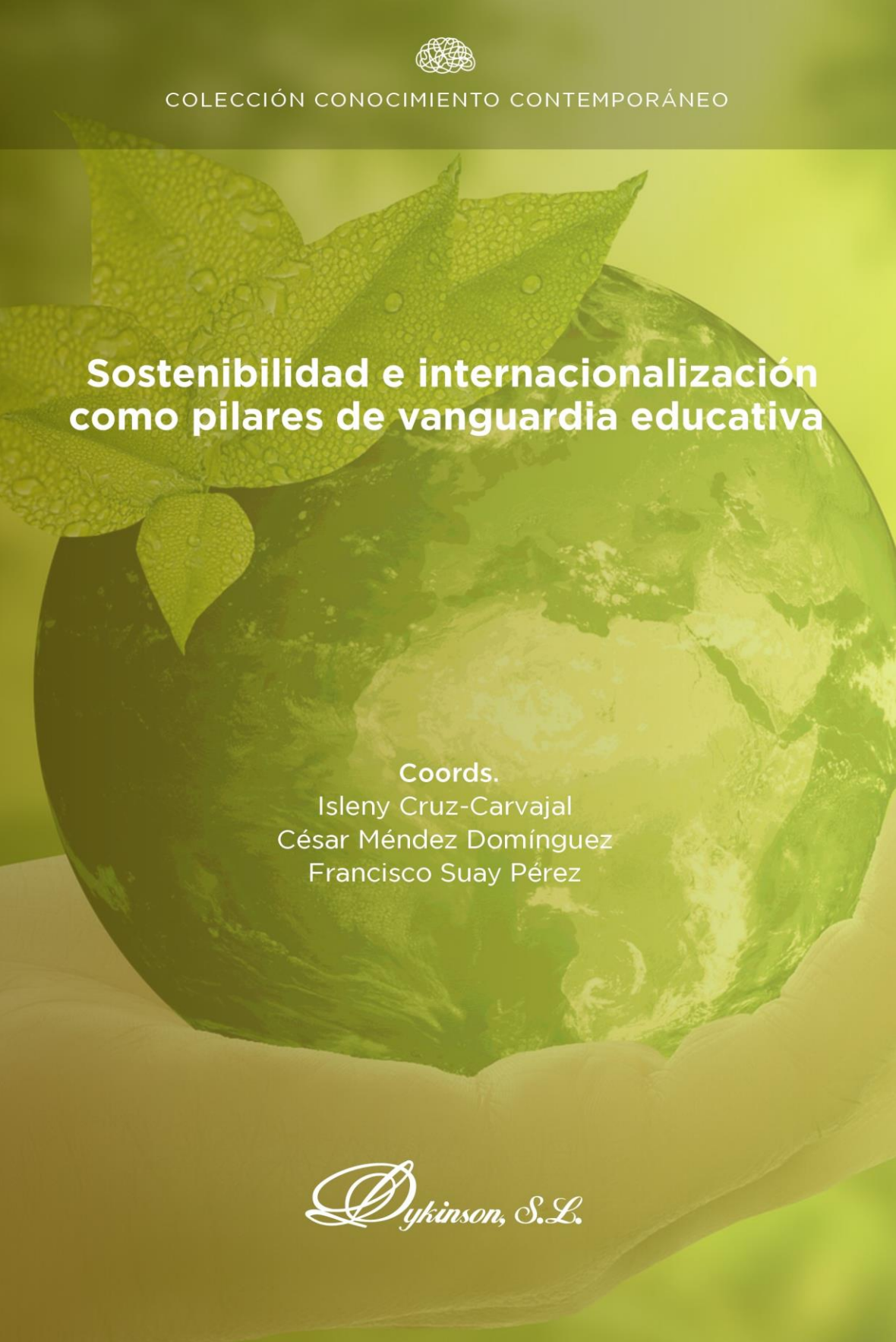

COLECCIÓN CONOCIMIENTO CONTEMPORÁNEO

Sostenibilidad e internacionalización como pilares de vanguardia educativa

Coords.
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METHODOLOGICAL PROPOSAL FOR INTEGRATING THE COMPETENCIES AND LEARNING OBJECTIVES RELATING TO RESPONSIBLE CONSUMPTION AND CLIMATE ACTION (SUSTAINABLE DEVELOPMENT GOALS 12 AND 13) INTO EDUCATIONAL PROGRAMS

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1. INTRODUCTION

Climate change is the greatest environmental challenge facing the world today and its consequences are already beginning to be felt in many other areas of our lives, such as the economy and society (and within that education). There is increasingly consistent scientific consensus that the rise in greenhouse gas (GHG) emissions produced by human activities is influencing the increase in global temperature (Cook et al. 2016). For this reason, in the different conferences of the United Nations Framework Convention on Climate Change they have repeatedly insisted on the need to make solid, strong commitments to reducing these emissions. This has led to the drafting of regulations and the implementation of different types of measures, often coercive (such as prohibiting the use of combustion-based heating systems, electrifying the automobile fleet, etc.). However, as the United Nations pointed out in a report on Education for Sustainable Development (UNESCO, 2014), real climate action will not be achieved without the active involvement of the general public, for which climate education is vital (Albareda-Tiana et al., 2022).

