

Project-Based Learning methodology (PBL) for the acquisition of Transversal Competences (TCs) and integration of Sustainable Development Goals (SDGs) in mechanical engineering subjects

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Abstract

This research is carried out within the framework of a two-year Educational Innovation and Improvement Project (EIIP) to be implemented at the Universitat Politècnica de València (UPV) during the academic years 2023-2024 and 2024-2025. The project aims to design and apply a Project-Based Learning methodology (PBL) for a proper acquisition of Transversal Competences (TCs) and integration of the Sustainable Development Goals (SDGs) in a mechanical engineering subject that is taught in the first year of the master's degree in Mechatronic Engineering from the School of Design Engineering. Based on an assessment by the teaching staff of the current situation and the aspects to be improved, this article explains how the PBL methodology will be implemented. Additionally, several quantitative and qualitative techniques are used to collect evidence such as surveys and group discussions with the students about their perception and satisfaction of the PBL, their affinity and level of knowledge regarding the TCs and the SDGs that are worked on in the subject. The results show the validity of applying active learning techniques such as PBL for the proposed purposes. However, the need to continue working on its improvement and practical implementation has been detected to achieve a more viable, attractive, and motivating subject, closer to the labor market and a sustainable society.

Keywords: Project-Based Learning methodology (PBL); Transversal Competences (TCs); Sustainable Development Goals (SDGs)

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1. Introduction

Nowadays higher education promotes both personal and professional development in response to globalization and the cultural, socioeconomic, and educational changes it implies. It is recognized from the framework of the European Higher Education Area (EHEA) that a change of methodological perspective in education is necessary. This paradigm shift in the higher education can be boosted by encouraging active teaching techniques such as project-based learning (PBL) methodologies as a natural way to acquire Transversal Competences (TCs) and to integrate Sustainable Development Goals (SDGs) (de los Ríos et al., 2010). To this end, various methodologies have been developed and applied to a wide range of educational contexts in different countries of the world (Gonçalves, 2014; Llopis-Albert and Rubio, 2021; Llopis-Albert et al, 2022; Bracho et al., 2023). The PBL is a learning model with which students have a leading role in the construction of their knowledge, skills, values, while the teacher strengthens its role of guide and counselor of that process (e.g., Chen and Yang, 2019; Crespí et al., 2022). On the one hand, in the PBL methodology students actively work, plan, implement, and evaluate projects that have real-world application beyond the classroom (Rubio et al., 2022). Therefore, these tasks allow students the chance to work relatively autonomously for long periods of time under the supervision of teachers, ending up with projects that are realistic (Fini et al., 2018). In other words, in the PBL methodology students play a pro-active role in the construction of knowledge, which involves pursuing solutions to problems, generating questions, debating ideas, performing a decision-making with regard to learning goals, designing plans, investigating to collect data, drawing conclusions, presenting their results to others, redefining their questions, and creating or improving a final product (Johari and Bradshaw, 2008). On the other hand, teachers must encourage the use of metacognitive processes, reinforce group and individual efforts, diagnose problems, offer solutions, give feedback and evaluating the results, plan each process to be carried out, etc.

Students must engage in a systematic research process, which involves decision-making regarding learning goals, inquiry into the topic, and construction of knowledge. However, this teaching-learning process constitutes a challenge in many aspects such as the roles of the different participating actors, the organizational aspects of the educational process, the dynamics of the classes, the evaluation procedure, etc. (Felce et al., 2018).

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The PBL has been proven to be an effective tool for fostering the acquisition of a set of generic abilities to meet the high demands when entering the competing labor market (Trenor and Prats, 2020; Haatainen and Aksela, 2021; Owens and Hite, 2022). Therefore, the educational praxis must put aside the usual methods and venture into new active teaching strategies that stimulate the development of skills for the improvement of the educational process. In this regard, many studies on PBL have been conducted and increasingly adopted in higher education institutions around the world. Many authors have also pointed out the importance to implement of the PBL methodology in the context of the Sustainable Development Goals (SDGs) and the Agenda 2030, which was formally articulated and adopted in the United Nations General Assembly (UNGA) (UN, 2015). SDGs are a set of 17 interconnected goals that are meant to act as a common blueprint for peace and prosperity for people and the planet from now on.

This paper is aligned with these findings and applies to a particular case study a Project-Based Learning methodology (PBL) for a proper acquisition of Transversal Competences (TCs) and the integration of the Sustainable Development Goals (SDGs) in mechanical engineering subjects.

The rest of the paper is organized as follows: section 2 presents the material and methods used. It covers the context in which this research is developed (i.e., the Educational Innovation and Improvement Project (EIIP) launched by the UPV in June 2023), together with its implications in the promotion of TCs and SDGs. Section 2 also illustrates the methodology followed in this study. Section 3 applies the methodology proposed to a case study. Section 4 provides the results, while in Section 5 a discussion of the results is introduced. Eventually, section 6 puts forward the conclusions.

2. Materials and methods

The following subsections explain the context in which this research is developed, covering the call for “Learning and teaching 2023” launched by the UPV, and university strategic plan for the organization and integration of the Transversal Competences (CTs) and the Sustainable Development Goals (SDGs) in their official titles. This section also presents the methodology followed in this study.

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2.1. Alignment of the EIIP call with the university strategic plan.

The EIIP call was launched by the Institute of Educational Sciences at UPV in 2023 (EIIP, 2023). The development of the innovation in the EIIP call is closely aligned with the strategic plan of the UPV for the period 2023-27, which has been developed as a permanent process of reflection and improvement to adapt the higher education institution to the numerous challenges that society demands. The strategic plan emphasizes the personalized learning of each student, the development of their technical and digital skills, their ability to innovate and work collaboratively, and their social commitment. The innovation in the EIIP call has been designed to address these objectives by promoting active teaching techniques, such as Project-Based Learning (PBL) methodologies, to facilitate the acquisition of TCs and the integration of SDGs in higher education.

This call has been established within the framework of the Organic Law 2/2023 of the Spanish university system (LOSU), and the implementation of the strategic plan of the UPV for the period 2023-27. On the one hand, the LOSU as a legal framework of reference, raises issues related to the quality and innovation of teaching, and promotes the acquisition of knowledge and academic and professional skills programmed in each teaching cycle. On the other hand, the strategic plan of the UPV aims to personalize the learning of each student, developing their artistic, scientific, digital, and technical skills, their ability to innovate and work collaboratively, and their social commitment. In addition, The EIIP is in line with the quality assessment programme of the teaching activity implemented at UPV (DOCENTIA), which is promoted by Spanish National Agency for Quality Assessment and Accreditation (ANECA) (Llopis-Albert et al., 2023), and the Spanish Organic Law 2/2023, of March 22, of the University System (LOSU, 2023; Rubio and Llopis-Albert et al., 2023).

