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## **Educating Preservice Teachers in Sustainability: Conceptions, Values and Attitudes of Students and Lecturers at the University**

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### **Abstract**

The university has the ethical, academic, and peremptory responsibility to train education students and future trainers in sustainability. It is also something that lecturers must be prepared to address. Through a pretest-posttest study, we analyze which sustainability values and attitudes preservice teacher acquire when they work with activities on sustainability. A total of 359 students completed the process. At the same time, we analyze the attitudes and knowledge held by the lecturers who carry out these activities in sustainability education. The findings regarding the difficulty students have in integrating the various aspects of sustainability are discussed, as well as the gaps and resistance of the lecturers who design and develop such processes. Future research could be designed in such a way that causal relationships could be established between the type of instructional design, the results obtained, and the conceptions and beliefs of lecturers regarding sustainability.

### **Keywords**

Teacher education, education for sustainability, syllabus-related sustainability, sustainable development goals, environmental citizenship.

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# La Formación de los Futuros Educadores en Materia de Sostenibilidad: Concepciones, Valores y Actitudes de los Estudiantes y del Profesorado de la Universidad

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## Resumen

La universidad tiene la responsabilidad ética, académica y perentoria de formar a los estudiantes de educación y a los futuros formadores en materia de sostenibilidad. También es un asunto que el profesorado universitario debe estar preparado para abordar. Mediante un estudio pretest-postest, analizamos qué valores y actitudes de sostenibilidad adquieren los futuros docentes cuando trabajan con actividades sobre sostenibilidad. Un total de 359 estudiantes completaron el proceso. Al mismo tiempo, analizamos las actitudes y los conocimientos que tiene el profesorado universitario que realizan estas actividades en la educación para la sostenibilidad. Se discuten los hallazgos relativos a la dificultad que tienen los estudiantes para integrar los distintos aspectos de la sostenibilidad, así como las lagunas y resistencias del profesorado universitario que diseña y desarrolla dichos procesos. Futuras investigaciones podrían diseñarse de forma que se establezcan relaciones causales entre el tipo de diseño instruccional, los resultados obtenidos y las concepciones y creencias del profesorado universitario sobre la sostenibilidad.

## Palabras clave

Formadores de profesores, educación para la sostenibilidad; sostenibilidad relacionada con el plan de estudios, objetivos de desarrollo sostenible, ciudadanía medioambiental.

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The university, through its teaching staff, is not showing itself to be competent in educating future professionals in sustainability. This is a serious problem if we consider that the issues deriving from climate change, environmental problems, and increasing social inequalities, etc. pose an unprecedented challenge both because of their global impact on the planet and their importance when it comes to influencing future development, and even the survival of humanity itself. Nonetheless, there are numerous supranational agreements related to environmental issues, starting with the 1974 Stockholm Conference, and continuing with the Millennium Development Goals in 2000 and the current Sustainable Development Goals (SDGs) set out in the 2030 Agenda for Sustainable Development. In this normative literature, the role that education should play as a first-order agent for achieving sustainability at an environmental, social, and economic level has been increasingly highlighted. The Aichi-Nagoya Declaration of 2014, adopted at the world conference on Education for Sustainable Development, consolidated the commitment to strengthen education at all levels to achieve sustainable development (UNESCO, 2014). At the 2015 World Education Forum, UNESCO and other similar institutions approved the Incheon Declaration for Education 2030. This document takes stock of what has been achieved so far in education and, for the 2030 Agenda, proposes a commitment to quality education that responds to current local and global challenges through education for sustainable development and education for world citizenship. In this way, the sustainability training of teachers at all educational levels constitutes one of the indicators for achieving Target 4.7 of the Sustainable Development Goals: ensuring that all learners acquire the necessary knowledge through, among other things, education for sustainable development, human rights, gender equality, global citizenship, etc. (UNESCO, 2015).

### **The University and the Lecturers Faced with Sustainability**

According to Vygostky's idea, education is fundamental for cultural ontogenesis, in that higher education oriented towards sustainability gives someone the facilitating potential to become what they are not yet (Lotz-Sisitka et al., 2015). However, there are several works that denounce universities for neglecting their responsibility to train for ecological, economic, and social sustainability (e. g. Alcántara et al., 2020; Debrah et al., 2021; Edwards et al., 2020; Michael et al., 2020; Sterling et al., 2018), thus contributing to the worsening of the current crisis (Bautista-Cerro et al., 2018). In this work we start from a concept of sustainability understood as the respect for the society-nature interrelationship organized in complex systems that include both the biophysical substrate and human societies; it is a definition in accordance with the idea of degrowth and good living (Ruggerio, 2021).

