Challenges in teaching practices for the incorporation of sustainable development approach in Compulsory Secondary Education

Retos en las prácticas docentes para la incorporación del enfoque del desarrollo sostenible en la Educación Secundaria Obligatoria

https://doi.org/10.4438/1988-592X-RE-2023-401-583

Belén Sáenz-Rico de Santiago
https://orcid.org/ 0000-0001-9207-889X
Universidad Complutense de Madrid

Mª del Rosario Mendoza Carretero
https://orcid.org/ 0000-0002-6924-3196
Universidad Complutense de Madrid

Raúl García Medina
https://orcid.org/ 0000-0003-4367-3160
Universidad Complutense de Madrid

Mercedes Sánchez Sáinz
https://orcid.org/ 0000-0002-7547-4724
Universidad Complutense de Madrid

Abstract

The purpose of this study[1] is to investigate the relationship between the degree of knowledge of the teachers of the Compulsory Secondary Education stage as regards sustainability and their teaching practice within the framework

[1] This research is framed within the: Eco-Social Literacy Project: a central element in the processes of curricular sustainability for the achievement of the 2030 Agenda (SDGs), in initial teacher training (PRAD-ODS) RTI2018-095746-B-I00, funded by the Ministry of Science, Innovation and Universities.

of the 2030 Agenda, as well as to identify the challenges they face to promote the sustainability approach in the classroom. Methodology: the data have been collected through a questionnaire sent to schools of Compulsory Secondary Education, validated by experts and with a reliability of α = .89. It has a non-probability sampling for convenience (N = 826), obtained using the snowball technique. A descriptive and inferential analysis was carried out, using an analysis of non-parametric tests. Results: The teachers who teach in centres that carry out projects and activities to raise awareness and awareness in the field of sustainability, have a greater degree of knowledge of both the 2030 Agenda and the SDGs and incorporate it into their subjects and into the development of competencies. ; The main challenges referenced by the teaching staff respond to the absence of the sustainable development approach in the organizational documents, time management for curricular innovation, and the need for specific training. **Conclusion:** The relationship between sensitization and awareness of teachers and their teaching practice oriented towards sustainability is confirmed. It is necessary to reinforce the training of teachers to increase their knowledge of the great challenges of the planet and the role of education in the transformation towards more sustainable societies.

Keywords: compulsory secondary education, eco-social literacy, teacher education, teaching practice, sustainable development.

Resumen

Este estudio[2] tiene como propósito indagar sobre la relación entre el grado de conocimiento del profesorado de la etapa de Educación Secundaria Obligatoria en materia de sostenibilidad y su práctica docente en el marco de la Agenda 2030, así como identificar los desafíos a los que se enfrenta para promover el enfoque de la sostenibilidad en el aula. Metodología: los datos se han recogido mediante un cuestionario enviado a centros educativos de Educación Secundaria Obligatoria, validado por personas expertas y con una fiabilidad de α = .89. Cuenta con un muestreo no probabilístico por conveniencia (N = 826), obtenido mediante técnica de bola de nieve. Se realizó un análisis descriptivo e inferencial, utilizando un análisis de pruebas no paramétricas. Resultados: El profesorado que ejerce su docencia en centros que desarrollan proyectos y actividades de sensibilización y concienciación en materia de sostenibilidad, tiene mayor grado de conocimiento tanto de la Agenda 2030 como de los ODS y lo incardina en sus materias y en el desarrollo de competencias; los principales desafíos referenciados por el profesorado responden a la ausencia del enfoque de desarrollo sostenible en los

[2] Esta investigación está enmarcada en el proyecto: La alfabetización ecosocial: un elemento central en los procesos de sostenibilización curricular para el logro de la Agenda 2030 (ODS), en la formación inicial del profesorado (PRAD-ODS) RTI2018-095746-B-I00, financiado por el Ministerio de Ciencia, Innovación y Universidades.

documentos organizativos, a la gestión del tiempo para la innovación curricular, y a la necesidad de formación específica. Conclusión: Se confirma la relación entre sensibilización y concienciación del profesorado y su práctica docente orientada a la sostenibilidad. Es preciso reforzar la formación del profesorado para incrementar su conocimiento ante los grandes retos del planeta y el papel de la educación en la transformación hacia sociedades más sostenibles.

Palabras clave: educación secundaria obligatoria, alfabetización ecosocial, formación de docentes, práctica pedagógica, desarrollo sostenible.

Introduction

The Earth Summit, held in Rio de Janeiro in 1992, recognised that education had an essential role to play in tackling various issues, such as socio-ecological issues (Murga-Menoyo, 2021), citizenship issues, and progress towards sustainability (Calero et al., 2019; Vilches & Gil, 2012).

The Decade of Education for Sustainable Development (2005-2014), proclaimed by the United Nations (UN) (Gil et al., 2006; United Nations Educational, Scientific and Cultural Organization [UNESCO], n.d.), aimed to engage the population in the transition towards sustainability (Calero et al., 2019), using education.

Education for sustainability uses various strategies to raise awareness of environmental and social justice issues (Fernández & Gutiérrez, 2014). It aims to solve "social, economic and ecological problems" (Fundación Benéfico-Social Hogar del empleado [FUHEM], 2018, p.9), and is involved in transforming people, improving their self-perception of eco-dependence and "the deep interdependencies that allow us to be alive" (FUHEM, 2018, p.9). It seeks to "develop competences for participation in improvement actions within the community" (Fernández & Gutiérrez, 2014, p.28).

Education is an engine for change in society (Fernández & Casado, 2017; Reyes, 2010), and teachers, regardless of their discipline or academic level (Calero et al., 2019), have the role of facilitating the acquisition of an adequate vision of the problems and challenges affecting humanity. With this support, citizens will be able to make evidence-based decisions (Alcalá et al., 2020) and "take responsible actions in relation to environmental integrity, economic viability and a just society, for current and future generations, while respecting cultural diversity" (Murga-Menoyo, 2021, p. 114).

It is therefore necessary to disseminate the model of education for sustainable development by addressing effective curricular sustainability processes. This is achieved when the principles and values of the approach permeate all teaching spheres and are incorporated into the curricula of the different educational levels (Azcárate et al., 2016), as well as in teacher training (Álvarez-García et al., 2018; Calero et al., 2019), which Valderrama et al. (2020) describe as scarce and inconsistent.

