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Do the Personal Attributes of Teachers in Training Affect Their Attitudes Towards Transformative Environmental Education?

¿Influyen las características personales del profesorado en formación en sus actitudes hacia una educación ambiental transformadora?

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Abstract

The environmental challenge is one of the main challenges facing teachers. The aim of this study is to find out how personal attributes and circumstances can influence the attitudes of future teachers towards transformative Environmental Education. For this purpose, a sample of 889 students from the Spanish Infant and Primary Education Grades was used, analyzing their scores in the factors of the validated questionnaire Attitudes Scale toward Environmental Education (ASEE) by means of descriptive and inferential statistical techniques. The results obtained indicate that factors such as gender, type of pre-university school and family education should be considered, and all this has practical implications for the training of future teachers in what we call Transformative Environmental Education.

Keywords: ASEE questionnaire, attitudes, personal attributes, teacher training, transformative environmental education.

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Resumen

El desafío ambiental es uno de los principales retos que debe afrontar el profesorado. La finalidad de este estudio fue conocer cómo las características y circunstancias personales pueden influir en las actitudes del futuro profesorado hacia una educación ambiental transformadora. Para ello se empleó una muestra de 889 estudiantes de los Grados en Educación Infantil y Primaria españoles, analizándose sus puntuaciones en los factores de la escala validada Attitudes Scale toward Environmental Education (ASEE), mediante técnicas de estadística descriptiva e inferencial. Los resultados obtenidos indican que factores como el sexo, el tipo de escuela preuniversitaria y la educación de las familias deben ser tenidos en cuenta, ya que tienen implicaciones prácticas para la formación de los futuros docentes en lo que denominamos una educación ambiental transformadora.

Palabras clave: actitudes, características personales, educación ambiental transformadora, escala ASEE, formación del profesorado.

Introduction

Current scenarios warn us that we are facing an unprecedented global emergency or systemic planetary crisis, in which education cannot and should not remain uninvolved (Bybee, 1991; Vilches & Gil, 2009; 2015). In fact, the quest for sustainability is one of the biggest challenges facing education in the 21st century (European Commission, EC, 2019).

This context shows clear evidence of how human beings are becoming the protagonists of the changes taking place in the processes that regulate the Earth's systems, which are referred to with terms such as global or anthropocene environmental change (Steffen, Broadgate, Deutsch, Gaffney, & Ludwig, 2015), which have been used in the scientific-experimental literature in recent years. Furthermore, over the last decade, numerous studies have indicated that many environmental limits have already been exceeded (Rockström et al., 2009; GEO-6, 2019), which puts us in a situation of uncertainty, as we are unaware of the possible consequences of complex and interrelated problems (Steffen et al., 2015). For this reason, Melero and Solís (2012) argue that we are not only facing a planetary crisis, but also crises involving civilizations; models of economic, social, scientific, and technological development, and, essentially, in education and values.

What lies behind this is the dominant socioeconomic model, which, as Stiglitz (2015) states, is unfair and unsustainable, since it entails unequal distribution of resources that worsens poverty and inequalities, and unprecedented environmental degradation. (Melero & Solís, 2012; Worldwatch Institute, 2015). In this respect, Gisbert (2007) and Rockström and Klum (2015) contend that continuous growth is not possible on a planet with limited resources.

As a consequence of this, in 2015 the UN approved the *2030 Agenda for Sustainable Development*. Through its 17 goals and 169 targets, it emphasizes the need for a joint plan of action to launch programs and initiatives that help create fairer and more sustainable societies.

Figure 1. 2030 Agenda for Sustainable Development and its 17 goals (UN, 2015).

Goal 4 of this agenda specifically states that the main role of education is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. With regard to this education, Irina Bokova—since 2009 the Director-General of the United Nations Educational Organization, Unesco, the agency responsible for monitoring progress in the achievement of goal 4—underlines that:

> We must fundamentally change the way we think about education and its role in human well-being and global development. Now, more than ever, education has a responsibility to foster the right type of skills, attitudes and behavior that will lead to sustainable and inclusive growth (Unesco, 2016, Foreword).

In this framework and with human beings as the focus, both education in general and environmental education of a transformative nature are presented as a necessary means of training people who are conscious and critical, capable of assessing the risks of current trends, and working for a sustainable future, in line with the evolution that this issue has undergone in recent decades (Murga-Menoyo & Novo, 2017).

However, for this to happen, the current educational model has to be reviewed because, as Álvarez and Vega (2009) argue, promoting sustainable development on the basis of environmental education implies "redefining the new educational settings, their times and rhythms, the role of teachers and all the actors involved in school practice, the curriculum, their management, and the current pedagogical ecosystem" (p. 246).

