Training Secondary Education Teachers through the Prism of Sustainability: The Case of the Universitat de València

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Abstract: Designing the training of future teachers through holistic and interdisciplinary visions is vital to developing coherent contents, epistemologies, and methodologies that put Education for Sustainability into action. The research presented here analyzes the teaching guides from the curriculum for the Master's Degree in Secondary Education Teaching at the Universitat de València (Spain). A collaborative study on the inclusion of sustainability in a selected sample of teaching guides was conducted from an Action/Research methodological approach. The study includes an analysis of the competences identified by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and their expected contribution to the 17 SDGs in the United Nations 2030 Agenda. The results of this research point to the need to promote collaborative work across disciplines in order to engage teachers in the transition to sustainability and encourage them to participate in the research process.

1. Introduction

For decades, international appeals and national regulations alike have underscored the urgency, complexity, and multidimensionality of different socio-environmental issues and of the need to start taking steps toward solving them. Chief among the most recent initiatives was the approval of the 17 Sustainable Development Goals (SDGs) and the 169 Targets at the 2015 Summit of the United Nations held in New York, and the 2030 Agenda for starting them called "Transforming Our World: the 2030 Agenda for Sustainable Development" [1]. This Agenda sets 17 interrelated goals to address a wide range of social, economic, and environmental challenges. Achieving them will require deep transformations in how people act and behave as well as in how societies and economies function. One of the main SDGs is Goal 4, regarding education, a target which mentions the need to ensure that every student acquires the knowledge and competences needed to promote Sustainable Development.

Essential to achieving this goal is the teacher, which implies paying close attention to the teacher's initial and ongoing training in sustainability. This need had already been formulated years earlier, particularly in Agenda 21, which called on teachers at every level and in every subject matter, in formal

and informal education, to contribute to Education for Sustainable Development (ESD) in preparing responsible citizens for the difficulties mankind now faces.

These goals were promoted by the United Nations Decade of Education for Sustainable Development (2005–2014). Its final report was presented at the World Conference on Education for Sustainable Development in November 2014, which not only assessed the achievements made over the decade, but also approved a World Action Plan to give continuity to the goals of the ESD.

However, discourse on sustainability and all its normative referents still coexist today with inertias associated with anthropocentric behavior. Businesses, public administrations, mass media, cultural and scientific output, civil society, and individual people all put up resistance to this discourse, more or less explicitly since they tend to accommodate themselves to the inertias of the system. In the context of the Spanish university, there are resistances to this necessary paradigm shift alongside good practices for transitioning to sustainability. Curricular initiatives are being developed, aimed at strengthening Education for Sustainability by means of a systemic, cross-disciplinary approach to training. One noteworthy initiative is at the Universitat de València [2].

However, despite the fact that teaching institutions have been integrating sustainability into their curricula for years and good practices can be found in many different countries and at all levels and contexts of education [3,4], the much-needed reorientation towards sustainability of the curriculum has yet to take place [5–9]. The latest reviews of the literature coincide in their affirmation that professional training, particularly of future teachers, needs to be re-thought if it means to contribute to the transition to sustainable societies [10,11]. As a result, a wide range of organizations talk today of the urgent need to transition to sustainability [12–14].

A certain amount of progress has been made in that regard in the field of Higher Education. Back in 2005, the Copernicus Network, consisting of more than 300 European universities, approved the document called "Sustainable Bologna: Recommendations for Sustainable Development", a plan with specific proposals for making headway in processes of curricular sustainability of university degrees. Furthermore, in 2005, the United Nations Educational, Scientific and Cultural Organization (UNESCO) highlighted "the competences model" as an innovative method for integrating sustainability in initial and ongoing teacher training in which every teacher and discipline can contribute to education for sustainability. The organization went on to issue guidelines and recommendations aimed at reorienting teacher training to take on sustainability, goals that UNESCO continues promoting today through the Global Action Program (GAP) [15], which covers policies and practices in ESD matters.

