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Integrating the SDGs into econometrics teaching: An application of the education-research-sustainability learning approach

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Abstract

This article proposes a teaching innovation aimed to deepen the education-research-sustainability teaching strategy by integrating the major challenges facing the planet as set out in the United Nations' SDGs. Thus, the teaching process acquires a professional identity that integrates teaching and research through the interrelation between teaching in the classroom, the analysis and measurement of the SDGs and the research that the teaching staff has been carrying out in this area. This framework is applied to the teaching of econometrics in the different degrees offered by the Faculty of Economics and Business of the University of the Basque Country (UPV/EHU). Results show that the teaching methodology has been supported by the opinion of the students, who state that the teaching methodology proposed has contributed to consolidating the knowledge acquired, has encouraged teamwork, participation in the classroom and has fostered the students' interest in the subject and the SDGs.

Keywords: *sostenibility; SDG; teaching innovation; PBL/RBL; econometrics.*

1. Introduction

Human well-being depends crucially on the Earth's natural resources. Economic, social and technological advances in recent decades have come at the expense of the planet's capacity to sustain present and future human well-being (Rockström et al., 2009; Steffen et al., 2015). Human prosperity today is further threatened by growing inequalities, not only in the distribution of wealth, but in the way global environmental degradation hits the poor and vulnerable hardest and falls hardest on today's youth and future generations. In this context, the 2015 World Summit on Sustainable Development marked a historic milestone by adopting the 2030 Agenda for Sustainable Development, a global roadmap aimed at eradicating poverty, protecting the planet and ensuring prosperity for all people. Since then, the Sustainable Development Goals (SDGs) have become the essential framework for public institutions and social and economic actors to establish their own strategy and action plan.

An example of this is the EHU Agenda 2030 for sustainable development (2019-2025) adopted by the University of the Basque Country, UPV/EHU (UBC, 2018). This agenda includes the contribution of this university to the 2030 Agenda, as well as the rereading of its educational model. The UPV/EHU's IKDi^3 educational model (UBC, 2010) is based on a cooperative, multilingual and inclusive teaching-learning strategy, which makes students the center of their learning with comprehensive, flexible training adapted to the needs of society. This educational model also proposes to multiply learning through research and sustainability, in order to align it both with the most recent pedagogical orientations and with European political priorities.

The aim of this teaching innovation is to deepen the IKDi^3 teaching strategy by integrating the major challenges facing the planet as embodied in the SDGs. In this way, the teaching activity acquires a professional identity that integrates teaching and research through the interrelation between teaching in the classroom, the analysis and measurement of the SDGs and the research that the teaching staff has been carrying out in this area. This framework is applied to the teaching of econometrics in the degrees of Business Administration and Management, Economics and Double Degree in Business Administration and Management and Law offered by the Faculty of Economics and Business of the University of the Basque Country.

The rest of the article is structured as follows: section 2 covers the methodology applied; section 3 the implementation and evaluation of the proposal; section 4 shows the main results, which are discussed in section 5 and section 6 concludes the article.

2. Methodology

2.1. The IKDi³ learning methodology: education-research-sustainability

The teaching-learning strategy of econometrics in the Quantitative Methods department has been developed following the IKDi^3 educational model, approved by the UPV/EHU in 2010 (UBC, 2010): using active methodologies (Project/Problem Based Learning), promoting the use of free software for data analysis, articulating cooperative work and self-learning. Sustainability issues can be also integrated in this learning methodology, as shown by Sáez de Cámara et al. (2021). In this teaching innovation, we aim to explore this educational model in greater depth, aligning it both with current pedagogical guidelines, which consist of multiplying learning through research, and with current political priorities and the great challenges facing the planet as set out in the SDGs. Within this framework, we propose a teaching-learning methodology based on two pillars: i) the incorporation of the SDGs into classroom work, and ii) the use of the Research-Based Learning (RBL) methodology (Healey, 2005). This approach aims to integrate teaching and research by interlinking classroom teaching, analysis and measurement of the SDGs and the research that teachers carry out in this area, thus giving teaching a professional identity.

The teaching strategy for incorporating the SDGs into the empirical econometric analysis is organized as follows. Firstly, the SDGs are presented in the classroom to provide students, with an overview of the sustainable development challenges using the UN website material and with a concise explanation of each SDG using videos from different institutions, including the Rotterdam School of Management, Erasmus University. This material is available on the university's teaching platform. Secondly, the SDGs become the focus of the empirical work by means of the tasks proposed to students in the practical classes.

With regard to the teaching approach, our proposal seeks to ensure that theory and practice are interconnected. We chose the RBL methodology, which integrates theoretical knowledge with appropriate data collection and procedures to analyse and test hypotheses both on the degree of overall compliance with the SDGs and on the factors that may influence their positive evolution. This methodology is applied in practical classes through tasks designed for students to generate new knowledge, either by searching for and synthesising new information, or because the results obtained lead them to work on new aspects of the problem posed. They are structured as follows:

1. Proposal to students on the teaching platform of a script of the work to be done on a given SDG (search for information, detection of problems, etc.) along with some basic references. This work is done in teams outside the classroom.
2. The results obtained by the teams are discussed and compared in the classroom. Students must provide the teacher with evidences of the research carried out, as well as the conclusions obtained from the common work in the classroom.