This represents a great challenge for teaching staff and, as Gough (2016) and Wiek, Xiong, Brundiers, and Leeiw Van Deer (2014) have stated, for teacher training too, since one of the keys to promoting change in future generations resides in this process, by putting into practice educational proposals that are oriented towards sustainability in centers of learning and which involve the whole educational community.

The challenge of transformative environmental education oriented towards sustainability

Nowadays we know that education in general and schools in particular play an important role in the acquisition of knowledge, abilities, skills, and attitudes oriented towards the promotion of new ways of life that are conscious and respectful of the environment and people (Worldwatch Institute, 2015). In spite of this, change must come from transformative environmental education (hereafter TEE) that is conceived on the basis of a critical and reflective perspective that questions the dominant socioeconomic model, for which schools must strengthen their efforts to ensure that citizens are trained and informed. As Milanés, Menezes and Quellis (2019) argue, educational establishments are an ideal space to promote the generation of new ideas that contribute to building fairer and more sustainable societies by allowing teachers, students, and the community to participate and make decisions regarding socio-environmental problems in their immediate surroundings.

Education for change must therefore begin in early childhood, because this is a time in which important foundations are established along with a desire for lifelong learning, which can lead students to see themselves as people capable of making valuable contributions to their community (Mackey, 2012). In this way, knowledge of socio-environmental problems and the reflective and participatory quest for solutions from the early stages of life are a way to prepare students for the complexity of the problems that they will face as they grow older. This gradual implementation would also help to address the great challenge of educating for sustainability in light of interconnected global problems (Kopnina & Meijer, 2014; Novo, 2006).

Facing this challenge, as Murga-Menoyo (2015) argues, requires a new didactic framework that promotes the development of skills and capabilities that are necessary for the creation of critical citizens who are committed to a different development model, at the same time as teaching to address global environmental challenges (Leicht, Heiss, & Byun, 2018; Scott, 2009; Unesco, 2017). In this respect, authors such as Olsson, Gericke, Sass, and Boeve-de Pauw (2020) contend that this can only be possible through the development of a competence for action, based on understanding the complex nature of socio-environmental problems, critical thought, individual and social responsibility, and participatory decision-making, in such a way that this recognizes the worth of developing pro-environmental values in the educational field (Jensen & Schnack, 2006; Mogensen & Schnack, 2010; Unesco, 2017).

Thus, as Jensen and Schnack (2006) point out, contributing to the development of this competence in TEE involves understanding the possible solutions to current socio-environmental problems, which implies promoting educational actions based on complex thinking (Bonil, Junyent, & Pujol, 2010; García, 2004; Morin & Pakman, 1994; Osorio, 2002), based on the need to make the new generations aware of the importance of making social and structural changes. This means overcoming the fragmentation of knowledge and the determinism of science, since these permeate pedagogical practices and initial teacher training programs (Saheb & Rodríguez, 2017). Complexity theory (Morin, 2001) thus aims to reaffirm the need to reconsider education in general and environmental education in particular by proposing a reform of thinking as a means of contextualizing learning.

On the other hand, Tilbury (1995) and Breiting (1997) also state that environmental education that encourages action should promote critical and reflective attitudes, assuming that critical thinking is a fundamental medium for action to take place, by representing the capability that we have to develop in order to make responsible decisions, think autonomously, and be an active part of current cultural, scientific, and socio-environmental decisions (Solbes & Torres, 2012; Torres & Solbes, 2016).

Thus, only from a holistic and participatory perspective will it be possible to progress towards real and effective sustainable development (Wals, 2014). In this respect, Vilches and Gil (2015) point to three characteristics of this new teaching approach, which must be: interdisciplinary, since it has to address complex challenges; transdisciplinary, since it requires the participation of all citizens; and it must have a broad perspective, that is, being global and having both a short- and long-term focus.

All of this means mobilizing education related to learning to be, know, live, do, and feel, which is essential to transform society (Lorenzo-Rial, Álvarez Lires, Arias Correa, & Pérez Rodríguez, 2019). These competences must be characterized by fostering attitudes of responsibility, commitment, and action, so involvement of the whole educational community will be essential (Bonil, Calafell, Granados-Sánchez, Junyent, & Tarín, 2012; Jara Campos, 2020), in addition to the implementation of didactic experiences that promote participation and decision-making on the part of students, who will be the protagonists of the necessary changes (Ayerbe López & Perales Palacios, 2020; Mackey, 2012; Öhman & Öhman, 2013).