In addition, various different studies show that about 2/3 of all GHG emissions are directly related with our individual habits: the energy we use in our homes, transport, the consumption of goods and services

(Ivanova et al., 2015; Hertwich & Peters, 2009). This highlights the importance of the role that each one of us must play as individuals in the fight against climate change. In order to put more climate-friendly habits into practice and to achieve a "low-carbon" society, climate education is absolutely essential.

This was emphasized by Allison Anderson (2010, p.6), when she argued that "Education is an untapped resource to combat climate change. The international community and particularly those within the climate change arena have overlooked the role of education in bringing about behaviour change for mitigation. Educators have long traditions of educating for social change and can use their expertise on knowledge, skills, and attitude and behaviour change to help reduce greenhouse gas emissions".

Various strategies for education and behaviour change for mitigation have appeared in recent years. These include calculating our personal carbon footprint, an idea that has shown great potential for increasing public awareness of the impacts of our personal habits on climate change (Murlow et al., 2019; Buchs et al., 2018) and for encouraging each one of us to take specific, scientifically grounded actions to reduce our personal footprint (Gram-Hanssen & Christensen, 2012).

Calculating one's personal carbon footprint is also a way of highlighting Sustainable Development Goals 12 (Responsible Production and Consumption) and 13 (Climate Action), although it is also connected with all the other SDGs to a greater or lesser extent. As Birnik (2013) indicated, "carbon calculators constitute a potentially powerful bridge to connect individual action and lifestyle choices with the increasingly urgent need to prevent dangerous climate change".

Within the field of education, international organizations have found that young people are demanding quality education on climate change (UNESCO, 2022). At the same time, however, many teachers state that they feel unprepared to teach subjects relating to climate change or other issues that we will be dealing with here, such as responsible production and consumption (UNESCO, 2021).

2. OBJECTIVES

In view of all the above, it is necessary to continue offering teachers the training they require about climate change and responsible consumption. They must also be provided with the right pedagogical tools for them to apply in the different subjects within which these issues can be discussed. This is the general aim of the methodological proposal set out here, which can be broken down into the following specific objectives:

- Integrate the cross-cutting competencies for achieving the SDGs and the specific learning objectives for SDGs 12 and 13 into the syllabus of the subjects related with environmental issues.
- Contribute to the development of critical thinking amongst the students as regards the repercussions of human activity on the environment.
- Improve students' understanding of climate change and raise their awareness of the importance of individual action.
- Broaden their knowledge of the carbon footprint indicator.
- Promote responsible consumption and sustainable habits.

3. METHODOLOGY

In order to decide on the best way to integrate the cross-cutting competencies for achieving the SDGs and the specific learning objective of SDGs 12 and 13 into educational settings, we began by reviewing the recommendations of international organizations on Education for Sustainable Development Goals (UNESCO, 2014; Rieckmann, 2017). We also reviewed the relevant publications about climate education, which emphasize that climate change is a key issue in Education for Sustainable Development (EDS) (Allison, 2010).

To this end we analysed the key cross-cutting competencies for achieving the SDGs as defined by UNESCO (Table 1) and the specific learning objectives for SDGs 12 and 13 (Tables 2 and 3) (Rieckmann, 2017). The nine competencies which our activity should help to develop amongst

the students are set out as follows (de Haan, 2010; Rieckmann, 2012; Wiek et al., 2011; in UNESCO, 2017):

> **Systems thinking competency**: the abilities to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty.
>
> **Anticipatory competency**: the abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to as-sess the consequences of actions; and to deal with risks and changes.
>
> **Normative competency**: the abilities to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions.
>
> **Strategic competency**: the abilities to collectively develop and im-plement innovative actions that further sustainability at the local level and further afield.
>
> **Collaboration competency**: the abilities to learn from others; to un-derstand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empath-ic leadership); to deal with conflicts in a group; and to facilitate col-laborative and participatory problem solving.
>
> **Critical thinking competency**: the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse.
>
> **Self-awareness competency**: the ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires.
>
> **Integrated problem-solving competency**: the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the abovemen-tioned competences.

Given that the aim of this research was to integrate the competencies and learning objectives of Education for Social Development into the educational sphere, it was also considered essential to take the key pedagogical approaches recommended by UNESCO for EDS into consideration (Rieckmann, 2017):

- **Learner-centred approach**. Students are seen as autonomous learners with an active role, and teachers as facilitators of students' progress and reflection rather than simply as transferrers of knowledge (Barth, 2015).

- **Action-oriented learning**. This approach requires the participation of the student in an activity (inside or outside the classroom) and according to Kolb (1984) is made up four stages: 1) Having a concrete experience, 2) Observing and reflecting, 3) Forming abstract concepts for making generalizations and, 4) Applying these concepts in new situations. One of the main advantages of this approach is that it connects theoretical concepts with real experience.

- **Transformative learning**. In this approach, it is not sufficient just to pass on knowledge but to arouse amongst students a critical attitude and encourage them to question and change their traditional worldview. The aim is to ensure that they have a better understanding of the world around them and can create new knowledge (Slavich & Zimbardo, 2012; Mezirow, 2000).

