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Characterization of Environmental Education in Spanish Geography Textbooks

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Abstract: Environmental problems endanger the sustainability and survival of our planet. A way to raise awareness of the seriousness of the current environmental situation among future citizens and instill proactive behaviors that place the environment at the center of decision-making is environmental education. This study analyzes nine primary and secondary education textbooks in order to see what environmental education students receive as part of the subject of geography across the years of compulsory education in Spain. These textbooks are published by three different and main companies, which are a good example of the adaptation of the official curriculum. The study was conducted using the design and development of a coding sheet combining analysis of format (quantitative) and content (qualitative). The results show much room for improvement there is in environmental education in Spain. This improvement should start from the organization of the curriculum and its subsequent transposition into the textbooks. Thus, many changes are needed if we wish to build a society capable of effectively solving the threat of the environmental problems that surround us.

Keywords: environmental education; geography; textbook; education for sustainable development; Spain

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1. Introduction

1.1. Context and Goal

Today's society is confronted with serious environmental problems, such as climate change, the hole in the ozone layer; the loss of biodiversity, of vegetal cover and of fertile soil; the shortage of drinking water or the accumulation of hazardous waste [1], the vast majority of which are caused by human activity [2]. Numerous authors have used the term "Anthropocene" to define the period in which the urban, agricultural, and industrial development of the human race around the world, together with the uncontrolled growth of the population, has negatively impacted the environment to such an extent that we are in the midst of a planetary emergency [3–5].

Since the end of the 19th century, multiple initiatives have attempted to educate and raise awareness of the protection and sustainability of the Earth. An example of this is the creation of protected areas. These actions started to grow in intensity at the end of the 1960s, with the emergence of the so-called green movement. The problems involved started to become more visible and a degree of environmental awareness began to take root [6]. A significant moment was the declaration of Earth Day in 1970 [7]. In this sense, the concept of sustainable development entered into common usage across the world, being definitively defined in 1987 by the World Commission on Environment and Development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The idea of sustainable

development was conceived of as an aspiration of humanity as a whole [8]. The United Nations has highlighted the problem with ongoing successive summit meetings on the planet with a focus on the environment. The conference held in Stockholm in 1972 [9], marked the emergence of environmental education as an important area of pedagogy [10], and since the iconic 1992 United Nations Conference on Environment and Development in Rio de Janeiro [11], it has remained in the spotlight as a key tool to help tackle environmental problems. Johannesburg was then home to a similarly historic conference 20 years later. Goal 4 of the 2030 United Nations Agenda for Sustainable Development continues to give education a key role in enhancing the sustainability of the Earth [12]. Despite all these global initiatives, which have generated local synergies, not only have the environmental issues not been solved, but they have in fact worsened considerably [6]. As the 21st century advances, the impact of human activity on the environment is growing exponentially.

Education is thus one of the primary means available to tackle these problems, a tool that can be leveraged, in mid- and long-term strategies to develop critical thinking that modifies the behavior of human beings in nature. An individual's attitudes and behaviors towards nature are largely shaped by the values they acquire during their education [13]. Formal education, together with the family, the media, and peer group, is the most significant influence on children and young people in their value formation [14].

Including environmental education within formal education is a prime necessity [15]. Given its cross-curricular nature, environmental education should be present in all subject areas and in all levels of compulsory education [16,17]. This cross-curricularity is increasingly linked to the new technologies and their penetration in schools [18]. Numerous elements of environmental education form part of the natural science curriculum, examples being energy, chemical changes, ecosystems, or health, while others are more typically studied under the umbrella of social sciences, with topics such as space, landscape, population, the economy, and natural resources. Moreover, it is more than possible to work on all this content through other fields of knowledge.

The emphasis is placed on how content is developed and sequenced in the different educational levels under analysis. This allows us to establish the level of knowledge that will be acquired by future citizens.

The aim of this work is to know the idea of environment and sustainability that geography textbooks for formal education of primary and secondary school transmit in Spain. It is carried out through the analysis of textbooks from three publishing houses with important implantation in the whole Spanish compulsory education system. The emphasis is placed on how content is developed and sequenced in the different educational levels under analysis. This allows us to establish an approach to the level of knowledge that is taught to students. The present work focuses on the areas in the primary and secondary curriculums that explicitly include geography. It shows the findings of the analysis of nine textbooks for the social sciences in primary education and for geography and history in secondary, edited by the leading publishing companies used in schools. These are the most widespread and representative elements in the education system [19,20], which justifies their use to examine the weight of environmental education in the formal education of Spanish citizens.

