Greening of the syllabus in faculties of education sciences through sustainable development goals: the case of public Andalusian universities (Spain)

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Abstract

Purpose – The purpose of this paper is to analyse the presence of the sustainable development goals (SDGs) proposed by the UN (2015) in university degrees within the fields of education, humanities and environmental sciences (ES) at Andalusian public institutions (Spain).

Design/methodology/approach – This paper shows an empirical analysis from a mixed methodological model on a total of 99 syllabi and training programs from nine different universities. The collection of information has been carried out through a rubric specifically designed within the framework of this body of research.

Findings – The results show that the syllabus of the subjects in the faculties of education includes the SDGs related to the social aspect of sustainability, with special focus on SDG4, SDG5, SDG10, SDG16 and SDG17, whereas others like SDG6 and SDG7 are less represented. SDGs are present in the majority of syllabus of the subjects analysed. It is certainly a positive finding which shows predisposition and a high interest on by the teachers involved. However, this is not enough as there is still a long way to go until achieving a thorough and complete incorporation of the principles of sustainability.

Originality/value – This research sheds light on the changes and transformations that the discourse linked to sustainability is generating in the university syllabi. Taking the SDG as a framework this paper highlights the most original aspects: a replicable methodology that allows diagnosing the level of curricular greening of the university syllabi is provided to other contexts the innovative value of connecting teaching with local and global environmental problems in their physical-chemical social and economic dimensions is shown and it has been possible to compare the difficulties of some universities in addressing compliance with the SDGs and curricular sustainability from a systemic and integrative perspective that will lead to methodological transformation and pedagogical renewal.

Keywords Evaluation, Sustainable development goals, Greening higher education, Education for sustainability, Competencies for sustainability, Syllabus

Paper type Research paper

Introduction

In 2015, the United Nations (UN) approved the so-called 2030 Agenda for Sustainable Development (UN, 2015), which includes 17 sustainable development goals (SDGs) that look

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to overcome the current socio-environmental crisis. However, forecasts on the degree of compliance with the SDGs indicate that the COVID-19 pandemic will affect all areas and sectors across the globe, as outlined in the latest UN Report published in 2020 (UN, 2020).

Five years on from the initial approval of the SDGs, there are numerous evaluations of the status of their incorporation to fulfill the 2030 Agenda across various sectors. The UN produces an annual report that records the efforts made toward fulfilling each of the SDGs across the globe, underlining progress and shortcomings.

In this task, there is a need to continue advancing in the development of sustainability competencies (Wiek *et al.*, 2011) and in investigating how to integrate the SDGs in the university context. As references, various works highlight the need to implement the SDGs in this context. Among them, we highlight the works of Perovic and Kosor (2020), who investigate the efficiency of European universities in achieving SDGs, concluding that there is a low efficiency in its application.

Leal Filho *et al.* (2019) explore the many advantages of the introduction of the SDGs into teaching and suggests that it can catalyse the engagement of students in higher education institutions with the concepts of sustainability.

Zamora-Polo and Sánchez-Martín (2019) addressed the different ways of understanding sustainability as a polyhedral concept and how sustainability can be understood under the umbrella of the SDGs. However, although the SDGs propose systemic responses to a global and interrelated vision, it is also true that it has been questioned that some goals are very idealistic and not very viable (Gómez, 2017).

Face with this limitation, there are good practices that seek to respond to the deficiencies in the integration of the SDGs in the university context. Among them we highlight the experiences of Franco and McCowan (2020) with case studies in universities in Mexico; Aleixo *et al.* (2018) with work at universities in Portugal; Omisore *et al.* (2017) with case studies in Nigerian universities, or the works of Priyadarshini and Abhilash (2020) in Indian universities.

Other experiences such as the School of Sustainability of the Arizona State University in the USA (Wiek *et al.*, 2014) or the School of Sustainability of the University of Leuphana in Germany (Müller-Christ, *et al.*, 2014) are examples of how sustainability acquires a priority character in university education.

In short, this challenge can be addressed within the framework of objective 4, referring to quality education, that universities assume a commitment to play an active role in fulfilling the 2030 Agenda, to become an essential pillar that faces the challenges of the society we live in and addresses the challenges of sustainability (Kioupi and Voulvoulis, 2019), from the initial training of teachers because, as Warren *et al.* (2014) point out, "attending to populations with the potential of having the most catalytic effect is essential to the goals of sustainability" (p. 3).

In the Spanish context, the region under study here, activities related to the sustainability of all Spanish universities have been carried out through the Conference of Rectors of Spanish Universities (CRUE) that is coordinated by the intersectoral commission Agenda 2030, regardless of the proposals that are being developed by each university individually. In total 67% of the 76 participating universities of CRUE state that they have adopted or are working on a specific strategy related to the 2030 Agenda (Government of Spain, 2018). However, although the SDGs were approved a number of years ago, their presence on university agendas remains modest, with a number of differences seen between countries (Losada, 2018). To advance, quality academic practice requires institutional structures. The Spanish Office for Climate Change and AECID are examples of alliances that support the principles of sustainability and put these into practice (Aznar and Ull, 2019).

Works such as those of Aleixo *et al.* (2020); Fleacă *et al.* (2018); and Franco, *et al.* (2019) reflect how the incorporation of the SDGs is being carried out within the national and international tertiary context, as well as the challenges that lie ahead.

From a global point of view, there are also good practices in the field of university sustainability. In fact, in 2017 all Spanish universities signed up to a policy that favoured fair trade and responsible consumption (Millán and Pérez, 2018). If we carry out an analysis broken down into regional territories, universities located in eastern Spain have gained momentum. For example, both the University of Valencia and the Polytechnic University of Valencia (PUV) have strategic plans that frame their activities in relation to the SDGs or the PUV has a complete strategic project that is focused on compliance with the 2030 Agenda (Millán and Pérez, 2018).

To the south, geographic context of our study, for example, the University of Huelva has approved its strategic plan, linking it to the SDGs, with their strategic axes including teaching and research (Márquez and Pomares, 2019).

If we now focus on the classroom, it is possible to find very diverse experiences, which we could consider to be inspiring practices. One benchmark example is the experience proposed by the Lausanne Business School in Switzerland with the introduction of the compulsory subject "SDG Explore" in the first year of the Business Administration degree (Casañas and Miñano, 2019). Along this line, though notably of a less formal nature, we can also find the proposal set out by the "Monash Sustainable Development Institute" at Monash University, through their "Take One Step" initiative, "an online platform for students, aimed at inspiring leadership and action in relation to the SDGs" (SDSN Australia/Pacific, 2017, p. 48). And finally, a number of universities that have built close relationships with nearby institutions have proposed collaborative projects that enhance the "real" social commitment of their students (YAKLAS project, Özyeğin University-Turkey or the AlmaENGAGE structure, University of Bologna-Italy) (Gul, 2020; Paletta *et al.*, 2020).

