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## INTEGRATION OF DISABILITY IN FINAL DEGREE PROJECTS RELATED TO GREEN AREAS WITHIN THE FRAMEWORK OF THE SERVICE-LEARNING PROJECT: "COLABORA A LA PAR"

*Alicia Perdigones*

``Universidad Politécnica de Madrid`` ,  
Higher Technical School of Agronomic,  
Food and Biosystems Engineering.  
Department of Agroforestry Engineering.  
Educational innovation group GIE-Project.  
Madrid, Spain  
<https://orcid.org/0000-0001-8006-6437>

*José Luis García*

``Universidad Politécnica de Madrid`` ,  
Higher Technical School of Agronomic, Food  
and Biosystems Engineering. Department  
of Agroforestry Engineering. Group of  
educational innovation in electrical and  
automatic technologies of rural engineering.  
Madrid, Spain  
<https://orcid.org/0000-0002-0044-8265>

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***Maria Teresa Gómez-Villarino***

``Universidad Politécnica de Madrid``,  
Higher Technical School of Agronomic,  
Food and Biosystems Engineering.  
Department of Agroforestry Engineering.  
Educational Innovation Group at Biosystems  
Engineering Teaching Innovation.  
Madrid, Spain  
<https://orcid.org/0000-0002-8720-3593>

***Ignacio Cañas***

``Universidad Politécnica de Madrid``,  
Higher Technical School of Agronomic,  
Food and Biosystems Engineering.  
Department of Agroforestry Engineering.  
Educational innovation group GIE-Project.  
Madrid Spain.  
<https://orcid.org/0000-0002-6337-6377>

***Fernando Ruiz Mazarrón***

``Universidad Politécnica de Madrid``,  
Higher Technical School of Agronomic, Food  
and Biosystems Engineering. Department  
of Agroforestry Engineering. Group of  
educational innovation in electrical and  
automatic technologies of rural engineering.  
Madrid - Spain.  
<https://orcid.org/0000-0002-6653-6911>

**Abstract:** Within the framework of the Service-Learning project “Colabora A LA PAR”, this being the starting point, work has been done on accessibility for people with disabilities in public spaces with the students of the ETSI Agronomic, Food and Biosystems of Polytechnic University of Madrid (Spain). Within the project, approved in the 2021 call, different activities were carried out both inside and outside the classroom: seminars, curricular practices, End of Degree Projects, design of garden equipment adapted to physical disabilities and visits to inclusive orchards. This study focuses on the Final Degree Projects carried out in the last two academic years in the degrees of Agricultural Engineering and Food Engineering. The objective is to generate a social awareness in engineering students that allows the integration of people with disabilities in the area of agricultural and food engineering in the future through universal design and the possible hiring of personnel from this group in the facilities designed. The A LA PAR Foundation has served as the central axis to carry out several of the Final Degree Projects, proposing in some cases improvements in its facilities (orchards and greenhouses) and incorporating, in the management of the projects, workers with disabilities.

**Keywords:** intellectual disability, universal design, inclusion, green areas, service-learning.

## INTRODUCTION

The Sustainable Development Goals (SDGs) integrated into the 2030 Agenda are today an important aspect that must be kept in mind in university education. They provide clear lines of action to guide the academic guides of the subjects of the different degrees, for social, environmental and economic improvement through the different engineering subjects, in coordination with the teaching of their

technical aspects.

The subjects related to the civil works of green areas, which include urban orchards, parks and gardens, among others, can greatly favor the development of the SDGs related to sustainable cities, healthy eating, biodiversity, climate (Cabral et al., 2017), energy, education (Hake, 2017), inclusion and health. They are interesting facilities in agricultural training, both because of the importance they have taken on in cities, and because of the broad subject matter they address (vegetable species, irrigation, lighting, construction, among others). Through them, the development of transversal skills aimed at meeting one or more of these SDGs can be easily introduced (Smith, Meerow & Turner, 2021).