In this regard, Orr (1993) states that the first step for building knowledge is initiation through a process of environmental literacy as a way of addressing the improvement of socio-environmental issues (Tuncer Teksoz, Boone, Tuzun, & Oztekin, 2013) with a systemic and transformative approach, integrating and promoting the search for a model of socioeconomic development that enables the consequences of continuous growth for the planet to be understood (Pérez-Rodríguez, Varela-Losada, Lorenzo-Rial, & Vega-Marcote, 2017). These efforts should ensure that students acquire a view of our eco-dependence, understanding the enormous impact of anthropogenic activities on the environment and on people, so that they can be aware of ecological principles (Braun, Cottrell, & Dierkes, 2018; Ernst & Theimer, 2011; Evans et al., 2007; Gifford & Sussman, 2012). In this context, Vilches and Gil (2015) talk about "sustainability science" to refer to the relationships between society and natural systems and the need to reorient the interactions between these two areas.

Finally, the school and initial teacher training have to establish synergies between natural, social, and cultural environments, in order to include the ecological debate and the implications of policies regarding the environment as issues that are necessary to understand the impact of our actions (Brody, 1996). The inclusion of environmental scientific literacy in education requires rethinking the objectives of TEE, reviewing the approaches in teaching materials that perpetuate the current development model, and critically reformulating teaching practices in order to know what is being taught, how it is being taught, and what is intended to be achieved (Jones, Ramanau, Cross, & Healing, 2010).

Transformative environmental education oriented towards sustainability in initial teacher training

There is no doubt that the environmental problem is one of the main challenges faced by the citizens of the 21st century, and therefore also teachers (Unesco, 2017).

In this context, universities play an important role in training professionals capable of adopting pro-environmental behaviors and practices that promote the conservation and protection of the environment and people (Heyl, Moyano Díaz, & Cifuentes, 2013). However, the reality is that, although school and university curricula have included sustainability as an interdisciplinary theme (Leal Filho et al., 2019), many of these study plans are limited to the introduction of short-term changes by ignoring the need to formulate proposals that consider the urgency of taking measures or the need to challenge the current, unsustainable, and unfair socioeconomic models (González Gaudiano, 2012).

In this framework, it is essential to have teacher training that promotes a specific profile of reflective and innovative teachers who are capable of mobilizing the knowledge of their students to help them assume their responsibility as agents of change (Ull, Piñero, Agut, & Aznar, 2014). In order to achieve this, the teacher must be able to understand the need to change the form of teaching and learning as a means of contributing to the development of competences for sustainability (Wiek, Withycombe, & Redman, 2011).

This change implies moving past the traditional teaching model, which is characterized by the transmission of knowledge, in order to focus on a socio-constructivist model that enables the training of committed, responsible, and capable people to act and solve socio-environmental problems (Albareda-Tiana, Vidal-Raméntol, Pujol-Valls, & Fernández-Morilla, 2018). However, in environmental education many teaching practices are framed by an activist approach that, despite its benefits, is still characterized by the use of traditional methodologies (Rodríguez & García, 2009). Thus, from a critical approach, Rodríguez (2011) points out in her doctoral thesis that, in spite of the good intentions of the teachers who include environmental education in their programs, their didactic approach

> does not promote an overall and systemic analysis of environmental problems, of reflection on the role of individuals and the various social groups with respect to them and, therefore, of the need to adopt pro-environmental behaviors autonomously and critically (Rodríguez, 2011, p. 42).

This is why Rodríguez and García (2009) argue that it is essential to seek constructivist models that include reflection on the purpose of the proposed activities, the preparation and organization of their contents, a globalized sequence design, and the participation of the students at whom the educational proposal is aimed, so teacher training in these topics should be promoted in the curricula (Álvarez-García, Sureda-Negre, & Comas-Forgas, 2015).

In the same vein, many studies conducted with teachers in initial training (Álvarez-García, Sureda-Negre, & Comas-Forgas, 2018; García-Esteban & Murga-Menoyo, 2015; Van Petegem, Blieck, Imbrecht, & Van Hout, 2005) agree on the reasons why this group has problems implementing transformative environmental education in their proposals for the classroom:

- lack of specific training on the subject,
- lack of experience in using innovative teaching methods,
- lack of reference to curricular elements related to environmental education, and
- lack of time, which implies an excessive workload.