As described, the application of sustainability in universities has a long trajectory (Blanco-Portela *et al.*, 2020). However, the field of teaching seems to be the most complex when introducing changes (Albareda-Tiana *et al.*, 2019). Therefore, a first approach is needed to understand the state under question which requires the revision of study plans, programs and syllabus in relation to the incorporation of the SDGs, which is the object of this study.

Design/methods

Nature of the study

Research focused on SDGs is incipient; it is necessary to continue deepening to shed some light in its reflection in the university environment as the existing knowledge to implement them is insufficient (ICSU, 2017). In this sense, the main objective of this body of research has been to analyse the presence of the SDGs proposed by the UN (2015) in university degrees within the fields of education, humanities and environmental sciences (ES) at Andalusian public institutions. To address this objective, the integration of the SDGs in the teaching outlines of these degrees has been analysed in depth in three dimensions: curricular objectives, content and general, specific and transversal competences linked to each subject.

The objective research nature directed the study toward a multi-method approach which integrated and combined the quantitative and qualitative approaches within the framework of a single study (Johnson and Onwuegbuzie, 2004) focused on public universities in southern Spain. This approach enabled the combining of both paradigms to obtain improved alternatives to approach the research problem. The multi-method approach has

proven to be an ideal and relevant methodology to analyse the difficulties and challenges of incorporating curricular sustainability in university classrooms (Leal Filho *et al.*, 2017)

Sample and context

To develop this study, nine public universities located in the autonomous community of Andalusia (Spain) were selected, amongst which are the universities of: Almeria (UAL), Cadiz (UCA), Cordoba (UCO), Granada (UGR), Huelva (UHU), Jaen (UJA), Malaga (UMA), Seville (USE) and Pablo de Olavide (UPO), located in Seville. Circumscribing the study to a specific geographical area responds to a commitment to social responsibility (Lall, 2011) that leads to contributing to the development and transformation of this region.

Once the sample was selected, the research was limited to degrees within the educational field. Specifically, degrees in early childhood education (CE), primary education (PE), social education (SE) and pedagogy/educational sciences. A decision was made to also include degrees in humanities and ES, as these are degrees that teach subjects related to the education for sustainability and the SDGs.

To address the objective of this research, relevant syllabi have been referenced as they include all aspects that will be addressed across each subject under study.

The selection criteria for these syllabi took into account the presence of the following descriptors in the subject title: science teaching, social and cultural heritage and environmental education. Under these reference indicators, a total of 99 syllabi were selected. Figure 1 shows the distribution of guides by these universities.

Focusing on the degrees, Figure 2 highlights that the majority of syllabi belong to the CE and PE fields.

In reference to the course in which these subjects are taught, the largest number of guides is concentrated in third and fourth year studies, with 35 and 37 guides analysed, respectively; 16 guides of second year and 11 guides of first course.

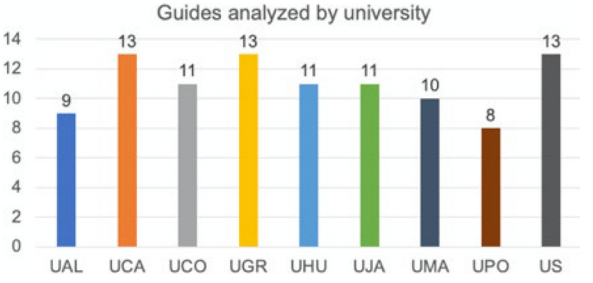

Figure 1.
Number of syllabi selected and analysed by university

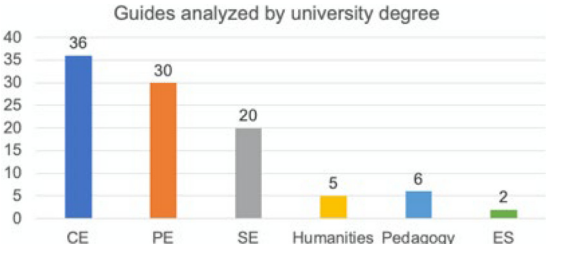

Figure 2.
Number of syllabi selected and analysed by university degree

Another interesting analysis variable of the selected sample is the one related to the type of subject; it should be noted that 45 of the 99 subjects analysed are compulsory subjects, followed by 37 elective subjects and 11 basic subjects.

At a general level, the selected subjects can be identified as subjects with a general approach to environmental education in a broad sense (e.g. *Didactics of Nature Sciences*) compared to other non-generalist subjects that focus its content on specific topics related to an SDG (e.g. *Social Changes and New Gender Relations*).

Regarding the departments responsible for teaching these subjects, it is also interesting to note that, although there is great variability in the nomenclature, there are three distinguishing types: departments linked to specific didactics (e.g. The Department of Didactics of Experimental and Social Sciences), departments in the area of psychopedagogy (e.g. The Department of Research and Diagnosis Methods in Education) and other Departments (not linked to education) (e.g. The Department of General Economics).

Data collection and analysis

The collection of information has been carried out through a rubric (Sustainability Assessment Rubric for the University Syllabus, SARUS) specifically designed within the framework of this body of research (Table 1). Specifically, it is a qualitative analysis instrument to analyse the degree of presence of the SDGs in the syllabus of the subjects under study.

The design of this rubric is defined by the independent variables – university, degree, subject, course, semester, the type of subject and department – and by four dimensions that mark the dependent variables under study: sustainability competencies, SDGs, methodology linked to sustainability and evaluations linked to sustainability. Each one of these is described through the same scale with a progressive gradient that goes from simpler levels, where the dimension to be analysed is not contemplated or is contemplated in a very elementary way, to more complex levels, where it is fully integrated in all its semantic display.

Specifically, this work focuses on the results obtained for the dimension of the SDGs and their presence in the objective curricular elements, content and competencies of the guides of those subjects under study. The rubric is designed as a self-assessment instrument so that university professors can self-assess the degree of integration of the SDGs in their teaching programs and adopt additional measures accordingly. Other studies support the development of this type of self-diagnosis instruments to evaluate sustainability in the university curriculum. Thus, reliable,

SDG	Keyword linked to each SDG	Curriculum element (objectives, contents, competencies)	Scale			
			1 = Absence	2 = Low presence	3 = Medium presence	4 = High presence
SDG1	Development – social – poverty – vulnerable groups – resources – protection – developing countries – distribution of wealth					

Table 1.
Example of the applied rubric (SARUS) for SDG1

valid and suitable information collection tools are consolidated for self-evaluation and reflection on the improvement of teaching practice (Tójar and Fernández, 2019).

The instrument used is presented in a Semantic Tree Diagram and consists of 51 units of analysis, where each of these units of analysis is built from the semantic field of the 17 SDGs in relation to the treatment given to them in the objectives, content and competencies, using a set of basic descriptors for each SDG as a reference.

The instrument was coded in a Limesurvey questionnaire that facilitated the collection, organization and analysis of the information.

Content validation was carried out through an evaluation by means of an inter-judge agreement (six researchers from the academic field of research methods and diagnosis in education, and five from the field of didactics of experimental and social sciences). Subsequently, a pilot study was carried out in which 11 syllabi were analysed. This analysis served to outline and readjust the information collection instrument detailed in Table 1.