In fact, target 4.7, one of the targets of SDG 4, quality education, of the 2030 Agenda approved by the United Nations (UN, 2015), defends the need for students to acquire the theoretical and practical knowledge necessary to promote sustainable development (UN, 2015). Similarly, Royal Decree 217/2022, of 29 March, which establishes the organisation and minimum teaching requirements for Compulsory Secondary Education, advocates promoting sustainable development through safe actions for students, "responding to the need to promote competent, autonomous, meaningful and reflective learning in all subjects" (BOE, p.4). Undoubtedly, teacher training must contribute to achieving this goal (Calero et al., 2019).

This leads us to ask and address the following questions: Is teacher training in sustainability adequate for teachers to take up this challenge? What knowledge and skills might teachers need to develop awareness-raising actions in favour of education for sustainable development in compulsory secondary education?

Teacher training for making the Compulsory Secondary Education curriculum more sustainable

Curricular sustainability is a cross-cutting pedagogical process that enables students to acquire the necessary competences and make a positive contribution to sustainable development. This requires that "the principles, values and procedures of education for sustainable development" (Murga-Menoyo & Novo, 2014, p.167) be incorporated into teacher training; only then will they become a reality in the classroom.

For the sake of coherence, making the curriculum sustainable requires, among other aspects, the involvement of teachers to generate changes that contribute to overcoming the challenges found and try to favour the immersion of students in the culture of sustainability (Alcalá et al., 2020;

Valderrama et al., 2020). To this end, teachers must develop and strengthen the sustainability competences (Brundiers et al., 2021; UNESCO, 2017) necessary for students, so that citizens feel concerned about, integrate and respond to the current eco-social challenges arising from the situation of the planet. Therefore, it has to raise questions and promote strategies that lead to the search for "critical and creative responses to socio-environmental conflicts, generating a social culture based on cooperation and communication, responsibility and participation" (Fernández & Gutiérrez, 2014, p.150).

This demand is not new; studies such as that of Vilches and Gil (2013) already pointed out the need to include the sustainability approach in the curriculum and in teacher training. Even years earlier, in Order ECI/3858/2007, of 27 December, which established the requirements for the verification of official university degrees that enabled the exercise of the professions of Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching (BOE, 2007), the construction of a sustainable future was already mentioned as one of the aims of learning spaces:

> Designing and developing learning spaces with special attention to equity, emotional and values education, equal rights and opportunities between men and women, citizenship training and respect for human rights that facilitate life in society, decision-making and the construction of a sustainable future (p.3).

Even so, at present, teachers continue to face challenges in their teaching professionalisation, which are related to sustainability issues and linked to their training, and which can make it difficult for them to advance in the process of curricular sustainability (Alcalá et al., 2020). They seem to feel that they do not have enough knowledge or tools to be able to contribute to a transformative education that favours a change in citizens' attitudes and behaviour in coherence with the sustainability approach (Alcalá et al., 2020).

The training of future teachers, despite the scientific background it provides (Murga-Menoyo & Novo, 2014), does not seem adequate for the transition towards sustainable societies. This could be due to several factors. On the one hand, there are gaps in the contents that favour its acquisition (Aznar et al., 2017; Vilches and Gil, 2012), although they do incorporate the training of sustainability competences within subjects and

disciplines. This hypothesis coincides with the results of other research, such as that of Filho et al. (2017), which warns of the teachers' lack of knowledge about how to environmentalise the curriculum of their subject. On the other hand, it could also be due to the teachers' own attitude towards their new role.

This role has changed due to the transformation of education. Teachers are no longer seen as mere transmitters of knowledge (Álvarez-García et al., 2018; Bermúdez & Lía, 2008; Southwell, 2013); they now have to respond to new literacies, which are interconnected and more complex. To address them, it is necessary to strengthen its training; to become literate and trained (Álvarez-García et al., 2018) in order to be able to implement a model of education for sustainability (McKeown-Ice, 2000; Olaskoaga-Larrauri et al., 2021).

Vilches and Gil (2013) suggested that teachers should be imbued with the culture of sustainability through their own teaching-learning process, so that they can then extrapolate it to the classroom with their students. This strategy, for example, could encourage education for sustainable development in secondary school classrooms. However, in the words of Aznar et al. (2017), "sustainability (...) is still far from achieving a reorientation of the curriculum in relation to sustainable development" (p. 227).

For all these reasons, it is considered relevant to identify the degree of knowledge in sustainability that teachers have, as agents of training and transformation, given the multiplier effect they can have on students during the teaching-learning process, in order to move towards a more sustainable society. Education for sustainability is a fundamental dimension of teacher training.

Education for sustainable development in the curriculum in compulsory secondary education

Acquiring competence in sustainability is a fundamental objective for sustainable development in education (Scharenberg et al., 2021). In Spain, it is anchored in the curricula, covering all educational stages corresponding to basic education.

Organic Law 3/2020 of 29 December, which amends Organic Law 2/2006 of 3 May on Education, states in its preamble that "education for

Received: 13/06/2022 Accepted: 28/1/2022

sustainable development and global citizenship must be included in the educational plans and programmes of all compulsory education, incorporating knowledge, skills, values and attitudes" (BOE, 2020, p.122871) so that people can make informed decisions, taking an active role in tackling and solving problems that concern citizenship.

In the organisation of the four years of this educational stage, in all subjects, in a cross-cutting manner, it is prescribed that education for sustainable development will be promoted, closely related to the critical and scientific spirit, emotional and values education, education for health –including affective-sexual education–, gender equality, mutual respect and cooperation among equals (BOE, 2020).

In this sense, FUHEM (2018) argues that the eco-social approach could be achieved through the curricular areas related to Biology and Geology, Physics and Chemistry, Geography and History, Economics, Introduction to Entrepreneurship and Business, and Eco-Social Values, because if students acquire basic knowledge and skills that enable them to understand the eco-social situation they are living in, they will be able to recognise the eco-dependence of human beings.

This would help to respond to the need for the formation of a planetary citizenship (Murga-Menoyo & Novo, 2017) and the development of the sustainability competences established by UNESCO (2017), so that citizens are capable of "reflection on one's own actions, bearing in mind their social, cultural, economic and environmental effects" (UNESCO, 2017, p.7) and can thus contribute to achieving the necessary transformation.