In order to overcome these limitations, universities and teacher training centers must provide future teachers with the tools, approaches, and means necessary to implement future educational proposals for the classroom that are focused on TEE and which involve the interrelation of socio-environmental problems and the complexity of designing global and interdisciplinary proposals. Knowledge about socio-environmental problems and sustainable development must also be included, as well as new approaches to teaching and learning, which also requires reviewing the current curricula (Cebrián & Junyent, 2014; Flores, Ruíz, & Del Socorro Rayas, 2017). In this respect, Tilbury (2011) argues that there are three great premises in the future of teaching and learning sustainable development models: to contribute to promoting technical-scientific competences; to reformulate the relationships between human beings and nature; and to introduce the idea of social change. She also adds that, in order to achieve the transformation of the system, it is essential for all those who make up the educational community to critically reflect on the future, taking into account the complexity of the changes, the uncertainty of their consequences, and the challenge that this new situation requires a change in our values.

All of this should be to train a teaching staff that is capable of critically reformulating their teaching practices (Jones et al., 2010) in order to introduce innovative methodologies that promote TEE, as well as rethinking their attitude and responsibility towards socio-environmental problems and being familiar with the foundations of sustainable development, paying special attention to the important role of the current socioeconomic model in socio-environmental trends.

Attitudes of teachers to TEE

In this context, studying attitudes is an essential element of this research, because they are usually related to the individuals' behavior (Gifford, 2014). Indeed, in a recent review Marcinkowski and Reid (2019) define attitudes as the dispositions and evaluative judgments of an individual about an "object" (for example, a being, a thing, an event, an idea, a matter, or an action), which are formed by the interaction between cognitive (knowledge, beliefs, etc.), affective (feelings, emotions, etc.), and conative (behavioral intention) components, and which are based at least partly on experiences and situations that people live through. Therefore, they normally occur as a result of their interaction with reality (Donahue & Miller, 2006) and derive from their own processes of socialization with other people (Kerin, Hartley, & Rudelius, 2009), affecting their beliefs and values (Bohner & Wanke, 2002).

From this perspective, attitudes can vary because of the influence of factors such as education, the media, and families, in addition to other elements, such as current affairs and neoliberal capitalist policies (Bentley, Petcovic, & Cassidy, 2019; Schindel Dimick, 2015).

Various studies thus indicate the existence of a correlation between personal characteristics and pro-environmental attitudes, which can result from the context in terms of demographic characteristics and personal and social factors (Gifford & Nilsson, 2014; Pavalache-Ilie & Cazan, 2018). These factors are also important variables during school age. Indeed, based on cognitive, social, and behavioral psychology (Gifford & Sussman, 2012; Winter & Koger, 2008; Lehnert, Fiedor, Frajer, Hercik, & Jurek, 2019), the influence of personal characteristics such as age, gender, personality, socioeconomic status, the area of residence (urban/rural), nation, religion, politics, values, experience, education, and environmental knowledge are often analyzed. In this respect, as a starting point for this study we took the hypothesis that teachers in training could show significantly different attitudes depending on their personal characteristics and circumstances, as argued by these authors.

On the other hand, in the literature there is a significant number of studies that show that the majority of teachers have high environmental awareness (Boubonari, Markos, & Kevrekidis, 2013; Forbes & Zint, 2010; Olsson, Gericke, Boeve-de Pauw, Berglund & Chang, 2019; Ull, Martínez-Agut, Piñeiro & Aznar-Minguet, 2014; Vega-Marcote & Álvarez, 2012; Yavetz, Goldman, & Pe'er, 2009), but this does not seem to be sufficient to obtain adequate training to teach TEE. In this respect, as Aarnio-Linnanvuori (2019) highlights, it is necessary to continue investigating the factors that influence the educational decision-making of teachers in order to design innovative training models that improve their teaching practice and promote conscious and responsible citizenship. It is because of all this that knowing about the environmental attitudes that characterize future teachers is essential to identify their role in teaching environmental education, their attitude to problems, and their important role in mitigating them.

The aim of this study was therefore to find out how personal characteristics and circumstances can influence the attitudes of future teachers towards TEE. To do this, we used a sample of students from degree courses in Early Childhood Education and Elementary Education in Spain, analyzing their scores on the factors of the validated Attitudes Scale toward Environmental Education (ASEE) using descriptive and inferential statistical techniques.

Methodology

This was a quantitative study and the approach we used was based on the foundations of the post-positivist paradigm, admitting that systems of value, culture, and other circumstances influence our perception of the world in different ways (Phillips & Burbules, 2000). From this perspective, we made an attempt to approach the relevant issues in the most objective and systematic way possible, but based on awareness of the limitations of this approach (Treagust, Won, & Duit, 2014). Specifically, what we intended to do with our research was to quantify and measure patterns that allow the identification of trends that can be extrapolated to other contexts or populations. In this framework, we used statistical analysis as a measurement tool.

