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Attitudinal Trends of Teachers-in-Training on Transformative Environmental Education

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Abstract

This study aims to obtain the attitudinal tendencies of a group of teachers in initial training in Spain (N = 889; 83.4% women and 16.6% men; 53.6% in Primary Education, and 44.8%, in Early Childhood Education), from cluster analysis of the data collected through a previously constructed and validated scale that relates their attitudes: (a) facing socio-environmental problems and (b) toward transformative Environmental Education. This analysis reveals the existence of critical and conformist attitudes that suggests that trainee teachers are not prepared to face sustainability challenges, although there is also a transformative profile consistent with Environmental Education focused on sustainable action. The results obtained may contribute to making training proposals in this field and in other contexts and to identifying those elements that should be reinforced.

Keywords: teacher training, transformative Environmental Education, attitudes, cluster analysis.

Resumen

El fin de este estudio es obtener las tendencias actitudinales de un grupo de profesorado en formación inicial en España (N = 889; 83.4 % mujeres y 16,6% hombres; 53.6% de Educación Primaria y 44.8% de Educación Infantil), a partir del análisis cluster de los datos conseguidos a través de una escala, previamente construida y validada, que relaciona las actitudes: (a) frente a la problemática socioambiental y (b) hacia a una Educación Ambiental transformadora. Dicho análisis pone de manifiesto la existencia de actitudes acríticas y conformistas que sugieren que el profesorado en formación no está preparado para afrontar los retos de la sostenibilidad, aunque también aparece un perfil transformador que concuerda con una Educación Ambiental enfocada hacia la acción sostenible. Los resultados obtenidos pueden contribuir a realizar propuestas formativas en este campo y en otros contextos y a identificar aquellos elementos que deben ser potenciados.

Palabras clave: formación del profesorado, Educación Ambiental transformadora, actitudes, análisis cluster.

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Introduction

Recent reports by prestigious international bodies (GEO-5, 2012; Worldwatch Institute, 2013) are warning about the rapid environmental damage that our planet is experiencing, and they primarily link it to the dominant socioeconomic model and to some human activities that are becoming increasingly more involved in a globalized, industrialized, consumerist and interconnected world. Thus, authors like Jensen and Schnack (2006), Silo (2013) or Stevenson, Wals, Dillon and Brody (2013) argue that the solutions to environmental problems should be sought in the fields of culture, socio-economy and politics.

Each person builds their own lifestyle through the process of socialisation, learning and attitude and behaviour development. The acquisition of this particular way of life depends not only on individual aspects but also on the socio-cultural environment where the individual develops (Gavidia & Rodes, 2004). Consequently, an important challenge is to expand upon and deepen how the influences of these areas contribute to shaping values, attitudes and behaviours (Gifford, 2014). So, education plays a key role.

Therefore, schools can and should provide an opportunity to promote the development of sustainable lifestyles (Varela-Losada, Vega-Marcote, Pérez-Rodríguez, & Álvarez-Lires, 2016). Education must develop the ability to think in a critical, ethical and creative way when evaluating socio-environmental situations as well as develop the capacity and the commitment to act, individually and collectively, in ways that sustain and improve the world we live in (Stevenson & Stirling, 2010).

From this perspective, sustainability offers an attractive and dynamic context for education because it can increase the interest and involvement of the student and provide useful preparation for public participation in socio-environmental problems such as mitigation of and adaptation to climate change (Feinstein, 2011). It allows, in addition, for the integration of science with other sources of knowledge in order to develop contextualized responses to real challenges (Feinstein & Kirchgasler, 2015; Pedretti & Nazir, 2011).

In this way, transformative Environmental Education requires a teaching staff that is committed to sustainability, who understand the interdisciplinary and globalised nature of environmental issues and share the goal of action using non-traditional teaching methods (Álvarez & Vega, 2009). Therefore, priming a responsible, participatory citizenry able to make responsible decisions in a global and complex world assumes that schools should foster critical reflection (Kyburtz-Graber, 2013), giving particular emphasis to the socioeconomic framework that determines the current unsustainable trends (Vega & Álvarez, 2012), should promote student participation in lessons and in the resolution of environmental issues (Mogensen & Schnack, 2010) and facilitate collaboration with communities (Wals, 2007).

Developing sustainable practices should fall within the framework of sustainability and problem-solving research (Gottlieb, Vigoda-Gadot, & Haim 2013; Kyburz-Graber, 2013; Mogensen & Mayer, 2005). Priority must be given to acquiring environmental literacy. This environmental literacy leads to the development of people who make knowledgeable behavioural decisions in the face of prominent environmental problems. Therefore, it involves relating critical thinking with an efficient use of decision-making skills (Kincheloe, 2008; Uskola, Maguregi, & Jiménez-Aleixandre, 2011).

Thus, a key factor in leveraging socio-environmental transformation from schools are the educators (Skamp, Boyes, & Stanisstreet, 2013), since they are directly responsible for teaching and the learning process. There is abundant literature on the impact of the relationships between teachers and students in a classroom (e.g. Jourdan, Pironom, Berger, & Carvalho, 2012; Roorda, Koomen, Spilt, & Oort, 2011) and on the importance of teachers and other adults as role models in the development of environmental literacy (e.g. Higgs & McMillan, 2006; Rickinson, 2001; Stern, Powell, & Hill, 2014). It is thus essential to define the teachers' roles in teaching Environmental Education (here in after EE), by linking their pro-environmental attitudes and their educational practices.

Teacher training needs with regard to EE

One of the main causes of the failure and low implementation of EE in schools seems to be inadequate teacher training (Knapp, 2000). Thus, teachers and trainee teachers do not seem to have a clear understanding of environmental thinking, of its components or how these components interact in a systemic way in different countries, as this and numerous other studies illustrate (e.g. Butler, Simmie, & O'Grady, 2015; Van Petegem, Bliek, & Ongevalle, 2007). In addition, research on their conceptual understanding of sustainable development has also shown gaps and a lack of holistic understanding (Borg, Gericke, Höglund, & Bergman, 2014; Summers & Childs, 2007). On the other hand, there is abundant evidence that both soon-to-be and current teachers do not have the knowledge necessary to understand complex environmental issues (e.g. Boubonari, Markos, & Kevrekidis, 2013; Cakir, Irez, & Kivilcan, 2010; Michail, Stamou, & Stamou, 2007).

Furthermore, research confirms that teachers-in-training in different contexts express moderate levels of pro-environmental attitudes although they are linked to gaps and weaknesses in different EE-related aspects (see the studies of Esa, 2010; Tuncer et al., 2009). Current teachers also seem to show positive attitudes toward teaching environmental issues, but they often do not cover them even though they believe these issues are important for their students (Kim & Fortner, 2006; Marx & Harris, 2006).