The EIIP pursues the following objectives:

- Boost projects aimed at improving learning and comprehensive development of students using Information and Communications Technology (ICT), the development of cognitive skills and professional life, and the overall satisfaction of both students and teachers.
- Promote the transfer of knowledge to the business and productive framework.
- Build up the curricular adaptation of innovation initiatives in UPV degrees.

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- Create synergies between teaching teams to gradually configure itineraries that favour multidisciplinary and interdisciplinary educative training.
- Support the development of projects boosting professionalized and academic teaching, based on teaching experimentation and a systematic analysis of the evidence of student learning, and subjected to the critical review from the entire university community.
- Promote actions that favour a society that is open to change, sustainable, technologically advanced, socially equitable, without any type of discrimination and clearly aligned with the SDGs.

This call comprises five major thematic areas:

- Curricular redesign of degrees, which cover the integration of the five Transversal Competences (CTs) as defined by the UPV, development of active learning activities such as Project-Based Learning methodologies (PBL), and evaluation oriented to the learning of competences.
- Incorporation of the Sustainable Development Goals (SDGs) promoting innovation proposals for the design, implementation and evaluation of learning experiences linked to social, economic, and environmental challenges.
- Disciplinary investigation for promoting proposals with the aim of solving problems in the learning process and on how to face them by means of the teaching activity.
- Use of Information and Communications Technology (ICT) for quality learning improvement. For instance, the design and implementation of different digital strategies to facilitate student involvement in their learning process.
- Involvement of students in their training, while considering with different factors that have a direct influence on educational results, such as personal factors (family environment, aptitudes, expectations, etc.) and institutional factors (types of students, organizational culture, administrative decisions, orientation programs, etc.).

2.2. Transversal Competences (CTs) as defined at UPV.

The project of CTs at the UPV was initially launched in 2014 to facilitate the active, committed, and responsible learning of its students, giving a quick and flexible response to the demands of a

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training that requires professionals capable of leading significant transformations to build an advanced society, socially equitable and environmentally sustainable (UPV, 2020). CTs include the skills, behaviours, attitudes, motivations, values, and knowledge necessary for people to develop successfully in a dynamic professional context (Llopis-Albert and Rubio, 2021, Carballeira et al., 2020).

The new organization and integration of the Transversal Competences (CTs) in the official titles of the UPV was approved by the university governing council on July 21, 2022. It defines a set of five CTs with a triple objective: to facilitate its evaluation by teachers, to facilitate understanding by society and to unify the requirements demanded by the different evaluating agencies at the national (Spanish National Agency for Quality Assessment and Accreditation - ANECA quality seals), European (seals of EURO-INF and EUR-ACE quality) and international (ABET North American quality seal). The CTs are established for any official title of the UPV, regardless of scope, duration, and level, and must favour the acquisition of other specific competencies.

The dimensions of the CTs comprises five strategic training objectives: social, environmental, innovation, quality, and progress values:

- **CT1:** Social and environmental commitment. Act with ethics and professional responsibility to face social, environmental, and economic challenges, while considering democratic principles and the SDGs.
- **CT2:** Innovation and creativity. Propose creative and innovative solutions to complex situations or problems, typical of the field of knowledge, to respond to the various professional and social needs.
- **CT3:** Teamwork and leadership. Collaborate effectively in work teams, assuming leadership responsibilities and functions and contributing to collective improvement and development.
- **CT4:** Effective communication. Communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.
- **CT5:** Responsibility and decision making. Act autonomously in learning, making informed decisions in different contexts, making judgments based on experimentation and analysis, and transferring knowledge to new situations.

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2.3. Mechanisms for the implementation, monitoring, and degree of compliance of the SDGs at UPV

The Sustainable Development Goals (SDGs) and the Agenda 2030 was formally articulated and adopted in the United Nations General Assembly (UNGA) (UN, 2015). SDGs are a set of 17 interconnected goals that are meant to act as a common blueprint for peace and prosperity for people and the planet from now on. It establishes a roadmap towards social, economic, and environmental sustainability, and underlines the need to carry out a significant effort of alignment and coordination by all the agents involved.

In UPV (2020a) a proposal to measure the degree of compliance of the SDGs based on four levels from lowest to highest measured using different indicators and eight categories (structure, publication of a sustainability report, academic offer/training activities, R+D+i transfer, regulations/institutional policy, debate and public policies, community, and alliances). Although much progress has been made since then, this last assessment already revealed high compliance percentages based on the levels of compliance 1 and 2 (i.e., those that are comparable between all the universities). In fact, they are greater than 90%, in seven of the eight categories (all except in the preparation/publication of a sustainability report).

Among the initiatives of the UPV to implement the SDGs, it could be highlighted: 1) integrate the SDGs into university degrees, 2) creation of a specific section on SDGs in the teaching guides of each subject, 3) provide teacher formation for the inclusion of sustainability in university teaching, 4) service-learning to integrate SDGs, which is a way of learning by doing a service to the community, 5) campaigns for the dissemination of the SDGs, 6) academic recognition of credits on sustainability, 7) promoting that final degree/master projects as well as research articles published by UPV staff are related to the SDGs, 8) concession of Educational Innovation and Improvement Projects (EIIP) within the thematic area of SDGs.

As a concluding thought, the UPV has made great progress in the design of mechanisms for the implementation and monitoring of the SDGs, although much remains to be done.

2.4. Methodology

The methodology outlines the research design, data collection procedures, data analysis methods, ethical considerations, and limitations of the study, providing a comprehensive overview of the research approach employed to investigate the integration of PBL methodology for the acquisition of TCs and the integration of SDGs in mechanical engineering education:

Research Design

This study employed a mixed-methods research design to investigate the integration of Project-Based Learning (PBL) methodology for the acquisition of Transversal Competencies (TCs) and the integration of Sustainable Development Goals (SDGs) in the mechanical engineering subject under study. The research design included both quantitative surveys and qualitative information based on a group discussion with the students to gather comprehensive data on their perceptions and attitudes towards the integration of TCs and SDGs in the subject.

Participants

The participants in this study were undergraduate students enrolled in the Dynamics of Mechanical Systems subject (code: 32911) in the first year of the master's degree in Mechatronic Engineering at the School of Design Engineering, Universitat Politècnica de València (UPV). A total of 45 students were enrolled in the subject during the 2022-2023 academic year.

Methods for gathering information: data collection procedures

- **Quantitative Data:** A survey questionnaire was developed based on the objectives of the study to assess students' awareness and understanding of TCs and SDGs, as well as their perceptions of the relevance of the subject to these competencies and goals. The survey was administered to all students enrolled in the subject at the beginning of the academic year.
- **Qualitative Data:** a group discussion with the students were conducted to gather in-depth insights into their experiences with the PBL methodology, their views on the integration of TCs and SDGs in the subject, and their suggestions for improvement.