Similarly, the Conference of Deans of Spanish Universities (CRUE, in its Spanish original) approved a document called *Guidelines for Curricular Sustainability* in 2005 [16], which was revised and reaffirmed in 2012. The document stated that all degree programs need to incorporate teaching methods and contents that will provide future decision-makers with not only technical competences but also ethical competences to address the complex mesh of needs of our planet and the people who inhabit it:

> "The University must not limit itself to creating disciplinary knowledge and developing competences; as part of a broader cultural system, its role is also to teach, foster, and develop the values and attitudes society truly needs. Universities must prepare professionals to be able to use knowledge not only in a scientific context but also for social and environmental needs. This does not mean adding another layer to the academic aspects of education, but rather to view the entire education process holistically, examining how learners will interact with others in their professional career, directly and indirectly." (CRUE, 2012. 2)

Context and Aims of the Study

The present article aims to address the different appeals for the educational community to incorporate sustainability in education. This research forms part of a broader project aimed at analyzing the inclusion of sustainability in the coursework in the Master's Degree in Secondary Education Teaching at several universities in Spain. The project conforms and strengthens collaborative work

groups among faculty members as a way to encourage them to include the acquisition of competences for sustainability in their training goals of their teaching, and to decide on the means, resources, and procedures needed to achieve them.

The ethical perspective and educational model of the Earth Charter constitute the epistemological framework [17] of the project in which this research takes part, as well as the preceding empirical research resulting from collaboration with researchers from the National Distance Education University (UNED). The principals and core values of the educational model defended here have their cornerstone in the concept of interdependency, from the intellectual perspective as well as the emotional [18]. This epistemological framework and the collaboration among researchers made it possible to detect needs and gaps in training from the point of view of curricular sustainability at both universities as well as assessing teaching methodologies to contribute to education for sustainable development [19–23]. More recently, it has permitted making and testing instruments to diagnose students and teachers' literacy in matters of sustainability [9,24].

In Spain, since 2007, secondary education teacher training requires future teachers to obtain a Master's Degree (MD) in Secondary Education Teaching, a one-year program aimed at university graduates who are interested in teaching at the high school level. This Master's Degree program is offered at all the Spanish universities and consists of a set of courses related to 24 specializations. Our research here focuses on the context of this MD in Secondary Education Teaching offered at the Universitat de València, which offers all the possible specializations.

The inclusion of Sustainability as a transversal dimension that must permeate the curriculum has been the motivating factor in this line of research. The final aim is to involve teachers in the Master's Degree program in collaborative teams to analyze the teaching guides of the Master's courses to find out if the principles and values of sustainability are included or not in the teaching projects and practices in those courses. The teaching guides (competences, syllabus, and methodological and assessment orientations) for each subject were analyzed with respect to the *four competences for sustainability proposed by UNESCO* [15] and the seventeen SDGs in the framework of the 2030 Agenda [1].

This method has provided continuity to the inclusion of sustainability in the curriculum at the different levels of teaching and especially in teacher training, which has been underway for a long time [13,25–28]. In addition, a growing number of institutions are acknowledging the need to include ethical and technical competences for developing sustainability into their coursework as an added value to the quality of their university degrees.

2. Materials and Methods

The Master's Degree in Secondary Education Teaching at the Universitat de València has an annual enrolment of approximately 1000 future teachers. The research was carried out in the academic year 2016–2017, in which 980 students were enrolled in the MD program.

The work presented here is based on the Action/Research approach as a relevant methodology for the study of an academic question in order to improve the quality of action within it. The Action/Research methodology features two characteristics we found to be relevant to our research purposes:

- It includes activities developed by teaching teams with the purpose of improving the usual practice through a process of inquiry about shared proposals.
- It is a reflective practice, where no distinction can be made between the practice being investigated and the research process of that practice [29].

The participatory research we have carried out represents a methodological proposal for the change towards the inclusion of sustainability in the teaching-learning processes; it is a scientific perspective to stimulate, support and facilitate the transformation processes; i.e., to build knowledge by transforming.

This methodological approach, with a critical perspective, was used to come up with a design that considers the following basic principles:

- The design is closely linked, conceptually and practically, with action-intervention
- Teachers themselves become intervention agents
- The processes are carried out and used by the teachers themselves
- The analysis and interpretation of data is done collaboratively, seeking consensus through three disciplinary dialogue seminars

Based on these premises, a representative sample of the teaching guides was analyzed by collaborative groups of teachers in the Master´s Degree program. These working groups had two main goals regarding the teaching guides:

- To identify explicit references to ESD and general sustainability in the different sections of the teaching guides, as described in Section 2.1.
- To detect occasions in which it is both necessary and possible to call attention to sustainability but it is not being done.

