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Original Article

TEACHERS' PROFILE IN SUSTAINABILITY: ASSOCIATION WITH PERSONAL AND SOCIAL RESPONSIBILITY IN PHYSICAL EDUCATION CLASSES

PERFIL DOS PROFESSORES EM SUSTENTABILIDADE: ASSOCIAÇÃO COM RESPONSABILIDADE PESSOAL E SOCIAL NAS AULAS DE EDUCAÇÃO FÍSICA

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RESUMO

Este estudo tem como objetivo identificar em uma amostra de futuros professores os perfis de suas percepções, atitudes e valores em relação ao desenvolvimento sustentável e determinar se um perfil específico está relacionado à responsabilidade pessoal e social e a comportamentos positivos nas aulas de Educação Física. A amostra foi composta por 372 alunos (idade = 22,02±3,16 anos; 66,67% meninas) da disciplina de Educação Física do curso de Licenciatura em Educação Básica (Universidades de Granada e Zaragoza). Uma análise inicial de agrupamento revelou a existência de dois grupos diferentes entre os futuros professores: O Grupo 1, "percepção negativa", representado por 36,3%, e o Grupo 2, "percepções positivas", com 63,7% da amostra. Assim, quase 40% da amostra não percebe a atual crise ambiental. A relação entre os grupos e o restante das variáveis-alvo foi analisada por meio de uma ANOVA de um fator, que revelou que os alunos do Grupo 2 tinham valores mais altos em todas as dimensões de responsabilidade pessoal e social e comportamentos positivos do que os do Grupo 1. Por fim, uma análise discriminante revelou que o fato de pertencer a uma determinada universidade determinava o pertencimento a um dos dois grupos, sendo que os valores obtidos pela amostra da Universidade de Granada eram mais altos do que os da Universidade de Zaragoza.

Palavras-chave: futuros professores; Educação para o Desenvolvimento Sustentável; investigação quantitativa; Educação Física; Ensino Superior.

ABSTRACT

This study aims to identify in a sample of future teachers the profiles of their perceptions, attitudes, and values towards sustainable development and to determine whether a specific profile is related to personal and social responsibility and positive behaviors in Physical Education classes. The sample comprised 372 students (Mage = 22.02±3.16 years; 66.67% girls) from the subject of Physical Education of the Degree of Teacher of Primary Education (Universities of Granada and Zaragoza). An initial cluster analysis revealed the existence of two different groups among future teachers: Cluster 1, "negative perception," represented by 36.3%, and Cluster 2, "positive perceptions" with 63.7% of the sample. Thus, almost 40% of the sample does not perceive the current environmental crisis. The relationship between the groups and the rest of the target variables was analyzed through one-factor ANOVA, finding that Cluster 2 students had higher values in all the dimensions of personal and social responsibility and positive behaviors than those of Cluster 1. Lastly, a discriminant analysis revealed that belonging to a certain university determined belonging to one of the two Clusters, with the values obtained by the sample from the University of Granada being higher than those from the University of Zaragoza.

Keywords: future teachers; Education for Sustainable Development; quantitative investigation; Physical Education; Higher Education.

Introduction

The current systematic crisis of the planet affects all social strata, with education being one of the most powerful tools in which to invest to alleviate it [1–3]. Every day, society and its members have more knowledge and means to face this global challenge [4]. With the arrival of the Sustainable Development Goals (SDGs), environmental, social, and economic goals have been set that should be achieved before 2030. To this end, the 2030 Agenda was created, which includes the guidelines to achieve these objectives [5]. Countries and institutions worldwide are committed to achieving them [6] and a great responsibility falls on educational institutions, with universities playing one of the most important roles [1,7]. In turn, teachers' initial training is a key scenario to achieve greater literacy in the sustainability of the entire society, as it trains those who will train future citizens [8].

However, the latest teacher training curriculum frameworks fail to adequately prepare teachers to teach education for sustainable development (ESD) in schools [9–12]. Sustainability, understood from an educational level, is based on introducing an ESD, an impulse of almost three decades of effort [2,13].