Data Analysis

- **Quantitative Data Analysis:** The quantitative data collected from the surveys were analyzed using descriptive statistics to summarize students' responses and identify trends and patterns in their perceptions and attitudes towards TCs and SDGs in the subject.
- **Qualitative Data Analysis:** The qualitative data obtained from a group discussion with the students were analyzed using thematic analysis to identify recurring themes and patterns in students' narratives regarding the integration of TCs and SDGs in the subject. The qualitative data were coded and categorized to extract key insights and findings.

Ethical Considerations

This study adhered to ethical guidelines for research involving human participants. Informed consent was obtained from all participants, and their confidentiality and anonymity were ensured throughout the data collection and analysis process. The study was approved by the Research Ethics Committee of the Universitat Politècnica de València (UPV).

Collaboration and Support

The development of the innovation in the EIIP has involved collaboration and support from various stakeholders within the university, including faculty members, educational experts, and administrative staff. The project has benefited from the expertise and insights of educators and researchers with experience in innovative teaching methodologies and sustainability education, contributing to the design and implementation of effective strategies for integrating TCs and SDGs in higher education.

Evaluation and Continuous Improvement

The development of the innovation in the EIIP has been accompanied by a robust evaluation framework to assess the effectiveness of the integrated PBL methodology in promoting the acquisition of TCs and the integration of SDGs in the subject. Ongoing monitoring and evaluation processes have been established to gather feedback from students, teachers, and other actors,

enabling continuous improvement and refinement of the innovation to align with the evolving needs and expectations of the educational community.

Impact and Future Directions

The development of the innovation in the EIIP is expected to have a positive impact on students' learning experiences, their preparedness for the labor market, and their contribution to sustainable development initiatives. Future directions for the innovation include the dissemination of best practices, the scaling of successful initiatives to other educational programs, and the exploration of interdisciplinary collaborations to further integrate TCs and SDGs across the university curriculum.

Limitations

It is important to acknowledge some limitations of this study, including the relatively small sample size of participants and the potential for response bias in the survey data. Additionally, the study focused on a specific subject and cohort of students, which may limit the generalizability of the findings to other educational contexts.

3. Application of the PBL methodology to a case study

The paper aims to design and apply a Project-Based Learning methodology (PBL) for a proper acquisition of Transversal Competences (TCs) and integration of the Sustainable Development Goals (SDGs) in a mechanical engineering subject. Specifically, it is intended to be implemented in the subject of Dynamics of Mechanical Systems (code: 32911) that is taught in the second semester of the first course of the master's degree in Mechatronic Engineering of the School of Design Engineering at UPV. It is a compulsory subject that consists of 4.50 European Credit Transfer and Accumulation System (ECTS) (2.5 of theory: and 2 of practices). ECTS is a common standard for comparing academic credits, that is, the volume of learning in accordance with the defined learning outcomes and their associated workload for higher education throughout the European Union and other cooperating European countries. The subject has a single theory group and two group of practices with 45 students enrolled in the 2023-2024 academic year.

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In the framework of the Educational Innovation and Improvement Project (EIIP), the authors of this work are intended to gradually adapt the subject from a teaching model based on a master class towards an active teaching model based on a project-based learning methodology (ABP) for the acquisition of CTs and the integration of SDGs, since as discussed in the introduction section the literature has illustrated that the PBL methodology has proven its ability to achieve these objectives in a simpler and natural way, while allowing students to reach a high level of mastery in the subject. The PBL methodology implies that the student works, individually and in groups independently, but under the guidance of the teacher.

In this sense, the teaching staff has analyzed the current situation of the subject and the aspects to be improved based on their experience and knowledge in the matter. The main conclusion is that the current situation still has a wide margin for improvement, and the need to make changes and introduce teaching innovations is justified by:

- Detection of a lack of motivation and involvement of the students.
- Reduced class attendance.
- Students show little active participation, involvement, and teamwork.
- Students achieve a low mastery and level of knowledge in the subject despite the high academic performance achieved (success rate of 87% in the 2022-2023 academic year).
- High dropout rate of the subject. Of the 13% of the failures corresponding to the 2022-2023 academic year (that is, 6 students), 5 of them have not taken part in any act of evaluation of the subject.
- Absolute ignorance on the part of the student of the transversal competences that are worked on in the subject.
- Obsolete way of evaluating TCs.
- The SDGs have not yet been worked on in the subject.

To reinforce these conclusions and obtain a more realistic picture of the current situation, at the beginning of the course in the first year of the project, the teaching staff have conducted an analysis through surveys and a group discussion with the students regarding their affinity and level of

knowledge of the TCs and the SDGs that are being worked on or should be worked on in the matter, and satisfaction in the learning process based on a Project-Based Learning methodology (PBL). Appendix A presents the survey questions.

It is worthwhile mentioning, that the student satisfaction is very high as collected in the teacher evaluation surveys with ratings greater than 9 points out of 10 during the last academic year. Nevertheless, only 8 students completed the survey showing the lack of students' involvement and the low-class attendance in the last sessions of the semester due to the proximity of the exams. Likewise, academic performance is very high, standing at around 90% in recent years. In addition, the failures usually correspond to students who have abandoned the master's degree. In this sense, this teaching innovation project also tries to minimize the dropout rate (which for the 2022-2023 academic year is 11.11%, i.e., it corresponds to 5 of the 45 students enrolled) by means of the PBL, to increase student motivation and make the subject more attractive and closer to the labor market and a sustainable society.

As mentioned above, the selected subject to implement the PBL methodology is Dynamics of Mechanical Systems, which contents are the design and kinematic and dynamic modelling of mechanical systems through the Lagrange-Euler equations of motion. This selection is based on the fact that it is an eminently applied subject, whose contents can be easily taught by means of computer-aided design/engineering (CAD/CAE) software tools. In this way, the 3D design of mechanical systems is proposed using the SolidWorks tool published by Dassault Systèmes, while the simulation of movement by programming the equations of movement in Wolfram Mathematica, which allows to analyze the temporary evolution of the variables of interest quickly and easily with respect to the variation of the input parameters. Both tools are available to the entire UPV university community, both through access in the classroom and through remote access, which makes it possible to implement different teaching models, such as face-to-face, online and hybrid. Specifically, the CTs that are intended to work with this methodology are TC1 and TC5, which can be measured and evaluated at the end of the two-year project to verify if the learning process has improved with the implementation of the PBL methodology bases on the indicators/evidence raised.