In this way, Kim and Fortner (2006) show that teachers' perceived ability for EE teaching reveal shortcomings related to providing real experiences in student involvement and resolution of socio-environmental problems. This work also demonstrates how teachers tend to believe that external and logistical barriers (lack of time and searching for curricular standards) are higher than the internal and personal ones (lack of conceptual and educational knowledge). Franklin and Johnson (2008) also point out that emphasising state curriculum standards and evaluations often produce isolated areas of knowledge. They focus only on textbooks and study plans and produce a tendency to leave out topics which are considered extra-curricular despite providing valuable opportunities. Thus, teachers and teachers in training tend to see certain aspects of science education and EE as low priority components of school programmes (Marx & Harris, 2006; Pujol, 2007).

In addition, there is evidence that, when teachers begin their professional career, they tend to not use the knowledge gained during their training and to base their work on existing curricular frameworks, also uncritically assuming the guidelines that establish the educational materials regarding the selection of the topics that must be taught (Fletcher & Luft, 2011; Rodríguez & Marrero, 2003). In this sense, Firth and

Winter (2007) indicate that trainee teachers often focus their planning and education process on the curriculum and not on the students, showing a lack of understanding of the constructivist approach (Driver & Oldham, 1986). Added to this is the fact that their talk tends to be more innovative than their actual practice (Rodríguez & López, 2006). Thus teachers are not familiar with innovative methodologies and, therefore, do not integrate them into their educational practices (Joyce & Showers, 1988).

All of this is a challenge in contexts where teachers are expected to teach differently from the way they learned during their own schooling (Millar, Leach & Osborne, 2000), especially in the EE framework, whose teaching must be focused on the development of a competence for action (Mogensen & Schnack, 2010), strengthened by critical thinking, autonomous decision-making, participation and interrelating schools and communities (Varela-Losada et al., 2016).

In this context, it is necessary to go deeper into the study of what teachers' environmental attitudes are in relation to their use of transformative pedagogical methods, due to the fact that these aspects have been poorly addressed in the literature. The purpose of this work, therefore, is to analyse the attitudinal trends of teachers in training regarding two topics: (a) their attitudes towards socioenvironmental problems and (b) their attitudes towards transformative EE. As a launch point, the hypothesis is that teachers in training would have attitudes significantly different.

Method

Participants

A non-probability sampling was carried out to create the study. The sample was selected according to availability criteria, ensuring that it was as broad as possible in order to be the most representative. The sample consisted of 889 students of Early Childhood Education (44.8%) and Primary Education (53.6%) degrees at two Spanish universities (Vigo and A Coruña), where 83.4 % were women (Table 1).

Table 1

Sample. Students by Degree and Gender

	Degree	*N*	%	% Male	% Female
Valid	Primary Ed.	477	53.6	26.2	73.8
	Early Childhood Ed.	398	44.8	5.0	95.0
	Total	875	98.4	16.6	83.4
Lost		14	1.6		
	Total	889	100.0		

The ages of the trainee teachers within the sample are typical of in-person degrees: .9% were under de age of 18; 71.5%, between 18 and 22 years old; 23.3%, between 22 and 30, and 4.3% were over 30 years old. Regarding the course of study chosen in high school, 2.8% had opted for the branch of Arts; 27.9% for Science and Technology, and 69.3% for Humanities and Social Sciences. The majority of students were from urban areas (65.8%), and 34.2% came from rural locations. 79.3% studied secondary education in a public school; 13.7%, studied it in a religious state-funded

school; 1.8%, in a secular state-funded school; 2.2% in a religious private school; and 1.9%, in a secular private school.

Since the sample includes students from two different degree programmes (Early Childhood and Primary), some homogeneity contrasts were carried out with the chi-square test ($p < .05$) in order to value their similarities. Thus, the homogeneity hypothesis was accepted for the variables regarding the course of study in high school, the type of school where the secondary studies were pursued, and their rural or urban origin.

Instrument

The instrument utilised in the research was a Likert-based scale, the Attitudes Scale toward Environmental Education (ASEE) (see Appendix), which provides information on the teachers-in-training in two main areas:

- Their attitudes toward environmental issues, where special attention is paid to their attitudes toward a complex socio-environmental problem and compared to the prevailing socioeconomic model, their individual responsibility and their way of making decisions.
- Their attitudes toward a transformative educational model based on teachers' roles and a methodology of information processing and problem resolution, which seeks to develop students' participation, reflection, critical thinking, decision-making and community involvement skills.

The construction and validation of this instrument is explained in detail in Varela-Losada (2016). To this end, the research team carried out a comparison of means, reliability analysis, principal component analysis and confirmatory factor analysis. SPSS™ 20 for Windows was used for the reliability and principal components analysis. The Factor 9.3 programme was also used to study the number of factors to extract and the calculation of the glb and Ω coefficients. The confirmatory factor analysis was performed with AMOS™ 21 software.

The results of the scale analysis showed that the instrument has good internal consistency ($\alpha = .804$, glb = .875 and $\Omega = .810$). The sample was split into two in order to carry out the exploratory and confirmatory factor analysis on each of the parts, respectively. After comparing different explanatory models, a factorial structure with five well-defined interrelated factors was found, where the two described areas are well represented (Table 2). The fit indices of the model chosen that correspond to the confirmatory factor analysis are adequate ($\chi^2/gl = 1.47$, AIC = 312.16, CFI = .955, RMSEA = .033). In Varela-Losada (2016), other details regarding the procedures carried out are described, as well as evidence of reliability and content validity, both convergent and discriminatory.

Table 2

Description of Factors within the ASEE Scale

Factor		No. Items	Explained Variance	
TEE	Transformative Environmental Education	5	24.7%	Includes items related to the need to cover EE at school, community involvement and the development of skills in the classroom (such as participation or decision-making).
ENP	Environmental problems	4	8.5%	Items refer to attitudes toward complex socio-environmental problems, climate change.
PCT	Transformative methodology based on participation and critical thinking	4	6.8%	Items refer to methodology and teachers' roles within transformative EE.
IER	Individual environmental responsibility	3	6.4%	Includes items related to individual responsibility in environmental problems and how decision-making is done.
SEM	Prevailing socioeconomic model	2	5.9%	Items refer to the socioeconomic model.

To create the paper-based scale, the optical mark recognition software SDAPS version 1.1.7 for Linux was used.