A representative sample was selected consisting of six of the 24 areas of specializations in the Master's Degree at the Universitat de València. The sample of teaching guides to be analyzed was chosen using a non-probabilistic sampling suitable for this type of research. The selection was made trying to include a representation of all the big knowledge areas, considering that sustainability needs to be addressed in all specializations. The sample includes 21 subjects that make up six specializations in the Universitat de València's Master's Degree in Secondary Education Teaching. The sample includes subjects of the specializations of Biology-Geology, Economics, Physical Education, Physics-Chemistry, Sociocultural and Community Services, and Geography-History. In each of the six specializations, two subjects were chosen from the common generic module (*Educational Processes and Contexts* (PC) for eight credit hours, and *Society, Family, and Education* (SFE) for four credit hours) and two courses from the specific module (*Learning and Teaching the subject* (LT), for 16 credit hours and *Complements for Disciplinary Training* (CDT), for six credit hours). In total the 14 teaching guides of those courses were studied, since the two common courses have the same course outline for all the specializations.

Collaborative work teams were formed among teachers of the Master's Degree in the chosen specializations in conjunction with the people who coordinate these specializations (coordinators). It was the coordinators' role to approach all the teachers of each specialization and to include in the teaching guides the necessary changes decided in the collaborative groups. Workshop seminars were held to sensitize and engage the participating teachers using holistic and interdisciplinary views to develop inclusive epistemologies, methodologies, and contents to be considered in the learning and teaching of sustainability. At the seminars, the teachers analyzed the guides using the same criteria as the researchers of this paper did, as discussed in the section below. In total, three seminar-workshops were organized, in which the teachers reflected in working groups, contrasting different ideas, consensus and differences, always with the support of the research team. These two-hour seminars were always held after an expert conference on the issue of Sustainability, as a starting point for reflection and collective debate. In the different sessions, the participants analyzed the teaching guides of their specialty, pointing out the attention given to ESD, detecting inadequacies and achievements and, in particular, when possible, suggesting ways to incorporate sustainability in the teaching-learning processes, as well as linking the contents and different sections of the guides with teachers' real teaching practices. Consensus was sought in order to incorporate sustainability wherever suitable and possible to start up in their classes with the future Secondary Education teachers.

2.1. Categories and Criteria for Analysis

In order to analyze the inclusion of sustainability in the Master's Degree curriculum, the following categories of analysis were selected from the teaching guides:

(1)   Explicit mention of the terms Sustainable Development/Sustainability: SD/SUST (or similar expressions such as Sustainable future, ESD, etc.).

(2)   Reference to the four competences for sustainability proposed by UNESCO in 2014 [15]: Systemic reflection; Critical analysis; Intergenerational responsibility; and Collaborative decision-making.

(3)   Reference to the Sustainable Development Goals within the 2030 Agenda framework [1].

The categories of analysis were applied to the different sections of the teaching guides by using the abbreviations in Table 1 to indicate the section in which each category appears (GC: General Competences, SC: Specific Competences).

Table 1. Abbreviations used in the sections analyzed in the teaching guides from the MD in Secondary Education Teaching.

Section in the Teaching Guide	Abbreviation
Competences	C (GC or SC)
Learning outcomes	LO
Contents (topics)	CON
Methodology	METH
Bibliographic References	REF
Evaluation	EVA

The criteria followed for the analysis were the following:

-   It was carried out independently by peers, with all the researchers in the project reaching a consensus on the results.

-   Even vague or indirect references were taken into consideration, bearing in mind the objectives of this research.

All the teaching guides are public and can be checked on the Master's Degree website [30].

3. Results

Shown below are the results from detailed analysis of the teaching guides of the selected courses in the Master's Degree in Secondary Education Teaching. The description is articulated in relation to the three dimensions of analysis stated above: explicit mention of the terms Sustainable Development/Sustainability, the four competences for sustainability proposed by UNESCO [15], and the 17 Sustainable Development Goals within the framework of the 2030 Agenda [1].