1.2. State of the Research Field

A textbook can be defined as a manual that provides the essential knowledge students of a certain age need to understand with relation to a specific discipline or topic [21]. Textbooks are learning tools, the main aim of which is to help pupils and facilitate teaching activity within the teaching-learning process [22,23], specifying and sequencing the curriculum set out for each subject [24]. Numerous authors have suggested that textbooks are the most widely used teaching and learning tool [25–27]. They present not only academic but also cultural and ideological content [28,29], acting in conjunction to transmit a reality to students that is established through the optic of the authorities [30].

They also condition habits and cultural trends, as the information they set out has a decisive impact on the way the recipients will, in the future, understand, interpret and symbolize reality [31]. In England, authors and editors of such books play a key role [32]. However, each country decides on the treatment and degree of freedom it gives in the preparation of textbooks. There are different perspectives of approving them specifically for subject teaching or in others as commercial publications. There is a wide range of possibilities in relation to curriculum requirements and evaluation [33]. In Spain, they are closely related to the current curriculum. The curriculum in geography is very extensive in content which makes it difficult to incorporate environmental issues and limits the flexibility of publishers to make different proposals. The weight of environmental education is unevenly distributed. For example, in secondary education, the environment is more specific and developed in the curriculum in subjects such as scientific culture in the 4th year than in geography in the 3rd year, despite the fact that these subjects are linked to geography from primary school. In addition, in other countries the curriculum is different from the Spanish one. This fact implies a difficulty in making comparisons and extrapolating results.

It is worth remembering, nonetheless, that a textbook is only one of a number of didactic resources, and, as such, its effectiveness depends on the use made of it. Hence, a bad book can promote good learning if used appropriately, while an excellent textbook will not help students acquire solid knowledge if it is not correctly used [22].

Environmental education must be approached from the prism of sustainable development and its triple aspect: environmental, but also economic and social [34]. Ecological sustainability ensures the maintenance of ecosystems and biodiversity in its broadest sense. Economic sustainability guarantees the efficient use and management of resources for their conservation for future generations. Finally, social sustainability allows a better management of equity and equality among all people. The natural components in environmental education are clear and tangible, but the anthropic components based on socioeconomic elements must also be tangible. The Aichi-Nagoya Declaration recognizes people as the central element of sustainable development [35,36]. The European Union has made these objectives its own in its strategic approach for a sustainable European future by including the SDG in policies and initiatives at all levels [37]. This document begins by reinforcing this idea: "Sustainable development has long been a central pillar of the European project. The EU Treaties give recognition to its economic, social and environmental dimensions, which must be addressed jointly." The geographic synthesis based on the relations between the environment, natural elements and man, and social and economic elements allows for a more adequate vision of environmental education [38].

Geography is one of the disciplines that best holistically covers most of the extensive knowledge on man's relations with the environment, but also with economy and social aspects. The cross-curricular and multidisciplinary nature of geography provides an optimal framework under which to address these topics. The science of geography studies the spatial and ecological relationships between society and the environment [39]. It analyses environmental questions, considering the interaction between these and the human race, which is the main force behind these problems [2]. One of the main aims, then, of geography is to achieve a more sustainable society [40,41]. In light of the above, geography can be considered one of the sciences which facilitates the comprehensive study of today's environmental problems.

Furthermore, the current legislation in Spain, that is, the Organic Law on the Improvement of Education (LOMCE) [42] and Royal Decrees 126/2014 and 1105/2014), clearly establishes environmental education as a cross-curricular subject. Consequently, we can find content related to environmental education in many areas; mainly in natural and social sciences in primary education (although also in physical education and citizenship) and in biology, geology, geography, and history in secondary education, while not forgetting its place in other subjects.

There is a large body of literature on the content of textbooks in social sciences, in general, and geography, in particular, in both primary and secondary education. Elmersjö [43] aimed to determine how the meaning of the word Europe had changed in Swiss textbooks between 1910 and 2008. Implementing a methodology combining quantitative techniques (word count) and qualitative methods (text analysis), 10 secondary education manuals were analyzed. The findings showed that the concept of Europe had undergone enormous changes over the course of the 20th century. Korfiatis, Stamou and Paraskevopoulos [44] conducted a study to analyze the environmental content in nature images in primary education textbooks in Greece. The authors studied all the natural science textbooks used across the six years of primary school (pupils aged from 6 to 12 years), concluding that the images gave a wholly incoherent vision of nature and its relationship with society. Both works, at different scales and with different methods, present the importance of the time variable in this type of study. The analysis of the evolution of certain concepts, in the school period through a longer period, through textbooks, shows nuances and changes that reflect changes in society and its priorities.