The question is that, to train others, it is first necessary to know the subject that is going to be discussed, which methodologies are the most appropriate to employ, and the like. One of the main obstacles is that lecturers are familiar with the concept of sustainability but are not able to incorporate it into their study plan (Alcántara et al., 2020; Evans, 2020; Solís-Espallargas et al., 2019). Educating for sustainability is extremely complex given the way that education and knowledge are currently posed. According to Gil and Vilches (2017),

sustainability requires interdisciplinarity; thus, it cannot be worked on or constructed as a new area of knowledge, rather it must permeate the various disciplines so that they always incorporate the interaction between nature and society. However, one can easily fall into the trap of considering that it is exclusive to the fields of environmental or natural sciences (Albareda-Tiana et al. 2018; Hudler et al., 2019; García-González et al., 2020; Saura & Hernández, 2008; Segalàs et al. 2010). Disciplinary thinking also seems to be at the root of the problems, along with the resistance of lecturers to include sustainability in their classes (Aznar et al., 2017), or in the curriculum of preservice teacher (Aznar et al., 2017; Evans, 2020; Dahl, 2019). Consequently, we find a contradiction with the UNESCO (2017) approach to contents, which requires educating for sustainability from different perspectives and disciplines with methodologies that reinforce values and attitudes of environmental and social commitment in the different educational spaces.

The competencies to educate for sustainability are described by Rieckmann (2018, p. 56) as “a teacher's capacity to help people develop sustainability competencies through a range of innovative teaching and learning practices”. It is therefore necessary that the lecturers also develop these competencies to train for sustainability, something demanded by this group (Alcántara et al., 2020; Sánchez-Contreras & Murga-Menoyo, 2019). The current convergence between education for sustainable development and education for global citizenship is an established fact in teacher training (Yemini et al., 2019). This linkup is feasible from participatory methodologies where research and education come together to develop their transgressive and transformative potential (Khoo & Jørgensen, 2021). However, analyses such as that carried out by Pashby et al. (2020) warn of the current neoliberal orientation that is being applied to education for global citizenship, its imbrication even being seen in its combination with social justice and humanist intentions (Coelho et al., 2022). In this orientation, local and individual issues are transferred to supranational legal frameworks, such as the United Nations, where relations are global and between countries, thus disguising the lack of commitment to structural inequalities. They propose as an alternative, to which we adhere, a critical-postcritical approach to education for world citizenship to change the status quo, to defend human rights, and to be transformative and anti-oppressive (Pashby et al., 2020).

Understanding the impact of globalization from other perspectives, especially from that of the less privileged, and recognizing the way in which power supports exploitation and suffering are key aspects to be understood (Myers & Rivero, 2020) and taught to preservice teachers. Among researchers (e. g., Gould et al., 2018; Lozano et al., 2019; Lozano & Figueredo, 2021; Lozano-Díaz & Fernández-Prados, 2020; Rousell & Cutter-MacKenzie-Knowles, 2019), there is broad consensus on the importance of using active, experiential, and critical methodologies that activate student understanding and involvement. To analyse how sustainability education impacts subjects, Sterling (2011), carried out a grading of transformative learning levels. Following these levels of transformative sustainable learning, Evans and Ferreira (2019), carried out a meta-analysis of the research on sustainability training for education students and concluded that, in none of the proposals developed, is truly transformative learning for sustainability achieved. They highlighted the fact that the lecturers describe the strategies followed very well, but they provide hardly any evidence of their effectiveness or impact on the students to find out what changes have occurred.

### Education Students Faced with Sustainability

Diverse authors (such as Evans, 2020; Olsson et al., 2020; Quan et al. 2019), defend the teaching role as the main agent for developing a future citizenry that possesses the knowledge, skills, and disposition to face the current environmental, social and economic crisis from a sustainability perspective. Evans (2020) expounds on the impact that the 84 million existing teachers, from all educational levels, could have if they effectively trained their students in sustainability.