The integration of ESD into initial teacher education remains limited, as change requires going one step further: a large-scale reorientation of the entire initial teacher training system [9,14,15]. The *Whole-of-system* model facilitates change across an entire system by incorporating many people, processes, and levels so that change occurs in a multifaceted way [12,16]. The model is based on curricular and organizational innovation, professional development, and innovative pedagogy. It also integrates leadership models that promote the improvement of competencies through an empowerment process [17,18]. To this end, Ferreira & Ryan, [19] emphasise that change comes from creating a common vision of change among all parts of the system. In addition, from this study and a subsequent analysis by the same author [12,19], a three-part process is proposed that underpins change and provides strategies on how to achieve it: (a) Working with initial teacher education systems: This step involves identifying and delineating the key components of the education system, as well as understanding the nature of the relationships between them. It is crucial to involve influential change agents within the system to support and promote the desired change. (b) Working with people: This emphasises the importance of building a shared vision among all stakeholders involved in the change process. It is suggested to use action research processes to develop the change capacities of the participants and to continuously adapt strategies according to the needs and challenges encountered. (c) Working for change: In this last step, the emphasis is on developing effective communication strategies that span the entire education system. This involves promoting coordinated and strategic approaches aligned with the collaborative vision of change. In addition, it is essential to constantly evaluate and monitor change processes to identify areas for improvement and to celebrate incremental achievements on the road to educational transformation.

Faced with this systemic challenge and considering sustainable development from an integral approach, sustainability as a whole nourished by environmental, social, and economic aspects, Murga-Menoyo [20] proposes a contribution based on the analysis of environmental perceptions, attitudes, and values, which occur when people and nature interact from the context. According to Murga-Menoyo [21], enhancing students' attitudes and values must be oriented toward creating a firm personality coherent with sustainability.

There is a strong need for education to create critical awareness and citizens who are not only aware of the challenge posed by today's society but can provide solutions and carry them out in a complex and uncertain context [1]. The analysis of students' perceptions, values, and attitudes towards sustainable development shows the need for training programs so that, in the future exercise of their profession and their civic responsibilities, they can contribute to European and international goals and plans concerning sustainable development [20].

As mentioned, it is not simply an issue of transmitting values or attitudes but enhancing them to promote transformative leadership among students and the university community [22]. It is, therefore, essential to provide students with the necessary training to successfully face the challenge of redirecting the social trajectory toward achieving education for global sustainability [1]. Through new training programs, new educational interventions should not be satisfied only with the mere acquisition of knowledge, values, and attitudes toward education for sustainability. Instead, they should involve the students in collective projects to transform the existing environment into a freer, more equitable, inclusive, and dignified one, supporting a model of active, responsible, and committed citizenship [23].

Educating in values and attitudes consistent with personal and social sustainable development is a challenge for which the Physical Education setting is optimal [24]. Physical

Education is a context where students develop adaptive behaviors from specific values and attitudes [25], such as cooperation, respect, coeducation, and entrepreneurship [26]. The study of Baena-Morales et al. [26] shows that action-based models, such as the model of personal and social responsibility, encourage students to develop sustainable behaviors and attitudes. Authors like Sanchez-Oliva et al. [25] confirmed the effectiveness of the Physical Education setting, which could be used as a vehicle to achieve all kinds of positive behaviors, both among the students themselves and toward the context where they practice.

Therefore, the context of Physical Education is a crucial opportunity to achieve the goals and objectives of the 2030 Agenda, as it creates a context conducive to the development of values such as cooperation, respect, coeducation, responsibility, entrepreneurship, and action [26,27]. Furthermore, studies such as that of Baena-Morales et al. [28] state that ESD should be integrated into the curricular structure of the area of Physical Education, in order to constitute a disciplinary corpus oriented towards sustainability. More specifically, Order ECD/1112/2022 [29], of 18 July, which approves the curriculum and authorises its application in schools in Aragon (Spain), presents a block of basic knowledge (curricular content) called 'Efficient and sustainable interaction with the environment' and is related to sustainable interaction with the natural and urban environment from a triple perspective: its use from motor skills, its conservation from a sustainable vision and its shared nature from a community perspective of the environment. In short, Physical Education should be worked on through motor behaviour, taking into account the implication that physical activity has on the environment, society and the economy, and how individuals can contribute to improving sustainability through the practice of Physical Education [30]. Some methodologies and pedagogical models used to teach this subject, such as cooperative learning, the health education model, and the personal and social responsibility model, among others, promote children's and young people's development of behaviors and competencies in sustainability education [26,27].

Social changes require students with personal and social skills to live their lives with critical responsibility [31]. This same author proposes a model to measure social and personal responsibility in physical education students. Personal responsibility comes from effort and autonomy and is related to values such as respect for others, participation, effort, autonomy, helping others, leadership, and transferring knowledge to other contexts [32]. In addition, this model emphasizes that the teacher's role is essential to achieve the objective and for the students to become people with social and personal responsibility. The teacher must be a model of all the positive behaviors to be imitated. They must grant protagonism to the students, enhance their autonomy and leadership, and make everyone succeed in their work [32].