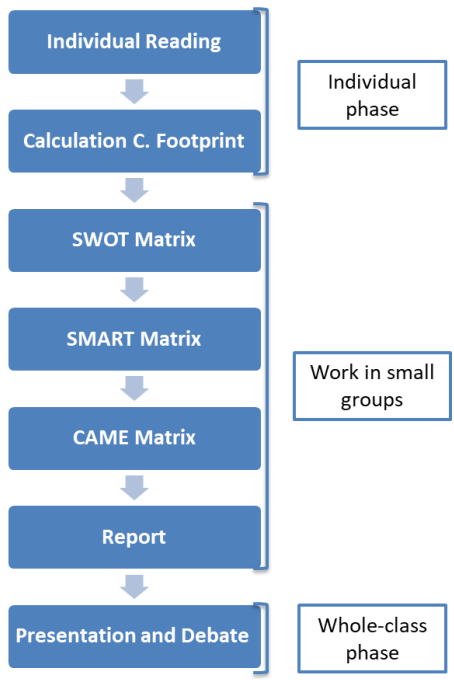
Specifically in relation to climate education, other authors have also emphasized that teachers should follow the Quality Learning Agenda, according to which the students must not only acquire knowledge, but must also develop critical competencies in analysing problems through participative, experience-based, critical and inclusive didactic methodologies (Allison, 2010).

In view of the above, we analysed the extent to which studying our personal carbon footprint could contribute to achieving these competencies and objectives in education. To this end, we devised an activity along similar lines to the educational approaches described above (learner-centred approach etc.). This meant, firstly, an activity in which the students played the central role (analysing their own individual consumption, transport habits etc.), secondly, an activity that involved action in a real-life situation, so as, thirdly and finally, to engage the students to such an extent that the experience became truly transformative for them (changing their individual habits so as to reduce their carbon footprint)

and perhaps even for the people around them (family or friends). The ultimate goal was therefore to create an experience-based, critical exercise at an individual level, while at the same time being participative and inclusive in the sense that it also contained group work activities.

On the basis of the analysis conducted, we designed an activity with the following main stages: 1) The students calculate their personal carbon footprint using a free access online tool; 2) They assess their current situation; 3) They set themselves personal targets; and 4) They identify the actions that may be necessary to achieve these objectives (Figure 1):

FIGURE 1. *General layout of the activity and its main stages.*



Source: The author

The activity contained phases of individual work (prior reading), group work (small groups) and whole-class work (presentation, debate and final reflection):

1. **Individual reading**. As a first step for this activity, the students were asked to individually review the scientific grounds for climate change and the carbon footprint from their class notes, specialist websites and complementary bibliography.

2. **Calculation of the personal carbon footprint**. Once they had assimilated the basic ideas about the carbon footprint as an indicator and its relationship with responsible consumption and climate change, the students then went on to estimate their own personal carbon footprint using the calculator available online at the CO2Web Observatory (https://huellaco2.org/) developed by the University of Alcalá (Burgui-Burgui & Chuvieco, 2020).

3. **Assessment of the current situation (SWOT matrix)**. The students were then asked to compare the footprints of each member of the group and analyse which factors could explain the different values obtained. The next stage was to select the specific case of one of the members of the group to study his or her carbon footprint in detail. Using a SWOT Matrix, they were asked to assess the particular aspects of this student's lifestyle that were affecting his/her carbon footprint as follows:

– *Strengths*: positive individual aspects (internal) that could make it easier for them to reduce their personal carbon footprint.

– *Weaknesses*: individual (internal) obstacles that make it difficult for them to reduce their personal carbon footprint.

– *Opportunities*: positive aspects and possibilities offered by the social and territorial setting that could make their footprint reduction target easier to achieve.

– *Threats*: social or territorial (external) obstacles that make it difficult for them to reduce their personal carbon footprint.

4. **Setting personal targets (SMART matrix)**. Taking the emissions data for the selected student as an example, the group must set some emissions reduction targets, using the SMART criteria as a guide:

– *Specific*: specific emissions reduction targets must be set for each different field (transport, domestic energy use, food, clothes, etc.).

– *Measurable*: this reduction must be measurable, which means the students must be asked to detail how they plan to schedule and record the gradual reduction in emissions.

– *Achievable*: the reduction targets must be realistic and achievable by the student in question.

– *Relevant*: at the same time as being realistic, the targets must also be relatively ambitious, given the current situation of climate emergency. On the basis of the review of international recommendations and technical reports, the students were asked to discuss what they considered would be a relevant (but achievable) emissions reduction percentage.

– *Timing*: the targets must be met within a specified timescale. The period normally used to measure changes in the individual carbon footprint is one year.

5. **Actions required to achieve the targets (CAME matrix)**. Once the personal emissions reduction target has been set, the best way to achieve it is by drawing up a route map. To this end, the students have to create a CAME matrix on the basis of the SWOT matrix in step 3:

– *Correct the Weaknesses*: identify the changes that must be made at an individual level.

– *Adapt to the Threats*: take steps to minimize the negative aspects of the social or territorial setting that make it difficult to reduce the footprint. This could involve both individual actions and measures that the public authorities (local, sub-regional…) could be asked to take.

– *Maintain the Strengths*: this point includes the "defensive strategies" for conserving existing individual strengths (in the face

of potential negative changes: price increases, restrictions in products or services, etc.).