This potential contrasts with the scarce knowledge that university education students have about ecology and sustainability (Georgiou et al., 2020; Olmos et al. 2019; Kukkonen et al., 2018; Villamandos et al. 2019;). The students do not recognize the multifaceted nature of sustainable development and its relationship with economic, political and cultural aspects reducing sustainability to environmental issues (García-González et al., 2020; Kagawa, 2007; Saura & Hernández, 2008). Studies on the opinions of education students conclude that they do not feel trained for sustainability (Solís-Espallargas, 2019; Valderrama-Hernández et al., 2020), and even less so to educate their future students in these aspects (Dahl, 2019). All this contrasts with research on the systemic changes and efforts made by higher education institutions to train, investigate and reorient their practices towards sustainability (Wals, 2014; Lozano et al. 2019).

Educating future teachers is essential for the training of future generations, and with it the incorporation of sustainability into society (García-González, 2020; Kieu et al., 2016). The role of the school is fundamental if one considers that studies in environmental awareness and sensitivity place the origin of their development and acquisition as being prior to entering university (Villamandos et al., 2019). Experiences with nature during childhood contribute in an important way to the future relationship and personal interest in caring for the environment (Beery & Jørgensen, 2018; Cheng & Monroe, 2012). The school is an ideal space to cultivate this sensitivity; indeed, research into the influence of eco-schools on the development of environmental awareness demonstrates a notable improvement in the students' knowledge of the subject (Pauw & van Petegem, 2013; Olsson et al. 2016). However, for learning to be both cognitive and behavioural, environments and pedagogies that favour the participation and active involvement of students are essential (Pauw & van Petegem, 2017; Olsson et al. 2019), and where affectivity and emotions play an important role (Brosch, 2021).

Given that there is a notable gap between the way in which lecturers apply sustainability training and the learning that students acquire (Edwards, 2020; Evans, 2020; Olsson et al., 2016; Sinakou et al., 2019), in this work we set out the following objectives: 1. To ascertain the level of learning about sustainability that university students acquire when they participate in activities designed for this purpose; and 2, to ascertain the level of knowledge, training and importance that the lecturers who carry out these activities give to the educational application of sustainability.

## Method

The methodological design was quasi-experimental in the form of a pretest and a post-test given to the students. At the beginning of the course, the education students' level of knowledge and awareness regarding sustainability was evaluated by means of a questionnaire. Following this, various training activities were undertaken with the students to discover what influence these activities might have. The same questionnaire was then employed at the end of the course to reassess their level of knowledge and awareness. For the three education lecturers, a single questionnaire was given once at the beginning of the course.

## Sample

Our study focused on education students, so the sample selection was incidental rather than probabilistic. The sample participants were students on the Early Childhood Education, Primary Education and Social Education Degree courses at the University of Almería (UAL) and at the Rey Juan Carlos University (RJCU). A total of 359 students completed the process, which is described below. The study was conducted throughout the 2020-21 academic year. The *Questionnaire of perceptions, attitudes and values towards sustainable development* was answered by 266 women and 93 men. With regard to age, more than half (55.2%) of the participants were over 20 years old. By university, just over half of the total sample (56.3%) were enrolled at the RJCU. The reason for selecting these two universities, one central and one peripheral in Spain, was to take advantage of the opportunity of a funded research stay.

## Instruments

Two different instruments were used to collect the data. To collect information from the students, the *Questionnaire of perceptions, attitudes, and values towards sustainable development* by Murga (2009) was employed. This consists of 59 items organized into four factors or scales. Scale 1 collects information regarding the students' perception of the environmental crisis at a global, ecological, social, and moral (or ethical) level. The second scale collects information on the students' perception of the limits of the dominant sociocultural model: the weaknesses and false beliefs of said model. Scale 3 pertains to the perceptions regarding the sustainable development model. It focuses on the theoretical principles and ethical axioms derived to put the model into practice. Scale 4 gathers information on the commitment to sustainability values; that is, the subjects' manifest intention to get personally and individually involved with the values of sustainability. The responses were presented on a Likert scale containing 5 options ranging from 1 "strongly disagree" to 5 "strongly agree".

The information collected from the lecturers was gathered using the *Cuestionario de ambientalización curricular* (Questionnaire of Curricular Environmentalization) by Alcántara, Limón and García (2020). This instrument consists of 26 items organized around seven aspects: the importance the lecturer attaches to environmental education; the inclusion of the environmental dimension in the teaching practice itself; the training of lecturers to put environmental training into practice; the university institution's involvement in environmental issues; the involvement of the lecturers in research related to environmental

education; participation and involvement outside the classroom; and obstacles and necessary changes. The responses were presented on a Likert scale with 5 options.