The inclusion of people with disabilities, the main axis of the work, is included in several of the SDGs of the 2030 Agenda, applicable to green areas (SDG10 - Reduce inequality in and between countries -, SDG11 - Sustainable cities and communities -, SDG16 - Promote just, peaceful and inclusive societies -).

It must be noted that green areas are being designed according to the urban regulations that depend on each country or each region, without including in many areas, actions that integrate aspects of accessibility, understanding as such, the adaptation of spaces to their use by people with disabilities (Imrie & Luck, 2014). Therefore, there are still many engineers who design spaces according to their experience and will attend to a greater or lesser extent to the differences between users, in terms of age, size, and different capacity (Null, 2003; Heylighen, 2014), according to their prior knowledge on the subject. This supposes a barrier for the real integration of the people of this group in the society.

Sometimes aspects of accessibility are addressed once the project has been completed and executed and the new needs are understood; this increases the price of the

project and generates a delay in the use of the facility by users (Steinfeld & Smith, 2012).

Thinking about a universal design of the facilities implies giving the project a practical approach that allows, from the initial moment of the design of the facilities, to act on those key aspects to eliminate architectural barriers and incorporate other communication elements or products that allow their use by the greatest number of people regardless of their abilities.

In this context, and as long as the spaces are accessible, the green areas represent a space for integration, which allows direct contact with nature, actively interacting with other users, both in terms of the leisure that is generated in these spaces, as well as the Possible employment in this area for people with disabilities.

#### **FOUNDATION: A LA PAR**

The Service-Learning project, which has served as the framework for action of the activities included in this work, has been developed in collaboration with the A LA PAR Foundation.

This Foundation has undergone changes in its objectives and activities since its inception. The Association was created by Carmen Pardo-Valcarce in 1950 with the purpose of welcoming the children of people with leprosy. Once this disease was eradicated, its activity was reoriented towards the integration of people with intellectual disabilities in society through their training, becoming, firstly, the Carmen Pardo-Valcarce Foundation (1990) and later (2017), A LA PAR Foundation.

Its activity is very focused on the training of people with intellectual disabilities, starting this training from the age of 12. The first years the training focuses on increasing their autonomy; later they carry out professional activities, such as gardening, carpentry, workshop or cooking, among others. Its activities also include the creation of

supervised housing, supervised housing, the “Diem” Day Center, attention to victims with intellectual disabilities, or research work that improves daily work with this group.

La Huerta de Montecarmelo, are agricultural facilities of the Foundation where the students of the gardening workshop are trained in a practical way, for their later employability. It has an approximate cultivated area of 4600 m<sup>2</sup>, dedicated to horticultural, fruit and aromatic crops, and two greenhouses that also serve as seedbeds. The workers in this garden are mostly people with intellectual disabilities (a minimum of 70% of the employees have intellectual disabilities as it is a Special Employment Center), who carry out the necessary agricultural work throughout the year.

The A LA PAR Foundation collaborates in the “Colabora A LA PAR” Service-Learning project, which is described in this study, tutoring End-of-Degree Project (TFG) students, setting out the initial situations and providing access to the facilities for writing TFG and Final Master’s Projects (TFM) at the Higher Technical School of Agronomic, Food and Biosystems Engineering (ETSIAAB) of the Polytechnic University of Madrid (UPM).

## **INTEGRATION IN UNIVERSITY EDUCATION**

Article 24 of the International Convention on the Rights of Persons with Disabilities (United Nations General Assembly, 2006), on education, recognizes their right to training on the basis of equal opportunities. In article 27, on work and employment, it is also indicated that access to professional and continuing training services must be allowed to “guarantee a job freely chosen or accepted in a labor market and environment that are open, inclusive and accessible to people with disabilities”. In the same way, in article 13, on comprehensive care, of ROYAL DECREE LAW

1/2013, of November 29, which approves the Consolidated Text of the General Law on the rights of people with disabilities and its social inclusion (BOE 289, 2013), comprehensive care is defined as “the processes or any other intervention measure aimed at enabling people with disabilities to achieve their highest level of development and personal autonomy, and to achieve and maintain their maximum independence, capacity physical, mental and social, and their full inclusion and participation in all aspects of life, as well as obtaining suitable employment”.