Teachers therefore need to be trained in sustainability to acquire a commitment and address what the curriculum establishes in their teaching practice, with an eco-social perspective. As FUHEM (2018) points out, "when educating, we should aim to help the people we train acquire the skills they will need throughout their lives" (p.12).

There are various teaching practices, such as that proposed in the study by Scharenberg et al. (2021), in which students acquire sustainability competences. This research shows that teachers' attitudes and knowledge about education for sustainable development are significant predictors of these outcomes. Therefore, the more knowledge teachers have, the more training, awareness and sensitivity towards sustainability, the more sustainability-related knowledge students will acquire.

Objective

In line with the above, the purpose of the research presented here is to investigate the relationship between the level of sustainability knowledge on the part of teachers of Compulsory Secondary Education (hereinafter ESO) and their teaching practice in the framework of the 2030 Agenda, as well as to identify the challenges faced by teachers in promoting the sustainability approach in the classroom.

Method

This quantitative, cross-sectional, multi-centre study was carried out at national level. Considering the following hypotheses:

- H1: The degree of knowledge that teachers have about the 2030 Agenda and the SDGs influences the implementation of programmes and activities related to environmental, social and economic sustainability in secondary schools.
- H2: Teachers' awareness and awareness of the sustainability approach reduces possible barriers to its inclusion in the teaching-learning process in secondary schools.

Sample

This research is based on non-probabilistic convenience sampling using a snowball technique. The sample consists of a total number of 826 teachers working at the Compulsory Secondary Education stage. 63.9% (n = 528) of the cohort are female, 35.1% (n = 290) are male and 1% (n = 8) are of other gender identities. The teachers in this study are aged 20-30 (6.4%; n = 53), 30-40 (19.9%; n = 164), 40-50 (35.1%; n = 290), 50-60 (34.4%; n = 284) and over 60 (4.2%; n = 35). They teach in public (91.8%; n = 758), private (1%; n = 8) and state-subsidised schools (7.3%; n = 60). The participation of teaching staff by Autonomous Community (hereinafter, AC) is shown in Table I.

Received: 13/06/2022 Accepted: 28/1/2022

TABLE I. Sample representation by Autonomous Community (AC)

Autonomous Community	Representation
Andalusia	10.3% (*n* = 85)
Aragon	1.8% (*n* = 15)
Balearic Islands	1.3% (*n* = 11)
Canary Islands	2.7% (*n* = 22)
Cantabria	1% (*n* = 8)
Castile and León	7.4% (*n* = 61)
Castile-La Mancha	6.5% (*n* = 54)
Catalonia	7.1% (*n* = 59)
Ceuta	0.4% (*n* = 3)
Community of Madrid	18.5% (*n* = 153)
Valencian Community	15.5% (*n* = 128)
Extremadura	1.2% (*n* = 10)
Galicia	8% (*n* = 66)
La Rioja	0.6% (*n* = 5)
Navarre	2.7% (*n* = 22)
Basque Country	3.8% (*n* = 31)
Principality of Asturias	8% (*n* = 66)
Region of Murcia	3.3% (*n* = 27)

Source: Compiled by author

Variables and Instrument

The variables that this research subjects to analysis are: years of teaching, tenure, autonomous community, degree of knowledge of the 2030 Agenda, degree of knowledge of the SDGs[3], curriculum competencies, ESO subjects, the difficulties faced by teachers in implementing the 2030

[3] It should be clarified that we differentiate between these two variables as the 17 Sustainable Development Goals are part of the 2030 Agenda for Sustainable Development. This makes the 2030 Agenda the framework for people and the planet in the 21st century, and the SDGs and their targets facilitators of the implementation of the 2030 Agenda, but not the only reference, as the Agenda incorporates, among others, the Universal Declaration of Human Rights and the Addis Ababa Action Agenda (UN, 2015).

Received: 13/06/2022 Accepted: 28/1/2022

Agenda and the SDGs in the classroom, and projects and activities to raise awareness of the SDGs, the latter being configured as the dependent variable.

A 'Questionnaire to inquire about ESO teachers' eco-social literacy' was developed using the Google Forms platform. This questionnaire is made up of a total of 14 items, which could be answered by single, multiple or Likert-type responses with an ordinal measurement level of five points. It was administered in 18 Autonomous Regions (1. Andalusia; 2. Extremadura; 13. Galicia; 14. La Rioja; 15. Navarre; 16. Basque Country; 17. Principality of Asturias; 18. Region of Murcia), sent anonymously to different secondary schools during the 2020-2021 academic year.

The questionnaire was validated by 10 experts from different fields: (2) sustainable development, (2) secondary school teachers, (2) the Conference of Rectors of Spanish Universities (CRUE), (1) university experts, (2) questionnaire experts and (1) civilians. The reliability analysis showed good results for the instrument as a whole (TABLE II):

TABLE II. Reliability analysis of the survey

Ordinal Reliability	Raw_alpha (.893)
Ordinal Omega	Omega_h (.715)
	Omega.lim (.773)
	Alpha (.900)
Ordinal Theta	.938

Source: Compiled by author

Procedure

A descriptive and inferential analysis was performed, using a non-parametric test analysis using Pearson's Chi-Square ($p < .05$) through the statistical programme JAMOVI 2.2.5 and IBM Statistical Package for Social Sciences (SPSS) version 27.

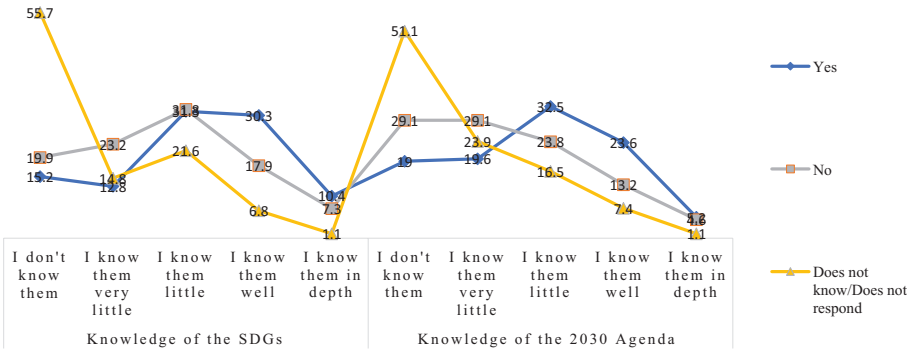
Received: 13/06/2022 Accepted: 28/1/2022

Results

It is important to begin by highlighting that, in the questionnaire on eco-social literacy administered, 94.2% of the teachers who responded considered that the basic concepts of environmental, social and economic sustainability should be part of the ESO curriculum.