Regarding the reliability of the data, the Cronbach's alpha (Table 2) was calculated on this dimension of the questionnaire. Its value is quite acceptable (0.952).

As indicated above, this study was carried out using a mixed approach, that is, a quantitative primary method, which was complemented with a qualitative secondary analysis (Pereira, 2011) that indicated the presence or absence of the SDGs in the curricular elements analysed in the syllabi. To collect and analyse the study information, an exploratory sequential strategy was developed. This process consisted of carrying out an analysis of the syllabi through the construction of a category system, which allowed obtaining a set of qualitative date grouped and classified (units of analysis) according to the different semantic fields under study. Subsequently, these units of analysis were transformed and organized into descriptive matrices (Miles *et al.*, 2014), which allowed us to carry out descriptive statistical analyses (measures of central tendency, measures of dispersion, frequencies and percentages) have been carried out on the quantitative information, to identify the absence/presence of the SDGs in the syllabi analysed at both an institutional and degree level, as well as non-parametric contrast tests (Kruskal-Wallis Test) based on the 17 SDGs to see the loads and correlation of each with the two most outstanding descriptive variables of the questionnaire: institution and degree. Finally, multidimensional scaling techniques have also been used to analyse the distribution of the SDGs across the different curricular elements of the guides in accordance with the independent variables of the study. All analyses have been carried out with the SPSS v.25 statistical package.

For the qualitative analysis, a content analysis procedure was developed, following the proposal of Miles *et al.* (2014): reduction of information, arrangement and transformation of data and extraction and verification of conclusions. Classification and categorization techniques were used, which made it possible to detect regularities in the text of the guides, develop reference frameworks and establish data typologies. From these processes, the SARUS Semantic Analysis Tool (Table 1) was designed to verify the treatment given to the SDGs in the fields of analysis of the syllabus: objectives, content and competencies. For these analyses, we have used the MAXQDA v.2020 software.

Table 2.
Cronbach's alpha coefficient of the questionnaire dimension "SDGs" of this study

	Cronbach's alpha	Items (number)
Dimension: SDGs	0.952*	51

Note: *High significance close to value 1

Results

Within the framework of the objective of this paper, to address how the SDGs are represented at the Andalusian universities. The following dendrogram (Figure 3) (cluster analysis by average link between groups) shows us how the SDGs are represented at the Andalusian universities. Three well-differentiated clusters are being analysed based on their presence in the syllabi under study; this cluster distributes the intensity of the presence of said SDGs in the guides analysed:

Cluster #1: SDG 6, 7, 13, 14 and 15. Low presence and representation of these SDGs in the syllabi analysed.

Cluster #2: SDG 1, 2, 3, 8, 9, 11 and 12. Average presence of the SDGs in the syllabi.

Cluster #3: SDG 4, 5, 10, 16 and 17. High presence of these SDGs in the syllabi.

This ranking is supported by the medians (Figure 4) that show that SDG4 – quality education, is the SDG that is most present in the syllabi, in comparison to SDG6 – cleaner water and sanitation and SDG7 - renewable energy, those SDGs with the least presence.

Considering the degree of presence of the SDGs at Andalusian universities (Figure 5), SDG4 – quality education is the goal that is most present in the syllabi at these institutions. In general, emphasis is given to the need to develop quality education that favours sustainable development, such as "educational techniques for sustainable development education" and the "need, justification and importance of education for sustainable development: quality education" (UAL). At most universities, this objective is present in 100% of the content analysed. It is only UPO that incorporates this goal in only 62.5% of the content analysed.

The UMA has been identified as the institution that least represents the majority of SDGs, with four of them (SDGs 8 – good jobs and economic growth, 11 – sustainable cities and communities, 12 – responsible consumption and 13 – climate action) absent in the analysed content.

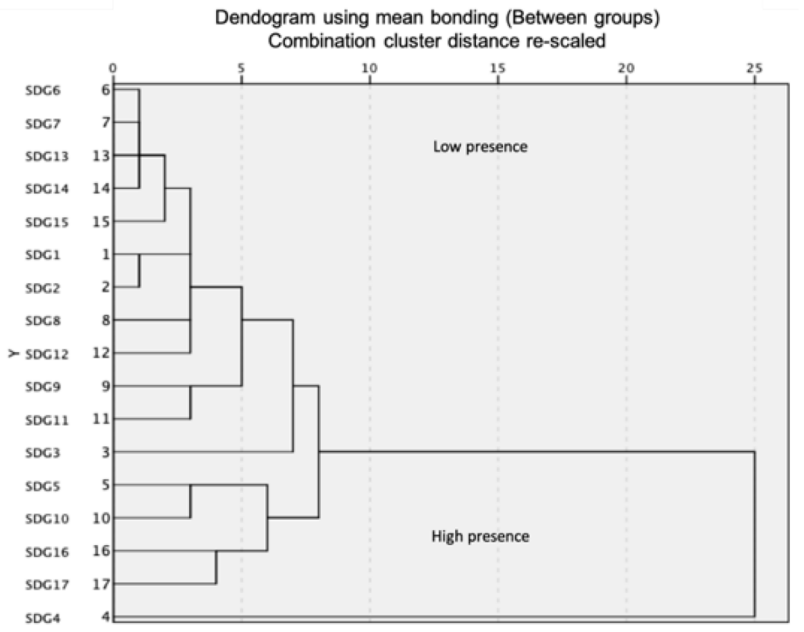

Figure 3.
Dendogram. SDGs ranking

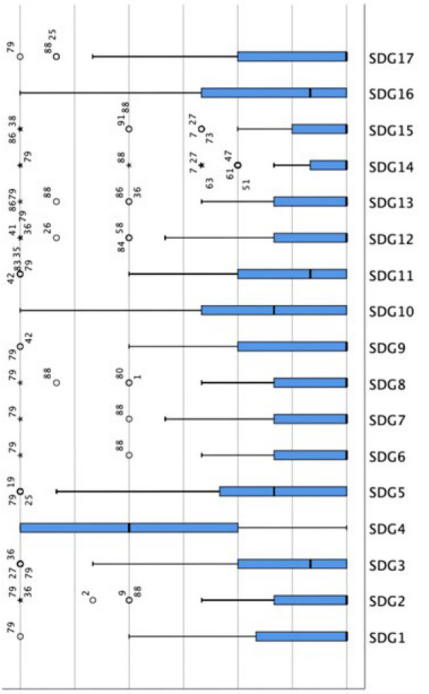

Figure 4.
Representation of SDGs according to medians

At the opposite end lies the UCO, which has the highest number of SDGs represented at 100%, highlighting SDGs 3 – good health, 4 – quality education, 10 – reduced inequalities, 11 – sustainable cities and communities and 16 – peace and justice in its syllabi. Thus, we find that the Early Childhood Education degree is intended to "develop educational proposals in relation to the interaction of science, technology, society and sustainable development," and the PE degree aims to "recognize the mutual influence between science, society and technological development, as well as relevant citizen behaviours, to seek a sustainable future."