Considering these elements, we should choose the most appropriate pedagogical approaches to integrate SDG in university education, according to the principles of ESD and the variables associated with improving perceptions, attitudes, and values towards sustainable development [33]. Learning approaches focused on critical thinking, holistic thinking, collaboration, respect, and responsibility for diversity should be enhanced [34,35]. Promoting this type of training will lead to greater transfer and social and personal responsibility. In turn, this will help to gain knowledge and attitudes to act in the face of environmental challenges [36,37,38]. Only in this way can future teachers play the role of leaders for sustainability education, consider their profession valuable and necessary for society, and understand the crucial role of Physical Education in the sustainability of the environment, society, and the economy – an integral/holistic approach [18,29,34].

Therefore, this research has two objectives: (I) to identify the existing profiles of the perception, attitudes, and values towards sustainable development in a sample of future

teachers; (II) to confirm the association of the resulting profiles with personal and social responsibility and positive behaviors in the context of Physical Education classes.

Methods

Sample

A non-probabilistic and intentional sample was selected using established criteria guaranteeing its representativeness. Participants were 375 students of the subject of Physical Education in Primary Education of the Degree of Teacher of Primary Education of the Universities of Granada (n = 125) and Zaragoza (n = 250). These two universities were chosen for their similarity in terms of their structure: both have three campuses where initial teacher training is provided. Although in the case of the University of Zaragoza the distribution is geographical, one per territorial unit (Zaragoza, Huesca and Teruel, provinces of the Autonomous Community of Aragon, Spain), in the case of the University of Granada it covers geographical areas outside the same Autonomous Community, such as Ceuta and Melilla. Another selection criterion was the syllabus, as both include Physical Education in Primary Education as a core annual subject in the Primary Education Teaching Degree in the third year on three campuses. In addition, this curriculum includes the Physical Education subject in the final year of the Bachelor's Degree in Primary Education, the final destination of the intervention in ESD.

The sample comprised 372 students, 125 from Granada, and 247 from Zaragoza, mean age 22.02 years (SD = 3.16); 66.67% were female. Three participants were excluded for the lack of informed consent and/or not completing the data collection process.

Procedures

Before starting the study, a meeting was held with all the faculties to explain the aim of the investigation and thank them for their participation and collaboration in the study. At the first meeting, given the COVID-19 pandemic, we considered that the best way to perform the study was through video calls and online questionnaires.

Two of the principal researchers contacted the students of each faculty to explain the research. The students were requested to sign the informed consent. Next, they completed three questionnaires in about half an hour, although there was no time limit. All the students were given the online link to the questionnaire so that if they were following the class at home, they could complete it at the same time as the rest of the students.

The study was approved by the Ethics Committee for Clinical Research of Aragon – CEICA; Ethic code: C.I. PI21/076–.

Measures

- Student perceptions, attitude, and values toward sustainable development

The data for this variable was collected through the Spanish *Questionnaire of Perceptions, Attitudes and Values for Sustainable Development* [20]. The instrument consists of 61 items, organized in four dimensions: 13 items for the Perception of the environmental crisis (e.g., "The current situation is one of global crisis, with a serious risk of collapse of the systems."; α = .870), 16 items for Limitations of the dominant socio-cultural model (e.g., "Humanity must use all the natural resources at its disposal to improve their standard of living"; α = .747), 17 items for basic Assumptions and Axioms of the sustainable development model (e.g., "Quality of life must take precedence over the standard of living"; α = .898), and 11 items for individual Commitment to the values of sustainability (e.g., "The West, even in its own interests, should act in its international relations driven by its moral debt to the Third World"; α = .769). All responses are rated on a five-point Likert scale, ranging from (*strongly disagree*) to 5 (*strongly agree*).

- Social and personal responsibility of students in the university context (specialty in Physical Education)

The Spanish *Personal and Social Responsibility Questionnaire (PSRQ)* [39] was used to measure this variable. The instrument consists of 14 items, organized in two dimensions: 7 items for Social Responsibility (e.g., "I collaborate with others"; α = .812) and 7 items for Personal Responsibility (e.g., "I try to work even if I don't like the task"; α = .837). Subjects rate their response on a 6-point Likert scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

- Perception of positive/prosocial behaviors of students in the university context (specialty in Physical Education)

The data for this variable was collected with the Spanish *Positive Behavior Questionnaire in Physical Education* [25]. The questionnaire is composed of 18 items, organized into five factors: 4 items for Respect for the facilities (e.g., "I respect the school facilities"; α = .811), 3 items for Effort (e.g., "To be successful, it is important to work hard"; α = .699), 4 items for Tolerance and Respect for partners (e.g., "I am tolerant with the behavior of my colleagues"; α = .749), 4 items for Self-control (e.g., "I control my actions"; α = .780), and 3 items for Cooperation (e.g., "I love to participate in group work"; α = .743). The items reflect negative and positive behaviors. The scale is rated on a Likert scale ranging from 1 (*agreement with a negative behavior*) to 5 (*agreement with a positive behavior*).