In response to H1, we can say that the degree of knowledge of the 2030 Agenda (p = .000) and the SDGs (p = .000) on the part of teachers correlates significantly (p = < .05) with the development of awareness-raising projects and activities by the school. Teachers who teach in schools that develop awareness-raising and sensitisation projects and activities have a higher level of knowledge about the 2030 Agenda (17.4%; n = 144) and the SDGs (24.5%; n = 203) compared to those who do not know whether their school develops projects with this approach (22.7%; n = 188). This shows that developing projects linked to the SDGs at the school where they teach leads to greater awareness of moving towards education for sustainable development in the classroom in line with H2 (FIGURE I).

FIGURE I. Development of projects and activities at school and level of awareness of the 2030 Agenda and SDGs



Source: Compiled by author

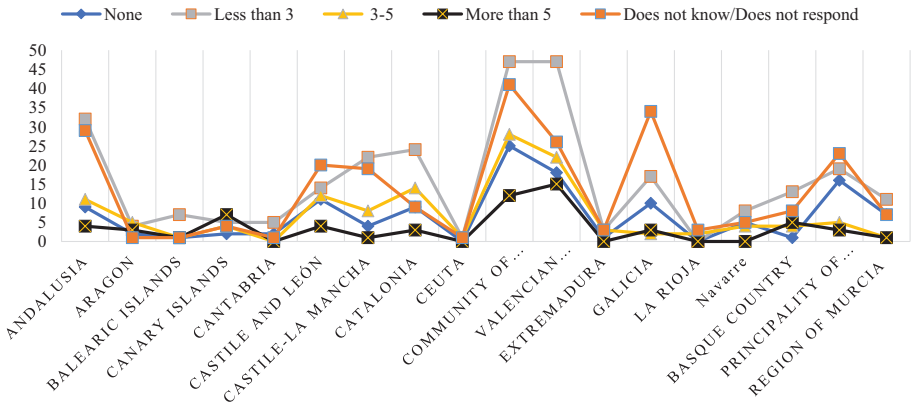
In turn, it is worth mentioning that there is a significant relationship (p = <.05) between the AC and the degree of knowledge that teachers have of the 2030 Agenda (p = .001) and the SDGs (p = .000), as well as between the AC and the development of projects and activities to raise

Received: 13/06/2022 Accepted: 28/1/2022

awareness of the importance of the SDGs (p = .000). 60.4% (n = 499) indicate that awareness-raising and sensitisation projects and activities on the importance of the SDGs are developed in their school, compared to 18.3% (n = 151) who say no, and 21.3% (n = 176) who do not know or do not answer.

Regarding the number of projects and activities implemented in the centre, their distribution is as follows: 14.9% (n = 123) indicate that none are developed, 33.8% (n = 279) indicate between one and two, 15.4% (n = 127) between three and five, 7.7% (n = 64) more than six, and 28.2% (n = 233) do not know or do not answer. In this sense, according to what was reported by the participants, the centres that develop the most projects and activities are those located in Andalusia, Castile and Leon, Castile-La Mancha, Catalonia, Community of Madrid, Community of Valencia, Basque Country and Principality of Asturias (FIGURE II).

FIGURE II. No. of projects and activities to raise awareness of the SDGs in education centres in the Autonomous Communities



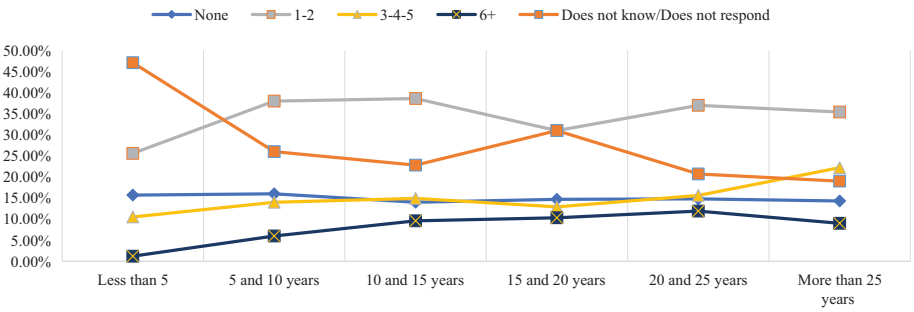
Source: Compiled by author

With regard to the number of years they have been teaching, the distribution is as follows: less than five years (20.8%; n = 172), between 5 and 10 years (12.1%; n = 100), between 10 and 15 years (13.8%; n = 114), between 15 and 20 years (14%; n = 116), between 20 and 25 years (16.3%; n = 135) and more than 25 years (22.9%; n = 189). It is confirmed that the

Received: 13/06/2022 Accepted: 28/1/2022

development of awareness-raising and sensitisation projects and activities by the school correlates with years of teaching (p = .001), specifically with those who have been teaching for less than five years (46.5%; n = 80) and those who have been teaching for more than 25 years (69.3%; n = 131). In addition, there is a significant relationship between the number of projects and activities the school has implemented (p = .000) and the years of teaching (FIGURE III).

FIGURE III. Distribution of the number of projects developed in the educational centres and the years of teaching practice



Source: Compiled by author

Regarding the development of curriculum competences and the degree of knowledge of the 2030 Agenda and the SDGs, there is a significant relationship (p = < .05) (TABLE III). Teachers who have a good or in-depth knowledge of the 2030 Agenda and the SDGs work on the following curriculum competences within the framework of the sustainable development approach: linguistic communication (14%, n = 116; 9.8%, n = 81 respectively), mathematics and basic competences in science and technology (13%, n = 107; 9. 92%, n = 82 correspondingly), digital (15%, n = 123; 10.6%, n = 88); learning to learn (19%, n = 156; 14%, n = 115); social and civic (25.5%, n = 211; 18%, n = 150); sense of initiative and entrepreneurship (15.4%, n = 128; 10.7%; n = 89), and cultural awareness and expressions (16.3%, n = 135; 11.2%, n = 93).