The remaining institutions, in some way, represent all the SDGs, with some standouts including SDG3 – good health at the UAL (100%); SDGs 5 – gender equality and 10 – reduced inequalities with 81.8% representation at the UHU; SDGs 16 – peace and justice and 17 – leaderships for the goals at the UJA with a representation of 90.9%; SDG10 – reduced inequalities with a representation of 80% at the UMA; and SDG11 – sustainable cities and communities with a 75% representation at the UPO.

Represented below in greater detail and using a colour scale [1] is the presence of the SDGs at Andalusian universities. Decisions to assign one colour or another have been made in reference to the cut-off scores of each SDGs organised into quartiles. This scale shows that SDG4 - quality education is the most present goal at these institutions and universities such as UCO and UPO stand out with more SDGs in positions of medium-high presence (Figure 6).

With a greater level of detail, and using this same colour scale to analyse the presence of these SDGs in the curricular elements of the syllabi analysed, at the level of the objectives

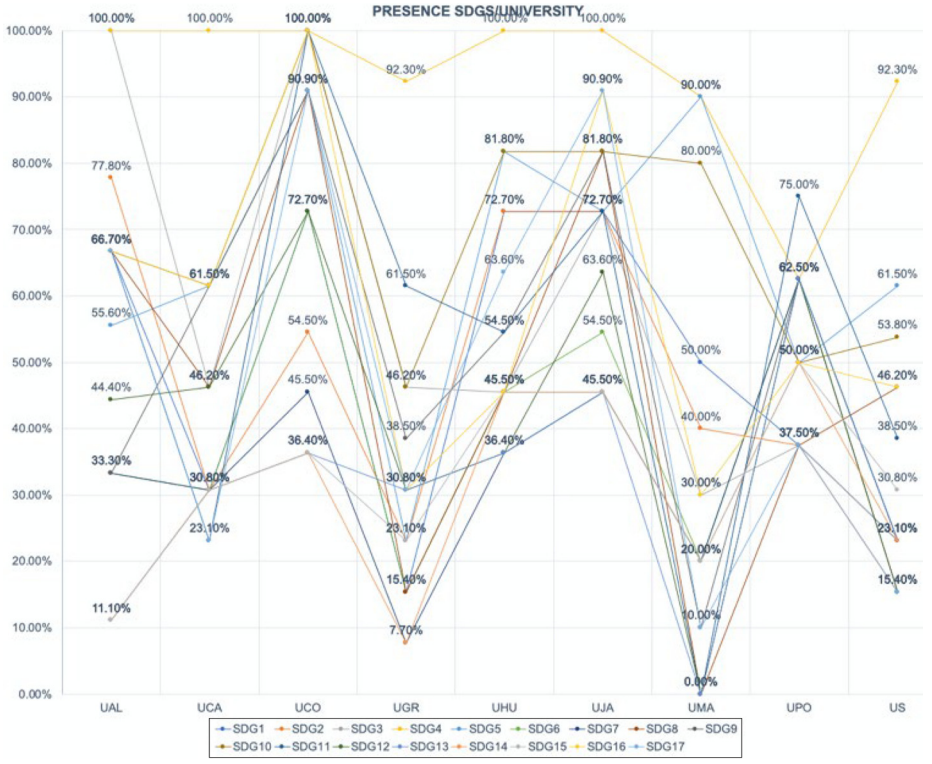

Figure 5.
Presence of SDGs for university

proposed in them, detailed content and competencies addressed in these curricular documents, there are some differences and details that are evident in Figure 7:

- In reference to objectives, the UJA is not explicit in their outlining of outcomes, and so an evaluation has not been possible. On the other hand, at the UMA, another SDG (SDG9 – innovation and infrastructure) has been added to the list of absent SDGs. At the universities UHU, USE and UPO, all SDGs are present, but at a low level, and the UAL and UCO stand out with a greater number of SDGs in a medium-high position.

Thus, intentions such as "to value individual and collective responsibility in achieving a sustainable future and to acquire the necessary training to promote a healthy life" are highlighted, as well as "to foster attitudes for the defence, conservation and improvement of the environment" (SDG4 – quality education) and to "reflect on the meaning and implications of the culture of peace, competence for citizenship, social and civic competences, cultural awareness and expressions, and Human Rights in the educational field" (SDG16 – peace and justice) at the UCO.In the case of the UAL, some of the aspects highlighted are "promoting healthy lifestyle habits from childhood" (SDG2 – no hunger) and "understanding and assuming the need for Environmental Education, from a transdisciplinary point of view, as an instrument for sustainability" (SDG4 – quality education).

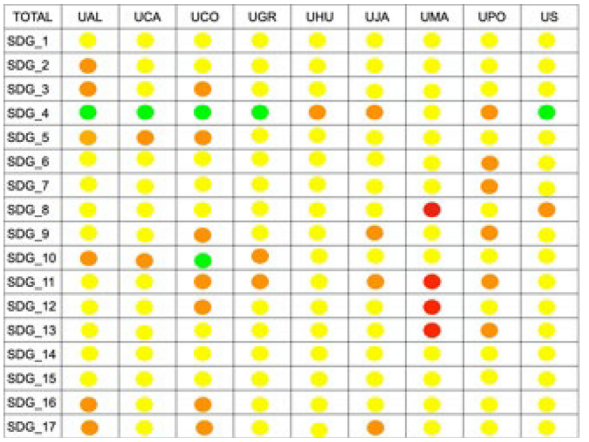

Figure 6.
Distribution of SDGs by university

Note: Degree of presence

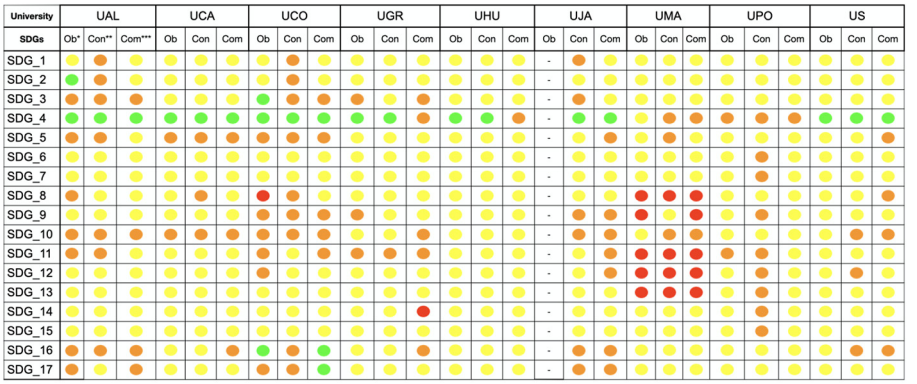

Figure 7.
Distribution of SDGs by university linked to objectives/content/ competencies