In the same way, this EIIP project seeks to integrate a series of SDGs, since none of them are currently being worked on in the subject. Particularly, it is expected that the student will acquire skills

related to the Sustainable Development Goal (SDG) number 7 (guarantee access to affordable, reliable, sustainable, and modern energy), mainly related to Target 7.3 (double the global rate of improvement in energy efficiency). Students will learn that mechanical systems are a set of physical parts connected through kinematic pairs to transform a form of energy into motion or work. Students will be able to determine the powers required by the mechanical systems to describe such movements and perform work, both through analytical equations and with specialized software. Also, using appropriate 3D design tools, students will design a mechanism with minimum use of material and number of operations necessary for its manufacture, and efficient when carrying out its mandated tasks. Likewise, it will be emphasized that the energy source of the mechanism must tend to be renewable and sustainable energy, thus working on Target 7.2 (boost substantially the share of renewable energy in the global energy mix) and SDG 9 (build resilient infrastructures, promote sustainable industrialization, and encourage innovation), and more specifically, Target 9.4 (infrastructure modernization, clean technology).

4. Results

The survey conducted at the beginning of the academic year aimed to assess students' satisfaction, knowledge, and perception of Project-Based Learning (PBL) methodology, Transversal Competencies (TCs), and Sustainable Development Goals (SDGs) in a particular mechanical engineering subject. Results are organized using a Likert scale, which is a rating scale that quantitatively assesses opinions, attitudes, or behaviors. Researchers usually treat Likert-derived data as ordinal. Here, response categories are presented in a ranking order, but the distances between the categories cannot be presumed to be equal. For example, consider a scale where 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. In this scale, 4 is more negative than 3, 2, or 1. However, it cannot be inferred that a response of 4 is twice as negative as a response of 2. Treating Likert-derived data as ordinal, allow to use descriptive statistics to summarize the collected data collected in simple numerical or visual form. The survey results and the subsequent application of learning analytics and statistics can be used for improving students' performance and the quality of the teaching-learning experience, assessing the classroom procedures, acquiring CTs, integrating

SDGs, and analyzing the attitudes and commitment that students exhibit (Llopis-Albert and Rubio, 2021a).

The responses of the survey questions (SQ) are provided in the Table 1 of Appendix. A summarize to key survey questions is summarized below:

- **SQ 1:** Knowledge of PBL: A significant proportion of students demonstrated a good understanding of PBL, with 75% being knowledgeable or very knowledgeable about the methodology.
- **SQ 2:** Utilization of PBL: Among the surveyed students, 35% reported not having used PBL in any subject.
- **SQ 3:** Satisfaction with PBL: For students who had experienced PBL, 75% expressed being satisfied or highly satisfied with the methodology.
- **SQ 4:** Preference for Active Methodology: Most students (98%) either strongly agreed or agreed that an active methodology like PBL is more appropriate than a traditional class model.
- **SQ 5:** Appropriateness of PBL for TCs and SDGs: Regarding the suitability of PBL for acquiring TCs and integrating SDGs, 71% of students found it adequate or very suitable for this purpose.
- **SQ 6:** Familiarity with TCs: Most of the students (58%) are not familiar with Transversal Competencies Project (TC) at UPV.
- **SQ 7:** Awareness of TCs and SDGs: A significant proportion of students (54%) reported being neutral or unaware of TCs and SDGs at the beginning of the course.
- **SQ 8:** Suitability of TCs: More than a half of students (63%) consider the Transversal Competencies (TCs) that are worked on in the subject appropriate.
- **SQ 9:** Evaluation of CTs: Despite the lack of awareness, 74% of students considered it is important or very important to work on and evaluate TCs and SDGs in the subject within a PBL methodology.
- **SQ 10:** Contribution of TCs to professional future: Most students strongly agree or agree (81%) that the acquisition of Transversal Competencies (TCs) can contribute positively to their professional future.

- **SQ 11:** University Support for TCs: However, 55% of students reported being neutral or unaware of the university's provision of information and/or training on the Transversal Competencies Project (TC).
- **SQ 12:** Concern for TCs: At the beginning of the subject, 45% of students expressed being concerned or very concerned about finding out the Transversal Competencies (TC) that will be addressed in the subject.
- **SQ 13:** Appropriateness of addressed TCs: Many students (60%) considered the Transversal Competencies (TC) that are worked on in the subject to be appropriate or highly appropriate.
- **SQ 14:** Mastering of TCs: 67% of students considered that they already master the TCs since they already have a university degree.
- **SQ 15:** Awareness of SDGs: A substantial proportion of students (48%) reported being neutral or unaware of the Sustainable Development Goals (SDGs) at the beginning of the course.
- **SQ 16:** Importance of integrating SDGs: Despite the initial lack of awareness, 70% of students considered it important or very important to integrate the Sustainable Development Goals (SDGs) for their future performance in a dynamic and competitive labor market.
- **SQ 17:** Integration of SDGs in the subject: At the beginning of the course, 45% of students reported being neutral or unaware of the integration of Sustainable Development Goals (SDGs) in the subject.
- **SQ 18:** Impact of SDGs in the subject: About half of students found the PBL methodology appropriate or highly appropriate to help motivate the student, improve the learning process, academic performance, and reduce dropouts in the subject.
- **SQ 19:** Importance of SDGs in the academic performance: Likewise, more than half of the students considered it important or very important to address the SDGs in the subject to improve academic performance.
- **SQ 20:** Importance of SDGs to reduce dropouts: Likewise, more than half of the students considered it important or very important to address the SDGs in the subject to reduce dropouts.
- **SQ 21:** Importance of SDGs to increase class attendance: Similar results to the previous two questions are obtained.

- **SQ 22:** Active participation of the PBL: Many students (78%) considered the PBL methodology helps to increase the level of active participation of the students.
- **SQ 23:** Evaluation followed by the PBL: A significant majority of students (81%) considered that the evaluation system through Project Based Learning (PBL) is adequate. Also, they consider that the PBL, together with the TCs and SDGs worked in the subject can contribute positively to their professional future.
- **SQ 24:** Exams in the subjects: Most students (63%) considered appropriate to carry out the exam proposed in the subject's teaching guide to evaluate the level of knowledge acquired by the student.
- **SQ 25:** Co-evaluation: A significant majority of students (86%) considered that the co-evaluation between students through the public presentation of the project is an appropriate evaluation method.
- **SQ 26:** General satisfaction: Most students (91%) are highly satisfied with the general approach of the subject (methodology used and evaluation system).

5. Discussion

These results provide valuable insights into students' perceptions and experiences with PBL, TCs, and SDGs in the context of higher education. It is worthwhile mentioning that the survey results are in line with the learning outcomes of the group discussion procedure. The findings suggest that while a significant proportion of students are satisfied with the general approach to the subject and are knowledgeable about PBL, there is a need to increase awareness and understanding of TCs and SDGs. The results also highlight the importance of active learning approaches like PBL for fostering competencies and addressing global sustainability goals. Additionally, the results highlight the need for educational institutions to provide adequate support and information regarding TCs and SDGs to enhance students' engagement and preparedness for the evolving demands of the labor market.