3. Each team, with the teacher as facilitator, will pose research question(s) and select data sources and econometric modelling.
4. The team works outside the classroom along the above lines. The results and conclusions obtained are presented in the classroom and the teacher offers feedback on the evidence delivered so that the students may know what they have learnt and change, if necessary, their learning strategy to improve their results.

The aim of these tasks is for students to internalise and practise research methods such as formulating a research question, following research procedures, analysing results, presenting them and proposing actions. The first part of the tasks focuses on the search for, preparation and consolidation of the information acquired autonomously, the second helps to resolve any doubts that may have arisen, the third focuses the research work, and the fourth consolidates the progress achieved. In this way, students acquire research skills, which are important for their professional future, and develop skills to deal with uncertainty, independence, teamwork and organisational skills.

2.2. Implementation

A first practical session was devoted to explaining this project framed in the IKDi[3] educational model and to presenting the SDGs by visiting the websites of the UN, the UPV/EHU's Sustainability Office, etc. All this information on the SDGs (presentations, reports on sustainable development, links to websites and videos and final degree projects) was gathered in a specific folder available in the teaching support platform.

Table 1. Topics

Topics	SDG
Overview of the SDGs	SDG1 – SDG17
Wage discrimination	SDG5, SDG8
Life expectancy	SDG1, SDG2, SDG3
Residential demand for water	SDG6
Real state market	SDG11
Recreational demand	SDG3, SDG15
Residential demand for energy	SDG7
Inclusive and equitable education	SDG4, SDG10
Mobility and modal split	SDG11, SDG13

Source: Own source.

The tasks for the practical sessions were designed to explore basic research studies on some topics related to different SDGs (see Table 1) using official databases and the free

econometric software Gretl. The development of these tasks had to be adapted to the special circumstances of the pandemic. Thus, the teaching team made it easier for students to make the connection between their learning and the research frontier sought with the RBL methodology by providing them with worksheets with the proposed research topic, the associated SDGs and the database for them to work on outside the classroom, and by proposing specific research questions for teamwork in the classroom to analyze the SDG in question. In addition, three individual tasks were proposed to ensure that students achieve the minimum level of competences. The students had to analyse the database, specify an econometric model to determine the factors influencing the variable of interest and describe actions to achieve the SDG analysed.

2.3. Evaluation

Two online questionnaires were designed to measure the degree of achievement of the project's objective and the level of student satisfaction with the proposed methodology, using Likert scale responses. The questionnaires were accesible on the teaching platform.

The first questionnaire was administered at the beginning of the course, before introducing the SDGs in the classroom. The first block gathered some basic questions on respondents' personal and academic characteristics; the second block contained 7 questions related to the degree of knowledge about the SDGs, and the third block 7 questions about attitudes, concerns and personal interests about the importance of achieving the SDGs. The results of this first survey gave information about the initial situation of students on this topic.

The second questionnaire, to be completed at the end of the semester, consisted of four blocks: the first two were the same as the first questionnaire; the third, added a few more questions on personal attitudes towards climate change and issues related to the SDGs to the ones included in the first questionnaire; and the fourth block contained some additional questions for the students to evaluate the teaching methodology. The comparison of students' answers to the second and third blocks of both questionnaires and the students' evaluation of the teaching methodology (block 4 of the second questionnaire) used in the course were the basis for evaluating the implementation of the teaching innovation.

3. Results

The sample includes the responses of students in the degrees of Business Administration and Management, Economics and Double Degree in Business Administration and Management and Law. In total, 130 questionnaires were completed in the first survey and 74 in the second.[1]

After completing the course, students seem to have improved their knowledge on what the SDGs are and when the date for achieving these goals is (out of 7 questions on this topic, the students get, on average, 4.38 correct answers in the first survey compared to 4.61 in the second survey). However, the test of equality of means shows that this difference is not statistically significant (p-value=0.257). But when analysing this relationship accounting for the students' interest in climate change, we find that students showing lower interest for climate change significantly improve the number of correct answers (from 3.87 to 4.69, with a p-value of 0.0337). In regard to the students' assessment of the teaching methodology, nearly half (42%) change the way they see climate change, 51% are satisfied with the teaching methodology and 57% consider the work with SDGs to be rather or very motivating. Figure 1 shows that the teaching methodology has contributed to consolidating the knowledge acquired, encouraged teamwork, participation in the classroom, and fostered students' interest in the subject and the SDGs.