Meanwhile, as references we used the *Declaration on Science and the Use of Scientific Knowledge* (Unesco, 1999) and the *Guía de buenas prácticas en investigación de la Universidad de Vigo* (Guide for good research practices of Universidad de Vigo) (approved by the Governing Council on March 20, 1999), following the guidelines for research carried out with humans. In this case, the data was handled with the prior informed consent of the participants and their personal data was protected in accordance with the ethical protocol of informed research when collecting the information. The results are also presented in a generic manner, in order to ensure the anonymity and confidentiality of those involved.

Participants

The sample was selected in a non-probabilistic way, following availability criteria. It consisted of 889 students from the degree courses in Elementary Education (54.4%) and Early Childhood Education (45.6%) at two Spanish universities (Vigo and A Coruña), with 83.4% of the participants being women and 16.6% men.

Instrument

We used the Attitudes Scale toward Environmental Education (ASEE) (see Appendix) as our data collection instrument. This was designed and validated by Pérez-Rodríguez et al. (2017) and is a Likert-type scale of 18 items with five response levels, providing information on about attitudes towards:

- environmental problems, inquiring about their attitudes towards climate change (a complex socio-environmental problem), their individual environmental responsibility, their ways of making decisions, and the prevailing socioeconomic model.
- an educational model of a transformative nature based on the role of teachers and on a methodology for processing information and solving problems, aimed at developing capabilities in students for participation, reflection, critical thinking, decision-making, and community involvement.

The instrument had sufficient reliability ($\alpha = .804$, GLB = .875 and $\Omega = .810$). The sample used for validation was divided into two, performing a principal component analysis on one of them and a confirmatory factor analysis with the other, comparing various explanatory models. The result was a factorial structure with five well-defined interrelated factors, where the two areas described are well represented (See Table 1). The model chosen had adequate fit indices so it respected the confirmatory factor analysis ($\chi^2/GL = 1.47$, AIC = 312.16, CFI = .955, RMSEA = .033).

Table 1
Description of the factors that form the ASEE scale

Factor	Code	Number of items	Explained variance	Description of the items
Transformative Environmental Education (TEE)	TEE	5	24.7%	Includes items related to the need to address environmental education at school, community involvement, and the development of skills in the classroom (such as participation or decision-making).
Environmental problems	ENP	4	8.5%	The items refer to attitudes towards a complex socio-environmental problem: climate change.
Transformative methodology based on participation and critical thinking	PCT	4	6.8%	The items refer to the methodology and the role of teachers in the framework of TEE.
Individual environmental responsibility	IER	3	6.4%	Includes items related to individual responsibility for environmental problems and the way in which decision-making takes place.
Prevailing socioeconomic model	SEM	2	5.9%	The items refer to the socioeconomic model.

Source: Prepared by the authors based on Pérez-Rodríguez et al. (2017).

The questionnaire also collected information on the personal characteristics and circumstances of the students: age, gender, degree course, progress on degree course, type of secondary education, type of school, and level of education of the mother and father.

Administration procedure

The instrument was administered in paper form. It was created with the SDAPS version 1.1.7 optical mark recognition software for Linux (Berg, 2014). The volunteer students covered this during classroom sessions under the supervision of teachers who provided instructions and clarified the questions. Recognition of the answers was done using the same program.

Variables

The variables used in the study are described in Table 2. We used the personal characteristics and circumstances of the teaching staff as dichotomous qualitative independent variables, while the scores on the five factors of the ASEE were considered as quantitative dependent variables.

Table 2
Independent and dependent variables in the study

Independent variables	
Variable	Possible values
Sex	Female
	Male
Age	22 or less
	Over 22
Degree course	Early Childhood Education
	Elementary Education
Progress on course	First half of course
	Second half of course
Secondary education	Scientific
	Non-scientific
Type of school	Public school
	Private school
Religious or secular school	Secular school
	Religious school
Mother's education	No education or elementary education
	Secondary or higher education
Father's education	No education or elementary education
	Secondary or higher education
Dependent variables	
Variable	Possible values
TEE Transformative Environmental Education (TEE)	Values between 1 and 5
ENP Environmental problems	Values between 1 and 5
PCT Transformative methodology based on participation and critical thinking	Values between 1 and 5
IER Individual environmental responsibility	Values between 1 and 5
SEM Prevailing socioeconomic model	Values between 1 and 5

Source: Prepared by the authors.

Statistical analysis

As we have noted, the characteristics and personal circumstances of the teachers in training comprising the sample were coded dichotomously in the independent variables. The dependent variables correspond to the attitudes on which this study is focused, measured using the ASEE scale. The mean scores are shown for every factor for each level of the independent variables.