Received: 13/06/2022 Accepted: 28/1/2022

TABLE III. Significance relationship between the level of knowledge of the 2030 Agenda, the SDGs and the curriculum competences

COMPETENCES	DEGREE OF KNOWLEDGE	
	Agenda 2030 (X^2) Sig.	SDG (X^2) Sig.
Linguistic communication	(7,750) .101	(17,878) .001
Mathematics and basic science and technology	(16,916) .002	(17, 486).002
Digital	(25,860) .000	(29, 402) .000
Learning to learn	(13,341) .010	(26,331) .000
Social and civic	(14,348) .006	(24,002) .000
Sense of initiative and entrepreneurship	(12,931) .012	(21,416) .000
Cultural awareness and expression	(12,229) .016	(16,468) .002

Source: Compiled by author

The results obtained show that the higher the level of knowledge of the 2030 Agenda and the SDGs by secondary school teachers, the greater the awareness and sensitisation to promote sustainable development in the classroom.

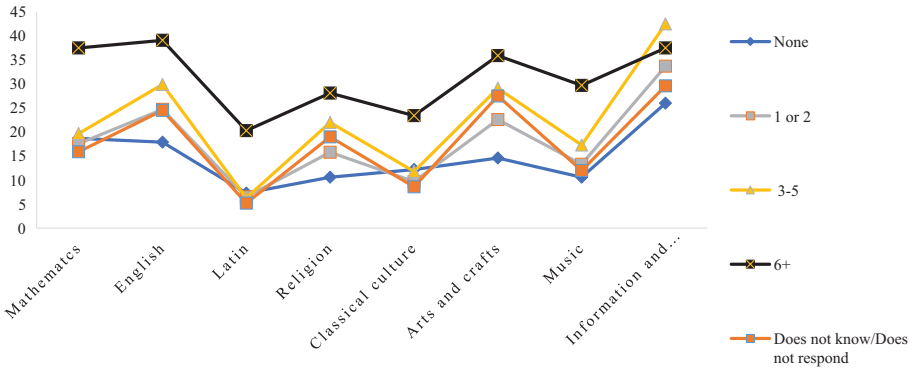
With regard to H2, developing projects and activities to raise awareness of the importance of the SDGs shows significant relationships (p = < .05) with linguistic competence (p = .036), learning to learn (p = .005), and social and civic competences (p = .003).

With regard to the variable Secondary Education subjects, significant relationships are detected between the degree of knowledge of the SDGs and the subjects of Economics (p = .023) (15%; n = 124), Initiation to Entrepreneurship and Business Activity (p = .049) (17.8%; n = 101), Ethical Values (p = .002) (17.4%; n = 144), and Scientific Culture (p = .008) (13.4%; n = 111), since the higher the degree of knowledge, the greater the implementation in the aforementioned subjects. There are no significant relationships between the subjects and the level of knowledge of the 2030 Agenda.

However, there are significant relationships (p = < .05) between the number of projects and activities to raise awareness of the importance of the SDGs that have been implemented in the school and the subjects Mathematics (p = .003), English (p = .002), Religion (p = .020), Plastic, Visual and Audiovisual Education (p = .007), and

Information and Communication Technology (p = .045) (FIGURE IV). The results show that the more projects are implemented in the school, the more they are incorporated into the subjects, especially in Mathematics, English, Art Education, and Information and Communication Technology.

FIGURE IV. Development of projects and activities and incorporation into the secondary secondary school curriculum



Source: Compiled by author

H2 of this research is accepted, as 77.5% (n = 640) of teachers reported having little, very little or no knowledge about the 2030 Agenda and 69.1% (n = 571) about the SDGs; compared to 22.5% (n = 186) and 30.9% (n = 255), respectively, who claim to know them well or in depth, showing that there are barriers to their embedding in the teaching-learning process towards the sustainability approach. Contradictorily, 78% (n = 644) of teachers' responses indicate that training is not a barrier; however, the analysis of the data reveals that there is a significant relationship (p = < .05) between the need for training by the teaching staff, the degree of knowledge of the 2030 Agenda (p = .003) and the SDGs (p = .000) (TABLE IV) to move towards curricular sustainability in the classroom.

TABLE IV. Difficulties in implementing sustainable development in the classroom depending on teachers' awareness of Agenda 2030 and SDGs

DIFFICULTIES	DEGREE OF KNOWLEDGE	
	Agenda 2030 (X^2) Sig.	**SDG (X^2) Sig.**
Excessive teaching load	(5,984) .200	(5,264) .261
Not explicit in the curriculum	(3,720) .445	(3,479).481
The school's organisational documents do not provide for it.	(2,217) .696	(1,141) .888
The teaching staff needs training	(16,084) .003	(20,279) .000
The management team does not consider it necessary	(2,545) .637	(1,885) .757
The educational community is not aware of it	(1,285) .864	(2,391) .664
I don't think it would entail any difficulty	(7,116) .130	(12,835) .012

Source: Compiled by author

In this sense, and in response to the second objective, the barriers detected to implement the 2030 Agenda and the SDGs in secondary classrooms seem to fall on the direct actions of teachers, which focus on the organisational management of time for curriculum innovation, with an excessive teaching load (25.9%; n = 214) and their own training (22%; n = 182) being understood as an obstacle to entering into processes of curriculum innovation in their own teaching practice.

Finally, there are significant differences between the difficulties in developing the 2030 Agenda and the SDGs in the classroom, and the development of activities and projects to raise awareness of the importance of the SDGs. In this sense, there is a significant relationship that could lead to difficulties in their implementation in 0.2% (n = 1) of teachers because the documents of the organisational centre do not contemplate it (p = .009) and in 8.4% (n = 42) because there is no culture of awareness in the educational community (p = .001).

Discussion

The transition towards a society based on sustainable development involves a long process of social learning (Fernández & Gutiérrez, 2014) and the school can be an essential vector in this construction. Following authors such as Bonil et al. (2012), any sustainability process to be

Received: 13/06/2022 Accepted: 28/1/2022

introduced in schools must respond to the integration of sustainability processes from a structural dimension that is reflected in policies, in the cultures of schools and in educational practices; that is committed to rethinking the teaching-learning process, facilitating a continuous dialogue with the context to find new ways of understanding the balance between human beings, nature and society. Our study, endorsing the bibliography mentioned, shows that the development of awareness-raising and sensitisation projects and activities by the centre is configured as a facilitating variable for change in educational practices.