Based on the evidence collected by performing the group discussion with students and teachers, the results of the method of the matrix of present and future scenarios and the SWOT (strengths, weaknesses, opportunities, and threats) analysis as perceived by students in the survey, several

recommendations can be made to enhance the integration of Transversal Competencies (TCs) and Sustainable Development Goals (SDGs) in mechanical engineering education:

- Enhance students' awareness and understanding of the integration of TCs and SDGs in mechanical engineering education through targeted information and training programs.
- Increase the relevance of the subject to SDGs by incorporating more SDG-related content and activities into the curriculum.
- Foster a more active and participatory learning environment by promoting teamwork, co-evaluation, and public presentation of projects.
- Enhance the evaluation system by incorporating more project-based learning (PBL) methodologies and co-evaluation between students.
- Provide more support and training to teaching staff to facilitate the application of PBL methodology from an interdisciplinary perspective.
- Foster a more student-centered approach to teaching and learning by designating responsibilities to project participants within the teaching-learning process with emphasis on the role of students as architects of their learning and skills.
- Encourage students, teachers, and other staff to become aware of the SDGs and relate their studies, activities, and work with them.
- Promote the integration of SDGs in university degrees by creating a specific section on SDGs in the teaching guides of each subject.
- Provide academic recognition of credits on sustainability to incentivize students to commit to the SDGs.
- Launch more calls of Educational Innovation and Improvement Projects (EIIP) within the thematic area of CTs and SDGs to promote the development of innovative teaching methodologies and practices.

Overall, the present study contributes to the growing body of research on the integration of TCs and SDGs in higher education and provides valuable insights into students' perceptions and attitudes towards the integration of TCs and SDGs in mechanical engineering education. The findings underscore the importance of promoting such integration to enhance students' preparedness for the

evolving demands of the labor market and contribute to global sustainability goals. Future research could further explore the effectiveness of PBL methodology in promoting the acquisition of TCs and the integration of SDGs in higher education and evaluate the long-term impact of these competencies and goals on students' professional development and contribution to global sustainability goals. However, several drawbacks have also been detected that cover:

- Students consider that to adequately follow this methodology, a greater number of meetings with teachers are required, beyond the classroom, to advise them on the project they must develop. Moreover, they consider that it should be done individually with each group of students who carry out each project to receive better feedback.
- On the other hand, teachers mention the greater effort they must make for the satisfactory implementation of the methodology. It comprises the advice to students out of the class hours and the preparation and training of teaching staff to be able to have the necessary tools that facilitate the application of this methodology from an interdisciplinary perspective, understanding its value for the achievement of significant competencies and learning for students.
- Problems in the distribution of responsibilities and the coordination of tasks by the participants of each project within the framework of the teaching-learning process with emphasis on the role of students as architects of their learning and skills.

6. Conclusions

The present study demonstrates the validity of applying active teaching methodologies, such as Project-Based Learning (PBL), for the proposed purposes of acquiring Transversal Competencies (TC) in a more appropriate and natural way and integrating the Sustainable Development Goals (SDGs). This is supported by results obtained, both from the survey and from the group discussion with the students. Furthermore, the indicators and evidence of both information collection methodologies are aligned and show how a significant percentage of the participants are satisfied with the general approach of the subject and the importance of working on the TC and the SDGs for their future work and the achieving a sustainable society and environment. Likewise, the methodology allows activities to be designed in a more appropriate way by promoting a more active

and participatory learning environment, while helping and training the different actors to become aware of the sustainable development objectives and relate their studies, activities, and work with them. Furthermore, the results of this experience can be extrapolated to other subjects and degrees, which will allow the problems and deficiencies detected in this work to be avoided. Among them, mentioning the greater demand that this methodology represents for both teachers and students.

Finally, this experience provides valuable information on the perceptions and experiences of students and teachers in the context of higher education and highlights the need for educational institutions to provide adequate support and information on TCs and the SDGs to improve participation and preparing students for the changing demands of the labor market.

Future research encompasses:

- Repeat the survey at the end of the course to analyze the differences regarding the results obtained at the beginning of the academic year and to further assess the effectiveness of PBL methodology in promoting the acquisition of TCs and the integration of SDGs in higher education.
- Apply other key sociological research techniques to gather qualitative information such as personal interviews (one-on-one setting), participant observation, matrix of present and future scenarios, SWOT analysis (weaknesses, threats, strengths, and opportunities), group interviews, group discussion and/or focus group with students (with 3 levels of academic performance and repeat students).
- Review the questionnaire used in order to optimize the information obtained.
- Evaluate the long-term impact of these competencies and goals on students' professional development and contribution to global sustainability goals.
- Expansion of the study scope: future work will aim to broaden the scope of the study to encompass a wider range of university subjects and educational programs. This expansion will provide a more comprehensive understanding of the potential impact and challenges associated with integrating PBL, TCs, and SDGs across diverse educational contexts.
- Refinement of educational activities: the research will focus on refining the design and implementation of educational activities aimed at promoting the acquisition of TCs and the

integration of SDGs. This will involve the development of innovative teaching materials, assessment tools, and collaborative projects that align with the specific learning outcomes and sustainability objectives of engineering subjects.

- Longitudinal assessment: future work will involve longitudinal assessment to track the long-term effects of the integrated PBL methodology on students' competencies, attitudes towards sustainability, and their professional development. Longitudinal studies will provide insights into the sustainability of the acquired competencies and the potential influence on students' career trajectories.
- Interdisciplinary collaboration: the research will explore opportunities for interdisciplinary collaboration to integrate TCs and SDGs across multiple disciplines within the university curriculum. Collaborative initiatives with other academic departments and research centers will facilitate the exchange of best practices and the development of holistic approaches to sustainability education.

The limitations of the present study, which may impact the generalizability and scope of the findings, include:

- Small sample size and contextual specificity: The study was conducted with a specific cohort of students enrolled in the Dynamics of Mechanical Systems subject at UPV, which may limit the generalizability of the findings to other educational contexts and student populations. Additionally, the relatively small sample size of participants may impact the statistical power and representativeness of the results.
- Response Bias: the reliance on self-reported survey data and the group discussion with the students introduces the potential for response bias, as participants may provide socially desirable responses, or their perspectives may be influenced by external factors. Efforts were made to mitigate this bias using validated survey instruments and semi-structured interview protocols.
- Contextual variability: the development of a PBL, and the integration of TCs and SDGs in mechanical engineering education may be influenced by contextual variability, including differences in institutional resources, faculty expertise, and student demographics. These

contextual factors may limit the transferability of the research findings to other educational settings.