Statistical analysis

To determine the future teachers' profiles of perception, attitudes, and values toward sustainable development, an initial cluster analysis was carried out. Subsequently, a one-factor ANOVA analysis was performed to determine whether the clusters differed significantly in the clustering variables (i.e., perception, weaknesses, assumptions, and commitment).

To determine whether membership in one of the clusters was determined by the student's university or sex, discriminant analysis was conducted to separate the groups [40]. Discriminant analysis determines group membership to predict scores on continuous variables [41]. The objective was to examine whether membership in one of the two clusters was determined by university membership or sex.

The differences in the rest of the target variables (personal and social responsibility and prosocial behaviors in Physical Education classes) were analyzed as a function of the two clusters with a one-factor ANOVA. Values with $p < .05$ were considered significant. All statistical analyses mentioned above were carried out with SPSS software version 26.

Results

The cluster analysis (Table I) revealed the existence of two groups of participants based on profiles that corresponded to negative (Cluster 1) or positive (Cluster 2) perceptions, attitudes and values toward sustainable development. The two groups differed in the number of participants (Cluster 1, n =135 [36.3%] and Cluster 2, n = 237 [63.7%]), and the clusters were significantly different in all the dimensions of the target variables of the study (Table 1). Students of Cluster 1 had a lower perception of the current environmental crisis, did not think that the dominant socio-cultural model or the assumptions and axioms of the sustainable development model have any limitations or weaknesses, and showed less individual commitment to the values of sustainability than the students of Cluster 2 (Table 1).

Table 1. Perceptions, attitudes, and values in the two groups identified

Variable	Cluster 1 *M* (*SD*) *N* = 135	Cluster 2 *M* (*SD*) *N* = 237	*p* value
Perception of the current environmental crisis	3.48 (.46)	4.42 (.35)	.000
Weaknesses and limitations of the dominant socio-cultural model	3.09 (.49)	3.41 (.58)	.000
Assumptions and axioms of the sustainable development model	3.50 (.44)	4.40 (.33)	.000
Individual commitment to sustainability values	3.30 (.45)	4.25 (.40)	.000

Source: Authors

The discriminant analysis showed that variance homogeneity could be assumed according to the Box M test, as it was nonsignificant, F (3, 2495746.288) = 2.283, p = .077. This analysis (Table 2) also revealed a discriminant function, explaining 4.1% of the variance (Canonical R^2 = 0.04, Λ = 0.96, χ^2 (2) = 15.5, p = .000). The discriminant loads indicated that the composition of the groups differed depending on students' university membership, with higher values obtained by the sample from the University of Granada.

Table 2. Discriminant analysis measures

Variable	Unstandardized	Standardized	Discriminant loading (Rank)	Univariate F ratio or χ^2
University	1.998	.929	.95 (1)	14.42***
Sex	0.631	.303	.38 (2)	2.28

Note*:* *positive behavior in Physical Education
Source: Authors

The students of Cluster 2 obtained higher values in all the dimensions of responsibility and prosocial behaviors than those of Cluster 1, and all of them were significant, except for the cooperation dimension (Table 3). The clustering process began with each observation treated as its own subgroup. Subgroups were then iteratively merged based on squared Euclidean distance using between-groups linkage methodology. The final number of clusters was determined through visual inspection of the dendrogram and comparison of silhouette plots and average silhouette scores across various cluster solutions [42]. Silhouette scores, ranging from -1 to +1, were used to assess cluster cohesion and separation, with higher average scores indicating more distinct clusters [43].

Table 3. Association between clusters and analyzed variables

Variable	Cluster 1 *M* (*SD*) *N* = 135	Cluster 2 *M* (*SD*) *N* = 237	*p*-value
Social responsibility	5.40 (.57)	5.53 (.46)	.024
Personal Responsibility	5.02 (.77)	5.21 (.64)	.013
Respect*	4.79 (.49)	4.95 (.18)	.000
Assessment of Effort*	4.48 (.63)	4.65 (.46)	.002
Tolerance*	4.53 (.64)	4.73 (.36)	.000
Self-control*	4.25 (.67)	4.43 (.58)	.007
Cooperation*	4.32 (.68)	4.38 (.71)	.444

Note*:* *positive behavior in Physical Education
Source: Authors

Discussion

Despite the efforts of the university system to commit to the planetary crisis through the 2030 Agenda [5], the training of teachers is currently not adequately preparing its students in ESD [10,11,12,38]. This is confirmed by the results of this research, which show high percentages of students' negative perceptions of sustainable development. More specifically, most of the students considered the current environmental crisis to be non-existent, stating that the dominant socio-cultural model is consistent and devoid of limitations and weaknesses and showing a weak commitment to the values of sustainability.

