and interest in sustainability issues, after participation 90% of them achieved a perception of improvement in their knowledge, and 42% considered the program and its activities as key to their training.

7. Conclusions

Hands-on and service learning education activities on UDC campus include examples such as decentralized composting systems, separate waste collection, sustainable urban drainage systems, efficient water use measures, examples of bioconstruction, actions in energy efficiency and renewable energy, urban gardens or rivers inspection. The education program used waste, water, transport and energy infrastructures on campus or schools as an

educational lab, as well as to transform them and promote better management practices. New actions and sectoral projects on campus and centers were the basis for promoting participation, also favored by academic recognition. After 6 editions, the program reached the participation of more than 11,000 people and 20,000 person-hours of dedication.

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