3.1. Results Obtained in the Analysis of Explicit References to SD/SUST

Explicit reference to the terms Sustainable Development or Sustainability were found in the Competences of 13 of the 14 teaching guides analyzed, with Specific Competence SC5 of the Master's Program being understood as a specific reference appearing in all 13 guides. That competence is formulated in the following terms:

SC 5. *Design and develop learning spaces with special attention to equality, emotional and values education, equal rights and opportunities for men and women, citizenship training, and respect for human rights that facilitate life in society, decision-making and the building of a sustainable future.*

The competence corresponds to the one set forth in ORDER ECI/3858/2007 of December 27 [29] establishing the requirements for verifying official university degrees that certify professionals to teach Compulsory Secondary Education and Upper Secondary Education, Vocational Training, and the Teaching of Foreign Languages.

Explicit reference to Sustainability also appears in the Contents and in the Learning Outcomes in three of the teaching guides analyzed. For example, in the case of the course outline from the course

called *Society, Family, and Teaching*, one of the learning outcomes states "Develop learning spaces that promote equality, social harmony, sustainability, and decision-making", and in the Contents section in the block called *Relationship of the school system with the social structure and social change* there is a section on "School and Community. Education for equality and for diversity. Education and democracy. Political and ecological training of citizenship".

As regards developing specific contents for the discipline that directly affect the inclusion of socioeconomic, environmental, and cultural aspects closely tied to sustainability, the specific course called "Learning and Teaching the Economy" stands out as noteworthy. The contents section of this course outline includes several teaching units with subject matter on sustainability, such as the contents of Topic 3: "Economic slowdown and its unequal impact on the world"; in Topic 6: "Environmental impact of economic activities: development and sustainability; environment and management of the economy; Defending the environment as an economic and social opportunity" and in Topic 9: "The economy and values—economy and environment—economy and gender equality—civic economy and moral choices—economy and education for peace".

Although Competence SC 5 is explicitly referenced in most of the teaching guides analyzed, its development does not always ensure its acquisition, and little attention is paid to the culture of sustainability. In general, the contents, the learning outcomes, the bibliographic sources, the epistemologies, and the teaching methodologies and evaluation methods outlined in the teaching guides rarely facilitate development of Competence SC 5 or its evaluation. Despite the fact that the guides were found to contain a few elements showing interest in socio-economic, environmental and cultural aspects closely tied with sustainability, in far too many cases the guides failed to display the necessary attention to sustainability and ESD.

3.2. Results from the Analysis of Attention to the References to the Four Competences for Sustainability Defined by UNESCO

The teaching guides were analyzed in terms of the four competences for sustainability proposed by UNESCO in the document "Roadmap for Implementing the Global Action Program on Education for Sustainable Development" [15]. These four competences are: systemic reflection, critical analysis, sense of responsibility toward present and future generations, and collaborative decision-making. The results can be seen on Table 2.

Table 2. Number and percentage of teaching guides with references to the UNESCO competences for sustainability.

	Learning Outcomes		Contents		Methodology		Bibliographic References	
UNESCO Competence	**N = 14**	**%**	**N = 14**	**%**	**N = 14**	**%**	**N = 14**	**%**
Systemic reflection	6	42.8	6	42.8	1	7.1	5	35.7
Critical analysis	5	35.7	7	50	7	50	5	35.7
Generational responsibility	5	35.7	6	42.8	0	0	6	42.8
Collaborative decision-making	0	0	2	14.3	6	42.8	4	28.8

As shown in Table 2, the competence for *systemic reflection* appears more or less explicitly in fewer than half the teaching guides analyzed as a learning outcome (in six of the 14 teaching guides analyzed) and as content (in six of the 14). It is also telling that it only appears once in relation to methodological aspects. Competence for systemic reflection is essential to understanding the vulnerability of the Earth and its interdependencies. To develop it requires putting into action a methodological component, especially in terms of changes in the models of learning and teaching.

The competence for *critical analysis* requires methodologies that present the contents in a dynamic context and stimulate students to build their own knowledge and opinion and can step back and revise

it from different coordinates. Critical analysis appears, though often very indirectly, only in roughly one third of the teaching guides as a learning outcome (in five of the 14).

The competence involving *generational responsibility* requires learning and teaching to understand the causes underlying unsustainable situations, concerning oneself about present urgent matters, and especially, taking future generations into account and the planet they will inherit, so that it can support their own needs. This competence was identified indirectly in roughly one third of the teaching guides as a learning outcome (in five of the 14). It appears implicitly referenced in nearly half of the guides (in six of the 14).