### **Procedure and Data Analysis**

This research was developed following a pretest/post-test methodological design carried out with each group according to the following guidelines:

1. Pretest - carried out at the beginning of the course: information was collected from the lecturers (a total of 3), who work with each group, through the online administration of the *Questionnaire of Curricular Environmentalization*. An initial assessment of the students' perceptions of sustainability was conducted by administering the *Questionnaire of perceptions, attitudes and values towards sustainable development* by Murga (2009). The questionnaire was administered via email using the open-source application LimeSurvey online survey tool.
2. Intervention throughout the course - at the UAL, students carry out activities related to sustainability based on the SDGs. The Early Childhood Education and Primary Education groups (A1, A2 and A3) receive general information about all the SDGs through readings, websites, and specific news, etc. Subsequently, in groups of 3-5 people, the students must choose a specific SDGs and do more in-depth research into it and its level of achievement; they must also establish measures that can be undertaken personally to achieve the SDGs they have chosen. Finally, they must record a podcast on the above information to disseminate to the university community. This activity takes place in a transversal way over the 10 weeks of the semester in the "History of the school and the educational system" course. The Social Education group (A4) works on sustainable development throughout the "Education and cooperation for development" course; in this way, both the theoretical and practical contents are oriented to the SDGs throughout the 15-week course, a total of 60 hours. Again, the students must carry out two tasks in small groups (3-5 people). Due to the COVID-19 pandemic, one of the tasks consisted of a virtual collaboration with a non-governmental environmental organization to design and develop a virtual campaign according to the needs of said organization. In the second activity, they had to develop an Instagram campaign to disseminate those measures that were awarded for their contribution to achieving the SDGs. Each group had to choose a particular measure that had received a UNESCO award. The Instagram campaign had to incorporate the following aspects: a minimum of 5 posts on the awarded measure they had chosen, an explanatory video about it, and a podcast reflecting on what was learnt during the activity. The intervention with the UAL students is carried out by the course lecturer. At RJCUC, all the students (B1, B2, B3 and B4) carried out the same Instagram campaign activity as the UAL students. The intervention was developed within the course "Didactics of Social Sciences" by the course lecturers, one male teacher and one female teacher. All the activities described here were designed by the UAL teacher.
3. Post-test - at the end of the course, the *Questionnaire of perceptions, attitudes and values towards sustainable development* was sent again exclusively to the students who had completed it at the time of the pretest.

To facilitate both the preparation of the tables and the comments on them, the groups were coded by university. For the UAL there were 4 groups: A1 (Primary A), A2 (Primary B), A3 (Infant C) and A4 (Social Education). Lecturer L1 intervened with these groups. At the RJCUC there were also 4 groups: B1 (Primary A morning), B2 (Primary B morning), B3 (Primary A afternoon) and B4 (Primary B afternoon). At this university, lecturer L2 intervened with the B1 and B2 groups, and lecturer L3 with the B3 and B4 groups. The analysis applied to the data obtained in the pretest and post-test is shown in the results section. First, certain psychometric properties of the *Questionnaire of perceptions, attitudes and values towards sustainable development* are described both for the pretest and for the post-test. Second, the average differences in the different factors and in the total of said questionnaire are graphically presented. Finally, these differences are assessed using the Student's t statistic as to whether they are significant in the different factors and in certain sample characteristics. In relation to the *Questionnaire on curricular environmentalization*, the psychometric characteristics of the same are described along with the values for each of the lecturers in the scale total and in its various sections.

## Results

### Questionnaire of Perceptions, Attitudes, and Values Towards Sustainable Development

The main descriptive characteristics and psychometric properties in each of the questionnaire's factors, both for the pretest and post-test measurements, are shown in Table 1. One can observe a good level of reliability for the scale, with a Cronbach's Alpha of .94 in the post-test. The four individual factors achieve a good level of reliability both in the pretest and in the post-test.

**Table 1**

*Psychometric properties of the factors and the scale pre and post*

	Nº. of Items	$\alpha$ Pre	$\alpha$ Post
Factor 1	13	0.82	0.87
Factor 2	17	0.70	0.76
Factor 3	18	0.82	0.88
Factor 4	11	0.78	0.84
Scale	59	0.91	0.94

Source. Own elaboration.

