

RESEARCH PROTOCOL: WHAT IS THE PERCEPTION AND KNOWLEDGE THAT UNIVERSITY STUDENTS OF ENGINEERING DEGREES HAVE ABOUT SUSTAINABLE DEVELOPMENT GOALS (SDG)?

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Abstract

The main objective of the work presented in this communication is to present a research protocol. The practical application of the proposed protocol, will allow to know the perception and degree of knowledge that students of several Engineering Degrees in a specific University have regarding sustainability in general, and more specifically, about the Sustainable Development Goals (SDG) declared by the United Nations (UN).

Once this perception and degree of knowledge is known, appropriate decisions and actions can be taken to improve the teaching-learning process in relation to it. In this way, knowing that starting point, it will be possible to increase the awareness and degree of knowledge of the students regarding the SDGs, designing and implementing different activities that, in a fully integrated way with the contents of a subject, can promote the sensitivity of the students towards the achievement of the SDG targets. This will enhance the focus of future graduates towards achieving the objectives through their work performance. Although the protocol is presented focused on a public higher education organization, and a specific degree and subject, this protocol can be applied without requiring too many adaptations, to any subject and degree.

Keywords: Research Protocol, Sustainable Development Goals, SDG, Engineering Studies, Teaching-Learning activities.

1 INTRODUCTION

The research that arises in this work focuses mainly on knowing the perception that students of Engineering studies have on the Sustainable Development Goals (hereinafter SDG). The aim is to analyze this perception in terms of the importance that students think that the SDGs have in their future work and, consequently, the importance they give to their training in this matter.

This research arises because, after several years of experience teaching subjects in various engineering degrees within the UPV, it has been observed that the majority of students do not give too much importance to the SDGs. In general, it is observed that they have a perception of themselves as something alien to them and their future work. In many cases, they think that everything related to the management and scope of the SDGs should be dealt with by specific professionals for it, such as future professionals of the Bachelor's Degree in Energy Engineering, among others. Therefore, the majority of engineering studies students believe that what is related to the SDG is outside their work environment and that it has no direct application in the possible performance of their future job as Engineers. However, nothing could be further from the truth. The SDGs are cross-cutting objectives, in which all types of professionals must be involved [1] and not only those specific to the energy sector.

Information has been collected from students in this regard over several years, and the authors' perception is based on data, such as those presented in [2]. However, it is estimated that this perception should be corroborated by scientific research with a more rigorously defined methodology than the one applied so far, and based on data obtained systematically in different subjects and degrees. That is why this research is proposed.

In this way, it can be said that the specific objective of the research is to find out what the perception that engineering studies students really have regarding the importance of the SDG in their future work. In this way, depending on the result obtained, a specific learning strategy for the SDGs could be proposed in the future, within the Engineering degrees, in a way adapted to this perception

2 THE SUSTAINABLE DEVELOPMENT GOALS (SDG)

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet, and improve the lives and prospects of people around the world. In 2015, all United Nations Member States approved 17 Goals as part of the 2030 Agenda for Sustainable Development, an initiative that establishes a plan to achieve the Goals established within 15 years.

Those 17 SDGs focus, as their name suggests, on achieving sustainable development, which can be defined as “development capable of meeting the needs of the present without compromising the ability of future generations to meet their own needs” [1]. This sustainable development requires focused efforts to build an inclusive, sustainable and resilient future for people and the planet. According to the UN proposal itself [1] to achieve sustainable development, it is essential to harmonize three basic elements, which are the following: economic growth, social inclusion, and environmental protection. The three elements are interrelated, and are all essential to be able to achieve the well-being of people and societies.

Currently, progress is being made in the development of this SDG initiative in many places, generating and implementing actions, strategies and policies to achieve the 17 SDGs. But overall, action to achieve the Sustainable Development Goals is still not progressing at the necessary speed and scale.

With less than 10 years left to achieve the Sustainable Development Goals, world leaders called for a decade of action and results for sustainable development, vowing to mobilize funding, improve national implementation and strengthen institutions to achieve the Goals on schedule, 2030, leaving no one behind.

Addressing the challenges of the SDGs will require new knowledge, new ways of doing things, making difficult decisions between competing options and, in some cases, profound transformations. Of course, this directly involves Universities, as organizations that drive technological and social progress through research, discovery, creation and adoption of knowledge [3]. Universities have already begun to implement programs to adapt to this initiative [4; 5]. But are university students aware of all this? They are the ones who, in the nearest future, must develop and support the strategies and actions necessary to meet these objectives. Without them and their support, it is practically impossible for these goals to be achieved.