Procedure

The questionnaire was administered in December 2015 by student volunteers. The printed paper survey was filled out anonymously during an in-person lecture that was supervised by the professors performing the study or, where appropriate, by collaborating lecturers. Afterwards, the answer recognition analysis was done with the SDAPS program, followed by a review of the automatic processing.

Data analysis

In order to segment the cases into groups of similar response profiles, cluster analysis techniques will be used on the scores of the five ASEE factors. Moreover, it will be determined whether there are significant differences between those groups. To accomplish that, the steps described in the following sections shall be carried out.

Variables and assumptions of the cluster analysis

The average scores will be calculated in the ASEE factors, replacing the missing values with the mean of the scores in the variables. These independent variables will receive the name already used in the factors of the scale: TEE, ENP, PCT, IER and SEM.

SPSS software will be used to identify atypical cases (with a rate of abnormalities >= 2 and a percentage of cases with the highest values of the anomaly index of 5%) that will be eliminated from the analysis.

To assess whether the effects of multicollinearity are important, the matrix of correlations between the variables will be analysed, assessing if they are high enough to suspect the existence of co-linearity. Furthermore, two statistics will be used to assess collinearity, the variance inflation factors (VIF) and the tolerance (Dormann et al., 2013).

Obtaining groups through hierarchical analysis

Given that a specific number of clusters was not determined *a priori* and that the sample size is moderate, hierarchical cluster analysis will be carried out by using Ward's method to minimize the differences within the cluster and avoid observation linkage problems (Hair, Black, Babin, & Anderson, 2009). Since the five variables being studied are metric, the Euclidean squared distance will be chosen as a measure of similarity. Given that all variables were on the same measurement scale, no data standardization will be done.

Different cluster solutions will be achieved for conglomerates, between two and ten. The analysis of this information, combined with the analysis of the corresponding dendrogram, will suggest which conglomerates to use.

Whether the differences between clusters are significant will be assessed through T tests for the equality of averages and one-way ANOVA. This will let us examine whether the proposed clusters have their own character.

Non-hierarchical cluster analysis (K-means) to fine-tuning

The hierarchical method described in the previous paragraphs will allow to obtain cluster solutions. However, there is a common problem to this type of methods: once two cases are joined in a clustering, a reallocation never takes place. The use of Ward's method minimizes the impact of this problem, but to optimize the solutions achieved, the K-means hierarchical method will be used so that cases are reassigned to clusters until maximum homogeneity is obtained within the clusters (Hair et al., 2009).

The first step will consist of selecting the seeds for the non-hierarchical analysis. For this purpose, the clustering centroids obtained through the hierarchical method will be used.

The clusters obtained through this procedure will be displayed in tabular and graphic form (box plots) and their similarity with those obtained using the hierarchical method will be assessed. Everything will be revisited to check if the differences between groups are significant, using the methods described above.

Validation

Given the exploratory and fundamentally atheoretical nature of cluster analysis, it is particularly relevant to confirm the validity of the solutions obtained. This ensures that the clusters obtained have practical significance (Hair et al., 2009). In this sense, a key strategy is the study of the stability of the cluster solutions, analysing whether the use of different strategies produces clusters similar to those obtained.

With that purpose, a second cluster study will be carried out, also using K-means clustering, but allowing the SPSS software to randomly choose the seed values. In order to assess the fit between the cluster solutions obtained with random seed and centroid

seed through non-hierarchical analysis, an analysis of cross-classification will be done. This will allow for the assessment of the stability of the cluster solutions and will be helpful in choosing between the solutions proposed, which will then be characterized and interpreted.

Results

Variables and assumptions of the cluster analysis

SPSS identified 18 anomalous cases that will be eliminated from the analysis, leaving a sample of N = 871. Evidence of multicollinearity was not found. The correlations between variables are significant ($p < .05$), but they never exceed a value of .5, with a maximum allowable of .8 for Field (2009) and Orme and Orme (2009), and .9 for Hair et al. (2009) and Tabachnik and Fidell (2007).

The VIF values are between 1.124 and 1.421 and tolerance between .704 and .890, indicating too that there are no problems of multicollinearity using the different criteria proposed (Demaris, 2004; Field, 2009; Hair et al., 2009; Orme & Orme, 2009; Stevens, 2002).

Hierarchical analysis

Ward's method was used to carry out the hierarchical cluster analysis, obtaining the different cluster solutions for between two and ten clusters. The most abrupt relative change in the clusters' homogeneity is produced by going from two to one cluster, and the next significant change appears when combining four clusters into three (Figure 1). Therefore, the solutions of two and four clusters were examined.

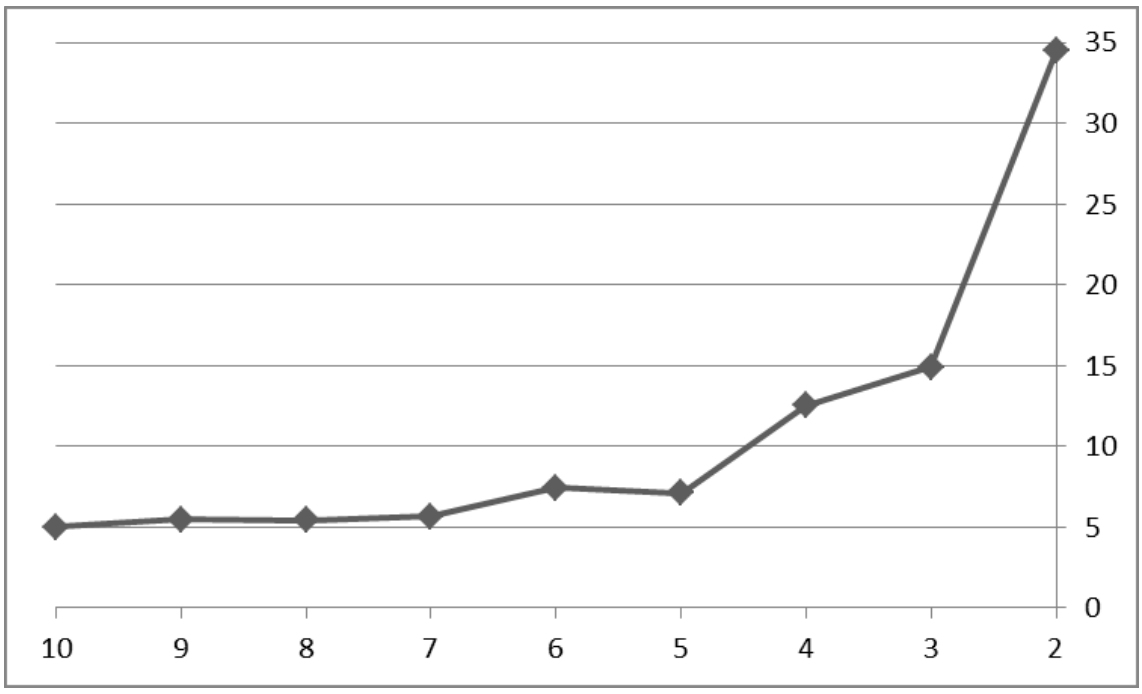

Figure 1. Percentage changes in the clusters' homogeneity.