In contrast, the competence on *collaborative decision-making* was not found among any of the learning outcomes in the teaching guides. It appears in only two of the 14 guides as learning content. Its presence in the section on methodology is slightly greater: it appears in six of the 14 teaching guides. However, it is not articulated in any consistent fashion with the rest of the items in the guides, which casts doubt on what effects it may have on teaching and learning. This is true except in the case of the subject *Learning and Teaching of Physics and Chemistry*, in which the references appear in all the sections of the teaching guide, both in the competences and in the learning results, in the content, in the methodology, and in the bibliographical references. The following examples can be highlighted: training of critical citizens, problem-based learning, or cooperative learning.

3.3. Results of the Analysis Regarding Explicit References in the Teaching Guides to the 17 SDGs and the 2030 Agenda

The next step after giving the results regarding attention to sustainability and the inclusion of cross-curricular competences identified by UNESCO is to analyze the degree of attention given to the Sustainable Development Goals. The universities' contribution to the SDGs is decisive and includes their action for social leadership to implement changes in the governance of the institution, the management policies and policies for university outreach, to gain a deeper understanding of the epistemologies and direct application of research for the transition to sustainability, and of course, with implications in the learning and teaching process, and in teacher training in particular, which is the aim of this study [30].

Yet the study did not find any explicit references to the 2030 SDGs as such, likely because the teaching guides analyzed were published on the website of the Master's Program in Secondary Education Teacher Training at the University of Valencia in June 2016, not long after the SDGs had been approved. However, there are several more or less indirect mentions made to the different topics included in the SD goals.

Table 3 shows the results of the analysis; the first row indicates the number of teaching guides in which the corresponding SDG is mentioned in each section of the guide and in the full text as a whole. As can be seen, in a few cases, a single outline mentions a particular SDG in more than one section, as is the case with SDG 5, which appears in the competences of the 13 teaching guides and is also found in Learning Outcomes in one guide, in Contents in two guides, and in Bibliographic References in three guides.

Table 3. Number and percentage of teaching guides (T.G.) with references to each of the 17 SDGs making up the 2030 Agenda.

Sections of the Teaching Guides	T.G. Competences	T.G. Learning Outcomes	T.G. Methodology	T.G. Contents (Topics)	T.G. References	Total No. of T.G.	Total T.G. (%)
SDG 2030 Agenda							
1. No Poverty	-	-	-	2	3	3	(21.4)
2. Zero Hunger	-	-	-	1	2	2	(14.3)
3. Good Health and Wellbeing	-	1	-	3	3	5	(35.7)
4. Quality Education	8	4	3	6	5	11	(78.6)
5. Gender Equality	13	1	-	2	3	13	(92.8)
6. Clean Water and Sanitation	-	-	-	2	2	3	(21.4)
7. Affordable and clean energy	-	-	-	1	2	2	(14.3)
8. Decent Work and Econ. growth	-	-	-	3	2	2	(21.4)
9. Industry, innovation and infra.	-	-	-	2	2	3	(21.4)
10. Reduced inequalities	13	2	-	2	3	13	(92.8)
11. Sustainable cities and communities	-	-	-	3	2	4	(28.6)
12. Responsible consumption and production	-	2	-	2	2	5	(35.7)
13. Climate action	-	-	-	3	2	4	(28.6)
14. Life below Water	-	-	-	2	2	3	(21.4)
15. Life on Land	-	-	-	3	2	4	(28.6)
16. Peace, Justice and Strong Institutions	4	1	-	2	3	8	(57.1)
17. Partnerships for the Goals	-	-	-	1	-	1	(7.1)

Mentioned below are some examples of the references to the SDGs found in the guides.

SDG 1: *End poverty in all its forms everywhere* appears in only two of the contents of the 14 teaching guides and in three bibliographic references. It is important not to forget the considerable impact the teaching and learning processes have in a Master's program such as the one analyzed on gaining the commitment of researchers, teachers, and society to reduce poverty and social exclusion everywhere in the world. The references appear on the course outline of "Complements for disciplinary instruction of economics" was found to have the content "Economic globalization and international economic relations" and on the course "Learning and teaching physics and chemistry" had "Education for Sustainability".