This legislative framework has meant a significant improvement in recent years in Spain, in terms of the inclusion of people with disabilities in all areas, including training, especially in the stages of basic education and professional training.

However, in terms of university education, the necessary modifications to be made at this educational level are not included in these regulations (Alcaín Martínez & Medina-García, 2017). As Alcaín Martínez & Medina-García (2017) explain, it is necessary to design the subjects in such a way that, among other things, “future professionals who will intervene in the design of environments are provided with a tool that allows them to address the problems of accessibility of their projects.

This point is of special interest in engineering degrees. In the case of agricultural engineering, this aspect is interesting in terms of the construction part (civil works) and design of orchards, parks and gardens, where these students will be decisive actors. In addition, it is necessary to normalize the situation of disability among future professionals in the sector, generating a social awareness that allows people with disabilities their full participation in society, not only socially, but also professionally.

## **ORGANIZATION OF DEGREES ACCORDING TO THE BOLOGNA PLAN**

In 1999, within the European Higher Education Area (EHEA), different countries signed the Bologna Treaty, through which a guide would be provided for the design of university curricula. This would facilitate the exchange of students between countries and would allow adapting its contents to the social and professional demands of the moment, in a coordinated manner. It was established that the Bachelor's studies would last four years, and the Master's could last one or two years.

To finish the Bachelor's and Master's studies, it is necessary to carry out a Final Degree Project (TFG) or Final Master's Project (TFM), respectively. These works are carried out individually and allow determining the level of competences developed by the student in the different subjects in which they have been trained throughout the degree. Both the level of technical skills and transversal skills are evaluated, such as the integration of social, environmental and economic aspects, so important today to achieve the SDGs integrated in the 2030 Agenda.

These TFG and TFM may have their origin in non-real installations. In these cases, the students propose a fictitious starting point from which they develop the rest of the project. In other cases, they deal with initial situations or problems in real installations, on which the student tries to find a solution. In these cases, the TFG and TFM can be oriented towards a service-learning methodology, providing an opportunity to make proposals for improvement on a real installation, and therefore carrying out professional work for a company in the sector or a group in particular.

## **GOALS**

The objective of this study is to develop social commitment among Agricultural Engineering and Food Engineering students through Final Degree Projects (TFGs), as an opportunity for the integration of people with disabilities.

Among the TFG that have been carried out in Agricultural Engineering, there are included those that provide proposals for the improvement of the infrastructures of the Huerta de Montecarmelo, within the framework of the Service-Learning Project Collaborate A LA PAR. These TFG address issues such as the improvement of irrigation, sanitation, application of phytosanitary products, without losing sight of the inclusion of people with disabilities. Final Master's Projects have also been developed, but examples of TFG will be included.

## **METHODOLOGY**

During the academic year 2021/22 and 2022/23, within the framework of the Service-Learning project «Colabora A LA PAR», students of two degrees (Degree in Agricultural Engineering and Degree in Food Engineering) were proposed to write TFGs where social aspects are incorporated. These degrees are taught at the Higher Technical School of Agricultural, Food and Biosystems Engineering (ETSIAAB) of the Polytechnic University of Madrid (UPM).

This activity is among those initiated within the framework of the Service-Learning project «Colabora A LA PAR», approved in the 2022 Call for «Service-Learning Projects» (Resolution of July 22, 2021) of the UPM. Among the activities that were carried out in the project, and that have been published in other studies, is the realization of seminars, curricular practices and design of garden equipment adapted to physical disabilities through 3D modeling programs (Perdigones



& García, 2022) and visits to inclusive school gardens (Perdigones et al., 2022). In addition, a study was carried out on the accessibility to urban gardens in Madrid (Spain) (Arteaga, Barbero & Perdigones, 2022). This study has focused on the writing of TFG.