Given that we wanted to know how personal characteristics and circumstances could influence the attitudes of future teachers towards TEE, we wanted to assess the degree of association between all pairs of associations of independent and dependent variables. In this case, the inferential statistical procedure we used was, therefore, to compare the scores obtained by each of the groups of students on the factors of the scale, analyzing whether there were significant differences. In order to do this, we conducted means comparison tests between two independent samples with the software SPSS version 20 for Windows (IBM, 2011).

Results

After carrying out previous analyses with the data, we noted that the necessary assumptions were not always met to carry out the parametric Student t test, because in some cases the normality tests (Kolmogorov-Smirnov & Shapiro-Wilk) and homoscedasticity (Levene's test) were significant. Therefore, we used the nonparametric Mann-Whitney test, which is more robust and did not require compliance with these assumptions.

Table 3 shows the mean scores by factor for each of the values of the dichotomous variables of personal characteristics and circumstances, indicating the cases in which there were significant differences. We can observe significant differences for at least one of the mean scores on the factors for all the independent variables, except in the case of the type of secondary school education. Similarly, all dependent variables were affected by various independent variables.

Table 3
Mean scores by factor and variables of personal characteristics and circumstances

		TEE	ENP	PCT	IER	SEM
Sex	Male	4.38**	4.23**	4.12**	3.51**	3.39**
	Female	4.21	3.90	3.83	3.33	3.26
Age	22 or less	4.32	4.19	4.06	3.43	3.38
	More than 22	4.44**	4.15	4.12	3.63**	3.36
Degree course	Early Childhood Education	4.40	4.24*	4.14*	3.52	3.46**
	Elementary Education	4.31	4.12	4.02	3.45	3.30
Progress on course	First half of course	4.28	4.12	3.95	3.47	3.29
	Second half of course	4.46**	4.26**	4.27**	3.50	3.51**
Secondary education	Scientific	4.35	4.21	4.10	3.57	3.45
	Non-scientific	4.31	4.16	4.06	3.44	3.34
Type of school	Public school	4.37*	4.22**	4.11*	3.53**	3.42**
	Private school	4.27	4.02	3.95	3.29	3.21

		TEE	ENP	PCT	IER	SEM
Religious or secular school	Secular school	4.37*	4.20**	4.09	3.51**	3.43**
	Religious school	4.26	4.01	3.96	3.32	3.15
Mother's education	No education or elementary education	4.38	4.24*	4.14*	3.50	3.42
	Secondary or higher education	4.33	4.13	4.03	3.47	3.34
Father's education	No education or elementary education	4.36	4.21	4.10	3.52	3.45*
	Secondary or higher education	4.34	4.15	4.05	3.45	3.32

Note: The cases in which there are significant differences (* p <.05, ** p <.01, bilateral contrast) on the Mann-Whitney test are denoted with asterisks. The asterisks are aggregated in the highest of the values for each dichotomous variable.

Source: Prepared by the authors.

Specifically, the relationship between independent variables and factors shows, as we can see in Table 3, that both personal characteristics (sex and age), as well as the type of school attended (ownership and/or religious or secular) and the parents' studies may be relevant, in addition to the university studies that the participants are taking (degree and progress on the course).

By way of summary, considering the personal characteristics, we find that the female teachers in training show a more positive attitude on all the factors than their male peers, while for the age variable, the data indicate that there is a significant improvement as the years go by, although only regarding the integration of innovative methodologies and the assumption of individual environmental responsibility.

With regard to the influence that the type of school that the teachers attended may have, we observed differences between those who attended public schools and those who studied at private schools, with significantly higher scores for students from public schools in all of the factors studied. The same is true when comparing the results of secular and religious schools: the scores are significantly higher for students from secular schools for almost all the relevant variables.

The results of this study also indicate that as teachers progress through the degree course they have a more positive attitude and significant changes in their attitudes are observed for almost all factors.

There are also differences between students studying the different university degrees. In this case, it seems that future teachers in Early Childhood Education are more aware of the need to address the challenge of climate change, and changes of methodology and socioeconomic model compared with those studying Elementary Education degrees. Their scores are therefore significantly higher for three of the five factors analyzed.

Another of the factors that seems to have an influence is the education of the parents. For example, significant differences were observed among students whose mothers had a lower level of education, as they had a more positive attitude towards complex problems such as climate change or the need to change the role of teachers and methodological approach of TEE.

The same is true regarding the type of secondary education of the students. Contrary to what one might believe, no significant differences were observed between students who had technical-scientific secondary education and those who had studied humanities or mixed courses.

Lastly, in this analysis it is necessary to highlight the results that can offer us clues about aspects that have to be improved in teacher training. The results of the factors referring to "individual environmental responsibility" and the "prevailing socioeconomic model" stand out, showing values around 3% (well below the rest) and reflecting a position of disaffection.