SDG 2: *End hunger, achieve food security and improved nutrition and promote sustainable agriculture* is only present as content in the course outline called "Learning and teaching physics and chemistry" in the topic "Education for sustainability".

SDG 3: *Ensure healthy lives and promote well-being for all at all ages* appears more or less directly referred to in five of the 14 guides. The guide to the subject "Learning and teaching biology and geology" links to the content "Education for health" and to one of the expected learning outcomes.

As might be expected, SDG 4: *Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all* appears indirectly referenced in 11 of the guides. This SDG is undoubtedly the one that receives the most attention in the guides analyzed in this study, appearing in the competences, the learning outcomes, methodologies, contents, and bibliographic references. This is to be expected in a MD program in teacher training and from what can be seen, it should be made more explicit and extensive in each and every teaching guide that constitute the curriculum.

SDG 5: *Achieve gender equality and empower all women and girls* is present in most of the teaching guides analyzed (13 of the 14). However, its articulation with the rest of the sections in each guide is deficient. The apparent presence of this SDG is due to the fact that its content is explicitly stated in competence SC5 of the Master's Program. It only shows up as a learning outcome in one of the teaching guides and as content in two guides even though the pertinence of gender equality is recognized in every branch of knowledge.

SDG 6: *Ensure availability and sustainable management of water and sanitation for all* has only indirect references and even those are few in the guides analyzed. For example, it appears in the subject "Learning and teaching biology and geology" in connection with the content "Earth and Environmental Sciences".

SDG 7: *Ensure access to affordable reliable, sustainable, and modern energy* has one of the scantiest presences in the entire set of guides analyzed. The only link found was to the content "Education for sustainability" in the guide of the subject "Learning and teaching physics and chemistry".

SDG 8: *Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all* also has a scant presence in the teaching guides, referenced in only two of the 14 guides. It connects to two of the contents in the course outline of "Complements for disciplinary instruction of economics". Specifically, it is mentioned in Content 2 "Measuring social and economic activities", with references, among other issues, to the gross national happiness index and the human development indexes.

SDG 9: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation* is present in only three teaching guides. Specifically, it appears in two subjects of the specialization of Sociocultural and Community Services and in one of Economy.

SDG 10: *Reduce inequality within and among countries* is present in nearly all the teaching guides (13 of the 14), although as we noted earlier, in many cases the references are indirect and therefore do not foster the necessary concern for this SDG. Furthermore, it should be noted that its articulation with the rest of the sections in each guide is deficient. The apparent presence of this SDG, as occurs in other cases, is due to the fact that its content is explicitly stated in Competence SC5 of the Master's program. It only shows up as a learning outcome and as content in two of the teaching guides analyzed.

SDG 11: *Make cities and human settlements inclusive, safe, resilient, and sustainable* is present more or less explicitly in four of the 14 teaching guides analyzed. It was found in conjunction with the content "Education for sustainability" in the guide of the subject "Learning and teaching physics and chemistry", and although not stated explicitly, it could be connected with the content "Specific methodologies: the case method" in the "Learning and teaching economics" guide as well as in the content "Activities in the natural environment" in the guide for the subject "Learning and teaching physical education".

SDG 12: *Ensure sustainable consumption and production patterns* shows more or less clear references in one third of the guides analyzed (five of the 14). Specifically, it appears in two of the bibliographical references, in two of the contents mentioned: the content in the teaching guides of "Learning and teaching physics and chemistry" and "Learning and teaching economics". Noteworthy is its connection with two of the learning outcomes. This SDG was also found in the course outline "Complements for disciplinary instruction of Biology and Geology" for the learning outcome "Know how to use natural and social resources" and in the "Educational processes and contexts" guide for the learning outcome "Acquire the sense of the teaching profession with special emphasis on the models of training and ties with society".

SDG 13: *Take urgent action to combat climate change and its impacts* is stated more or less explicitly in only four of the 14 teaching guides analyzed. It was found in connection with the content "Education for sustainability" in the "Learning and teaching physics and chemistry" guide, with the content "Earth and environmental sciences" in the "Learning and teaching biology and geology", guide and with the content "Activities in the natural environment" in the "Learning and teaching physical education" guide.