In the light of the evidence found regarding possible barriers to the implementation of actions for sustainability, centred on the excess of teaching hours and the need for training, in line with the results of Pramling and Kaga, (2008), it is necessary to incorporate teaching innovation as a key process for the sustainability of schools and curricula in Compulsory Secondary Education through processes of reflection and construction of meanings that enable teachers to empower themselves to guide their professional knowledge (Martínez, 2022), while promoting a process of shared leadership with the educational community, as indicated by Inoue et al. (2017), for the construction of conceptual, procedural and attitudinal content from the interdisciplinary complexity required to understand and respond to the current challenges of the planet (Albareda et al., 2017; Lasen et al., 2017). Change and quality in education "do not come from a clear and precise design, whether in the formulation of objectives or competences, but from the demand for the empowerment and professional autonomy of teachers" (Martínez, 2022, p.139), which is why teaching innovation from the classroom-school context could be an enhancer for the know-how of teachers towards a collective formulation of new goals and strategies aimed at building education from the complexity and uncertainty of the processes involved in the current model of human development.

The limited knowledge of the SDGs and the 2030 Agenda itself among the teachers interviewed, in line with the research carried out by Inoue et al. (2017), and the small number of projects of this nature in terms of years of professional practice, leads to the need to address intergenerational training processes. Through contextualised training –initial and ongoing– that allows us to respond to collaborative needs (Imbernón, 2022), we will move towards the creation of new school environments that foster dialogic processes to address local and global eco-social challenges and challenges within formative contexts (Novoa & Alvim, 2022).

We believe, like authors such as Sureda-Negre et al. (2013), that one of the causes of the low level of knowledge among teachers and the low number of educational projects on sustainability in schools is the fragmented and unbalanced approach to the term that was included in Royal Decree 1631/2006, which develops a competency framework based on the so-called key competences for lifelong learning (Unión Europea, 2007), without including competences in sustainability. Perhaps the new decree on minimum teachings, Royal Decree 217/2022 of 29 March, which establishes the organisation and minimum teachings of Compulsory Secondary Education, will enable greater development of the key competences in current education systems (Patta-Tomas & Murga-Menoyo, 2020) by making their incorporation explicit, albeit in a transversal manner, in the training that students must attain at the end of this stage. Even so, we consider that the absence in the current regulatory framework of what are known as sustainability competences –incorporated as key, specific or transversal competences– could be a barrier to the implementation of actions leading to curricular sustainability.

Conclusions

Incorporating the sustainability approach in secondary education classrooms requires identifying possible barriers that may be present in teaching practices in order to provide keys that can "contribute to the education of a responsible citizenry, prepared to participate in decision-making and to address the serious socio-environmental problems facing humanity by adopting informed measures" (Vilches & Gil, 2012, p.25).

The results of the research presented here identify some challenges that need to be addressed not only by the education community, but also through policy frameworks. These correspond to the need to:

- Incorporate key competences in the field of sustainability –systemic thinking, anticipatory thinking, strategic thinking, collaboration, critical thinking, self-awareness and problem solving– into teacher training (UNESCO, 2017), so that they can transfer them to their practices. It is therefore necessary to focus on contextualised initial and ongoing teacher training that equitably and fairly guarantees the training of a citizenry that is sensitive and committed to current and future environmental and socio-economic needs and demands.

Received: 13/06/2022 Accepted: 28/1/2022

- Reinforce the training and professional development of secondary school teachers who have been teaching for between 5 and 25 years, so that they receive training in the sustainability approach, since in the light of the results obtained, they are less involved in the development of projects and activities linked to the sustainability approach. Incorporate this group into reflective theoretical-practical training processes (Martínez, 2022) that are constructive of meanings, based on the problematisation derived from current development models and leading to the construction of a teaching identity aligned with the sustainability approach, as they are a fundamental vector of change in the short and medium term and therefore of impact on future generations.
- It is considered necessary for schools to develop interdisciplinary projects or other types of activities linked to the sustainability approach, providing spaces during school hours to "deliberate on how to do things together, to make decisions collegially and to train in choice and responsibility" (Meirieu, 2022, p.187), for teachers to acquire not only a greater awareness and knowledge, but to embed it in their teaching practice with a holistic approach, integrating the various purposes of education: social, economic, cultural, ethical, environmental or otherwise. Only in this way can we move towards a systemic transformation of the current approach of conceiving education as watertight, non-interconnected disciplines.
- Educational communities need to be made aware of the importance of education for sustainable development, driven by the teaching staff, in order to achieve the multiplier effect of education.

To reduce them, some key points are proposed that can be taken into account. These are:

- Promoting educational policies that ensure the incorporation of the sustainability approach in the teaching-learning processes in order to respond to social requirements, promote values and build a more united world (Meirieu, 2022).
- Teacher training to promote awareness and sensitisation, while providing teaching tools to promote a transformative approach in the different subjects from a holistic and interdisciplinary approach

(Alcalá et al., 2020), as it has been ratified, as a key vector, that the degree of knowledge of the 2030 Agenda and the SDGs by secondary school teachers is a facilitator for incorporating the sustainability approach in the classroom.

- Having management and teaching teams in schools that exercise leadership in favour of the sustainability approach, with a proactive attitude towards change, moving towards more humanistic educational models, sharing a clear vision of a sustainable future, and being able to foster innovative processes that promote curricular sustainability.
- Considering the advisability of creating, strengthening and reinforcing inter-school collaboration networks with a vocation to grow and project themselves towards state and international networks (Fernández & Gutiérrez, 2014).

Limitations and prospects

The study presented here, although it explores the level of knowledge of secondary school teachers on sustainability and identifies some challenges that need to be faced in order to promote curricular sustainability in their classrooms, may be limited by the fact that the questionnaire does not include a question aimed at identifying the teaching specialty, since the current challenges facing the planet require a holistic and interdisciplinary approach, and not just a reference to subjects such as Biology and Geology, and/or Physics and Chemistry with a high degree of awareness and sensitivity to environmental issues, as is reflected in the study in the question asked about which subjects would incorporate the sustainability approach.

Royal Decree 217/2022, of 29 March (BOE, 2022), incorporates education for sustainability as a pedagogical principle to be developed in a cross-cutting manner; as well as specifying for the ESO exit profile that the key competences should be linked to the main global challenges of the 21st century (UNESCO, 2019), as well as the Sustainable Development Goals of the 2030 Agenda (UN, 2015).