Addressing these limitations and building on the future work will contribute to the ongoing advancement of innovative educational practices and sustainability education within the mechanical engineering curriculum at UPV. Furthermore, the results of this experience can be extrapolated to other higher education contexts, which will allow to avoid the problems and deficiencies detected in this work. This outlines the potential future directions for the research, including the expansion of the study scope, refinement of educational activities, longitudinal assessment, and interdisciplinary collaboration, as well as acknowledging the limitations of the current research related to sample size, response bias, and contextual variability.

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Conflicts of Interest: The authors declare no conflict of interest.

Data Availability: Data will be made available on from the corresponding author on reasonable request.

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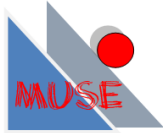
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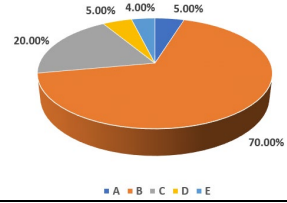
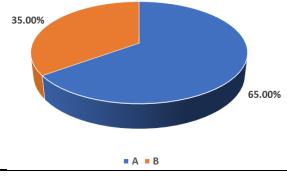
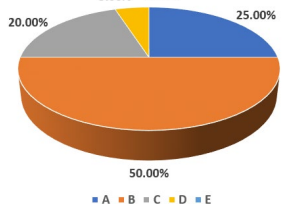
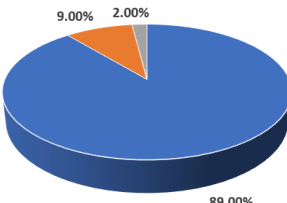
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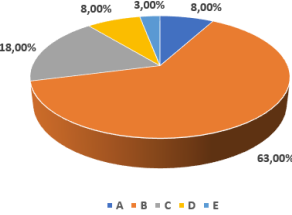
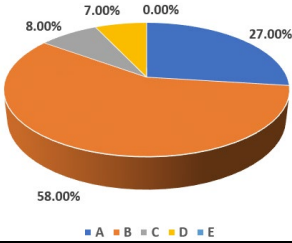
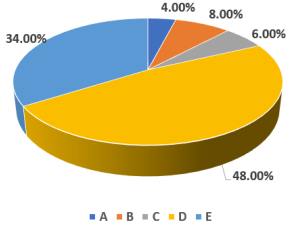
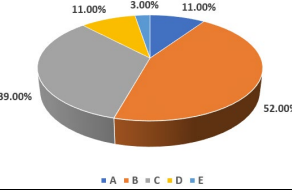
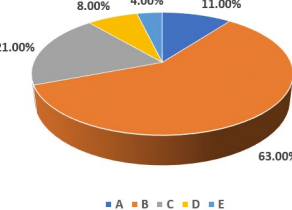
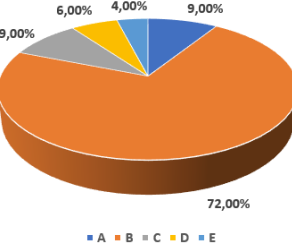


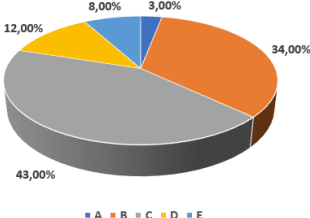
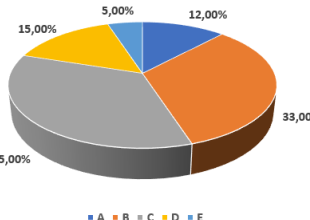
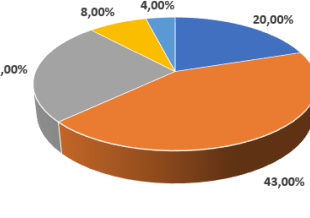
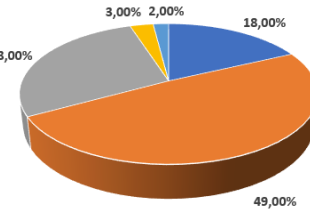
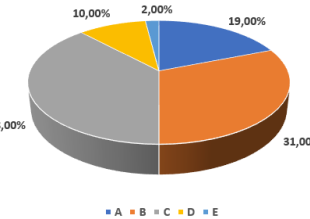
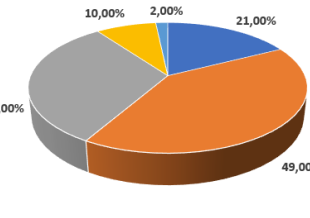
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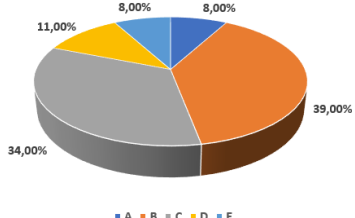
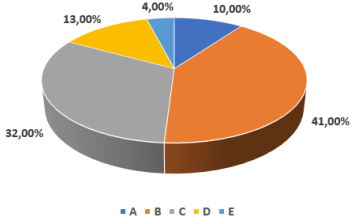
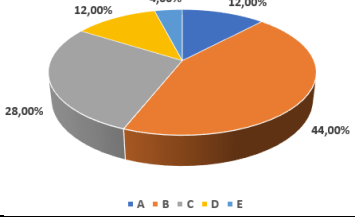
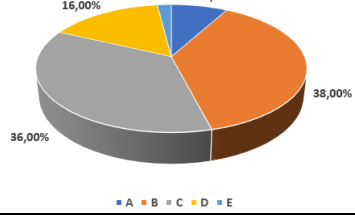
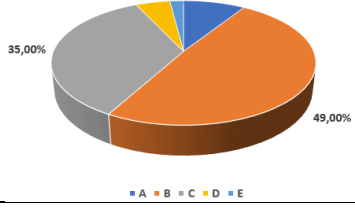
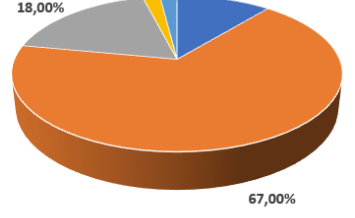
Appendix A. Survey

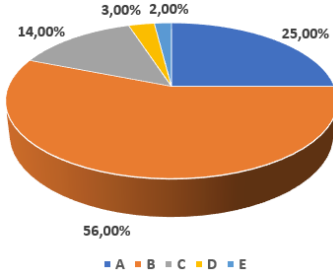
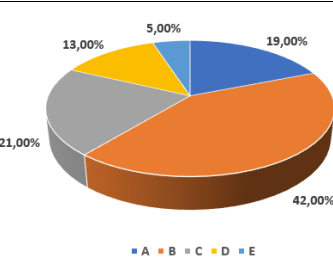
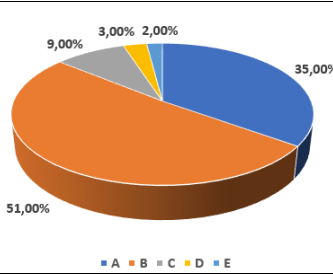
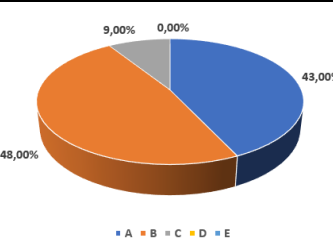
Table 1. Survey at the beginning of the academic year on the level of knowledge of students about: a) the active methodology related to Project-Based Learning (PBL); b) the generic and relevant skills that students have to develop through the several stages of the educational degree materialized in the Transversal Competences (TCs); c) the Sustainable Development Goals (SDGs) that are meant to act as a common blueprint for peace and prosperity for people and the planet from now on; d) and their perception of the importance of acquiring TCs and integrating the SDGs for their future performance in a dynamic and competitive labor market. Results are organized using a Likert scale, which is a rating scale that quantitatively assesses opinions, attitudes, or behaviors.