In fact, these results warn us about the urgency of a change in the education system, which could imply a Copernican spin to address the challenge of the environmental crisis. In this sense, it is the responsibility of the whole university education system to draw an itinerary to correct and alleviate it [1–3,7], promoting learning approaches focused on critical and holistic thinking [29,30,31].

Although students support the need to implement training programs in ESD [20], the negative perception found in this work shows the urgency for teacher training to become a reference. Teacher training is the scenario in which to achieve literacy in sustainability, with future teachers becoming the catalysts of this social challenge [16]. To carry out this change, ESD must be integrated through innovative models that help reorient the initial training system [9,15,16].

These innovative models should focus on creating critical awareness to assume the systemic challenge [1], and thus enhance future teachers' perceptions, attitudes, and environmental values [21], supporting a model of active, responsible, and committed citizens [23]. Consequently, initial training should contribute to promoting transformative leadership among students and in the university community [22].

The results of the second objective of the research allow us to confirm the statistically significant association of the resulting profiles with personal and social responsibility and positive behaviors in Physical Education classes. Therefore, they confirm the studies that determine the effectiveness of Physical Education in developing values and attitudes such as cooperation, respect, coeducation, and entrepreneurship [24,26].

The context of Physical Education reveals a disciplinary habit based on innovative models of action, such as the model of personal and social responsibility, favoring sustainable commitments and behaviors [26]. The positive behaviors of the students of Physical Education in the present research coincide with those of the students analyzed by Sánchez-Oliva et al. [25], promoting commitment and social responsibility [27].

As one of the areas of initial training, Physical Education must demonstrate the need for models of critical responsibility to develop students with personal and social skills who can assume global and holistic challenges [31], performing leadership roles in sustainability education [33,38]. Therefore, trainers must foster critical responsibility through their intervention programs, assuming their influence and leadership [44]. Only in this way will it be possible to act in the face of present and future challenges [36,37].

Conclusion

Concerning the main objectives of the research, the first objective involved identifying future teachers' profiles of perceptions, attitudes, and values toward sustainable development. The results significantly determined that there were two defined groups in the sample. One of them, made up of 63.7% of the participants, represented those who had a positive perception of the environmental crisis; that is, those who are aware of the weaknesses of the current dominant socio-cultural model. However, 36.3% of the sample represented a population that, on the contrary, does not perceive the current environmental crisis, does not appraise the limitations and weaknesses of the model, nor do they feel individually committed to the values of sustainability. For years, studies such as those provided by UNESCO [4] have stated that society and the people who compose it have the means, resources, and tools to achieve knowledge in sustainability. Despite this, research such as the current one still obtains data as representative as this one, where almost 40% of the sample does not know about the global problem we face.

Secondly, the present research, aiming to verify the association between variables, studied the relationship between the created profiles and the personal and social responsibility and prosocial behaviors in Physical Education classes. The results of this association were clear: 63.7% of the sample, belonging to the first cluster, obtained higher scores in personal and social responsibility, respect, valuation, tolerance, self-control, and cooperation—values that represent positive behaviors in Physical Education classes. The importance of the context in which knowledge is developed was also clear, with Physical Education being one of the most affable and optimal to produce values and behaviors supporting sustainability.

To conclude, in addition to the analyses mentioned so far, the discriminant analysis revealed differences in the composition of the groups as a function of the students' university (University of Granada or University of Zaragoza), with the scores obtained by the students of the University of Granada being higher than the those of the University of Zaragoza. This result was considered by the research as a prospective issue to be considered. This is because this study is part of the diagnostic evaluation of a doctoral thesis that aims to integrate Education for Sustainable Development within the training of Physical Education teachers. Based on the results from this and other studies [45,46], an intervention program is being created, targeting future teachers of Physical Education of the University of Zaragoza, as they obtained lower scores than the students from the University of Granada.

In terms of the limitations of the study, it should be noted that although the study used a robust quantitative design that included appropriate statistical analyses such as cluster analysis and discriminant analysis, a longitudinal design was not used to examine changes in students' perceptions and attitudes over time. A longitudinal approach would have provided

a more complete understanding of how these variables develop over time and how they might influence future behaviour. On the other hand, the study was conducted during the COVID-19 pandemic, so the online data collection modality and the stressful situation and changes in participants' lives might have influenced their responses and behaviours, which could bias the results.