This new pedagogical principle, which is incorporated into the current regulatory framework for ESO, is based on the need for knowledge, skills and attitudes to be addressed from a holistic and systemic approach to the different areas, fields and subjects that make up the curriculum.

Received: 13/06/2022 Accepted: 28/1/2022

This questioning leads us to consider that it would be interesting to investigate curricular sustainability in secondary classrooms according to the teaching specialty, in order to detect the real challenges, according to specialty, to which teachers are exposed in their teaching practice in the face of the challenge of the approach of education for sustainable development, and to propose possible keys that contribute to improving the teaching-learning process.

Do secondary school teachers understand sustainability as a holistic, systemic and therefore interdisciplinary construct that must modify teaching practices? Does the specialisation of secondary school teachers mediate the incorporation of the sustainability approach? These questions lead us to think that, although a high percentage of the teachers participating in the study may not have considered training as an obstacle to curricular sustainability, there is still a need, in the face of this new pedagogical challenge, for an update in the ongoing training of teachers.

Bibliographical references

Albareda, S., Fernández, M., Mallarach, J.M., & Vidal, S. (2017). Barreras para la sostenibilidad integral en la Universidad. *Revista Iberoamericana de Educación, 73*, 253-272. https://doi.org/10.35362/rie730301

Alcalá, M.J., Santos, M.J., Leiva, J.J., & Matas, A. (2020). Sostenibilidad curricular: una mirada desde las aportaciones del profesorado de la Universidad de Málaga. *Revista Internacional de Educación para la Justicia Social, 9*(2), 309-326. https://doi.org/10.15366/riejs2020.9.2.015

Álvarez-García, O., Sureda-Negre, J., & Comas-Forgas, R. (2018). Evaluación de las competencias ambientales del profesorado de primaria en formación inicial: estudio de caso. *Enseñanza de las Ciencias, 36*(1), 117-141. https://doi.org/10.5565/rev/ensciencias.2338

Azcárate, P., González-Aragón, C., Guerrero-Bey, A., & Cardeñoso, J.M. (2016). Análisis de la presencia de la sostenibilidad en los planes de estudios de los grados: un instrumento para su análisis. *Educar, 52*(2), 263-284. http://dx.doi.org/10.5565/rev/educar.745

Aznar, P., Ull, M.A., Martínez-Agut, M.P., & Piñero, A. (2017). La evaluación de la formación de formadores. Un catalizador en el proceso de cambio curricular hacia la sostenibilidad. *Revista Iberoamericana de Educación,* 73, 225-252. https://doi.org/10.35362/rie730300

Received: 13/06/2022 Accepted: 28/1/2022

Bermúdez, G., & Lía, A. (2008). La educación ambiental y la ecología como ciencia. Una discusión necesaria para la enseñanza. *Revista Electrónica de Enseñanza de las Ciencias,* 7 (2), 275-297. http://reec.uvigo.es/volumenes/volumen7/ART1_Vol7_N2.pdf

Bonil, J., Calafell, G., Granados, J., Junyent, M., & Tarín R.M. (2012). Un modelo formativo para avanzar en la ambientalización curricular. *Profesorado. Revista de currículum y formación del profesorado, 16*(2),145-163. https://recyt.fecyt.es/index.php/profesorado/article/view/43723

Brundiers, K., Barth, M., Cebrián, G., Cohen, M., Diaz, L., Doucette-Remington, S., Dripps, W., Habron, G., Harré, N., Jarchow, M., Losch, K., Michel, J., Mochizuki, Y., Rieckmann, M., Parnell, R., Walker, P., & Zint, M. (2021). Key competencies in sustainability in higher education-toward an agreed-upon reference framework. *Sustainability Science, 16*, 13-29. https://doi.org/10.1007/s11625-020-00838-2

Calero, M., Mayoral, O., Ull, Á., & Vilches, A. (2019). La educación para la sostenibilidad en la formación del profesorado de ciencias experimentales en Secundaria. *Enseñanza de las ciencias: revista de investigación y experiencias didácticas, 37*(1), 157-75. https://doi.org/10.5565/rev/ensciencias.2605

Fernández, R., & Casado, O. (2017). "Somos uno". La educación como motor de cambio social. Revista de Infancia, *Educación y Aprendizaje, 3*(2), 486-491. https://revistas.uv.cl/index.php/IEYA/article/view/768/744

Fernández, M.A., & Gutiérrez, J.M. (2014). *La educación hacia la sostenibilidad en la CAPV. Contribución de la educación ambiental a la difusión de la cultura de la sostenibilidad.* Eusko Jaurlaritzaren Argitalpen Zerbitzu Nagusia.

Filho, W.L., Brandili, L.L., Castro, P.C., & Newman, J. (2017). *Handbook of Theory and Practice of Sustainable Development in Higher Education.* Springer

Fundación Benéfico-Social Hogar del empleado (FUHEM). (2018). *Educar para la transformación ecosocial. Orientaciones para la incorporación de la dimensión ecosocial al currículo.* FUHEM ecosocial

Gil, D., Vilches, A., Toscano, J.C., & Macías, Ó. (2006). Década de la Educación para un Futuro sostenible (2005-2014): un punto de inflexión necesario en la atención a la situación del planeta. *Revista Iberoamericana de Educación, 40*(1), 125-178. https://rieoei.org/historico/documentos/rie40a06.pdf

Imbernón, F. (2022). Políticas y prácticas educativas en la formación del profesorado. En En C. Rodríguez y F. Imbernón (Coords.), *De las políticas educativas a las prácticas escolares* (pp. 283-296). Morata

Inoue, M., O'Gorman, L., Davis, J., & Ji, O. (2017). An international comparison of early childhood educator's understandings and practices in education for sustainability in Japan, Australian, and Korea. *International Journal of Early Childhood, 49*, 353-373. https://doi.org/10.1007/s13158-017-0205-5

Lansen, M., Skamp, K., & Simoncini, K. (2017). Teacher perceptions and self-reported practices of education for sustainability in the early years of primary school: An Australian case study. *International Journal of Early Childhood, 39*, 391-410. https://doi.org/10.1007/s13158-017-0200-x

Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. *Boletín Oficial del Estado (BOE),* núm. 340, de 30 de diciembre de 2020, 122868-122953.