– *Exploiting Opportunities*: "offensive strategies" to take advantage of any favourable situations that the student has so far left untapped.

6. **Drafting of a report on the activity**. All the work done must be set out in a group report that includes: the carbon footprint data for all the members, the individual case selected and the reasons why it was selected, the three matrices together with their relevant explanations, and a final group reflection.

7. **Presentation and debate**. In a final phase involving all the students, each group must present their work to the whole class. After each group presentation, there will be a question-and-answer session. Finally, the teacher will lead a general reflection about the lessons that can be learnt from this activity and how they relate to the more theoretical issues addressed earlier in class.

In order to assess the success of the activity in terms of the achievement of its objectives, a twofold evaluation process was planned: 1) Self-assessment by the students in which they answered a brief questionnaire about the activity (related with the learning objectives for SDGs 12 and 13); 2) Hetero-evaluation by the teacher reviewing the degree to which the crosscutting competencies for sustainability had been integrated into the teaching activity.

The self-assessment questionnaire was drawn up and applied using the free Google Forms tool, which is well-known and widely used by the students. It was sent out to a total of 136 third-year students from the degree courses in Environmental Sciences (University of Granada) and in Tourism (University of Alcalá) during academic years 2021/2022 and 2022/2023 respectively, in both cases as part of a practical activity on the teaching syllabus. In the questionnaire, the students were asked to indicate how much they agreed with the following statements using a

Likert scale with values of 1 to 5 (ranging from 1 “Not at all” to 5 “Very much so”):

1. “After carrying out this activity, I have broadened my knowledge about Climate Change".
2. "After carrying out this activity, I have more information than before about the Carbon Footprint and I understand this indicator better".
3. “Indicate how surprised you were about the level of emissions associated with the different categories of our individual habits”.
4. "After using the Carbon Footprint Calculator, I am more aware of which of my habits produces the greatest impact on climate change".
5. “After this activity, I am more aware of how I can change my habits to reduce my carbon footprint”.
6. "I will use the calculator again in a while to find out if I have reduced my footprint".

These questions were selected after scrutinizing the learning objectives for SDGs 12 and 13. As with the other SDGs, UNESCO classifies these learning objectives in three blocks: cognitive, socioemotional and behavioural (Rieckmann, 2017), so when it came to selecting the set of questions for our survey (necessarily brief so as to ensure a high participation amongst the students), we aimed to evaluate at least three objectives in each block (cognitive, socioemotional and behavioural), although in some cases there were more than three. A detailed presentation of the relation between the learning objectives and the questions used to assess them can be seen in Tables 1 and 2. To complement this information, we also indicate certain phases of the activity in which the specific learning objectives that were not directly covered in the questionnaire were explored.

TABLE 1. *Relation between the specific learning objectives for SDG 12, the phases of the activity and the questions chosen for the self-assessment questionnaire.*

LEARNING OBJECTIVES FOR SDG 12 "RESPONSIBLE PRODUCTION AND CONSUMPTION"		QUESTION Nº or PHASE
Cognitive learning objectives	1. The learner understands how individual lifestyle choices influence social, economic and environmental development.	2,3,4,5
	2. The learner understands production and consumption patterns and value chains and the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.).	2,4,5
	3. The learner knows roles, rights and duties of different actors in production and consumption (media and advertising, enterprises, municipalities, legislation, consumers, etc.).	Group debate
	4. The learner knows about strategies and practices of sustainable production and consumption.	2,4,5
	5. The learner understands dilemmas/trade-offs related to and system changes necessary for achieving sustainable consumption and production.	2,4,5
Socioemotional learning objectives	1. The learner is able to communicate the need for sustainable practices in production and consumption.	Group debate
	2. The learner is able to encourage others to engage in sustainable practices in consumption and production.	Group work
	3. The learner is able to differentiate between needs and wants and to reflect on their own individual consumer behaviour in light of the needs of the natural world, other people, cultures and countries, and future generations.	4,5
	4. The learner is able to envision sustainable lifestyles.	4,5
	5. The learner is able to feel responsible for the environmental and social impacts of their own individual behaviour as a producer or consumer.	2,4,5
Behavioural learning objectives	1. The learner is able to plan, implement and evaluate consumption-related activities using existing sustainability criteria.	2,4,5
	2. The learner is able to evaluate, participate in and influence decision-making processes about acquisitions in the public sector.	Group debate
	3. The learner is able to promote sustainable production patterns.	CAME Matrix
	4. The learner is able take on critically on their role as an active stakeholder in the market.	4,5,6
	5. The learner is able to challenge cultural and societal orientations in consumption and production.	4,5,6

Source: The author, based on Rieckmann (2017)

TABLE 2. *Relation between the specific learning objectives for SDG 13, the phases of the activity and the questions chosen for the self-assessment questionnaire.*