The analysis of the dendrogram (Figure 2) supports the use of two or four clusters, with two large branches which bifurcate and a considerable horizontal distance until they divide again.

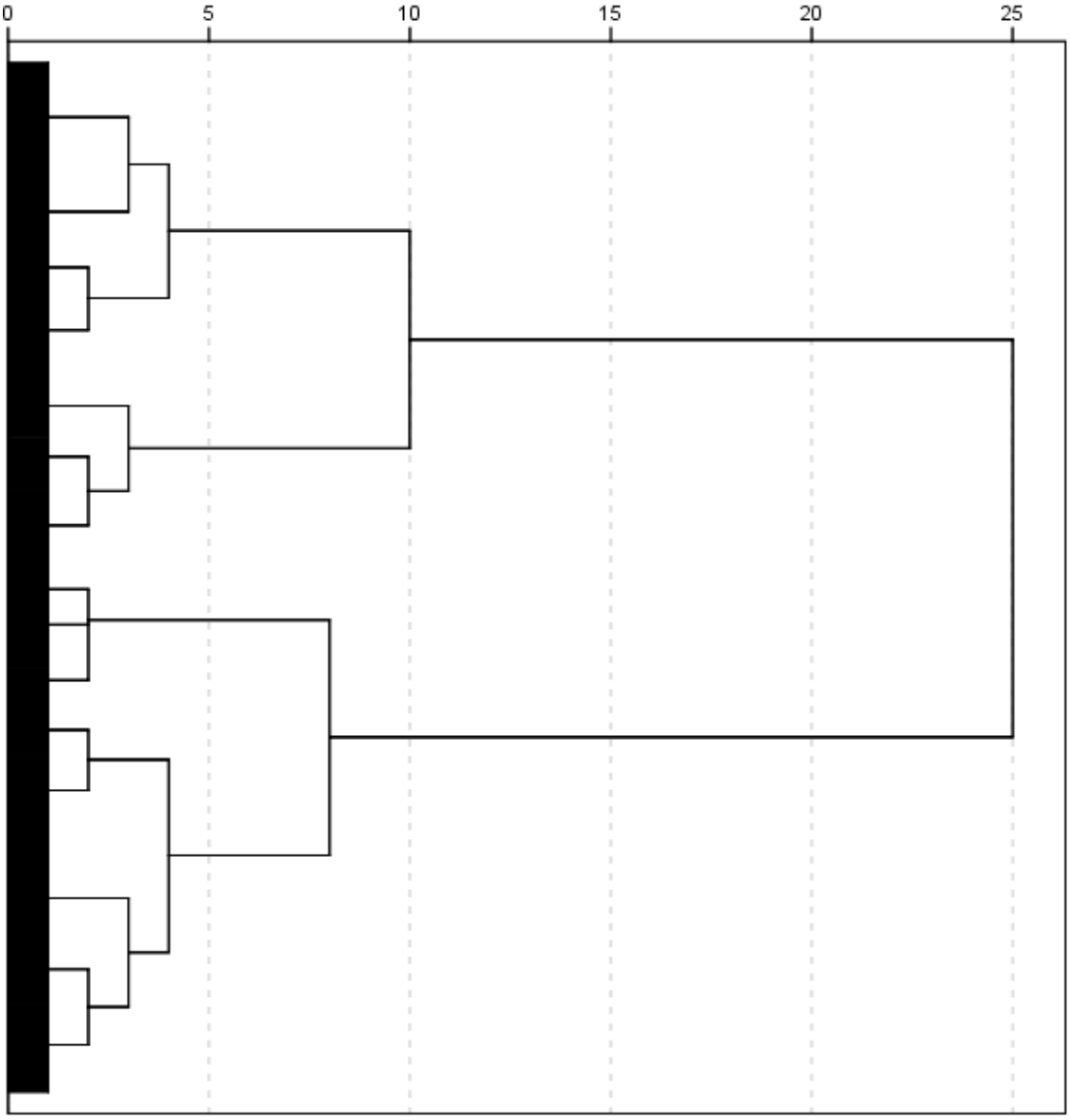

Figure 2. Dendrogram of Ward's method clustering.

To assess whether the differences between groups are significant, a T-test for the equality of means was carried out with the solution of two clusters and an ANOVA of one factor with that of the four clusters. Membership in the clusters was used as an independent variable, and the TEE, ENP, PCT, IER and SEM factors were used as dependent factors. In all cases, the differences are significant ($p < .01$). This significance suggests that the proposed clusters have their own character or personality, which supports continuing with the analysis. It should be kept in mind that the clusters have been chosen to maximize the differences between the cases in different clusters.

Non-hierarchical cluster analysis

To optimize the solutions found, the non-hierarchical K-means clustering was used, using the cluster centroids obtained with the hierarchical method as seed points.

Table 3 shows the clusters obtained by this procedure, and Figures 3 and 4 show this information graphically using box plots.

Table 3

K-means Clustering to Fine-Tuning

	TEE	ENP	PCT	IER	SEM	Students per cluster
Solution of two clusters						
$C2_1$	4.57	4.50	4.48	3.89	3.89	444
$C2_2$	4.14	3.85	3.69	3.06	2.87	427
Solution of four clusters						
$C4_1$	4.59	4.54	4.49	3.88	4.43	236
$C4_2$	3.88	3.44	3.09	3.09	2.56	144
$C4_3$	4.27	4.06	4.06	2.94	3.30	285
$C4_4$	4.56	4.46	4.37	4.06	2.88	206