Discussion

With these results, we can see that being aware of the environmental attitudes of teachers in initial training is of great interest, as is understanding the relationship between these attitudes and their personal characteristics and circumstances.

In this respect, the study suggests that some of these particularities may significantly influence the attitude of future teachers towards TEE. Indeed, women show more positive attitudes here than men, a finding also highlighted by other studies (Bord & O'Connor, 1997; Goldsmith, Feygina, & Jost, 2013; Hunter, Hatch, & Johnson, 2004), with these investigations also indicating that these differences are based on the theory of gender socialization, that is, on the existence of discrepancies in the construction of identities based on gender (McCright & Xiao, 2014; Olsson & Gericke, 2017).

Regarding the study of the possible influence of the pre-university establishment from which the students come, those from public schools in this study scored significantly higher than students from private schools. In this case, there seems to be no consensus in the literature, because while some research shows a relationship between high socioeconomic level and greater environmental concern (Marquart-Pyatt & Petrzelka, 2008; Stevenson, Peterson, & Bondell, 2019), others emphasize the fact that these factors do not demonstrate that private school students have greater knowledge or better behavior than students from public school (Barazarte Castro, Neaman, Vallejo, & García Elizalde, 2014). These diverse results may be the consequence of several assumptions which are related, on the one hand, to the characteristics of the context or the type of methodology used to bring environmental education closer to students or, on the other, to the fact that the teaching staff at private schools may have conditioned their educational practice to a certain degree (Agirreazkuenaga, 2019). Whether educational establishments are religious or not was also seen to be significant in this study: previous studies have shown the same variation regarding students coming from secular pre-university establishments (Arbuckle & Konisky, 2015), with the conclusion that religious beliefs may negatively influence environmental attitudes (Alkaher & Carmi, 2019).

As regards teacher training, this study suggests that environmental attitudes improve as one advances in a teaching degree course. Other research, however, shows that this is not always the case (Álvarez-García et al., 2018; Pe'er, Goldman, & Yavetz, 2007; Yavetz et al., 2009). When we talk about specialties in initial teacher training, the future Early Childhood Education teachers included in this study seem more sensitized than those on Elementary Education degree courses. Studies such as that by Yurt, Cevher-Kalburan, and Kandır (2010) point out that there are few references in the literature to the environmental attitudes of Early Childhood Education teachers, since the majority of them are focused on Elementary and Secondary Education teachers. A Spanish study (Ull et al., 2014) underlines the need to strengthen sustainability skills as a means of promoting sustainable development in Early Childhood and Elementary Education degrees, which would require a reformulation of the curricula, they state.

Another aspect that seems to have some level of influence is the education of the parents, which have sometimes been claimed in the literature to be essential to consider (Gifford & Nilsson, 2014), although in this research it appeared to have a limited effect.

On the other hand, contrary to what one might consider, no significant differences are observed between students who had a technical-scientific secondary education and those who had one focused on humanities or mixed courses. The trainee teachers surveyed therefore seem not to have a more positive attitude despite having taken subjects related to understanding the natural environment than those who have not. Although various studies do indicate that there are differences (Müderrisoğlu & Altanlar, 2011; Tehrani, Karbassi, Monavari, & Mirbagheri, 2010; Thapa, 1999) in environmental attitudes and behaviors due to previous education, in Spain the curricular materials tend to reproduce the current development model, which, in addition to the lack of specific training of teachers on environmental issues, leads to a failure to establish relationships between the consumption and production models and the need to change them to promote sustainable development (Hernández, Burgui, Velázquez, & Corrales, 2018). Furthermore, environmental education does not explicitly appear as such in the compulsory education curricula, but is mentioned only anecdotally in the general objectives of the curricula.

With respect to the analysis of the results, we observe lower values for items related to individual responsibility for environmental problems and those regarding the socioeconomic development model. It seems that this indifference may be related to the lack of specific training and "environmental" curricula, which focus on the complexity and speed of the existing interconnections between ecosystems, societies, and economies and make reference to these synergies (Rieckmann, 2012; Ull et al., 2014). In fact, the results related to individual environmental responsibility show that there does not seem to be a significant change in attitude during the training process and the effect of the choice of degree or secondary education does not appear to have an effect either. These aspects should therefore be specifically considered in the design of educational models as part of TEE.

Educational implications

We believe that compiling this kind of information in this study can contribute to developing educational itineraries that allow the evolution of ideas, beliefs, and attitudes towards models that are more committed to the environment (Yus Ramos, 1993). With that in mind, these new models should take into account the interest of future teachers in changes in methodology and the role of teachers for TEE, in which social and individual responsibilities set the didactic context and serve as a starting point for its design.