Therefore, it is essential that university students are aware of the SDGs. And therefore it is necessary to know their perception of them, in order to achieve that awareness if they do not have it.

As can be read in [6], the perception that students have of a subject affects subjective variables, such as motivation, understanding, etc., which condition their learning process. Thus, according to these authors, when the contents of a subject are perceived as interesting, important and useful, students are more willing to learn that subject by understanding it. In fact, in that same work, citing [7], they indicate that the most frequent cause of a student's lack of motivation is that he does not see the real usefulness of the subject, that is, what it is going to serve him for. For this reason, motivation seems to influence the way of thinking and, with it, on the process and final result of learning [8]. Furthermore, the perception that students have of a subject or subject is directly related to their academic performance [9].

Obviously, the teacher can greatly influence and favor these subjective variables [10]. In this way, if you use appropriate teaching methods, you can improve the vision, the perception that the student has about a discipline and thus capture the interest of it, which can help achieve deep learning.

Of course, the first step to be able to evaluate if there is an improvement in the student's perception of a subject is to know what the starting point is, the student's initial perception of it [11]. For this reason, this research is proposed, in order to be able to know the perception of the students, and based on this, later, to be able to establish the appropriate strategies, to finally be able to design the most appropriate teaching-learning process to the identified situation. And for that purpose, as the first step of the research, the research protocol that is presented in this work is proposed. In this way, the protocol will establish the steps to be followed to carry out the investigation [12].

3 CONTEXT DESCRIPTION

At this point, it should be noted that the research presented in this work focuses on SDGs and their perception by students of different engineering degrees at the Polytechnic University of Valencia (UPV). This University has the following characteristics [13]: Spanish public university with just over 50 years of history, medium-large (annual budget close to € 400M; 6,000 workers; 40,000 formal training

students) and considered one of the universities leaders in technological education (engineering) worldwide. The Academic Ranking of World Universities (ARWU), popularly known as the Shanghai ranking and internationally considered the most prestigious indicator of universities in the world due to the objectivity of its methodology, places UPV as the best polytechnic in Spain, in the range between the 301-400 Universities first universities in the world. The QS World University Rankings also included the UPV in the world top 400 (371st), also marking it as the best university in the Valencian Community.

On the other hand, the magazine Times Higher Education (THE) recognized the UPV as the university with the greatest social and economic impact in Spain. It also highlights its firm commitment to the Sustainable Development Goals (SDG), including it among the 25 best in the world in three of them: clean and affordable energy (12th), responsible consumption and production (20th), and climate action (22nd).

Specifically, the research will be carried out in the UPV degrees shown below in the first column of table 1, and which are assigned to the schools also indicated in the second column of the same table.

Table 1: Degrees and entities where the research is going to be implemented

| <i>Degree</i> | <i>Entity (School)</i> |
|---|--|
| Bachelor's Degree in Industrial Engineering | School of Industrial Engineering |
| Bachelor's Degree in Informatics Engineering | Higher Polytechnic School of Alcoi |
| Master's Degree in Telecommunication Engineering | School of Telecommunications Engineering |
| Bachelor's Degree in Digital and Multimedia Technology | School of Telecommunications Engineering |
| Bachelor's Double Degree in Mathematics + Telecommunication Technologies and Services Engineering | School of Telecommunications Engineering |
| Bachelor's Degree in Industrial Organization Engineering | School of Industrial Engineering |

Source: self made

4 PREVIOUS PUBLICATIONS

Research on the SDG has experienced an exponential boom in recent years, and "Education" is one of the Keywords in several of the articles of these investigations [14]. Therefore, it can be thought that there is already research developed in relation to the SDGs and their educational aspect. But it is not clear that there is research in relation to what the present work proposes.

For this reason, a literature search on the subject has been carried out, with the aim of finding out if the research being proposed has already been carried out, even in some other setting. It is important to note that a study like the one presented here is highly dependent on the environment in which it is carried out. The results may be different depending on the geographical area, but also in terms of the degrees and Universities in which the study is carried out, even within the same geographical area. It can even be said that it depends on the students taking the degree and the subjects, which obviously vary from year to year, and with it the existing perception.

Therefore, initially, the search was planned taking into account the degrees in which the research will be carried out. However, when restricting the search in this sense, no reference appeared, which is an indicator that there are no studies in this area and specific context. For this reason, it was decided to remove this restriction and broaden the search. In this way, similar studies have been sought in the scientific literature, even in other settings or contexts, that can help to propose the study and the methodology.