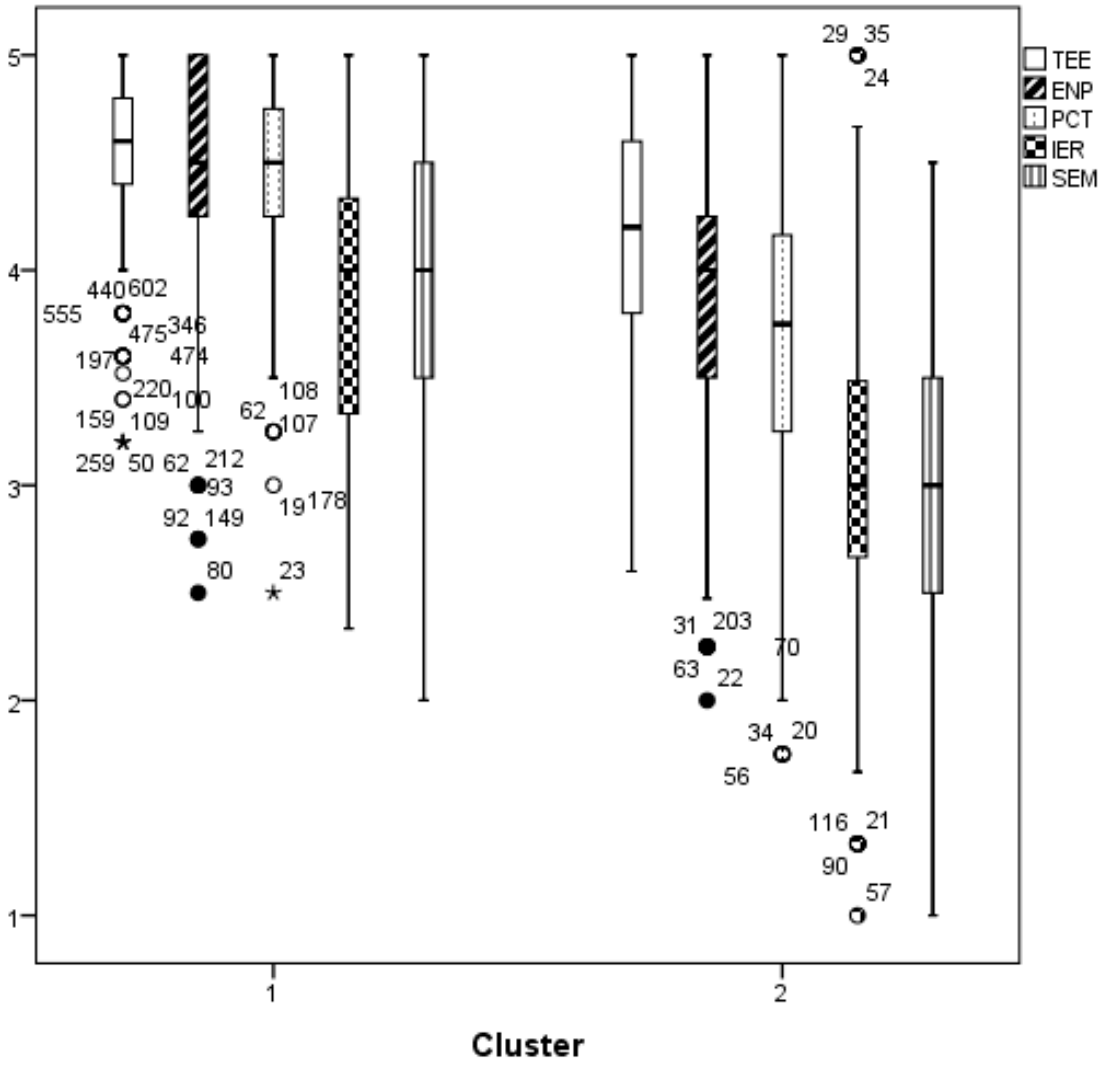

Figure 3. Solution of 2 clusters by using K-means clustering.

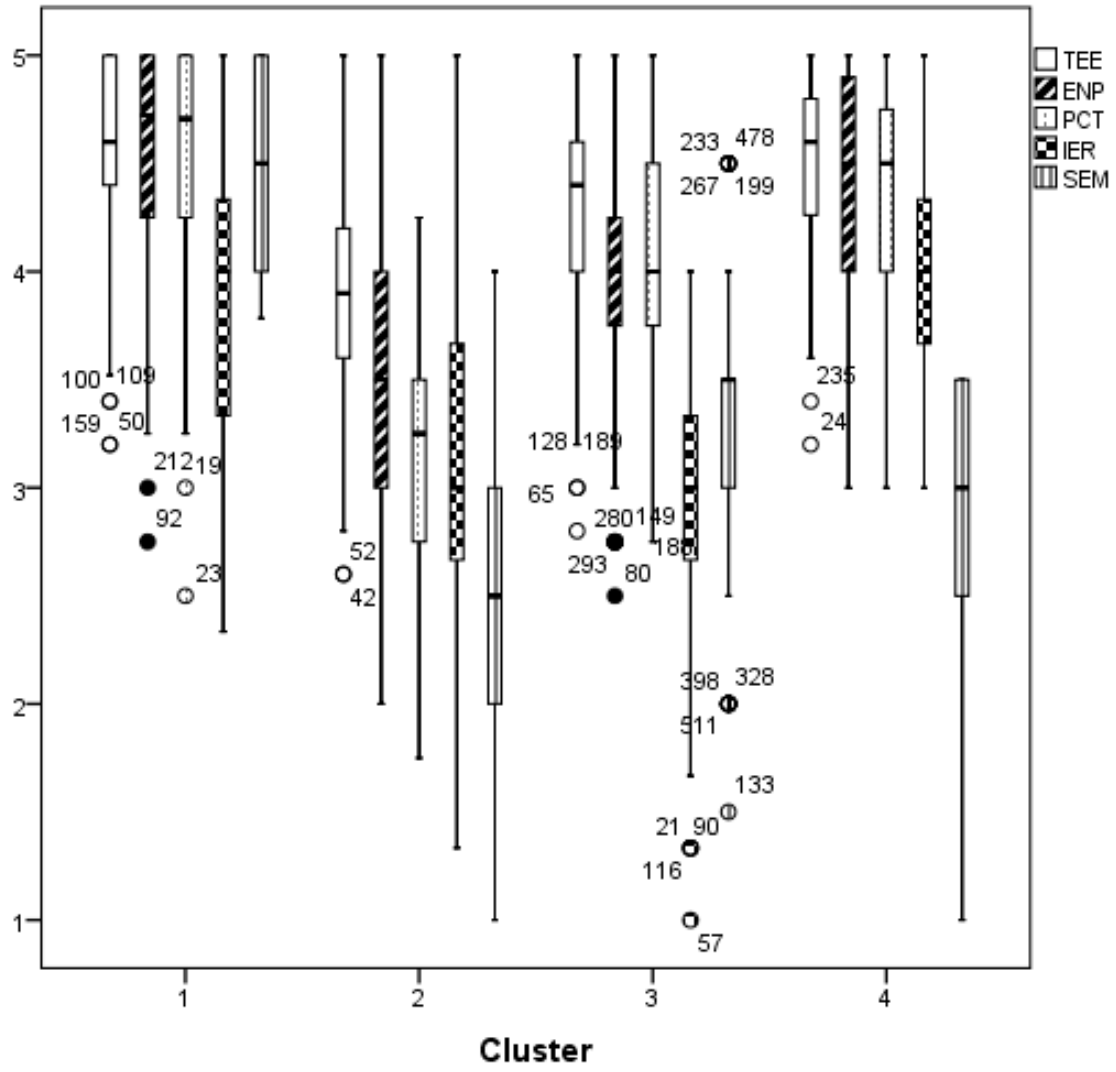

Figure 4. Solution of 4 clusters by using K-means clustering.