Martínez, J. (2022). Políticas del currículum: complejidad, participación, culturas y hegemonía. En C. Rodríguez y F. Imbernón (Coords.), *De las políticas educativas a las prácticas escolares* (pp. 133-150). Morata

McKeown-Ice, R. (2000). Environmental education in the United States: A survey of preservice teacher education programs. *Journal of Environmental Education, 32*(1), 4-11. https://doi.org/10.1080/00958960009598666

Meirieu, P. (2022). Fines y modos de nuestras instituciones educativas. En C. Rodríguez y F. Imbernón (Coords.), *De las políticas educativas a las prácticas escolares* (pp.187-198). Morata

Murga-Menoyo, M.Á., & Novo, M. (2014). Sostenibilizar el currículum. La Carta de la Tierra como marco teórico. *EDETANIA, 46*, 163-179. https://revistas.ucv.es/edetania/index.php/Edetania/article/view/166/141

Murga-Menoyo, M.Á., & Novo, M. (2017). Sostenibilidad, desarrollo `glocal´ y ciudadanía planetaria. Referentes de una pedagogía para el desarrollo sostenible. *Teoría de la Educación. Revista Interuniversitaria, 29*(1), 55-78. https://doi.org/10.14201/teoredu2915579

Murga-Menoyo, M. Á. (2021). La educación en el Antropoceno. Posibilismo versus utopía. *Teoría de la Educación. Revista Interuniversitaria, 33*(2), 107-128. https://doi.org/10.14201/teri.25375

Novoa, A., & Alvim, Y. (2022). Los profesores después de la pandemia. En C. Rodríguez y F. Imbernón (Coords.), *De las políticas educativas a las prácticas escolares* (pp. 29-48). Morata

Received: 13/06/2022 Accepted: 28/1/2022

Olaskoaga-Larrauri, J., Guerenabarrena-Cortazar, L., & Cilleruelo-Carrasco, E. (2021). Academic staff attitudes and barriers to integrating sustainability in the curriculum at Spanish universities. *Culture and Education, 33*(2), 373-396. https://doi.org/10.1080/11356405.2021.1905957

Orden ECI/3858/2007, de 27 de diciembre, por la que se establecen los requisitos para la verificación de los títulos universitarios oficiales que habiliten para el ejercicio de las profesiones de Profesor de Educación Secundaria Obligatoria y Bachillerato, Formación Profesional y Enseñanzas de Idiomas. *Boletín Oficial del Estado (BOE),* núm. 312, de 29 de diciembre de 2007, 1-6.

Patta-Tomás, M., & Murga-Menoyo, M.A. (2020). El marco curricular de la Educación Secundaria Obligatoria: posibilidades para la formación de competencias en sostenibilidad. *Revista internacional de comunicación y desarrollo, 3*(13), 90-109. https://doi.org/10.1080/11356405.2021.1905957

Pramling, I., & Kaga, Y. (2008). *The contribution of early childhood education to a sustainable society*. UNESCO

Real Decreto 217/2022, de 29 de marzo, por el que se establece la ordenación y las enseñanzas mínimas de la Educación Secundaria Obligatoria. *Boletín Oficial del Estado (BOE),* núm. 76, de 30 de marzo de 2022, 41571-41789.

Reyes, M.M. (2010). La formación del profesorado Motor de cambio en la escuela del siglo XXI. *Revista de Educación Inclusiva, 3*(3), 89-102. https://revistaeducacioninclusiva.es/index.php/REI/article/view/175/169

Scharenberg, K., Waltner, E.M., Mischo, C., & Rieß, W. (2021). Development of students' Sustainability Competencies: Do teachers make a difference? *Sustainability, 13*(22), 12594. https://doi.org/10.3390/su132212594

Southwell, M. (2013). *La escuela ante nuevos desafíos: participación, ciudadanía y nuevas alfabetizaciones*. Santillana

Sureda-Negre, J., Catalán-Fernández, A., Álvarez-García, O., & Comas-Forgas, R. (2013). El concepto de "desarrollo sostenible" en la regulación del currículum de la Educación Secundaria Obligatoria en España**.** *Estudios Pedagógicos, 39(1*), 253-267. http://dx.doi.org/10.4067/S0718-07052013000100015

Unión Europea. (2007). *Competencias clave para el Aprendizaje Permanente. Un marco de Referencia Europeo.* https://n9.cl/483y

Received: 13/06/2022 Accepted: 28/1/2022

United Nations (UN). (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

United Nations Educational, Scientific and Cultural Organization (UNESCO). (s.f.). *UN Decade of ESD*. https://en.unesco.org/themes/education-sustainable-development/what-is-esd/un-decade-of-esd

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2017). *Education for Sustainable Development Goals: learning objectives*. https://unesdoc.unesco.org/ark:/48223/pf0000247444

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2019). *Reconceptualizing and Repositioning Curriculum in the 21st Centurty: A Global Paradigm Shif*. http://www.ibe.unesco.org/es/news/reconceptualizing-and-repositioning-curriculum-21st-c-global-paradigm-shift

Valderrama, R., Alcántara, L., Sánchez, F., Caballero, D., Gil, D., Vidal, S. & Miñano, R. (2020). ¿Forma en sostenibilidad el sistema universitario español? Visión del alumnado de cuatro universidades. *Educación XXI*, 23(1), 221-245. https://doi.org/10.5944/educxx1.23420

Vilches, A., & Gil, D. (2012). La educación para la sostenibilidad en la universidad: el reto de la formación del profesorado. *Profesorado. Revista de Currículum y Formación del Profesorado, 16*(2), 26-43. https://www.ugr.es/~recfpro/rev162ART3.pdf

Vilches, A., & Gil, D. (2013). La ciencia de la sostenibilidad en la formación del profesorado de ciencias. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias, 10*(número extraordinario), 749-762. http://dx.doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2013.v10.iextra.17

Contact address: Belén Sáenz-Rico de Santiago. Universidad Complutense de Madrid, Facultad de Educación, Dpto. Estudios Educativos. Edificio – La Almudena. C/Rector Royo Villanova, 1. Ciudad Universitaria (28040, Madrid). E-mail: bsaenzri@edu.ucm.es

Received: 13/06/2022 Accepted: 28/1/2022