In recent years, numerous methodological proposals have been made in this direction, which involve TEE that combines educational theory and practice. Examples of this could be the models developed by Cebrián and Junyent (2015) to solve social and environmental problems and the ideas of Leal Filho, Shiel, and Paco, (2016) about learning by projects. Also of interest are eco-methodology approaches (Vega-Marcote & Álvarez, 2012) and service learning experiences such as those of Barth, Adomßent, Fischer, Richter, and Rieckmann (2014). We believe that these ideas are capable of promoting changes in teacher training aimed at preparing teachers who are able to educate students who are critical, responsible, and respectful of the environment and individuals.

Conclusions

Education and schools must address the challenges posed by socio-environmental problems. From this perspective, the predisposition of teachers towards a transformative approach to environmental education appears to be a sign of progress: on the one hand, to overcome environmental illiteracy, characterized by the lack of

knowledge about the complexity of the Earth system and the lack of understanding regarding the interdependence between natural systems and socioeconomic models, and, on the other, to rethink their attitude and commitment to the foundations that support sustainable development.

To sum up, this study allowed us to explore how the personal characteristics and circumstances of teachers can influence their environmental attitudes, which, as argued by Skamp (2009), are very important in order to be aware of the evolution of the ideas and beliefs demonstrated by the students at different levels of education. The results therefore enable us to observe differences in relation to gender and the type of pre-university school, where its public/private nature and religious/secular orientation are factors that need to be taken into account. Also interesting—particularly because of their implications for teacher training—are the data collected regarding modest individual responsibility and the indifferent posture with respect to an unfair and unsustainable model of socioeconomic development. However, it is also necessary to point out that all of these results should be expanded in future research through qualitative and mixed studies. Using a qualitative approach can help us find out about the meaning that each person attributes to their experience and, as a result, how they understand and explain it (Creswell, 2014), so that it can contribute to in-depth study of the data obtained in the context of this research and to help explain the inconsistencies compared with other studies.

The evidence shown in this and other studies on the importance of integrating TEE into initial teacher training should therefore serve to improve the education of a 21st century citizen who is capable of facing present and future problems, both at the local and global level.

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Appendix

Attitudes Scale toward Environmental Education (ASEE) (Pérez-Rodríguez, Varela-Losada, Álvarez-Lires, & Vega-Marcote, 2017).

Basic Information

Age:	☐ Under 18 ☐ 18-22 ☐ 22-30 ☐ Over 30
Sex:	☐ Male ☐ Female
Degree:	☐ Degree in Elementary Education ☐ Degree in Early Childhood Education
Course (indicate only the highest):	☐ 1st ☐ 2nd ☐ 3rd ☐ 4th
Secondary Education:	☐ Arts ☐ Science/Technology ☐ Humanities and Social Sciences
School of origin:	☐ Public ☐ Subsidized Private Secular ☐ Subsidized Private Religious ☐ Private Secular ☐ Private Religious
Mother's level of education:	☐ No education ☐ Elementary ☐ Secondary ☐ Higher
Father's level of education:	☐ No education ☐ Elementary ☐ Secondary ☐ Higher

	QUESTIONNAIRE. Read the following statements carefully and indicate your degree of agreement or disagreement
i1	Facing the current environmental problems, it is a priority to integrate environmental education at school
i2*	I consider that it is not a priority for environmental education to address the current socioeconomic model based on consumption
i3	Environmental education should especially work on the development of skills such as critical thinking, reflexive decision-making, and participation
i4*	I believe that analyzing environmental problems and finding solutions is too complex for primary school students
i5*	Students waste too much time searching and analyzing information. It is much more useful to provide them with already selected and analyzed information
i6	For environmental education to be as effective as possible, there should be a commitment from the entire educational community
i7*	I think teachers' behavior is a very important factor in the education of environmental values
i8	I believe that including environmental education at school can contribute to changing the environmental behavior of the whole community
i9	I think it is important that all teachers receive environmental training
i10*	I think that individually I have no power in solving environmental problems
i11*	The best indicator of a country's prosperity is its economic growth
i12*	I think the factor that most determines people's welfare is their income
i13*	I would prefer to know how the goods that I consume have been produced
i14*	I prefer a cheaper product although I think that it has been produced in an irresponsible manner
i15*	The seriousness of climate change has been exaggerated
i16*	I think climate change's effect on my life is important.
i17*	Pollution due to energy production is a lesser evil compared to the benefits it generates
i18*	It seems to me that using a car for personal purposes means a large increase in the gases which contribute to climate change

Note: The asterisks indicate that the responses to the item are recoded by reversing their order.

Source: Prepared by the authors