Questionnaire	Likert scale	Results												
1) Do you know what a Project Based Learning (PBL) is based on?	A. Very knowledgeable B. Knowledgeable C. Neutral D. Little knowledgeable E. Totally unaware	 <table border="1"> <caption>Data for Question 1 Results</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>5.00%</td> </tr> <tr> <td>B</td> <td>20.00%</td> </tr> <tr> <td>C</td> <td>70.00%</td> </tr> <tr> <td>D</td> <td>4.00%</td> </tr> <tr> <td>E</td> <td>5.00%</td> </tr> </tbody> </table>	Response	Percentage	A	5.00%	B	20.00%	C	70.00%	D	4.00%	E	5.00%
Response	Percentage													
A	5.00%													
B	20.00%													
C	70.00%													
D	4.00%													
E	5.00%													
2) Have you used the Project Based Learning (PBL) in any subject?	A. Yes B. No	 <table border="1"> <caption>Data for Question 2 Results</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>65.00%</td> </tr> <tr> <td>B</td> <td>35.00%</td> </tr> </tbody> </table>	Response	Percentage	A	65.00%	B	35.00%						
Response	Percentage													
A	65.00%													
B	35.00%													
3) If yes to the second question, were you satisfied with the methodology? If you have never taken a subject following the Project Based Learning (PBL) methodology, do not answer this question.	A. Highly satisfied B. Satisfied C. Neutral D. Dissatisfied E. Highly dissatisfied	 <table border="1"> <caption>Data for Question 3 Results</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>25.00%</td> </tr> <tr> <td>B</td> <td>50.00%</td> </tr> <tr> <td>C</td> <td>20.00%</td> </tr> <tr> <td>D</td> <td>5.00%</td> </tr> <tr> <td>E</td> <td>0.00%</td> </tr> </tbody> </table>	Response	Percentage	A	25.00%	B	50.00%	C	20.00%	D	5.00%	E	0.00%
Response	Percentage													
A	25.00%													
B	50.00%													
C	20.00%													
D	5.00%													
E	0.00%													
4) Do you consider it more appropriate to follow an active methodology such as Project-Based Learning (PBL) than a traditional class model?	A. Strongly agree B. Agree C. Neutral D. Disagree E. Strongly disagree	 <table border="1"> <caption>Data for Question 4 Results</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>89.00%</td> </tr> <tr> <td>B</td> <td>9.00%</td> </tr> <tr> <td>C</td> <td>2.00%</td> </tr> </tbody> </table>	Response	Percentage	A	89.00%	B	9.00%	C	2.00%				
Response	Percentage													
A	89.00%													
B	9.00%													
C	2.00%													

<p>5) Do you consider that a Project-Based Learning (PBL) is an appropriate methodology for the acquisition of Transversal Competencies (TC) and the integration of the Sustainable Development Goals (SDGs)?</p>	<p>A. Very suitable B. Adequate C. Neutral D. Not very suitable E. Not at all suitable</p>	
<p>6) Are you familiar with Transversal Competencies Project (TC) of the Universitat Politècnica de València (UPV)?</p>	<p>A. Very familiar B. Family C. Neutral D. Unaware E. Totally unaware</p>	
<p>7) At the beginning of the subject, did you worry about finding out the Transversal Competencies (TC) that will be addressed in the subject?</p>	<p>A. Very concerned B. Concerned C. Neutral D. Unconcerned E. Very unconcerned</p>	
<p>8) Do you consider the Transversal Competencies (TC) that are worked on in the subject to be appropriate?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	
<p>9) Do you consider it important to work on and evaluate Transversal Competencies (TC) in the subject?</p>	<p>A. Very important B. Important C. Neutral D. Unimportant E. Very unimportant</p>	
<p>10) Do you consider that the acquisition of Transversal Competencies (TC) can contribute positively to your professional future?</p>	<p>A. Strongly agree B. Agree C. Neutral D. Disagree E. Strongly disagree</p>	