The profiles of the solutions obtained with the non-hierarchical method are very similar to those found with the hierarchical method. The main difference is that in the solution of four clusters the groups now have a somewhat more homogeneous size.

To assess whether the differences between groups are significant, a T-test for the equality of means was carried out with the solution of two clusters and an ANOVA of one factor with that of the four clusters. Since five variables were used to make the clusters, the results should be significantly different, as is in fact the case ($p < .01$).

Validation

A new cluster study was carried out, again using the analysis of K-means clustering (solutions of two and four clusters), but this time allowing the SPSS software to randomly choose the seeds.

To assess the fit between the cluster solutions obtained with random seed and centroid seed through non-hierarchical analysis, an analysis of cross-classification was done by studying the clusters to which the cases are assigned with the different methods.

This analysis of cross-classification showed that for the case of two clusters, 100% of the cases have been classified in the same way. Whereas in the case of four clusters, this percentage is 87.6 %. Therefore, the cluster solutions seem to be stable

Characterisation of the solution proposed

In view of the above, it was decided to retain the solutions of two and four clusters obtained with K-means method and centroid seeds calculated by using the hierarchical method.

In this way, in the case of two clusters, some differences can be observed between them in the values of the five variables involved and, in all of them, the values for the case of the $C2_1$ clustering are higher (Figure 5).

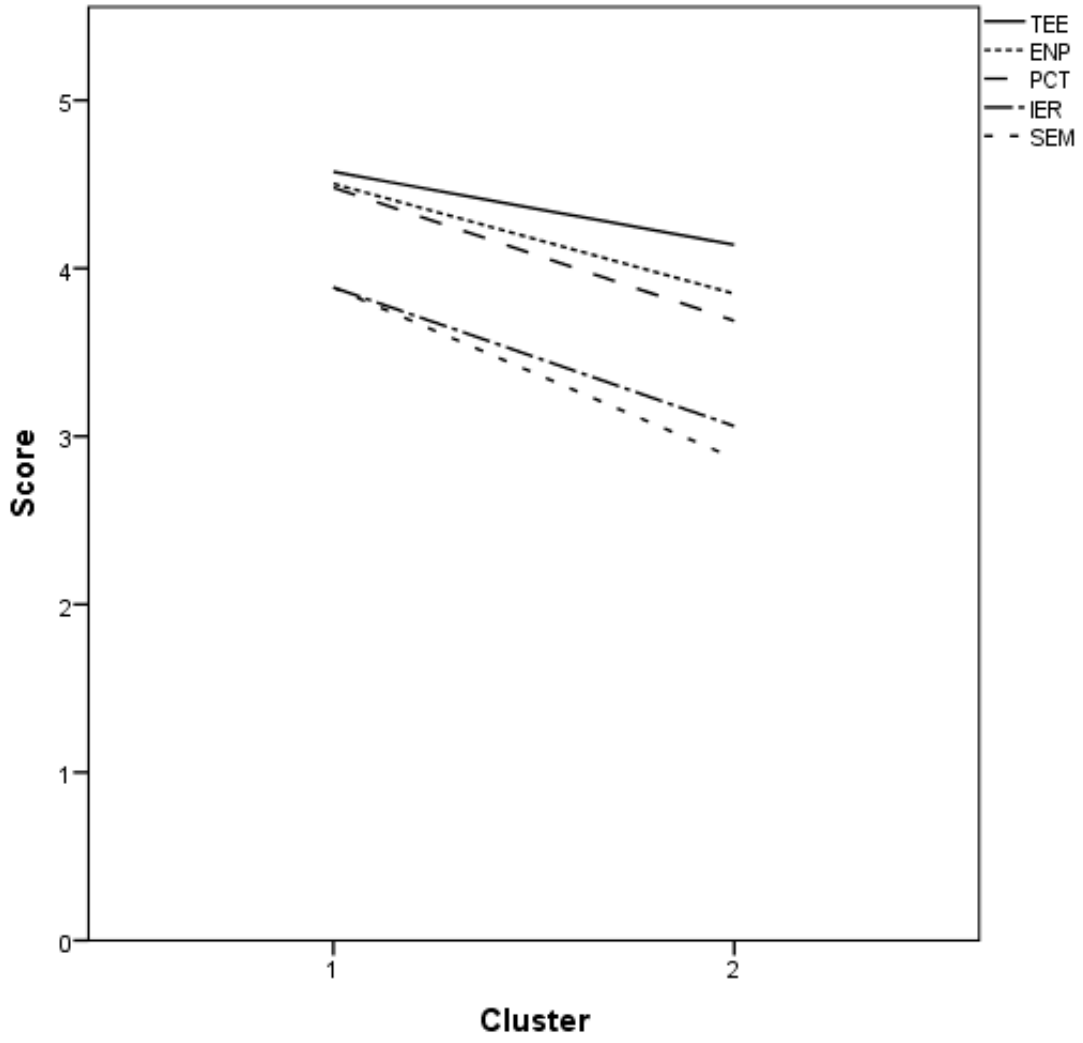

Figure 5. Profiles of the final solution of two clusters.

Regarding the solution of four clusters (Figure 6), the cluster with the highest scores ($C2_1$) is divided into $C4_1$ and $C4_4$, which are primarily distinguished by the fact that their SEM factor scores are different (higher in the case of $C4_1$). On the other hand, the $C2_2$ cluster is divided into $C4_2$ and $C4_3$. The second one has higher scores in all variables (except IER, which has similar values) than the first one.