For the results analysis, a linear transformation has been carried out on the aggregate scores for the items corresponding to each factor to obtain subscales from 0-10, thus making the results' interpretation easier.

Table 3 shows the descriptive values for each of the factors, both at the time of the pretest and the post-test. In relation to sex, there are no great differences between men and women, either in the scale total or in each of the factors, although women present a slightly higher average. Factor 1 - perception of the environmental crisis - was the one in which they present the highest level of initial knowledge both before and after the course. Factor 2 stands out -



perception of the dominant sociocultural model - as the factor presenting the lowest level of initial knowledge, both at the pretest and post-test. In relation to age, older students show a higher average, both in the scale total and in each of the factors; however, there are hardly any improvements between the time of the pretest and post-test in the two age groups. By university, the UAL students show a slight increase in the scale total. By factors, it is in Factor 4 - commitment to the values of sustainability - where the total number of UAL students show most progress between the pretest (7.0) and the post-test (7.2) By groups within the UAL, Group A4 shows the greatest progress in the scale total between the pretest and post-test. In fact, it is the only group that shows progress in all 4 factors. Regarding the URJC, as can be seen in Table 2, there are no differences in the student total between the pretest and post-test. By groups, the increases are very slight in the scale total between the pretest and post-test; in fact, the Group B4 score is even worse in the total for their perception, attitudes, and values towards sustainable development, going from 7.1 in the pretest to 6.8 in the post-test. By groups, it can once again be observed that all the students have a notable perception of the environmental crisis (Factor 1) although there is no increase between the pretest and post-test. This is again repeated in Factor 2 - perception of the dominant sociocultural model - in which the students present less knowledge and where there are more variations between the groups' pretest and post-test, with Groups B1 and B2 among those where there is more difference.

**Table 2**

*Descriptive data of the scale and its factors (Pretest and Posttest) according to socio-demographic variables*

	Scale		Factor 1		Factor 2		Factor 3		Factor 4	
	$\bar{x}$ Pr	$\bar{x}$ Post	$\bar{x}$ Pr	$\bar{x}$ Post	$\bar{x}$ Pr	$\bar{x}$ Post	$\bar{x}$ Pr	$\bar{x}$ Post	$\bar{x}$ Pr	$\bar{x}$ Post
Sex										
Female	6.7	6.8	7.5	7.5	5.3	5.4	7.0	6.9	7.3	7.4
Male	6.6	6.7	7.3	7.5	5.1	5.3	6.9	6.9	7.1	7.4
Age										
20 or less	6.5	6.6	7.2	7.3	5.0	5.2	6.7	6.7	7.1	7.1
Over 20	6.9	6.9	7.6	7.6	5.3	5.5	7.1	7.1	7.4	7.5
University										
UAL	6.5	6.6	7.2	7.3	5.0	5.1	6.7	6.7	7.0	7.2
A1	6.6	6.6	7.4	7.3	4.9	5.2	7.0	6.8	7.3	7.1
A2	5.9	6.0	6.3	6.5	5.0	4.7	6.1	6.1	6.1	6.4
A3	6.3	6.3	6.8	7.0	5.0	4.9	6.6	6.3	6.6	6.9
A4	6.7	6.9	7.6	7.8	5.1	5.3	6.8	7.1	7.3	7.6
URJC	6.9	6.9	7.6	7.6	5.4	5.5	7.1	7.0	7.5	7.5
B1	6.9	7.0	7.7	7.6	5.5	5.8	7.1	7.2	7.5	7.4
B2	6.8	6.9	7.6	7.6	5.0	5.6	7.1	7.1	7.4	7.5
B3	6.7	6.9	7.3	7.7	5.4	5.3	6.9	6.9	7.2	7.7

	Scale		Factor 1		Factor 2		Factor 3		Factor 4	
	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$
	Pr	Post	Pr	Post	Pr	Post	Pr	Post	Pr	Post
B4	7.1	6.8	7.8	7.7	5.6	5.3	7.4	6.9	7.6	7.6
Total	6.7	6.8	7.5	7.5	5.2	5.4	7.0	6.9	7.2	7.4

Source. Own elaboration.