References

1. Serrate-González S, Martín-Lucas J, Caballero-Franco D, Muñoz-Rodríguez JM. Responsabilidad universitaria en la implementación de los objetivos de desarrollo sostenible. Eur J Child Dev Educ Psychopathol. 2019;7(2):183–96. Available from: http://dx.doi.org/10.30552/ejpad.v7i2.119
2. UNESCO. Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability. Education for Sustainable Development in Action. 2005. p. 44. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000143370_spa
3. Vinces-Centeno MR, Milán MR, Muñoz-Campos MR. Estrategia de Educación Ambiental no Formal : contribución al cumplimiento de la Responsabilidad Socio Ambiental de la Facultad de Non-Formal Environmental Education – A Strategy for the Faculty of. Estud del Desarro Soc. 2018;6(3). Available from: https://revistas.uh.cu/revflacso/article/view/5683
4. UNESCO. Roadmap for Implementing the Global Action Programme on Education for Sustainable Development. In 2014. p. 39. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000230514https://sustainabledevelopment.un.org/content/documents/1674unescoroadmap.pdf
5. Shiel C, Smith N, Cantarello E. Aligning Campus Strategy with the SDGs: An Institutional Case Study. In: Leal-Filho W, Salvia A, Bradli L, Pretorius R, editors. Universities as Living Labs for Sustainable Development: Supporting the Implementation of the Sustainable Development Goals. Springer. 2019. p. 11–27. Available from: http://dx.doi.org/10.1007/978-3-030-15604-6_2
6. REDS. Cómo evaluar los ODS en las universidades [Internet]. 2020. p. 4–29. Available from: www.reds-sdsn.es/documentos
7. Martín-Lucas J, Caballero-Franco D. La Cooperación Oficial europea y española ante el nuevo escenario del sistema internacional de cooperación al desarrollo. Acciones e Investig Soc. 2017;37(2017):7–25. DOI: https://doi.org/10.26754/ojs_ais/ais.2017372186
8. Ferreira J-A, Ryan L, Tilbury D. Mainstreaming education for sustainable development in initial teacher education in Australia: A review of existing professional development models. J Educ Teach Int Res Pedagog. 2007;33(2):225–39. Available from: http://dx.doi.org/10.1080/02607470701259515
9. Alcalá del Olmo MJ, Santos MJ, Leiva JJ, Matas A. Curricular sustainability: A view from the contributions of teaching staff at the university of Málaga. Rev Int Educ para la Justicia Soc. 2020;9(2):309–26. DOI: https://doi.org/10.15366/riejs2020.9.2.015
10. Aznar-Minguet P, Ull-Solís M, Martínez-Agut M, Piñero-Guilamany A. Evaluar para transformar : evaluación de la docencia universitaria bajo el prisma de la sostenibilidad. Enseñanza las ciencias Rev Investig y Exp didácticas. 2017;35(1):5–27. DOI: https://doi.org/10.5565/rev/ensciencias.2112
11. Boon HJ. Climate change? Who knows? A comparison of secondary students and pre-service teachers. Aust J Teach Educ. 2010;35(1):104–20. Available from: https://files.eric.ed.gov/fulltext/EJ908193.pdf
12. Ferreira J-A, Ryan L, Davis JM. Developing Knowledge and Leadership in Pre-Service Teacher Education Systems. Aust J Environ Educ. 2015;31(2):194–207. DOI: https://doi.org/10.1017/aee.2015.24
13. UNESCO. Strategies for the Training of Teachers in Environmental Education. 1987. p. 88. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000073252
14. Ferreira J-A, Ryan L, Tilbury D. Mainstreaming education for sustainable development in initial teacher education in Australia: A review of existing professional development models. J Educ Teach. 2007;33(2):225–39. DOI: https://doi.org/10.1080/02607470701259515
15. Miles R, Harrison L, Cutter-Mackenzie A. Teacher Education: A Diluted Environmental Education Experience. Aust J Environ Educ. 2006;22(1):49–59. DOI: https://doi.org/10.1017/S0814062600001658
16. Ferreira J-A, Ryan L, Tilbury D. Planning for Success: Factors influencing change in teacher education. Evaluation. 2007;(C):2005–7. DOI: https://doi.org/10.1017/S0814062600000707
17. UNECE. Learning for the future. Competences in Education for Sustainable Development [Internet]. 2011. p. 11. Available from: http://www.unece.org/env/welcome.html
18. UNECE. Education for Sustainable Development. Vol. Volume-2, United Nations Educational. 2017. 131–134 p. Available from: https://unece.org/publications/education-for-sustainable-development
19. Ferreira J-AL, Ryan L. Working the system: A model for system-wide change in pre-service teacher