<p>11) Has the university provided you with information and/or training on the Transversal Competencies Project (TC)?</p>	<p>A. Strongly agree B. Agree C. Neutral D. Disagree E. Strongly disagree</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>34,00%</td> </tr> <tr> <td>B</td> <td>43,00%</td> </tr> <tr> <td>C</td> <td>8,00%</td> </tr> <tr> <td>D</td> <td>3,00%</td> </tr> <tr> <td>E</td> <td>12,00%</td> </tr> </tbody> </table>	Response	Percentage	A	34,00%	B	43,00%	C	8,00%	D	3,00%	E	12,00%
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<p>12) Have you worried about finding information or receiving training on Transversal Competencies (TC)?</p>	<p>A. Very concerned B. Concerned C. Neutral D. Unconcerned E. Very unconcerned</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>35,00%</td> </tr> <tr> <td>B</td> <td>33,00%</td> </tr> <tr> <td>C</td> <td>15,00%</td> </tr> <tr> <td>D</td> <td>5,00%</td> </tr> <tr> <td>E</td> <td>12,00%</td> </tr> </tbody> </table>	Response	Percentage	A	35,00%	B	33,00%	C	15,00%	D	5,00%	E	12,00%
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<p>13) Do you consider the evaluation system for the Transversal Competencies (CT) worked on in the subject to be adequate?</p>	<p>A. Very suitable B. Suitable C. Neutral D. Not suitable E. Not at all suitable</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>43,00%</td> </tr> <tr> <td>B</td> <td>25,00%</td> </tr> <tr> <td>C</td> <td>20,00%</td> </tr> <tr> <td>D</td> <td>8,00%</td> </tr> <tr> <td>E</td> <td>4,00%</td> </tr> </tbody> </table>	Response	Percentage	A	43,00%	B	25,00%	C	20,00%	D	8,00%	E	4,00%
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<p>14) Do you consider that at the beginning of the course you already master the Transversal Competencies (CT) that will be worked on in the subject?</p>	<p>A. Strongly agree B. Agree C. Neutral D. Disagree E. Strongly disagree</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>49,00%</td> </tr> <tr> <td>B</td> <td>28,00%</td> </tr> <tr> <td>C</td> <td>18,00%</td> </tr> <tr> <td>D</td> <td>3,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	49,00%	B	28,00%	C	18,00%	D	3,00%	E	2,00%
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<p>15) Are you familiar with the Sustainable Development Goals (SDGs) launched by the United Nations?</p>	<p>A. Very knowledgeable B. Knowledgeable C. Neutral D. Little knowledgeable E. Totally unaware</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>38,00%</td> </tr> <tr> <td>B</td> <td>31,00%</td> </tr> <tr> <td>C</td> <td>19,00%</td> </tr> <tr> <td>D</td> <td>10,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	38,00%	B	31,00%	C	19,00%	D	10,00%	E	2,00%
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<p>16) Do you consider it important to work on and evaluate the Sustainable Development Goals (SDGs) based on the projects that you must carry out in the subject?</p>	<p>A. Very important B. Important C. Neutral D. Unimportant E. Very unimportant</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>49,00%</td> </tr> <tr> <td>B</td> <td>38,00%</td> </tr> <tr> <td>C</td> <td>21,00%</td> </tr> <tr> <td>D</td> <td>10,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	49,00%	B	38,00%	C	21,00%	D	10,00%	E	2,00%
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<p>17) Do you consider that at the beginning of the course you are aware of the SDGs that will be worked on in the subject and that you contribute to their achievement?</p>	<p>A. Strongly agree B. Agree C. Neutral D. Disagree E. Strongly disagree</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>8,00%</td> </tr> <tr> <td>B</td> <td>8,00%</td> </tr> <tr> <td>C</td> <td>39,00%</td> </tr> <tr> <td>D</td> <td>34,00%</td> </tr> <tr> <td>E</td> <td>11,00%</td> </tr> </tbody> </table>	Response	Percentage	A	8,00%	B	8,00%	C	39,00%	D	34,00%	E	11,00%
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<p>18) Do you consider that the PBL methodology is appropriate to help motivate the student?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>10,00%</td> </tr> <tr> <td>B</td> <td>41,00%</td> </tr> <tr> <td>C</td> <td>32,00%</td> </tr> <tr> <td>D</td> <td>13,00%</td> </tr> <tr> <td>E</td> <td>4,00%</td> </tr> </tbody> </table>	Response	Percentage	A	10,00%	B	41,00%	C	32,00%	D	13,00%	E	4,00%
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<p>19) Do you consider that the PBL methodology is appropriate to help improve the learning process, academic performance and the level of knowledge acquired about the subject by the student?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>12,00%</td> </tr> <tr> <td>B</td> <td>44,00%</td> </tr> <tr> <td>C</td> <td>28,00%</td> </tr> <tr> <td>D</td> <td>12,00%</td> </tr> <tr> <td>E</td> <td>4,00%</td> </tr> </tbody> </table>	Response	Percentage	A	12,00%	B	44,00%	C	28,00%	D	12,00%	E	4,00%
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<p>20) Do you consider that the PBL methodology is appropriate to help reduce dropouts in the subject?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>8,00%</td> </tr> <tr> <td>B</td> <td>38,00%</td> </tr> <tr> <td>C</td> <td>36,00%</td> </tr> <tr> <td>D</td> <td>16,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	8,00%	B	38,00%	C	36,00%	D	16,00%	E	2,00%
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<p>21) Do you consider that the PBL methodology is appropriate to help increase class attendance?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>9,00%</td> </tr> <tr> <td>B</td> <td>49,00%</td> </tr> <tr> <td>C</td> <td>35,00%</td> </tr> <tr> <td>D</td> <td>5,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	9,00%	B	49,00%	C	35,00%	D	5,00%	E	2,00%
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<p>22) Do you consider it important to increase the level of active participation of the student as follows a PBL methodology?</p>	<p>A. Very important B. Important C. Neutral D. Unimportant E. Very unimportant</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>67,00%</td> </tr> <tr> <td>B</td> <td>18,00%</td> </tr> <tr> <td>C</td> <td>11,00%</td> </tr> <tr> <td>D</td> <td>2,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	67,00%	B	18,00%	C	11,00%	D	2,00%	E	2,00%
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<p>23) Do you consider the evaluation system through Project-Based Learning (PBL) adequate?</p>	<p>A. Very suitable B. Adequate C. Neutral D. Not very suitable E. Not at all suitable</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>25,00%</td> </tr> <tr> <td>B</td> <td>56,00%</td> </tr> <tr> <td>C</td> <td>14,00%</td> </tr> <tr> <td>D</td> <td>3,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	25,00%	B	56,00%	C	14,00%	D	3,00%	E	2,00%
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<p>24) Do you consider it appropriate to carry out the exam proposed in the subject's teaching guide to evaluate the level of knowledge acquired by the student?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>19,00%</td> </tr> <tr> <td>B</td> <td>42,00%</td> </tr> <tr> <td>C</td> <td>21,00%</td> </tr> <tr> <td>D</td> <td>13,00%</td> </tr> <tr> <td>E</td> <td>5,00%</td> </tr> </tbody> </table>	Response	Percentage	A	19,00%	B	42,00%	C	21,00%	D	13,00%	E	5,00%
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<p>25) Do you consider co-evaluation between students through the public presentation of the project an appropriate evaluation method?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>35,00%</td> </tr> <tr> <td>B</td> <td>51,00%</td> </tr> <tr> <td>C</td> <td>9,00%</td> </tr> <tr> <td>D</td> <td>3,00%</td> </tr> <tr> <td>E</td> <td>2,00%</td> </tr> </tbody> </table>	Response	Percentage	A	35,00%	B	51,00%	C	9,00%	D	3,00%	E	2,00%
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<p>26) What is your degree of satisfaction with the general approach of the subject (methodology used and evaluation system)?</p>	<p>A. Highly appropriate B. Appropriate C. Neutral D. Inappropriate E. Highly inappropriate</p>	 <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>43,00%</td> </tr> <tr> <td>B</td> <td>48,00%</td> </tr> <tr> <td>C</td> <td>9,00%</td> </tr> <tr> <td>D</td> <td>0,00%</td> </tr> </tbody> </table>	Response	Percentage	A	43,00%	B	48,00%	C	9,00%	D	0,00%		
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<p>Please provide any additional comments that you consider important.</p> <p>For instance, based on:</p> <ul style="list-style-type: none"> -The method of “Matrix of present and future scenarios”. Explain What there is not, and I would not like there to be in the subject; what there is not, and I would like there to be; what there is, and I don't like it; what there is, and I like it. -The “SWOT analysis”: provide the weaknesses, threats, strengths, and opportunities detected. <p>The results are commented in the discussion section.</p>														