To determine to what extent the average differences between the previously mentioned pretest and post-test times are significant, the Student's *t* statistic was calculated as shown in Table 3. One can observe how neither of the demographic variables, sex, or age, show significant differences, not in the scale total or in any of the 4 factors. The same happens at the level of universities, where no differences are produced in the student total for each university. When considering the factors, one can see that, as in Factor 1, perception of the environmental crisis does not present any significant difference between the pretest and post-test for any of the eight class groups in the student sample. Factor 2 - perception of the dominant sociocultural model - presents significant advances in four of the groups between the pretest and the post-test. Factor 3 - perception of the sustainable development model - only presents significant differences in Group A4 and Group B4, the latter group also worsened their perception of sustainable development between the pretest and post-test, as can be seen in Table 3. In Factor 4 - commitment to sustainability values - only two groups, A3 and A4, show significant differences between the pretest and post-test. Also noteworthy is the fact that two groups, A2 and B3, do not present significant changes in any of the sections contemplated. Finally, it is important to highlight the significant differences between the pretest and post-test obtained by Group A4, both in the scale total and in each of the factors, except for Factor 1, where there are advances between the time of the pretest and post-test although they are not significant.

**Table 3**

*Comparison of means between Pretest and Posttest according to factors (Student's *t*)*

	Scale		Factor 1		Factor 2		Factor 3		Factor 4	
	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.
Sex										
Female	-0.25	0.803	0.01	0.994	-1.67	0.096	0.86	0.390	-0.77	0.444
Male	-1.20	0.235	-1.10	0.275	-1.32	0.192	-0.30	0.768	-1.25	0.216
Age										
20 or less	-0.77	0.442	-0.94	0.347	-1.52	0.130	0.20	0.842	-0.59	0.559
Over 20	-0.50	0.621	0.05	0.957	-1.53	0.128	0.63	0.528	-1.26	0.209
University										
UAL	-1.44	0.153	-0.95	0.342	-1.54	0.125	-0.33	0.741	-1.88	0.062
A1	0.20	0.842	0.81	0.422	<b>-2.23</b>	<b>0.032</b>	0.74	0.465	0.68	0.503
A2	-0.06	0.956	-0.86	0.397	1.56	0.131	-0.02	0.981	-1.13	0.266
A3	0.22	0.825	-1.36	0.187	0.69	0.499	1.16	0.258	<b>-2.12</b>	<b>0.046</b>

	Scale		Factor 1		Factor 2		Factor 3		Factor 4	
	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.	<i>t</i>	Sig.
A4	<b>-3.22</b>	<b>0.002</b>	-1.53	0.130	<b>-2.12</b>	<b>0.038</b>	<b>-2.41</b>	<b>0.019</b>	<b>-2.93</b>	<b>0.005</b>
URJC	-0.26	0.796	-0.10	0.924	-1.62	0.108	0.93	0.355	-0.45	0.653
B1	-0.51	0.614	0.61	0.545	<b>-2.06</b>	<b>0.043</b>	-0.53	0.600	0.70	0.486
B2	-0.70	0.490	-0.04	0.967	<b>-2.47</b>	<b>0.017</b>	0.34	0.732	-0.11	0.917
B3	-0.57	0.573	-1.27	0.214	0.19	0.850	-0.09	0.930	-1.37	0.180
B4	1.35	0.184	0.47	0.641	1.29	0.203	<b>2.20</b>	<b>0.033</b>	-0.08	0.939
Total	-0.87	0.383	-0.58	0.563	-2.12	0.034	0.59	0.555	-1.34	0.181

Source. Own elaboration.

### Curricular Environmentalization Questionnaire

The reliability analysis of this scale using Cronbach's  $\alpha$  statistic turns out to be 0.91, which shows a good level of reliability and internal consistency of said instrument. To analyse the results, a linear transformation of the sections' aggregated scores was again performed to obtain scores from 0-10, thus simplifying their interpretation.

Table 4 shows both the scale total and the sections related to the involvement of the lecturers in research related to environmental education. In the scale total, one can see how two of the lecturers, L1 and L2, have a high-performance level in terms of adapting the curriculum and the environmental education teaching and requirements. This is not the case for lecturer L3, who presents a low level, 2.3 out of 5, in her activity and attitude towards curricular environmentalization. In line with the above, it can also be observed how lecturers L1 and L2 attach great importance to environmental education in terms of university responsibility, their commitment as lecturers and to training preservice teacher; this is not the case for lecturer L3, who is shown to disagree with such aspects.

Regarding the inclusion of the environmental dimension in teaching practice, lecturer L1 has the highest level of agreement in including and seeking methodological strategies that integrate the environmental theme in the curriculum. In relation to the lecturers' own training in environmental issues, only lecturer L2 claims to have been trained by the university in such issues; agreement is unanimous regarding the importance of encouraging and promoting refresher training on these issues.