Notes: Degree of presence; *Objectives; **Content; ***Competencies

- In relation to the analysis of the teaching guides' content, in many cases there is an increase in the presence of SDGs, from low to medium presence, and in this case UPO, UCO, UAL and UJA universities stand out. Thus, special emphasis is made on aspects such as "local populations and socio-environmental conflicts" (SDG4 – quality education, UPO), "contemporary economic growth and social conflict" (SDG10 – reduced inequalities, UCO) and "gender inequalities and the achievement of citizenship in democratic frameworks" (SDG5 – gender equality, UAL).
- In the field of competencies, the UCO continues to stand out with almost 50% of the SDGs having a medium-high presence prevailing in SDGs 4 – quality education, 16 – peace and justice and 17 – partnerships for the goals. Thus, for example, it is proposed to "promote and facilitate learning in early childhood, from a globalizing

and integrating perspective of the different cognitive, emotional, psychomotor and volitional dimensions" (SDG4) or to "promote coexistence in and out of the classroom and address the peaceful resolution of conflict" (SDG16). However, the UMA continues to be the institution with the greatest absence of SDGs, although there are other universities that are not leading examples in their approach to competencies linked to the SDGs, such as the UPO and UHU. By way of example, it is intended to develop competencies such as "analysing and incorporating issues such as gender and intergenerational relations, multiculturalism and interculturality, discrimination and social inclusion and sustainable development" (SDG10 – reduced inequalities at UMA) or "analysing the various forms proposed for education for consumption" (SDG3 – good health at UGR).

The other universities have balanced values in relation to the presence of SDGs, among what is visible at both a general and a detailed level in respect to objectives, content and competencies, being grouped into a low-medium level, such as the universities UGR, USE, UAL and UCA.While there are SDGs that are less discussed at an institutional level, they are addressed at some universities, for example, the SDGs related to "consumption in the context of sustainable development goals" (SDG12 – UAL) or "climate change" (SDG13 – UPO).

Regarding the presence of the SDGs in the degrees that have been analysed (Figure 8), SDG4 – quality education continues to lead the list with the highest presence found across all degrees. However, completion of the SDG is only listed as 40% in humanities degrees and is only offered at the UPO, compared to 100% in pedagogy and early childhood education degrees.

In the case of the syllabi of all social sciences degrees, with all SDGs represented, SDGs 9 – innovation and infrastructure and 10 – reduced inequalities stand out (in addition to SDG4) in the PE degree with 60% representation, respectively; the same SDGs also prevail in the SE degree with 55% and 80%, respectively, and only SDG10 in pedagogy degrees, with a representation of 66.7%.

In the humanities degree, SDG11 – sustainable cities and communities is backed by 100% representation and is the degree with the highest percentages of overall SDG presence.

At the opposite end is pedagogy degree in which only 5 of the 17 SDGs are represented and all at 50% of their representation; these are SDGs 4 – quality education, 11 – sustainable

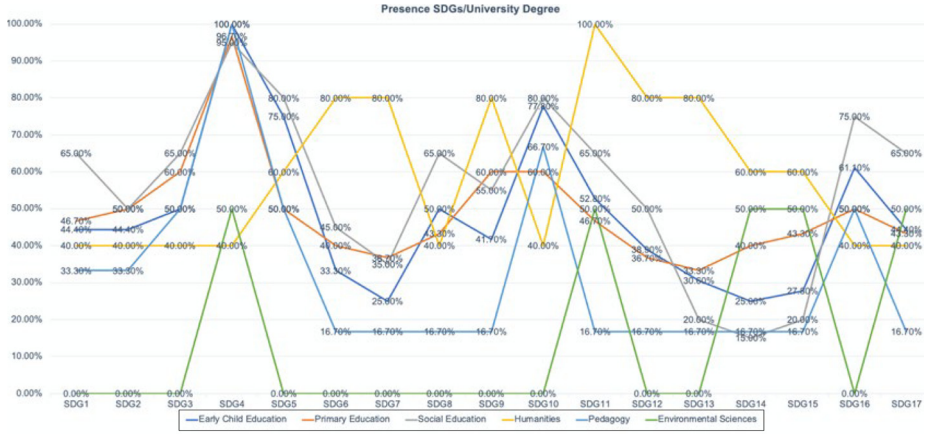

Figure 8.
Presence SDGs for university degree

cities and communities, 14 – life below water, 15 – life on land and 17 – partnerships for the goals.

To delve into the previous descriptive analyses and to understand the degree of association or independence between some independent variables (university, degree, course, semester and type of subject), we have carried out some inferential statistical analyses (Kruskal-Wallis) identifying statistically significant differences across the SDGs for the variables "university" and "degree"; not finding differences in the remaining independent variables studied (Tables 3 and 4).

Table 3 details the analysis of contrasts between university and SDGs, highlighting only those in which significant differences ($p \leq 0.5$) have been found with respect to this independent variable.

As shown in the table above, with respect to the variable "university," the significant differences occur in SDGs 1 – no poverty, 3 – good health, 4 – quality education, 8 – good jobs and economic growth, 9 – innovation and infrastructure, 11 – sustainable cities and communities, 12 – responsible consumption, 16 – peace and justice and 17 – partnerships for the goals. This shows that the presence of these SDGs is conditioned by the university to which the subject is associated. In this way, in all the SDGs with significant differences, the significance corresponds to those subjects that belong to the UCO compared to the USE in the case of SDGs 1 and 3; to the UMA in the case of SDGs 4, 8, 9, 11, 12 and 17; and to the UHU in the case of SDG16.

On the other hand, regarding the analysis of contrasts between degree type and SDGs, those highlighted are only those in which significant differences have been found ($p \leq 0.5$) with respect to this independent variable in Table 4.

In this case, there are significant differences in SDGs 5 – gender equality, 10 – reduced inequalities and 11 – sustainable cities and communities. Regarding SDGs 5 and 10, there are significant differences regarding their presence amongst those subjects that belong to a SE degree (average range 60.15 and 64.95, respectively) compared to those within the field of ES (average range 18.00 and 16.00, respectively). Finally, those subjects associated with a humanities degree have greater significance with respect to the presence of SDG 11, with an average range of 91.5, compared to those linked to a pedagogy/ES degree, with an average ranking of 34.75.

Finally, the following diagram captures a benchmarking exercise between the university and subject analysed through their teaching guides and the average value of the SDGs scale (Figure 9).

This diagram shows how the majority of the syllabi analysed in relation to the presence of SDGs score somewhere between quartiles 1 and 3, highlighting those teaching guides for subjects with extreme scores (outliers). In the case of those with the best scores, the subjects "globalization and sustainability" (UPO), "environmental education" (USE) and "nutritional and health education" (UGR) were identified. Those with the lowest scores are found at the UGR, with the subject "environmental education and training," at the UMA with most subjects, and at the UCO with the subject "teaching of experimental sciences in primary education."