LEARNING OBJECTIVES FOR SDG 13 "CLIMATE ACTION"		**QUESTION Nº or PHASE**
Cognitive learning objectives	1. The learner understands the greenhouse effect as a natural phenomenon caused by an insulating layer of greenhouse gases.	1
	2. The learner understands the current climate change as an anthropogenic phenomenon resulting from increased greenhouse gas emissions.	1
	3. The learner knows which human activities – on a global, national, local and individual level – contribute most to climate change.	2,3,4
	4. The learner knows about the main ecological, social, cultural and economic consequences of climate change locally, nationally and globally and understands how these can themselves become catalysing, reinforcing factors for climate change.	1
	5. The learner knows about prevention, mitigation and adaptation strategies at different levels (global to individual) and for different contexts and their connections with disaster response and disaster risk reduction.	4,5
Socioemotional learning objectives	1. The learner is able to explain ecosystem dynamics and the environmental, social, economic and ethical impact of climate change.	Group work, Whole-class debate
	2. The learner is able to encourage others to protect the climate.	Group work, Whole-class debate
	3. The learner is able to collaborate with others and to develop commonly agreed-upon strategies to deal with climate change.	5
	4. The learner is able to understand their personal impact on the world's climate, from a local to a global perspective.	2,3,4
	5. The learner is able to recognize that the protection of the global climate is an essential task for everyone and that we need to completely re-evaluate our worldview and everyday behaviours in light of this.	3,4,5,6
Behavioural learning objectives	1. The learner is able to evaluate whether their private and job activities are climate friendly and – where not – to revise them.	4,5,6
	2. The learner is able to act in favour of people threatened by climate change.	Group debate
	3. The learner is able to anticipate, estimate and assess the impact of personal, local and national decisions or activities on other people and world regions.	2,4,5,6
	4. The learner is able to promote climate-protecting public policies.	CAME Matrix
	5. The learner is able to support climate-friendly economic activity.	4,5

Source: The author, based on Rieckmann (2017)

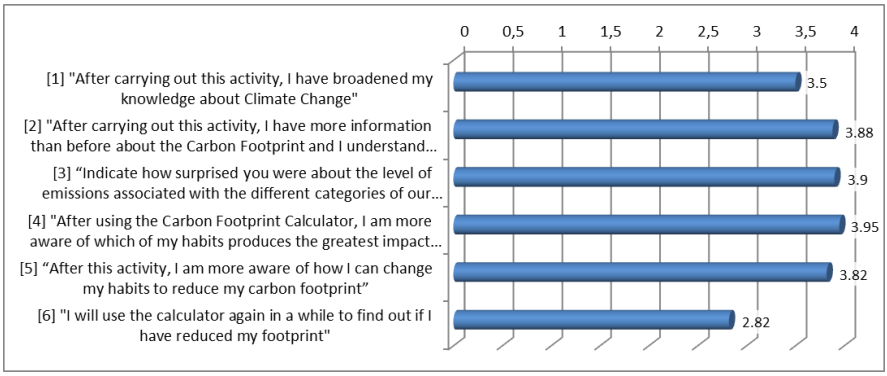
As regards the assessment conducted by the teacher, this focused above all on the degree to which this activity enables students to work on the cross-cutting competencies for sustainability set out in the aforementioned UNESCO document (Rieckmann, 2017). In this case, we used a scale of four colours (with values of 1 to 4) similar to that used by the United Nations in its evaluation of the achievement of the SDGs in different areas and countries. The values from 1 to 4 were set out in a double-entry table, according to the degree (low, medium, high or very high) to which the different phases of the activity enabled the cross-cutting competencies for sustainability to be integrated into the educational setting.

4. RESULTS AND DISCUSSION

Once the activity had been completed, the self-assessment questionnaire was sent to the 136 participants. In spite of it being anonymous and not obligatory for the students' grade assessment process, a total of 102 replies were received. We will now present a number of figures displaying the results. The first (Figure 2) shows a summary with the average score awarded by the students in response to each statement.

As can be seen, in general the scores are very high, with four out of the six questions scoring over 3.8/5, and an overall average of 3.645/5 for the activity as a whole. However, we should highlight two main points that we will later go on to discuss in greater detail. The first is that the activity did not seem to broaden the students' knowledge about climate change to the same extent as it did about the concept of carbon footprint and other more specific questions related with this indicator, and secondly, the relatively low interest on the part of the students in calculating their carbon footprint again in the near future.

FIGURE 2. *Average score obtained for each question in the self-assessment questionnaire on a scale of 1 to 5 (where 1 means "Not at all" and 5 "Very much so")*