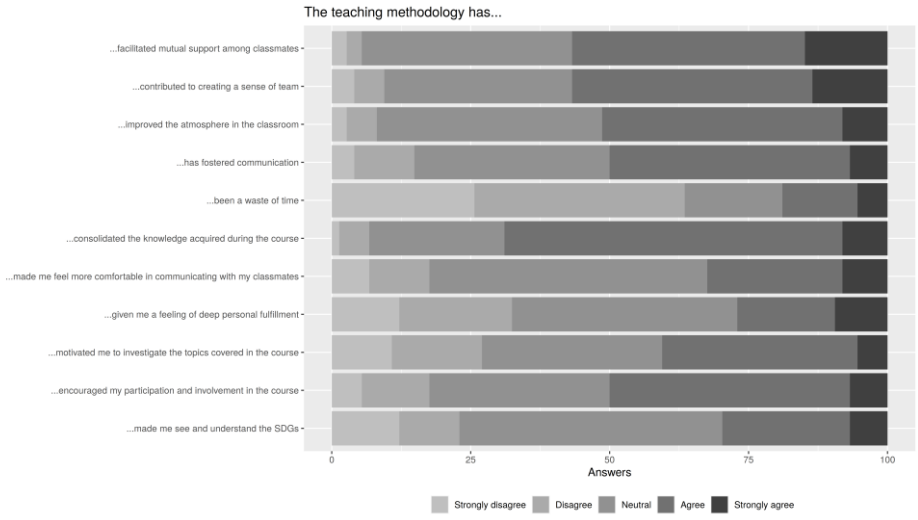

Figure 1. Students' evaluation of the teaching methodology. Source:own elaboration.

[1] Collection of data was affected by the COVID19 pandemic situation. While the first questionnaire was mostly answered in class time, the second questionnaire was mainly answered outside the classroom due to time constraints. As a result, participation was significantly reduced from the first questionnaire to the second.

4. Discussion

Given the implementation of the project methodology and the responses obtained in the initial and final surveys, we find that students have improved their general knowledge of the SDGs and that they have learned that the UPV/EHU has its own agenda for sustainable development. Concerning the students' personal attitudes, the implementation of the project has not significantly changed their involvement with the issues related to the SDGs. It seems that this methodology has encouraged them to think more of them, but it has not motivated them to take the SDGs into account in their daily lives and to take personal actions and initiatives. This is probably due to the fact that changes in attitudes require a longer period of time than a semester. However, quite interestingly, the attitudes towards climate change issues and recycling have improved significantly among students who initially showed a low interest on these issues, suggesting that attitudinal improvements may be easier to capture when starting from lower grounds.

As for the assessment of the teaching innovation itself, although students are generally satisfied with the teaching methodology, they do not seem to have a good understanding of its purpose and functioning. The work done with the SDGs did not have a significant influence on their motivation to study econometrics. This result suggests that students are motivated to carry out exercises and practices that apply the econometric methods explained in the theoretical classes, but not so much in the specific subject they are working on.

A proposal for future improvement would involve to increase the team work time in the practical classes devoted to the SDGs. Each team would elaborate a poster showing the results obtained in the classroom, including an introduction to a chosen SDG, the research questions to be reaised from the point of view of econometrics in relation to the SDG, and a summary of the main conclusions obtained. Later, the poster would be uploaded to the teaching platform so that it is available to the rest of the teams in the classroom. Besides, the work of each group would be presented in a seminar, to promote the cooperative knowledge of the rest of the students and the discussion on the chosen SDGs. Finally, students would prepare a final research report summarising their findings during the semester.

It is important to stress that although the general objectives of the project were achieved, the pandemic situation experienced in the course 2020-2021 significantly altered the planning of the teaching innovation, delaying its implementation in the classroom from the second term of the academic year 2020/2021 to the first term of the academic year 2021/2022. In addition, this last course began with bimodal teaching, so that student attendance was reduced to 50% during the first 3 weeks of the course (20% of the total hours). The sessions delivered with the bimodal system did not progress at the stipulated pace, the time spent on the scheduled tasks was reduced and the RBL methodology used in the tasks was loosened. This has almost certainly influenced the results, which should be read with caution.

5. Conclusions

This article presents the main results of the teaching innovation developed by the econometrics teaching team of the Department of Quantitative Methods of the UPV/EHU. The teaching innovation has been based on a rereading of the UPV/EHU's own educational model, IKDi[3] consisting of multiplying learning through research and sustainability. Our goal was to integrate the international framework of the SDGs and the research developed in this field within the Department of Quantitative Methods into the teaching of econometrics in the different degrees offered at the Faculty of Economics and Business.

To measure both the degree of achievement of our objective and the students' level of satisfaction with the chosen methodology, two questionnaires were designed to be filled in by the students at the beginning and end of the course. The results show a slight increase in the average number of correct answers to the basic questions on the SDGs, although this difference is not statistically significant. However, further analysis, differentiating students by their initial interest in climate change (high interest or low interest), shows that the intervention has a greater effect on students who start with a low interest in climate change. This result suggests that the teaching innovation has succeeded in arousing interest in this topic, especially among those students who initially viewed it with more distance.

The teaching methodology has been supported by the students' opinions in terms of their vision of climate change and their positive assessment of the teaching-learning process and the integration of the SDGs. Furthermore, students state that this methodology has contributed to consolidating the knowledge acquired, encouraged teamwork, participation in the classroom, and fostered their interest in econometrics and the SDGs.

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