Thus, the search was carried out following the process detailed below:

Regarding the selection of databases, in this study the Web of Science (WoS) and SCOPUS databases were selected. These databases have many high-impact international scientific and technical publications from all disciplines.

Two search strings were used for each database. For the WoS, the Search 1 was TOPIC: ("SUSTAINABLE DEVELOPMENT GOALS") AND TOPIC: ("STUDENT* PERCEPTION*"), and the Search 2 was TOPIC: ("SDG*") AND TOPIC: ("STUDENT* PERCEPTION*"). In a similar way, for SCOPUS, the Search 1 performed was TITLE-ABS-KEY ("SUSTAINABLE DEVELOPMENT GOALS") AND TITLE-ABS-KEY ("STUDENT* PERCEPTION*"), and the Search 2 was TITLE-ABS-KEY ("SDG*") AND TITLE-ABS-KEY ("STUDENT* PERCEPTION*"). The searches in the databases were carried out on Dic 2021.

The following table summarizes the searches performed in Clarivate-WOS and the results found.

Table 2. Clarivate-WOS search results. Search date: 12/26/2021

| Id | Search Strategy | Items |
|----|---|-------|
| W1 | Keywords: "Sustainable Development Goals" in "Topic" AND "Student* perception" in "Topic" | 19 |
| W2 | Keywords:: "SDG*" in "Topic" AND "Student* perception" in "Topic" | 14 |

Source: self made

Table 3. Search results in Scopus. Date 12/26/2021

| Id | Search Strategy | Items |
|----|--|-------|
| S1 | (TITLE-ABS-KEY (sustainable AND development AND goals) AND TITLE-ABS-KEY(student* AND perception*)) | 162 |
| S2 | (TITLE-ABS-KEY (sustainable AND development AND goals) AND TITLE-ABS-KEY (student* AND perception*)) | 42 |

Source: self made

After analyzing the articles found, it is observed that most of them are not related to the study presented here. They do analyze the perception of students, but not in relation to the SDGs, but to other issues, although related to some of the SDGs in particular.

However, there is a fairly recent work in the line of this research. It is specifically the article by Aleixo et al [15]. This study is developed through a survey of more than 1000 university students in Portugal. However, the questions posed, focus on the perception of the training they have received regarding the SDGs, and not so much on how they perceive them. In its conclusions, it is indicated that almost all students agree that Higher Education Institutions (HEIs) should actively incorporate and promote Sustainable Development in their training offer. However, currently only about 25% of students feel that SD topic is covered in their course, and 21% report that it is not covered at all in the course they attend. The vast majority of students (94%) feel that HEIs could do more to train students with skills in relation to the SDGs. When asked about the SDGs, half of the students claim to know what they are, but 34% have heard of them, but do not know what they are, and 16% have never heard of them. This shows that, although HEIs are already developing SD skills, they still have a role to play in training students in the area of the SDGs.

However, even this study, which seems closely related to the research presented here, does not analyze how students perceive the SDGs, and what importance they believe they have in their work and personal future. It does go into details of its behavior taking into account recycling, or concern for environmental climate change.

There are studies that investigate what students know about the SDGs, but not so much to know how they perceive them.

5 RESEARCH QUESTIONS

In this research we propose to analyze what is the perception that students have regarding the SDGs. The research questions to be solved could be:

- Do students know what the SDGs are?
- Do you know the relationship your future profession may have with the scope of the SDGs?
- Do they recognize the importance of training in SDGs for the performance of their future work? In relation to other subjects?
- Do students think that learning about the SDGs is useful?
- Do you find the SDGs interesting?
- Do you think that training in SDGs should be compulsory in the curriculum of an Engineer?

- Do you think this possible training should be integrated with the subjects, or with specific SDG's courses?
- Are they currently receiving training in SDGs on their degree? How?
- If so, do you think they are receiving adequate training?
- Do students perceive the SDGs as a difficult subject, expensive to study?

5.1 Why is this research important?

This research is considered to be important in several aspects, both for the companies in which future professionals will work, as well as for academics.

5.2 Contribution for enterprises

Once this research has been carried out, actions can be carried out with the aim of improving the training of students in relation to the SDGs. In this way, companies will be able to incorporate professionals with adequate training to achieve these Goals.

Furthermore, the area of the SDGs is an area in constant and rapid change and growth. Through this research project, it will be possible for future professionals to have a better attitude towards SDGs, and, consequently, to be able to better manage and respond to these changes.