## FINAL DEGREE PROJECTS WRITTEN

The most representative TFG of inclusion, which have been presented this year, or for which its completion has been approved and which are currently being drafted, are listed below. They have the following titles:

- Project for the adaptation of the urban gardens of the ETSIAAB, with an area of 650 m<sup>2</sup>, for the inclusion of people with physical and sensory disabilities.
- Landscaping, according to the 2030 Agenda, of a 6500 m<sup>2</sup> plot, currently occupied by the English Court of Méndez Álvaro (Madrid).
- Design of a 2400 m<sup>2</sup> urban garden in the Parquesur Shopping Center in Leganés (Madrid) to promote the employment of people with intellectual disabilities.
- Design of a 200 m<sup>2</sup> greenhouse and proposal for a training program to hold social inclusion workshops in Montecarmelo (Madrid).
- Design Project for a Self-sustaining Urban Park of 9825 m<sup>2</sup> in Las Tablas (Madrid).
- Urbanization and landscaping project for a 3800 m<sup>2</sup> surface area of a winery with Denomination of Origin, in the municipality of Valdecastillas (Valladolid)
- Design and sizing of a production line for ready-to-eat dishes with a capacity of 8,000 kg/week in Mejorada del Campo (Madrid).

In some of these TFG, the theme is clearly oriented to the universal design of public

spaces; in others, whose main theme is the design of a line of food processes, the technical issues that are related to accessibility are found both in the urbanization of the industrial estate, as well as in architecture and interior spaces, as well as in business management, proposing the incorporation of people with disabilities to the workforce.

For the design and writing of the projects, tutorials have been carried out in each phase of the TFG, explaining to the students the necessary actions so that their work was inclusive. In most of the TFG, visits have been made to orchards or public parks, analyzing the construction details and services that allow the integration of people with disabilities.

## RESULTS AND CONCLUSIONS

Students request this type of TFG/TFM, interested in the social aspects that they include, and that they perceive as something new and with added value.

The concepts on which more work has been done are the following:

- Lowering of the sidewalks and incorporation of accessible tree pits.
- Accessible car parks located near the entrances.
- Pedestrian ramps to overcome obstacles, with slopes of less than 8%.
- Incorporation of tactile paving and rigid paving without protrusions.
- Ischiatic support along the route.
- Heights free of passage in the route of 2.2 m.
- Pedestrian accesses and walkways with sufficient width for the passage and turning of wheelchairs.
- Information panels with braille and high relief (accessible communication).
- Botanical trails with accessible elements.

The explanation of these concepts and the way in which they must be introduced in the projects, has been shown within the subjects of “Civil works and infrastructures of green areas”, “Electrification of green areas and fruit and vegetable farms” and in “Electrical installations and automation”. He has also worked intensively in individual tutorials and seminars.

On the one hand, it is necessary to generate social awareness in future employers in the sector (current students) to promote job creation or facilitate access to jobs for people with disabilities (Alcaín Martínez & Medina-García, 2017). On the other hand, designing these spaces in a universal way (taking into account the constructive elements, products and communication) is essential for the social integration of individuals (Null, 2003).

In the case of people with disabilities, the spaces must be adapted to each need, from the initial design stage, which will result in a benefit for all, both socially and economically. Universal design must be an important part

of planning in architecture and landscaping (Null, 2003).

Although in many countries the laws and urban regulations have changed in recent years, incorporating aspects of accessibility, it is necessary that future professionals, responsible for the design of these spaces, are aware of these needs and, for this, it is essential to previously train the teachers on disability (Carballo, Morgado & Cortés-Vega, 2019).

From the university it is essential to combine the technical aspects, typical of engineering, with social aspects that make students understand the importance of their work and how it influences the way in which people with disabilities integrate into society.

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