SDG 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development and SDG 15 Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss also have a very low, incidental presence in the teaching guides analyzed. It was only found in two guides in the area of the experimental sciences, which shows the need to address this issue from all areas by means of an interdisciplinary dialog. It is found, for example, in relation to the content "Earth and environmental sciences" in the "Learning and teaching biology and geology" guide.

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions at all levels appears in half of the guides analyzed (eight of the 14). Its presence is due to Competence SC5. It is present for example in the content "Transversality in subjects on economics" in the "Complements for disciplinary instruction of economics" guide. It is also present as a learning outcome "Acquire knowledge and competences needed to develop civic competence in students" in the "Educational processes and contexts" guide.

SDG 17: *Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development* appears in only one of the teaching guides analyzed: in Content 9 "Transversality in subjects on economics"; in the "Complements for disciplinary instruction of economics" guide. This finding underscores the need for universities to become aware of the importance of their role in the 2030 Agenda.

4. Discussion of the Results

These first results of the analysis of the selected sample of guides clearly show how sustainability and ESD have been integrated into the curriculum. References made more or less explicitly are attached to some of the items in the teaching guide without considering any changes in the teaching-learning models themselves. Overall, the presence of Competence SC5 regarding Education for Sustainability provides in and of itself no guarantee that suitable means have been made available for its acquisition, as was clearly noted in most cases.

This fact becomes even more evident in the analysis of the descriptors of sustainability in relation to the competences of Education for Sustainability set out by UNESCO: systemic reflection, critical analysis, generational responsibility, and collaborative decision-making can all be found, albeit only indirectly, in the analysis of the different sections of the teaching guides. However, because they are mentioned only incidentally, they have little impact on any of the learning activities proposed, on how the contexts are developed, the evaluation instruments, and the interactions that are to be stimulated.

Rather than reductionist views of the socio-environmental issues that research has repeatedly shown to actually hinder taking the required actions, what is needed is a holistic approach to enable development of competences linked to systemic reflection. Therefore, it is troubling that only one of the teaching guides contains a descriptor linked to the development of competences that lead to systemic reflection. These results in the analysis of the teaching guides reveal how little impact this competence has on the training of future teachers.

This fact also becomes evident in the analysis of the guides and the influence on them of each of the 17 SDGs. Moreover, it is very important for the guides to be reviewed from the perspective of SDGs. For example, SDG 8 needs to be included in all the areas of specialization in the Master's program so that students can develop the tools needed for satisfactory employability and to promote citizenship education to attain true social inclusion and progress toward a model based on sustainable

development rather than on growth on a planet of limited resources. Similarly, SDG 10, *Reduce inequality within and among countries,* is a widely recognized goal that easily connects to different items in the guides for all the specializations. Teacher training needs to foster explicit willingness to develop and deepen the interdisciplinary analysis of this serious and growing problem and to gain the commitment of citizens and institutions alike in eradicating it. Education for Sustainable Development Goals: Learning Objectives [31], provides a key instrument to introduce the SDG in the teaching.

In general, Competence SC 5 in the Master's Degree program is applied mostly to socio-environmental matters in subjects that cover contents regarding biology, geology, physics, chemistry, or economics. It would be worthwhile, for example, to initiate a joint reflection to relate ESD to the considerations and concepts in Education for Human Rights [32].

The revision of the teaching guides was also useful to establish a baseline. This has revealed what is currently being done in regard to Education for Sustainability in the context of the MD in Secondary Education Teaching at the Universitat de València, thereby making it possible to set priorities and different levels of action.

Previous research [24] has noted that sustainability-related issues are rarely treated directed in the classroom. Likewise, it has also become clear that teacher training programs fail to address suitable methodologies to approach socio-environmental problems. This lack of adequate methodological tools can prevent teachers from putting sustainability issues into practice in their classes. It is therefore necessary to pay attention to methodological aspects in order to help teachers make a didactic transposition, including for example the design of unit didactics on resources for sustainability, adapted to each of the areas of the Master's Degree. In this sense the creation of a resource center for the Master's Degree points out among other proposals as a good starting point in which teacher´s coordination is essential.