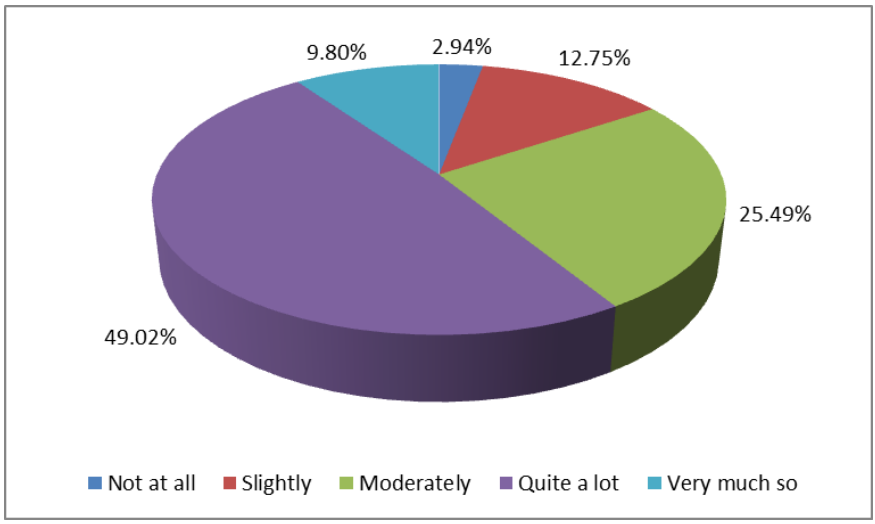
Source: The author

Figure 3 is related to Question [1] "After carrying out this activity, I have broadened my knowledge about Climate Change"; and Figure 4 is related to Question [2] " After carrying out this activity, I have more information than before about the Carbon Footprint and I understand this indicator better".

As regards the first question, the most popular option was "Quite a lot" (49.02%), followed by "Moderately" (25.49%). Only 9.8% of the students considered that the activity had provided them with a lot of new information about climate change.

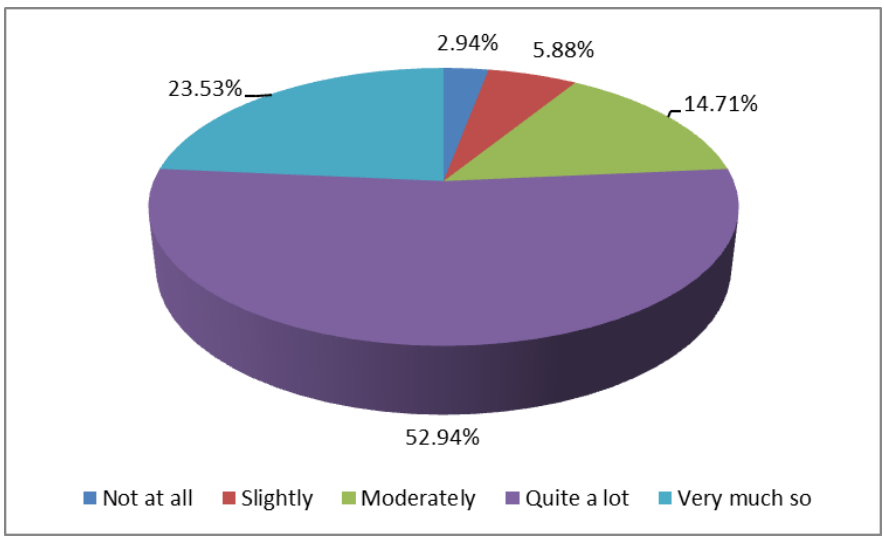
However, the percentages for the options "Quite a lot" and "Very much so" were considerably higher for the question about the carbon footprint, at 52.94% and 23.53% respectively. Undoubtedly, in recent times in schools and universities and indeed throughout the media, information about climate change has increased significantly so heightening students' awareness and knowledge. Nonetheless, the carbon footprint concept is still relatively new to them.

FIGURE 3. *Percentage of replies to the different options in Question 1.*



Source: The author

FIGURE 4. *Percentage of replies to the different options in Question 2*



Source: The author

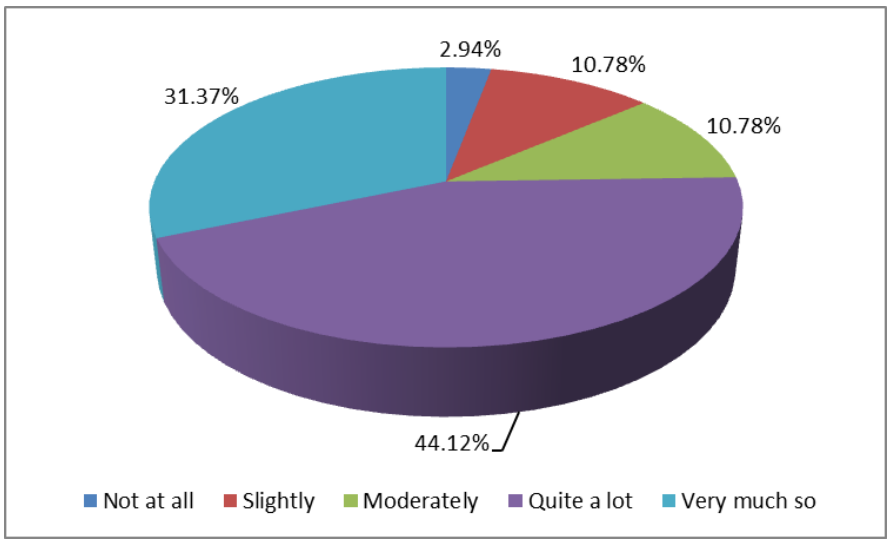
Figure 5 shows the scores awarded to Question 3, "Indicate how surprised you were about the level of emissions associated with the different categories of our individual habits", while Figure 6 shows those for

Question 4, "After using the Carbon Footprint Calculator, I am more aware of which of my habits produces the greatest impact on climate change".

These results support the explanation offered in the previous paragraph, by highlighting an increase in the “Very much so” answers in both cases (totalling 31.37% and 35.29%, respectively).