education. Aust J Teach Educ. 2013;37(12):29–45. DOI: https://doi.org/10.14221/ajte.2012v37n12.3
20. Murga-Menoyo MA. Percepciones, valores y actitudes ante el desarrollo sostenible. Detección de necesidades educativas en estudiantes universitarios. Rev Esp Pedagog. 2008;66(240):327–44. Available from: https://redined.educacion.gob.es/xmlui/bitstream/handle/11162/78592/240-09.pdf?sequence=1
21. Murga-Menoyo MA. Sobre las diferencias de género en la percepción social del desarrollo sostenible. Estudio empírico en estudinates universitarios de alto rendimiento. Rev Investig Educ [Internet]. 2009;27(1):169–83. Available from: https://www.redalyc.org/pdf/2833/283322804010.pdf
22. Mendoza-Torres MR, Ortiz-Riaga C. El Liderazgo Transformacional, Dimensiones e Impacto en la Cultura Organizacional y Eficacia de las Empresas. Rev Fac Ciencias Económicas. 2006;14(1):118–34. Available from: https://www.redalyc.org/pdf/909/90900107.pdf
23. Martínez-Martín M, Esteban-Bara F. Una propuesta de formación ciudadana para el EEES. Vol. 63, Revista Española de Pedagogía. 2005. p. 63–83. Available from: https://www.redalyc.org/pdf/909/90900107.pdf
24. Valero-Valenzuela A, Merino-Barrero JA, Manzano-Sánchez D, Belando-Pedreño N, Fernández-Merlos JD, Moreno-Murcia JA. Influencia del estilo docente en la motivación y estilo de vida de adolescentes en educación física. Univ Psychol. 2020;19:1–11. DOI: https://doi.org/10.11144/Javeriana.upsy19.iedm
25. Sánchez-Oliva D, Sánchez-Miguel PA, Leo FM, Amado D, García-Calvo T. Desarrollo y validación de un cuestionario para analizar la percepción de comportamientos positivos en las clases de educación física. Cult y Educ. 2013;25(4):495–507. DOI: https://doi.org/10.11144/Javeriana.upsy19.iedm
26. Baena-Morales S, Jerez-Mayorga D, Delgado-Floody P, Martínez-Martínez J. Sustainable development goals and physical education. A proposal for practice-based models. Int J Environ Res Public Health. 2021;18(2129):1–18. DOI: https://doi.org/10.3390/ijerph18042129
27. García-Rico L, Martínez-Muñoz LF, Santos-Pastor ML, Chiva- Bartoll O. Service-learning in physical education teacher education: a pedagogical model towards sustainable development goals. Int J Sustain High Educ. 2021;22(4):747–65. DOI: https://doi.org/10.1108/IJSHE-09-2020-0325
28. Baena-Morales S, Barrachina-Peris J, García-Martínez S, González-Víllora S, Ferriz-Valero A. La Educación Física para el Desarrollo Sostenible: un enfoque práctico para integrar la sostenibilidad desde la Educación Física. Rev Española Educ Física y Deport. 2023;437(1):1–15. DOI: https://doi.org/10.55166/reefd.vi437(1).1087
29. Departamento de Educación C y DG de A. Orden ECD/1112/2022, de 18 de julio, por la que se aprueban el currículo y las características de la evaluación de la Educación Primaria y se autoriza su aplicación en los centros docentes de la Comunidad Autónoma de Aragón. Departamento de Educación, Cultura y Deporte. Gobierno de Aragón 2014 p. 28. Available from: https://educa.aragon.es/documents/20126/2789386/Orden+curr%C3%ADculo+Educaci%C3%B3n+Primaria+Arag%C3%B3n+%28versi%C3%B3n+4%29.pdf/dd73c20b-210f-1fd8-1e52-7b527ba5e3fb?t=1661516064093
30. Baena-Morales S, González-Víllora S. Physical education for sustainable development goals: reflections and comments for contribution in the educational framework. Environ attunement Heal Sport Phys Educ. 2022;28(6):697–713. DOI: https://doi.org/10.1080/13573322.2022.2045483
31. Escartí A, Gutiérrez M, Pascual C. Propiedades psicométricas de la versión española del Cuestionario de Responsabilidad Personaly Social en contextos de educación física. Rev Psicol del Deport. 2011;20(1):119–30. Available from: https://dialnet.unirioja.es/servlet/articulo?codigo=3395769
32. Escartí A, Gutiérrez M, Pascual C, Wright P. Observación de las estrategias que emplean los profesores de educación física para enseñar responsabilidad personal y social1. Rev Psicol del Deport. 2013;22(1):159–66. Available from: https://www.researchgate.net/publication/288345291_Observacion_de_las_estrategias_que_emplean_los_profesores_de_educacion_fisica_para_ensenar_responsabilidad_personal_y_social_1#fullTextFileContent
33. Fuertes-Camacho MT, Graell-Martín M, Fuentes-Loss M, Balaguer-Fàbregas MC. Integrating sustainability into higher education curricula through the project method, a global learning strategy. Sustain. 2019;11(3):767. DOI: https://doi.org/10.3390/su11030767
34. Murga-Menoyo MÁ. Competencias para el desarrollo sostenible: las capacidades, actitudes y valores meta de la educación en el marco de la Agenda global post-2015. Foro Educ. 2015;13(19):55–83. DOI: https://doi.org/10.14516/fde.2015.013.019.004
35. Wiek A, Withycombe L, Redman CL. Key competencies in sustainability: A reference framework for academic program development. Sustain Sci. 2011;6(2):203–18. DOI: https://doi.org/10.1007/s11625-011-0132-6
36. Martí-Noguera JJ, Gaete-Quezada R. Construcción de un Sistema de Educación Superior Socialmente Responsable en América Latina: Avances y Desafíos. Arch Analíticos Políticas Educ. 2019;27(97):1–26. DOI: https://doi.org/10.14507/epaa.27.3925