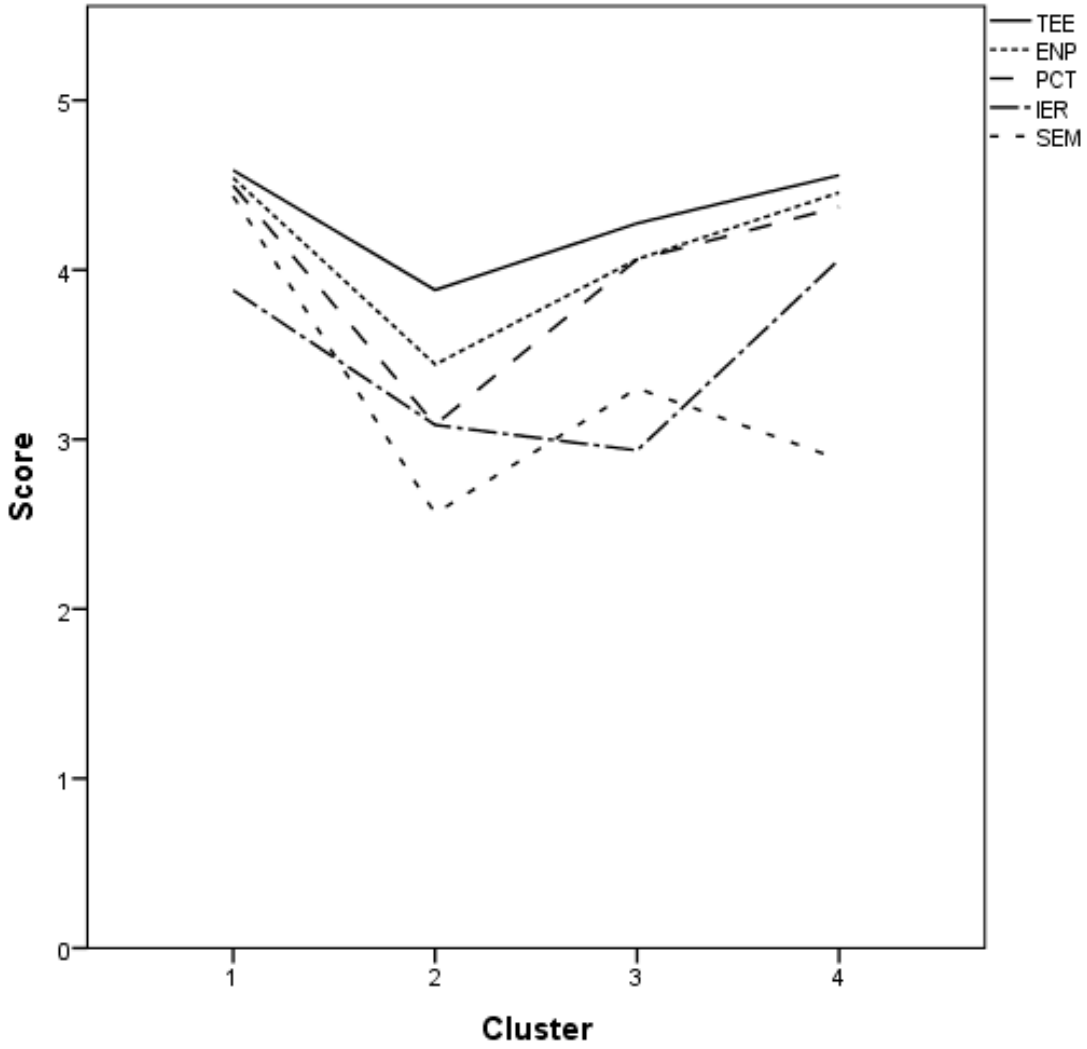

Figure 6. Profiles of final solution of four clusters.

Discussion

Teachers are essential in EE teaching and learning because of their direct responsibility in the process and their influence as a role model for students. For this reason, it is necessary to train teachers who are committed to sustainable action, who promote critical thinking on the role of people in the system and the influence of socioeconomic factors in their lifestyles, autonomous and rational decision-making, participation and the interrelationship between schools and communities to strengthen collective commitment.

However, as is discussed in the introduction, a literature review exposes training needs. It has also been found that there is a lack of research focused on teaching staff and their teaching style as seen from a critical approach (Varela-Losada et al., 2016). There is also little research out there on teachers' stances or opinions, their compressive cultural models of social realities, and their approaches to learning (Hart, 2007). Thus, this study has been carried out to help meet that need and to understand socio-economic influences on their behaviour, as stated by authors like Gifford (2014) or Uzzell and Räthzel (2009).

Taking into account the research objective, it was assumed that the group studied would show trends that were significantly different from each other. In order to analyse these attitudinal trends, the characterisation of each factor of the ASEE scale and its mean values were taken into account (Table 3). The factors related to the attitudes toward EE (TEE and PCT) have high mean values, as might be expected from a sample made up of teachers in initial training. The same thing happens with the factor that alludes to attitudes toward a particular socio-environmental problem (ENP). However, the mean values of the IER factors, which refers to individual responsibility and the way in which decisions are made, and those SEM factor values, which alludes to their socioeconomic ideology, have mean values closest to a score of three.

When it comes to descriptively analysing teachers' attitudinal profiles during initial training, the option chosen was the one based on four clusters with significant differences. Its interpretation appears richer, allowing for the characterisation of four different attitude profiles. Here it is necessary to take into account that the $C4_1$ and $C4_4$ groups were segregated on the basis of the $C2_1$ group, and the $C4_2$ and $C4_3$ groups were separated from $C2_2$. The differences that allow them to be separated are largely due to their position against the SEM factor, which it is associated with their attitudes toward the socioeconomic model).

These trends can be categorized as follows depending on their scores in the factors of the scale (Figures 7 and 8):

- $C4_1$ is characterised by high values in TEE, PCT, ENP and SEM, and with slightly lower values than these in the IER factor. It suggests that they are students conscious of the need to cover EE in school, community involvement and the development of skills, as well as being aware of methodology and teachers' roles in accordance with transformative EE. They also seem to be sensitized to global socioenvironmental problems like climate change and have a critical attitude toward the prevailing socioeconomic ideology. This would be a transformative attitude.
- $C4_2$ is characterised by lower values than the mean in all the factors included in the attitudes scale. This suggests that it is a group with few aspirations in

relation to innovative and transformative EE, of barely critical thinking. This would be an acritical attitude.

- $C4_3$ is the largest group (285 people) and has values very close to the means of all the factors, except in the case of the IER factor, which is slightly lower. Thus, people categorized within this profile have high mean values in terms of educational issues, but lower regarding their individual responsibility and their critical attitude toward the socioeconomic model. This would be a conformist attitude.
- $C4_4$ has high values in all the factors, except in the SEM factor. This suggests that it is a group aware of innovative EE, with great individual responsibility, but not very critical of the socioeconomic model. This would be an integrated attitude.

In view of this results, it is relevant to wonder how future teachers, given these attitudes, will be able to encourage a lifestyle change if they are not aware of the challenges involved in the pursuit of sustainability nor appreciate the use of methodologies and perspectives seeking to train students to make decisions and act in a responsible and participatory way. It is necessary to improve teacher training in EE with a transformative outlook.