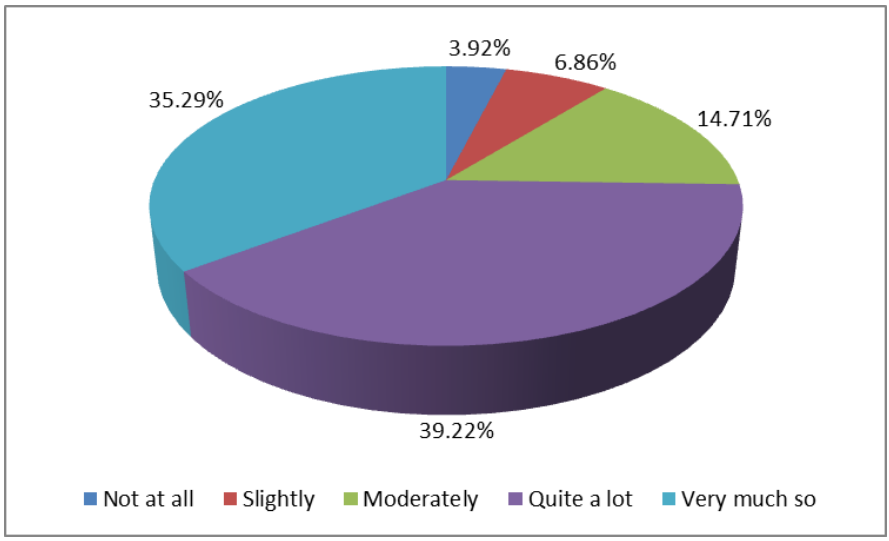
This indicates that the carbon footprint concept, expressed here in terms of the emissions produced by each individual habit, is something very new for around a third of the students and quite new for around 40%. In this way, one could argue that 75% of the students claimed to have broadened their knowledge on this issue considerably.

FIGURE 5. *Percentage of replies to the different options in Question 3*



Source: The author.

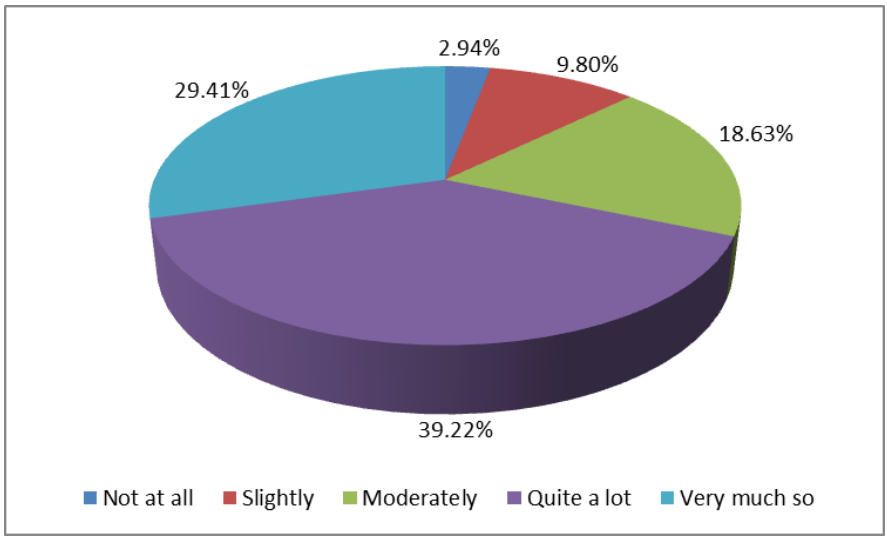
FIGURE 6. *Percentage of replies to the different options in Question 4*



Source: The author

Figure 7 shows the scores awarded to the different options in Question 5 "After this activity, I am more aware of how I can change my habits to reduce my carbon footprint". This figure shows a very similar distribution of answers to Figures 4 and 5, although in this case, the "moderately" option is selected more frequently (18.63%). In general, the students claim to have acquired new information about how to develop climatically more sustainable habits. This is logical given the close relationship between this question and the contents of the two previous questions, set out in Figures 5 and 6.

FIGURE 7. *Percentage of replies to the different options in Question 5*



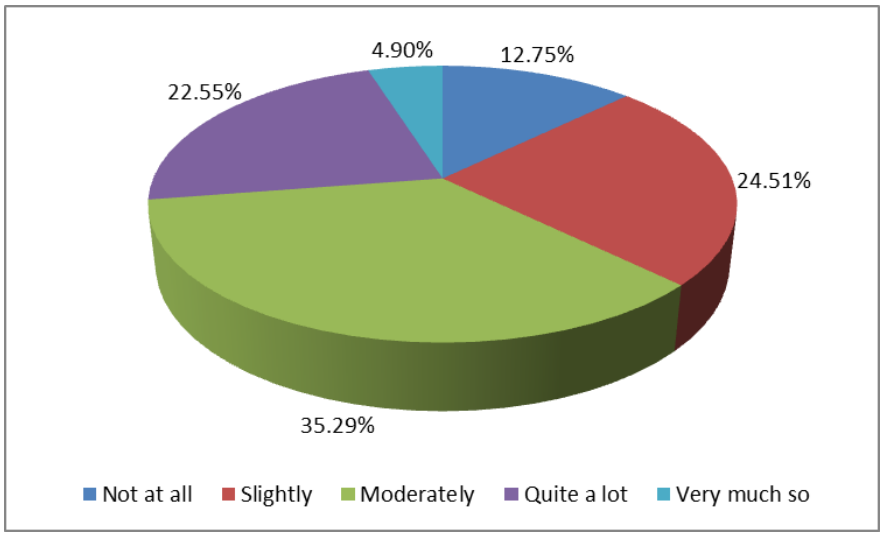
Source: The author

Lastly, Figure 8 refers to Question 6: "I will use the calculator again in a while to find out if I have reduced my footprint". In this case, although the average score was acceptable (2.82/5), the distribution of the answers was strikingly different from those of the other questions.