37. Simsek MR. The impact of service-learning on EFL teacher candidates' academic and personal development. Eur J Educ Res. 2020;9(1):1–17. DOI: https://doi.org/10.12973/eu-jer.9.1.1
38. Geli AM, Collazo L, Mulà I. Contexto y evolución de la sostenibilidad en el curriculum de la universidad española. Rev Educ Ambient y Sostenibilidad. 2019;1(1102):617–27. DOI: https://doi.org/10.25267/Rev_educ_ambient_sostenibilidad.2019.v1.i1.1102
39. Li W, Wright PM, Rukavlna PB, Pickering M. Measuring students perceptions of personal and social responsibility and the relationship to intrinsic motivation in urban physical education. J Teach Phys Educ. 2008;27(2):167–78. Available from: https://www.researchgate.net/publication/267040278_Measuring_students'_perceptions_of_personal_and_social_responsibility_and_its_relationship_to_enjoyment_in_urban_physical_education
40. García Bengoechea E, Wilson PM, Dunn S. From liability to challenge: Complex environments are associated with favorable psychosocial outcomes in adolescent sport participants. J Adolesc [Internet]. 2017;58:74–83. Available from: http://dx.doi.org/10.1016/j.adolescence.2017.05.004
41. Sherry A. Discriminant Analysis in Counseling Psychology Research. Couns Psychol. 2006;34(5):661–83. Available from: http://dx.doi.org/10.1177/0011000006287103
42. O'Regan A, Hannigan A, Glynn L, Garcia-Bengoechea E, Donnelly A, Hayes G, et al. A cluster analysis of device-measured physical activity behaviours and the association with chronic conditions, multi-morbidity and healthcare utilisation in adults aged 45 years and older. Prev Med Reports [Internet]. 2021;24(101641). DOI: https://doi.org/10.1016/j.pmedr.2021.101641
43. Rousseeuw PJ. Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. J Comput Appl Math. 1987;20(C):53–65. DOI: https://doi.org/10.1016/0377-0427(87)90125-7
44. Escartí A, Gutiérrez M, Pascual C, Marín D. Application of Hellison's Teaching Personal and Social Responsibility Model in physical education to improve self-efficacy for adolescents at risk of dropping-out of school. Span J Psychol. 2010;13(2):667–76. DOI: https://doi.org/10.1017/s113874160000233x
45. Lorente-Echeverría S, Murillo-Pardo B, Canales-Lacruz I. A Systematic Review of Curriculum Sustainability at University: A Key Challenge for Improving the Professional Development of Teachers of the Future. Educ Sci. 2022;12(11). DOI: https://doi.org/10.3390/educsci12110753
46. Lorente-Echeverría S, Canales-Lacruz I, Murillo-Pardo B. The Vision of Future Primary School Teachers as to Education for Sustainable Development from a Competency-Based Approach. Sustain. 2022;14(18). DOI: https://doi.org/10.3390/su141811267

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