The three integration models obtained by applying the multidimensional scaling technique by objectives, content and competencies are shown in the following graphs (Figure 10). They show that the treatment given to each SDG according to the type of subject (basic, compulsory or elective) is different. For example, if we look at the first three graphs relative to basic subjects, we find an expanded adjustment pattern, in which the 17 SDGs are addressed across objectives, content and competencies in a distributive way. In the four quadrants, we can find at least 25% of the SDGs; however, if we observe the centroids of the

Table 3. Correlation between SDGs and independent variable "university" (Kruskal-Wallis)

Independent variable – university	UAL	UCA	UCO	UGR	UHU	UJA	UMA	UPO	US
SDG1									
Average range	62.44	43.12	66.91	35.58	55.64	57.50	51.90	46.60	37.96
Statistical Kruskal-Wallis					15.48				
p.					0.050				
Average range	63.22	38.54	81.82	41.73	48.86	67.82	32.20	45.50	36.00
Statistical Kruskal-Wallis					35.46				
p.					0.000				
SDG3									
Average range	74.33	42.62	81.73	48.73	40.32	55.91	35.85	41.81	34.08
Statistical Kruskal-Wallis					32.83				
p					0.000				
SDG4									
Average range	48.39	82.19	62.14	46.31	38.27	45.59	16.60	36.06	60.27
Statistical Kruskal-Wallis					39.19				
p					0.000				
SDG8									
Average range	59.00	47.12	70.59	33.96	46.73	67.23	26.50	51.44	50.65
Statistical Kruskal-Wallis					25.50				
p					0.001				
SDG9									
Average range	39.94	49.38	78.95	45.15	47.91	68.82	29.45	60.56	33.08
Statistical Kruskal-Wallis					32.47				
p					0.000				
SDG11									
Average range	51.39	34.12	73.36	57.73	41.41	60.95	23.50	69.38	43.88
Statistical Kruskal-Wallis					30.79				
p					0.000				
SDG12									
Average range	53.50	52.04	67.05	46.92	45.27	60.05	30.00	62.25	37.54
Statistical Kruskal-Wallis					18.59				
p					0.17				

(*continued*)

Table 3.

Independent variable – university	UAL	UCA	UCO	UGR	UHU	UJA	UMA	UPO	US
SDG16									
Average range	61.00	48.15	84.23	39.35	35.55	58.23	36.05	49.38	42.31
Statistical Kruskal-Wallis					28.03				
p					0.000				
SDG17									
Average range	63.22	38.54	81.82	41.73	48.86	67.82	32.20	45.50	36.00
Statistical Kruskal-Wallis					35.46				
p					0.000				

Independent variable – university	Early child education	Primary education	Social sciences	Humanities	Pedagogy/education sciences	Environmental sciences
SDG5						
Average range	56.47	38.70	60.15	53.50	41.58	18.00
Statistical				12.70		
Kruskal-Wallis p.				0.26		
SDG10						
Average range	52.54	40.95	64.95	41.30	48.75	16.00
Statistical				12.44		
Kruskal-Wallis p				0.29		
SDG11						
Average range	49.65	45.43	52.58	91.50	34.75	41.00
Statistical				14.81		
Kruskal-Wallis p				0.011		

Table 4.
Correlation between SDGs and independent variable "academic degree" (Kruskal-Wallis)

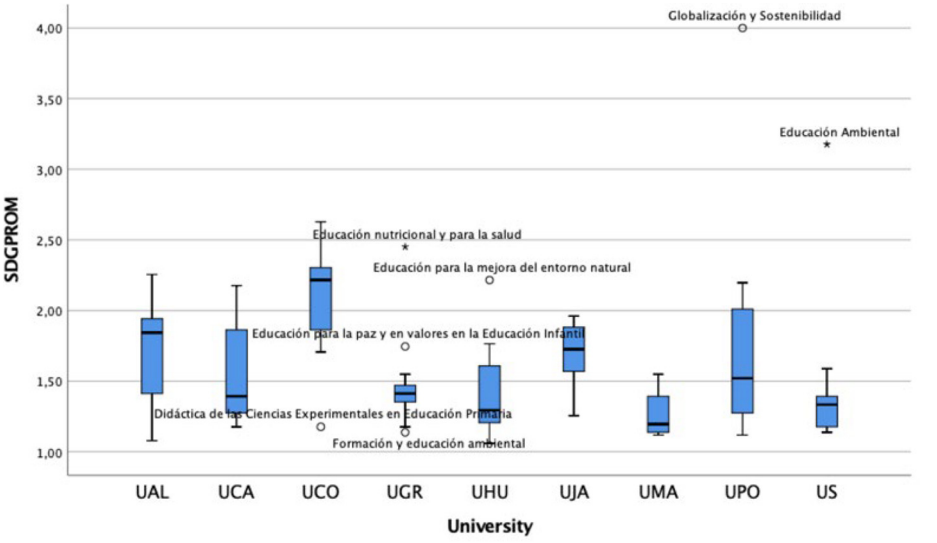

Figure 9.
Bench-marking between university and subject according to average value SDGs

Note: We leave the name of the subjects in Spanish so as not to lose the identity of the syllabi analysed

last six representations related to compulsory and elective subjects, a more concentrated model is observed, with a higher concentration density and treatment of groups of SDGs in some quadrants, compared to isolated SDGs, generally SDG 4 – quality education.

In the following figure (Figure 11), a reiterated pattern is observed in relation to the integration model of the 17 SDGs, in the objectives, content and competencies that carry the main weight for SDG 4 – quality education, showing quite acceptable linear adjustment models.

Finally, an examination of the internal consistency of the evaluations carried out through the opinions of the expert evaluators yields highly significant correlation values (alpha, 0.01) between objectives and content ($r = 0.558$), between objectives and competencies ($r = 0.596$) and between content and competencies ($r = 0.612$). This enables the obtainment of highly rigorous conclusions on a solid and highly coherent basis in the information evaluated across the different guides (Table 5).

Discussion

Taking as a reference the objective of the study, and as it has just been argued in the previous section, the results show that the teaching guides of the subjects related to education contemplate generic and transversal SDGs related to the social aspect of sustainability by highlighting SDGs, such as SDG4 – quality education, SDG5 – gender equality, SDG10 – reduction inequalities, SDG16 – peace and justice and SDG17 – leaderships for the goals, against the least represented such as SDG6 – clean water and sanitation and SDG7 – renewable energy; two SDGs that in contrast are very specific to the environmental aspect of sustainability.

A nod to various SDGs can be found in many of the guides, with their presence captured in a more open but less in-depth way. This invites us to continue to rethink teaching guides