5.3 Contribution for academics

Regarding the contribution for academics, this study can be used as a point of reference by all academics who must teach something related to the SDGs, in order to focus their subjects and their teaching-learning process to develop the awareness about them. As well, this study can be used to design other studies to observe the perception that students have about the ODS in different environments.

However, this is only a starting point, since the study is proposed in some specific degrees and a specific University, but it can be perfectly extrapolated to other Universities where the same degrees are taught, and even to other subjects and degrees. , who can use this work as a reference to be able to make an analysis with similar objectives, although in different environments.

Based on the results, the teaching-learning process can be approached in the most convenient way for the particular situation.

6 DESCRIPTION OF THE INTERVENTION

The research will be carried out through an intervention that begins with the configuration of the surveys that will be transferred to the students so that they can fill it out, and with this the data for the analysis will be obtained.

Therefore, the data will be obtained through a questionnaire that will be passed to the students in class or through a web link. The questionnaire is developed in Google Forms, and students can access it through a link provided by the teacher, if they have not been able to fill it in in class, or prefer to do it later.

The questionnaire will be based on the one proposed in Oltra-Badenes et al [2], complemented with questions from the work of Aleixo et al [15].

In addition, open questions are added at the end of the questionnaire, where the student is given the opportunity to express their opinion.

The questionnaire will be passed twice, both at the beginning and at the end of the course of different subjects of the titles indicated in Table 1. In this way, it will be possible to analyze whether taking the subject has any effect on the perception of the students of the SDGs.

After each of the survey passes, the analysis corresponding to each subject of each degree will be carried out individually, which will allow knowing the results obtained.

Finally, a joint analysis will be carried out, both of the different subjects and of the initial and final surveys, which will allow analyzing similarities and differences between subjects and degrees, and drawing conclusions on the possible actions carried out in them.

The process can be seen in the following figure:

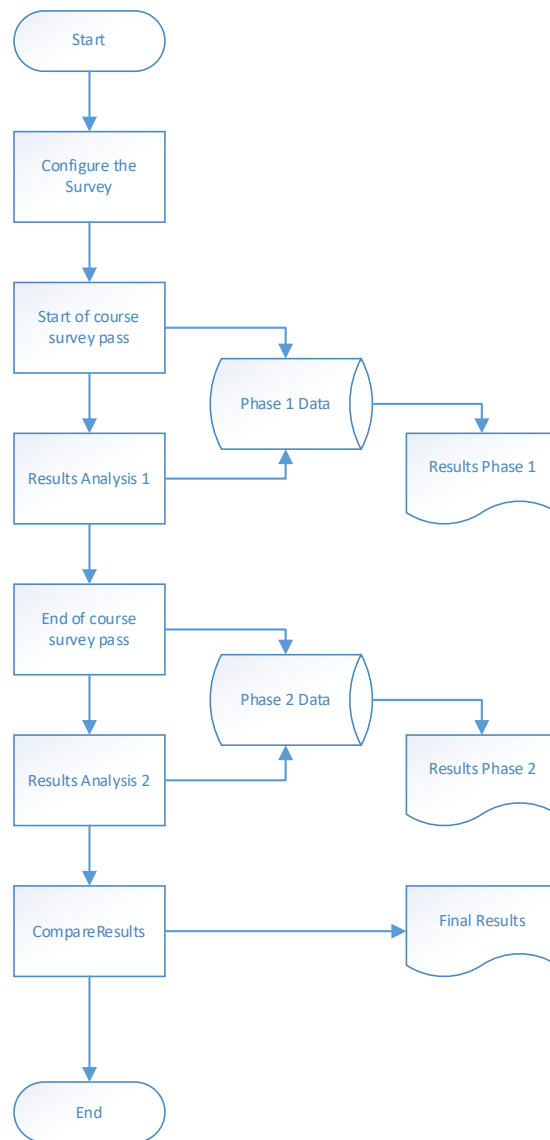


Figure 1. Procedure for data collection and analysis

7 CONCLUSIONS

In this work, the research protocol that will be followed to carry out the intervention of an educational research project has been presented. The protocol is reasoned and justified based on existing research and the objectives of the research, and will serve as a guide to carry out the intervention through which the necessary data will be collected. In this way, the specific objective of the research can be achieved, which is to find out what the perception that engineering studies students really have regarding the importance of the SDG in their future work. In this way, depending on the result obtained, a specific learning strategy for the SDGs could be proposed in the future, within the Engineering degrees, in a way adapted to this perception.

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