Having the teachers of the Master's program themselves analyze the guides and discuss them in collaborative teams of participants in the Seminars of disciplinary dialogue has also shown the usefulness of this approach as a tool for reflecting on socio-environmental issues and their implications on the steps that need to be taken. The urgency of initiating actions for the transition to sustainable societies therefore requires that sustainability be included in teacher training. Indeed, as research in this field has shown, the strategy that seems potentially most effective for that inclusion consists of engaging future teachers to learn the contents, procedures and attitudes and understand the need for incorporating them into the culture of sustainability in their teaching. This can only be done if the subjects in the Master's program systematically implement this orientation of learning and if the didactic training of the teachers, i.e., their appropriation of the body of knowledge informed by educational research, is oriented as a discovery process of the problems of teaching/learning involved in the educational endeavor [33–37].

As noted at the beginning of this paper, the main purpose of this research is not only to reveal the current situation of the inclusion of sustainability in the MD in Secondary Education Teaching, pointing out progress, shortcomings, and limitations. Rather, it fundamentally aims to contribute to ESD in the Master's program by increasing the teaching faculty's involvement by means of a collaborative work on the serious socio-environmental crisis currently underway, and thereby improve the training processes aimed at Education for Sustainable Development.

In this way, the analysis carried out on the teaching guides from the sustainability point of view may be considered as a starting point for work with teachers. The sustainability-related aspects included in the guides and in particular the detection of many occasions in which they should be included can be taken as examples to follow and enlarge upon and to be useful in the impetus needed to have them included in the training of future high school teachers.

The presence of specific competence SC 5 in the Master's program proved essential in encouraging teachers to reflect on whether or not they are effectively helping their students acquire it, and if not, how they could do so, with what contents, evaluation criteria, methodologies, etc. The overall results show that the subject matters analyzed can easily and effectively incorporate attention to ESD. This is

an essential factor in the reflection on the importance and urgency of ongoing attention to sustainability in the curriculum, and in particular, it has clearly shown the feasibility and facility of doing so in the different subjects and specializations involved in the study.

Furthermore, by carrying out the task of analyzing the teaching guides, searching for indicators of strengths and weaknesses helped encourage teachers to reorient their own teaching practices. In that sense, it would be greatly helpful if the university were to set policies that favor conditions for people to make an ongoing commitment to building a culture of sustainability. In our case, we had the support of the direction of the Master and the Vice-Principal for Equality, Diversity and Sustainability of the Universitat de València.

With regard to teacher training in sustainability, the establishment of collaborative work groups, which have analyzed the teaching guides in different workshops and seminars with the help of the research team, has facilitated a reflection on the need to pay more attention to sustainability in their teaching practice. In the sessions that took place, the 15 teachers participating worked detecting issues related to sustainability that appeared in the guides, relevant aspects that were not included, as well as the many opportunities to favor its incorporation.

This analysis, which was collected by each team preparing a report from each session, was convergent with the results obtained by the researchers to whom we referred earlier. Teachers also made methodological proposals for the possible incorporation of ESD from the perspective of their activity and considering the SDGs. They also worked on thematic proposals that may be incorporated into the investigations and proposals of the Master´s Degree Thesis.

Consequently, we found the results to be very positive, showing that collaborative teamwork can be of great help for team member involvement and ultimately for including the principles and values of sustainability in the projects and the teaching practice of subjects. It is worth noting that all these efforts have been concretized in issues such as the incorporation into the contents of aspects related to sustainability and the SDGs in the next edition of the teaching guides. Currently we are in the process of evaluating the progress made.

5. Limitations to the Study

Limitations to the research done here include the ones inherent in selecting an intentional sample that, although giving a general overview of the MD teaching guides, does not necessarily have any direct implications in the teaching and learning of each and every area of the curriculum in the MD program in Secondary Education Teaching at one university, although a similar process is also taking place at other Spanish universities with which this research team works in a broader project, as we have mentioned previously, and it is transferable to other universities.

Moreover, the results obtained suggest the need for further research that would not only look deeper into the participative and critical analysis, but also address the clear request from the teachers: to make specific pedagogic tools available to them. This would involve reviewing the resources and teaching materials currently existing on matters of sustainability, assessing their repercussions and usefulness, selecting ones of proven effectiveness, contrasted in other research and organizing them by issues and topics that can be used in an interdisciplinary manner, as the contents of sustainability and ESD should be. This would all be done in a framework of a short-, mid-, and long-term research strategy involving the active participation of the different agents in the university community.

as teachers committed to sustainability, and hope they continue contributing in the future in the collaborative teams that were constituted during the process.

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