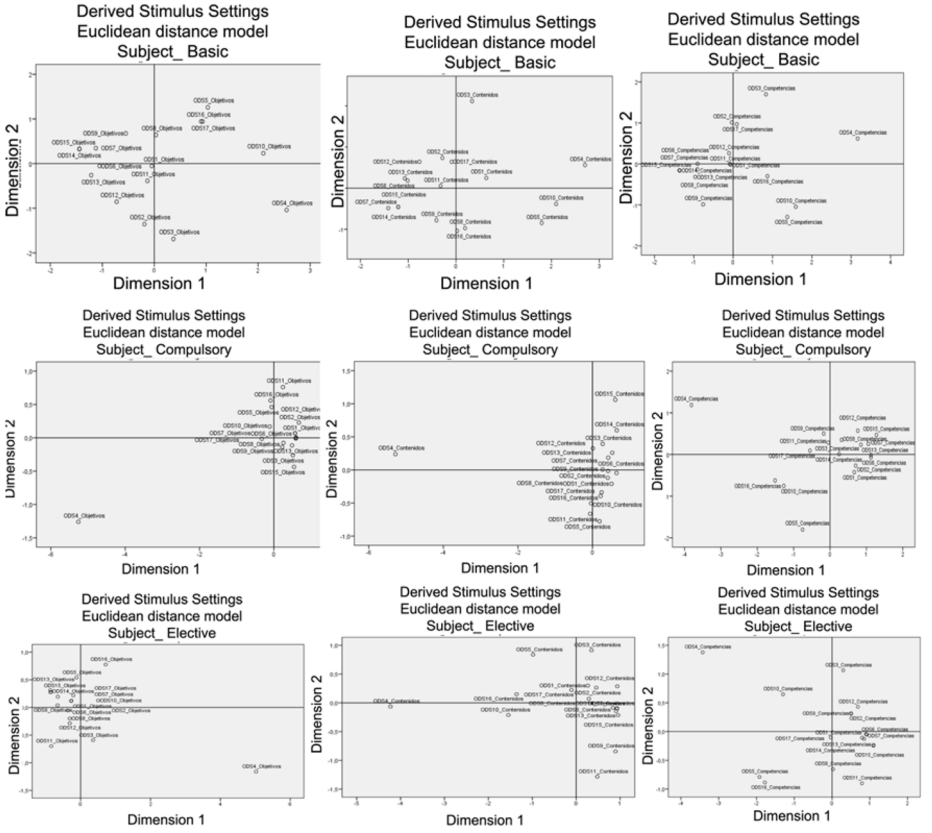

Figure 10.
Results of multidimensional scaling technique by objectives, content and competencies

and provides a call for teachers to continue to reflect on these guides and to adapt them to better specify their intentions toward sustainable development. There are only a few exceptions where the SDGs and the need to be educated about them are clearly visible.

These SDGs could be organised around a main one, SDG4 – quality education, as shown in the previous figures, because the majority of degrees undertaken are related to education and the ways of encouraging learning. In other words, although the guides do not largely specify how education for sustainability works, addressing various socio-economic-environmental problems in matters where sustainable development is concerned is a constant (Figure 12).

This is why those SDGs that are related to environmental education and the didactics of natural sciences are highlighted, those in which the need for education for sustainability and the various issues that can be addressed are emphasized, and as a consequence, all other SDGs are also addressed superficially – this is especially true in regard to what relates to nature, its conservation, the impact of people's daily actions and how they can solve it.

A second group is made up of subjects related to the social sciences, which are more directed to aspects related to human values, natural heritage, citizenship, landscaping and its care.

There is a third group of subjects that are related to the area of physical education, where concern for health and human well-being is expressed (SDG3 – good health), relating their

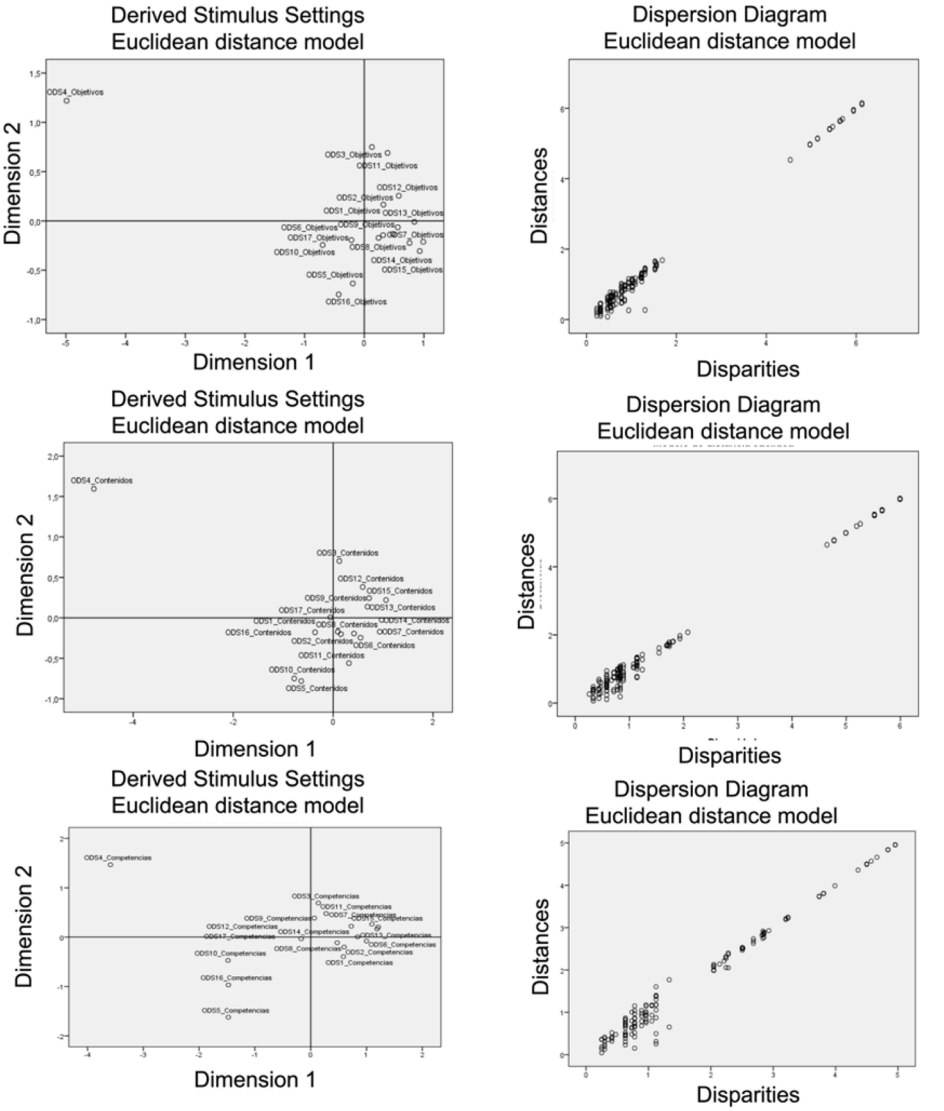

Figure 11.
Results of multidimensional scaling technique by objectives, content and competencies

practice to caring for the environment and its link with sustainable development. Specifically, they address healthy eating and habits, such as practicing sports in natural settings in an environmentally respectful way.