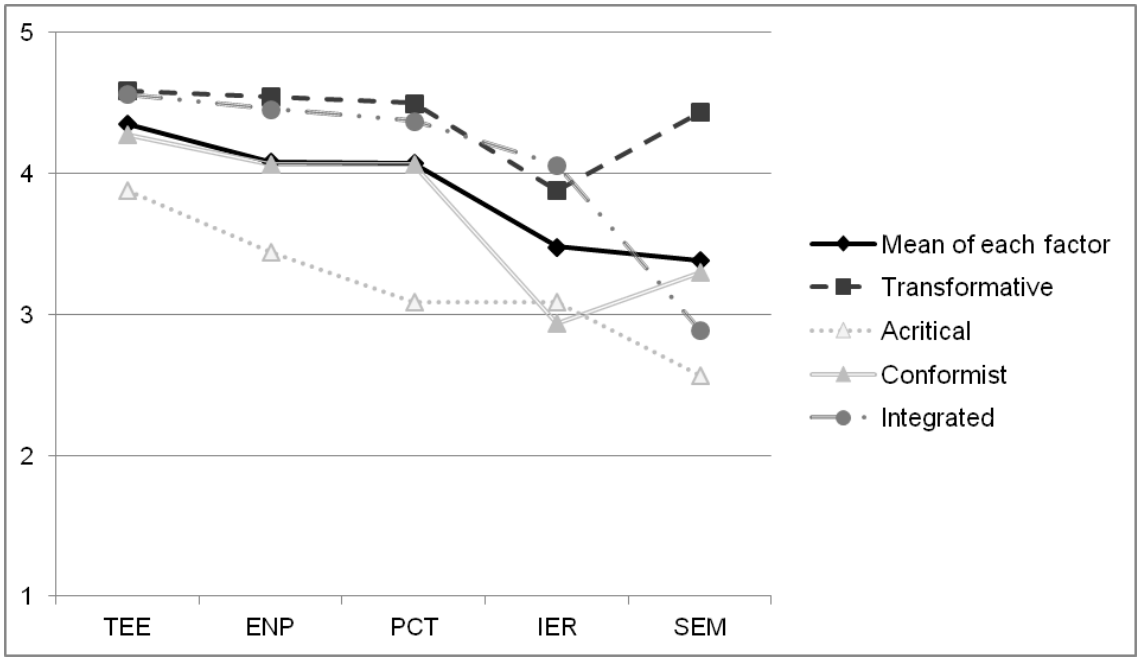

Figure 7. Profile characterisation according to their scores in the factors of the scale.

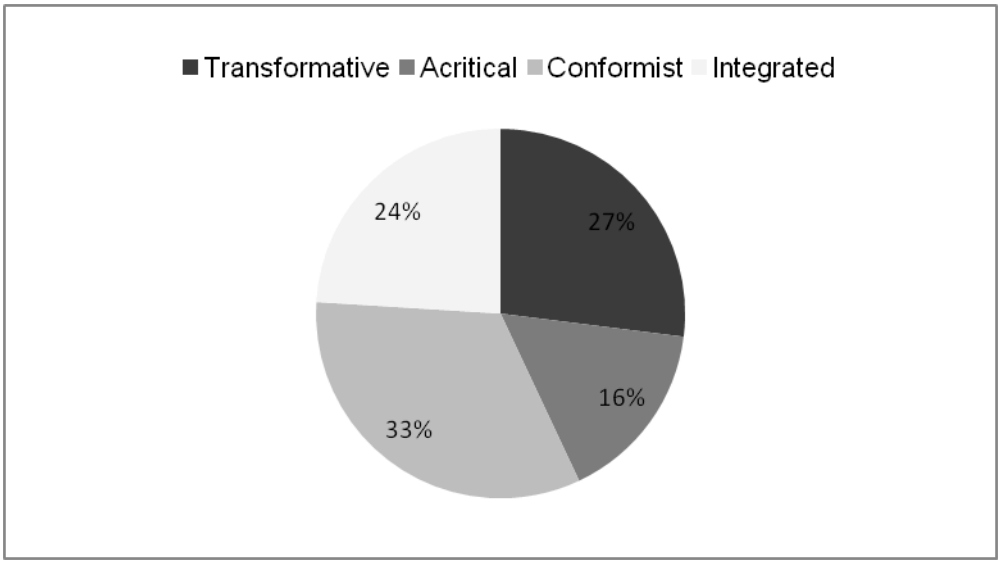

Figure 8. Size of clusters.

This research allowed for the analysis whether the attitudes of teachers in initial training are consistent with transformative EE based on the development of skills and on participation. The data analysis revealed a series of attitudinal profiles toward EE that enable us to distinguish different groups from the sample on the basis of the factors extracted from the ASEE scale. Among them, there is a transformative profile that agrees with EE focused on sustainable action, but integrated, critical and conformist attitudes draw special attention and suggest that teachers in initial training are not prepared to face the challenges of sustainability.

It is necessary to consider the limitations of this study. It deals with research on a subject that is little explored but that can create a starting point for future studies. Thus, though an instrument with good psychometric properties has been used, it could be refined (Varela-Losada, 2016). Moreover, although the sample used is wide and is composed of students from several universities and campuses, it was not obtained in a random manner. It also needs to be taken into account that environmental action is a complex process (Wals, Brody, Dillon, & Stevenson, 2014) which must be studied using other strategies (in particular, the triangulation of these results with information otherwise obtained). All of these limitations will be addressed in future research.

In conclusion, this research can contribute to characterizing trainee teachers and detecting those elements that should be reinforced in their training, so that appropriate educational proposals can be designed in this field and in other contexts. Such proposals must be aimed at providing the ability to understand sustainability as a comprehensive conceptual framework that can be used to rework the way we think and behave toward others and the planet, and that facilitates their capacity to carry out sustainable educational practice (Holdsworth, Thomas, & Hegarty, 2013).

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Appendix

Attitudes Scale toward Environmental Education (ASEE)

i1	Facing the environmental problems of our time 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 socio-economic 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 analysing environmental problems and finding solutions is too complex for primary school students
i5*	Students waste too much time searching and analysing information, it is much more useful to provide them with already selected and analysed information
i6	For environmental education to be as effective as possible there should be a commitment from the entire educational community
i7*	I do not think that teachers' behaviour is a very important factor in the learning of environmental values
i8	I believe that including environmental education at school can contribute to changing the environmental behaviour 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 prefer not to know how the goods 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 not 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 private travel does not mean a large increase in the gases causing climate change

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