With regard to the involvement of the university institution in environmental issues, only the lecturer L2 considers that the institution is sufficiently involved in the existence of initiatives, projects, research groups and organizing events on issues related to environmental education. Lecturer L3 manifests a high level of disagreement with these aspects.

Regarding the lecturers' own involvement in research related to environmental education, the lecturer L3 is the only one who does not have environmental education as one of her research lines, nor has she directed any Final Study Project or published anything on this theme. Lecturer L1 has the highest scientific production on environmental issues, with around 4-5 articles.

**Table 4***Descriptive of teachers on the Curricular Environmentalisation Scale and of some items*

Questionnaire	L1	L2	L3
	$\bar{x}$	$\bar{x}$	$\bar{x}$
1. Importance that teachers attach to environmental education (items 1, 2, 3, 4).	10	8	2
2. Inclusion of the environmental dimension in teaching practice (items 5, 6, 7)	10	6.	6
		6	
3. Teacher training in environmental practice (items 8, 9, 10, 11)	8	7	6
4. Involvement of the university institution in environmental issues (items 12, 13, 14).	6	8	3.
			4
5. Involvement of teaching staff in research related to environmental education (items 15, 16, 17).	6.	5	2
	4		
6. Participation and involvement outside the classroom (items 18, 19, 20, 21, 22).	10	8.	8.
		4	8
7. Obstacles and changes (items 23, 24, 25, 26)	10	8.	9.
		4	4
Total (26 items)	9	7.	4.
		1	6

*Source.* Own elaboration.

*Note.* 1 = "Strongly Disagree"; 5 = "Strongly Agree"

With regard to participation and involvement outside the classroom in terms of personal involvement in environmental activism, the importance of citizen involvement and a willingness to train as a professional, there is a consensus on these aspects among the three lecturers.

The last section - obstacles and changes - presents notable agreement among the three lecturers regarding the need to address new methodological strategies that facilitate the educational treatment of sustainability, the need to ensure its inclusion in curricula, the need to increase the exchange of experiences on the subject and the motivation of the lecturers to promote curricular environmentalization.

## Discussion

In this research work we set out to respond to the research gaps observed, such as the relationship between the application of activities on sustainability, the learning results obtained by the education students who undertake such activities (Evans & Ferreira, 2019; Olsson et al., 2016; Sinakou et al., 2019) and the level of knowledge possessed by the lecturers who develop such activities on environmental issues and sustainability.

The primary objective consisted of determining the level of learning on sustainability that university education students acquire when they undertake activities designed for this purpose. The results show that the students have a remarkable perception of the current environmental crisis; furthermore, this perception does not increase or decrease following the intervention. In fact, there were no significant changes in any of the eight intervention groups; in addition, this was the only section in which the Social Education group (A4) showed no significant differences after the intervention. One possible explanation could be that the intervention did not focus exclusively on the physical deterioration of the

environment, an aspect for which they had already acquired training through different routes, but which did not usually incorporate social harm or the inappropriateness of considering development as the sole engine of progress and well-being (Misiaszek, 2019; 2020). Consistent with the above, the students showed a low level of perception of the dominant sociocultural model, in such a way that they exclusively rely on scientific advances to solve environmental problems while defending economic development as the exclusive form of progress; similar results were found by Murga (2008, 2009), and Kukkonen (2018). Symptomatic of this aspect's low level is the fact that, in four of the groups, its perception has been the most sensitive to intervention and improvement; despite this, inconsistencies prevail, such as considering that technological risks are controlled and admitting that science is not neutral or moved solely by the desire for knowledge. The perception of the sustainable development model turns out to be the section obtaining the worst results; indeed, the B4 group significantly worsened their perception of the ethical and theoretical principles and assumptions derived from said model. Thus, we see how it is difficult for education students to integrate the ecological, social, and environmental dimensions of sustainable development, results like those found by Sinakou et al. (2019). However, through a course focused on education for development, it is possible to significantly improve knowledge on what sustainable development involves; this was the case for Group A4, in which the entire subject revolved around the topic. Authors such as Telešienė et al. (2021), found similar results following a course to improve the level of environmental citizenship in university students. In the final section - commitment to sustainability values - there were also improvements in all the groups, but these were only significant in groups B3 and B4. Despite this, contradictions persist, such as defending the lowering of the Western consumption level so that developing countries can increase theirs and, on a personal level, putting material concerns before one's quality of life. The resistance of students to modifying their consumption habits is a recurring element found by researchers such as Lozano and Figueredo (2021) or Marcos-Merino et al. (2020).