These results show that the UCO is the institution that has best identified SDGs in their educational degree teaching guides. This data is corroborated with the actions that this university, specifically its Faculty of Education, is developing to cover each SDG through various initiatives [2]. At the opposite end is UMA, as according to the evaluators, four of the

		Correlations		
		SumObj	SumConten	SumCompet
SumObj	Correlation of Pearson	1	0.558**	0.596**
	Sig. (bilateral)		0.000	0.000
	N	99	99	99
SumConten	Correlation of Pearson	0.558**	1	0.612**
	Sig. (bilateral)	0.000		0.000
	N	99	99	99
SumCompet	Correlation of Pearson	0.596**	0.612**	1
	Sig. (bilateral)	0.000	0.000	
	N	99	99	99

Note: **The correlation is significant at the 0.01 level (two-tailed)

Table 5.
Correlation objectives-content-competencies

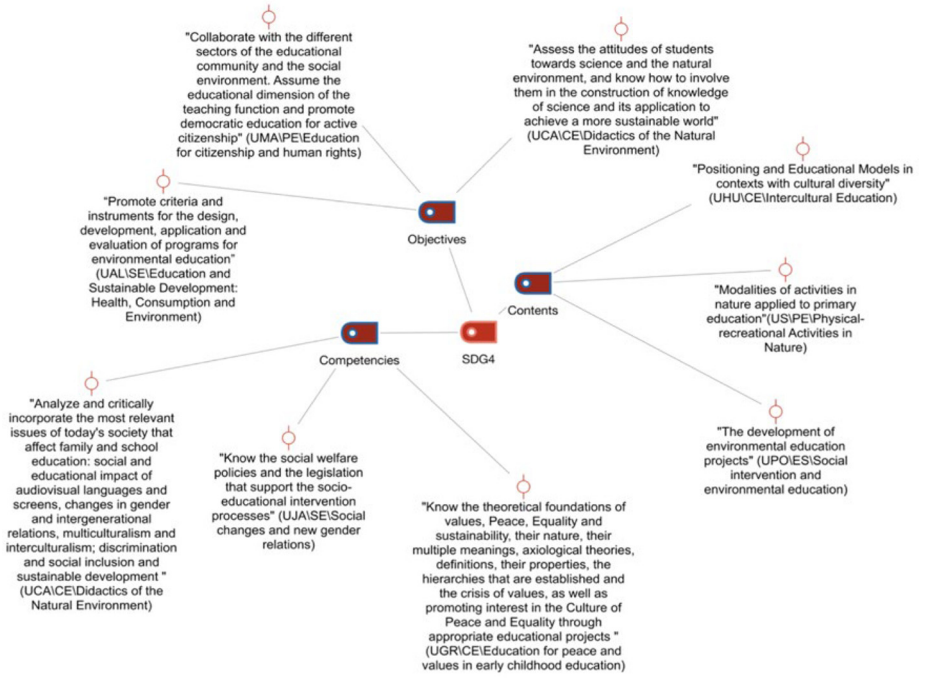

Figure 12.
SDG4. Excerpts from the syllabi analysed

17 SDGs have no presence in their educational teaching guides at all. Those SDGs absent include SDG8 – good job and economic growth, SDG11 – sustainable cities and communities, SDG12 – responsible consumption and SDG13 – climate action. Despite these shortcomings, this university is proposing initiatives related to the incorporation of SDGs on a campus level with an example of this being the SMART-Campus Project (SmartUMA).

In regard to degrees, the pattern that stands out following an analysis is that, within those degrees in the field of social sciences, it is humanities, together with SE degrees, where SDGs have the greatest presence. This result supports the guidelines of UNESCO and the

UN in their priority to recover the value of the humanities and culture against STEAM (Science, Technology, Engineering, Arts, Mathematics) areas to strengthen sustainability competencies such as critical and systemic thinking, which helps to educate sustainable competent citizens and contributes to progress in the fulfilment of the 2030 Agenda on a global scale (Utrera, 2020).[AQ3]

On the other hand, of all the educational guides analysed, it is worth highlighting that of the "globalization and sustainability" unit, which in encompassed within the humanities degree at UPO, and the subject "environmental education" in the ES degree at the USE, as both have a higher average score for the presence of SDGs than the other institutions.

The first of the units outlined above, "globalization and sustainability," proposes a curricular structure that advocates working on the concept of sustainability from a critical, constructive and reflective perspective, addressing the impact of global issues at both a local and global level. From these approaches, this subject clearly presents the current controversies surrounding sustainable development, as well as the development of sustainability skills (Utrera, 2020). In regard to the second teaching highlighted above, "environmental education," the unit raises the importance of addressing environmental education and education for sustainability as a mechanism to resolving global conflicts from models of community participation based on the principles of inclusion and equity. In this case, the teaching staff responsible for this subject have a long history in this field that is reflected in the curricular focus of the subject, a key aspect to efficiently guide the curricular elements of the teaching programs (Floden, 2021).

In general terms, therefore, the results bring to the forefront that although the SDGs are present in the majority of teaching guides of the subjects analysed, there is still a long way to go until achieving the incorporation of the principles of sustainability, in the full sense, in both teaching practices and in the curricula of the degrees at Andalusian universities.

Conclusions

In summary, the results show that SDGs are present in the majority of teaching guides of the subjects analysed. In the faculties of education, these syllabi include the SDGs related to the social aspect of sustainability, with special focus on SDGs 4 – quality education, 5 – gender equality, 10 – reduced inequalities, 16 – peace and justice and 17 – partnerships for the goals, whereas others like SDG6 – clean water and sanitation or 7 – renewable energy are less represented.

The treatment given to each SDG according to the type of subject (basic, compulsory and optative) is different. On the other hand, the analyses show a reiterated pattern in relation to the integration of the 17 SDGs in the objectives, content and competencies, pattern that marks the main weight for SDG4 – quality education and the grouping of the rest of SDGs with a similar trend showing quite acceptable linear adjustment models.

The main highlights of the research are the following:

- Sustainability is progressively permeating university spaces, especially the areas of management and research.
- Teaching is incorporating the discourses of sustainability in the syllabi of the degrees from a complex, systemic and integrating perspective of reality, taking the SDGs as a framework.
- In a declarative way, relevant changes can be seen in the sustainability objectives, competencies and content of the syllabi.
- This is a first step in curricular planning that is having a direct impact on the transformation of the teaching methodologies and evaluation.

- The study opens up interesting transfer paths that neutralize resistance to curricular innovation and make it possible to address sustainability competencies in the syllabus of academic degrees in science, engineering, arts and so on.

An intensive work of academic mentoring and curricular counselling has started from this study, giving rise to a systematic work in the different university campuses and that is specified in two fronts of pedagogical intervention and curricular innovation within the framework of the training program and teaching innovation:

(1) on the one hand, the attention required by the training of the new teachers who joins university teaching and have an interest in these topics but does not know where to star; and

(2) as a space for professional development and improvement of senior teachers with more than ten years of teaching experience and who see these issues as an opportunity to improve and update their methodologies and curricular activities.

From this logic, their work, necessarily, must also be oriented to respond to the problems and issues that are outside their walls. They have to act as a socio-educational reference, as a socio-scientific issue and, from their social responsibility, offer tools, strategies and actions to improve the reality of the situation.

In light of the results of this research, while Andalusian universities are committed to the inclusion of sustainability, it is still necessary to continue working towards this priority. There is still a need for a more in-depth approach to link SDGs to tertiary greening models.

Notes

1. Colour scale: Red – absence of SDG (Q score: 1); Yellow – low presence (Q Score: 1.01-2); Orange – medium presence (Q Score: 2.01-3); Green – high Presence (Q Score: 3.01-4).
2. www.uco.es/rsu/la-universidad-de-cordoba-con-los-ods

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