As can be seen, the dominant option is “moderately” (35.29%), followed by “slightly” (24.51%) and “quite a lot” (22.55%). The option “very much so” was a long way behind with just 4.90% of the answers.

Although in this study, we did not ask the students about their reasons for (not) using the calculator again and measuring their carbon footprint, in conversations with them during the course of the activity, we noticed two fundamental reasons that have nothing to do with their interest, or lack of it, in climate change or their personal consumption habits.

FIGURE 8. *Percentage of replies to the different options in Question 6*



Source: The author.

The first is that it took a long time, and secondly, the problems they had filling in some of the details requested by the calculator to estimate their carbon footprint (for example it asks for domestic energy bills, very precise figures about meals, the use of electronic devices etc.). It is highly likely that if the indicator was simpler to use, it would require less time for completion, and the students would use it more frequently, so highlighting that their two main complaints are related. This is an interesting recommendation that should be borne in mind when it comes to designing tools of this kind. The challenge lies in creating a calculator with as much detail as possible (so that it can estimate one's personal carbon footprint accurately), while at the same time being quick and easy to use.

As regards the results of the hetero-assessment conducted by the teacher, these are displayed in Table 4. Although obtaining a quantitative numerical value is not the ultimate purpose of evaluations of this kind, for guidance purposes, a numerical value (of 1 to 4) was assigned to each colour. The average score obtained was highly satisfactory (3.69/4), although it was not completely homogeneous for the different competencies.

FIGURE 9. *Results of the hetero-assessment conducted by the teacher*

HETERO-ASSESSMENT RUBRIC		Phases of the Activity				$\overline{X}$
		Individual work	Group work	Reports	Presentation and Debate	
Competencies	Systems thinking competency	4	4	4	3	3.75
	Anticipatory competency	4	4	4	3	3.75
	Normative competency	4	4	4	4	4
	Strategic competency	2	4	4	4	3.5
	Collaboration competency	1	4	4	4	3.25
	Critical thinking competency	3	4	4	4	3.75
	Self-awareness competency	4	4	4	3	3.75
	Integrated problem-solving competency	3	4	4	4	3.75
	Average:	3.13	4	4	3.63	**3.69**

Source: The author

For example, and always bearing in mind the definition set out in the aforementioned UNESCO document, the individual work phase does little to enhance some of the cross-cutting competencies. These include the strategic competency and the collaboration competency, which by definition require teamwork or are particularly empowered by it. For their part, the oral presentation and debate phases are not particularly conducive to working on other competencies such as the anticipatory competency or the self-awareness competency. However, in this sense one could argue that the activity is designed in an evenly-distributed, complementary way, with a balance between the phases that encourage more individual-type competencies and others that are more oriented towards collaborative work. In addition, there are times in which the students must compare their individual opinions and findings (personal emissions and their causes) with the rest of the group and finally with the whole class. In this way we achieve a certain degree of continuity and cross-disciplinarity in the process, while ensuring that the activity conforms to the Quality Learning Agenda recommended in Education for Sustainable Development (Allison, 2010). This requires the analysis of problems using participative, experience-based, critical and inclusive pedagogical methodologies.

5. CONCLUSIONS

In this research, we presented the design of an activity which combined different pedagogical approaches recommended for Education for Sustainable Development, in a bid to integrate the key crosscutting competencies for sustainability recommended by UNESCO and the specific learning objectives of SDG 12 (Responsible production and consumption) and 13 (Climate action) into the educational field. At the same time, the activity sought to improve the students' knowledge about Climate Change and the carbon footprint indicator. It also had several complementary objectives, including the development of critical thinking regarding the environmental impact of our individual habits and the promotion of climatically more responsible consumption.

The suitability of this activity for achieving the objectives we set ourselves was evaluated in two different ways: self-assessment by the students and hetero-assessment by the teacher. In the first case, the assessment was more focused on the specific learning objectives of SDGs 12 and 13, while in the second case it was related with the cross-cutting competencies for sustainability. In both cases, the results were very satisfactory with high overall averages from a quantitative point of view (3.645 points out of 5 and 3.69 points out of 4, respectively) and some interesting qualitative opinions from the students about what they had learned.

In short, one can conclude that the design of critical and participative activities about the personal carbon footprint made a decisive contribution to incorporating the cross-cutting competencies for achieving the SDGs and the specific learning objectives for SDGs 12 and 13 into an educational setting. Activities of this kind also have great potential for educating students about climate change and raising their awareness as to the importance of their individual role, so promoting responsible consumption.

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