The second research objective was to understand what degree of knowledge, training and importance is given to the educational application of sustainability by the lecturers who carry out these activities. Two of the lecturers presented a high level of performance in adapting the curriculum and teaching to the requirements of environmental education. However, lecturer L3 considered that it was not the university's job to offer training on sustainability values. She did not know which related activities were carried out within her institutional academic environment and, consequently, was not involved in research related to environmental training. This acceptance, but also resistance, to introducing environmental criteria in the curriculum, has also been observed in studies such as those by Alcántara et al. (2020), Coronado-Marín et al. (2020) and Evans (2020). Another type of reluctance found is the difficulty that lecturers perceive in connecting any subject with sustainability, or with their own teaching practice (Bautista-Cerro et al., 2018; Aznar et al., 2017). All agreed on the importance of involving lecturers in environmental issues outside the classroom, on the need to promote the university's role and on the training and support given to lecturers in this regard. The demand for the university to be involved in all aspects related to sustainability, and to train its lecturers in this, is a recurrent theme in the research studied (e. g. Alcántara et al. 2020; Bautista et al. 2018; Busquets et al. 2021). Finally, although neither the analyses nor the data allow a causal

relationship to be established between the teaching staff who apply the activity to each group and the results obtained by them, it is interesting to comment on certain aspects. One of the designed activities was the same for all the URJC students and for Group A4 at UAL. However, the results varied considerably between the groups - Group B3 did not improve significantly in any aspect whereas Group B4 worsened in matters such as the perception of the dominant sociocultural model or the sustainable development model; this group obtained the worst results of all. These are the two groups that undertook their activity with lecturer L3, who in turn obtained the lowest level in terms of environmentalizing the educational activity. One possible explanation could be that the instructional design or planned activity is not the same as the instructional practice. Therefore, analysing the instructional practice would allow a more realistic interpretation of what really happens in a class (Sinakou et al. 2019). To this, one must add that the lecturers' beliefs have a fundamental impact on learning by supporting or hindering it through educational actions (Fives & Buehl, 2016).

Among the limitations of this research are the small sample size, both for the students and, especially, for the lecturers. Another limitation is the limited intervention time and the sustainability training given to the students, barely fifteen hours spread over ten weeks. However, it has been useful to contrast the results from this short intervention with results from a full course focused on education for development (a total of 75 hours over fifteen weeks). Future research could be designed in such a way that causal relationships could be established between the type of instructional design, the results obtained, and the conceptions and beliefs of lecturers regarding sustainability. It would also be interesting to delve into the possible polarization processes of the students' attitudes and values towards sustainable development when intervening in these aspects. Other aspects that could help to better understand the results would be to collect information on the students' prior involvement in environmental organizations, or the use of other more sensitive tools to measure the aspects considered.

## Conclusions

In this work, we set out to know the attitudes and knowledge on adapting the curriculum to sustainable development requirements (curricular environmentalization) possessed by lecturers who decided to apply sustainable development activities. At the same time, we wanted to know how the perception, attitudes and values of preservice teacher who undergo this training were affected. As the main result, one can appreciate how the students have a remarkable understanding of the environmental crisis, but that it is very difficult for them to complete this perception by framing it in the totality of elements involved in sustainability, such as the social, economic, and ecological aspects. Indeed, notions based on false premises persist regarding the dominant sociocultural model, which require more work and information for them to be properly dismantled. Short-term interventions have little effect on the knowledge students obtain; nevertheless, a course focused on education for development leads to notable and significant improvements. Conversely, the training and beliefs of the lecturers who apply these activities are important when it comes to qualifying and giving meaning to educational practice, and these can become key elements that support or hinder education on sustainable development. To get young people committed to sustainability

values, the educational methodology is key (Lozano-Díaz & Fernández-Prados, 2022). Thus, we argue that the main theoretical contribution of this study is to focus on the role played, when applying the methodology and instructional design, by the values and knowledge that lecturers have about sustainability and about their own role in training on this aspect. According to Leal Filho et al. (2021), the scientific contribution from the university to educate for sustainability must also involve developing the capacity of lecturers.

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