Carvalho, Tracana, Skujiene and Turcinaviciene [15] investigated whether the current relationships between human beings and nature were reflected in images in secondary education textbooks. They used a sample of 25 different textbooks designed for 14- to 16-year-old students in 14 countries in Europe and Africa. In 2016, Maier and Budke [45] conducted and analysis of the way 19 geography textbooks (10 British and 9 German) taught students about socio-environmental and spatial problems about the present and future. Their findings revealed considerable differences between the books in both countries (the British ones being more positive), none of them gave the issues the importance they deserve, considering the social, environmental, and spatial problems of these two territories. In a study in Germany, Kowasch [46] examined 13 geography textbooks edited by four publishing companies with a focus on the concept of sustainable development, finding their treatment of the question to be insufficient, with little connection to cases in the students' daily lives, tending instead towards simplistic explanations. In this case, the authors show another way of approaching the comparative study of environmental education in textbooks. There are differences between countries or even with the different way of approaching the study in one's own country with different publishers. Both regarding the temporal variability and with the spatial variability, diverse results are perceived that converge in the fact that the teaching of the textbooks reflects a moment and a social environment.

It is worth highlighting the study on ten geography textbook authors in England, with reference to both primary and secondary education [32]. The work does not focus on the textbooks themselves but rather the motivations, perspectives, and influences of those with the complex task of transposing the requirements of the national curriculum to effective instruments for classroom use. In the same vein, Lee [47] presented a more complete study on primary and secondary geography textbooks in seven countries across five continents. Beyond the difficulties and heterogeneity of perspectives, a common vision was found, reflected in the books, and adapted to the circumstances of the individual countries.

In Spain, social science textbooks edited by two different publishing companies and used from 1st to 6th grade of primary education were recently analyzed [48]. The authors concluded that the textbooks largely promoted rote learning, failing to help the students to properly understand how society functions. The conclusions of another recent study on 6th grade were similar [19]. A year later, and with a focus on secondary education, were reviewed 63 natural and social science textbooks, suggesting that these books failed to develop cognitive skills using a constructivist methodology [20]. The result of several investigations, and fundamentally the one mentioned, refer to a very theoretical and memory learning process of teaching and learning as opposed to a learning resulting from a social construction in the classroom based on the concept of constructivism. The activities and tasks must pursue the understanding and transformation of the world. The

books must increase the participation of students in their learning process. Although there are tasks aimed at this objective, they are usually complementary and located at the end of the subject behind the theoretical contents.

In summary, the previous literature suggests that the way geography textbooks address environmental education in primary and secondary education could be improved. These weaknesses vary enormously between countries. The search carried out on studies in Spain revealed no cases in which primary and secondary geography textbooks are analyzed together.

2. Materials and Methods

2.1. Materials

The sample was intended to cover a broad range of levels of compulsory education in Spain, so as to have a detailed idea of the nature of the environmental education students are provided with within the discipline of geography. Compulsory education in Spain comprises ten levels (from 1st to 6th grade of primary education and from 1st to 4th grade of secondary education), from which we selected three equal intervals (3rd and 6th grade of primary and 3rd grade of secondary). The primary education textbooks correspond to the subject of social sciences, while the secondary education ones are those for the subject of geography and history. Third grade of secondary education was chosen because geography has a greater weight in that year, while in 1st, 2nd, and 4th, the focus is more on history. For each grade, we evaluated three publishers, and thus the sample consisted of nine books, three for each grade (3rd and 6th of primary education and 3rd of secondary education) and three for each publisher chosen (*Anaya*, *Santillana*, and *SM*). The three chosen publishers are a representative sample and are present in all the studies consulted. All of them are part of the National Association of Book and Teaching Material Publishers. This association does not break down the market share of its members in its reports [49]. These are the three most widely used publishers in Spanish schools, accounting for more 50% of the market [50]. Other sources report that *Santillana* and *Anaya* occupy almost three quarters of the market. They are followed at a distance by *Vicen-Vives* and *SM* [51]. *Santillana* and *Anaya* lead with the state schools, while *Anaya* and *SM* lead with the private schools [52]. The references of the textbooks analyzed are included in Appendix A.

2.2. Methods

The scientific literature includes a considerable number of studies that aim to determine how textbooks address certain content. Following Güemes [28], most of these studies have used qualitative methodology, mainly by means of text analysis and interviews, both applied to case studies. The present work implements non-experimental case studies. It is grounded in an empirical, systematic search in which the independent variables are already established or cannot be manipulated [53]. The textbooks are analyzed using both qualitative and quantitative methodology, combining format analysis using frequency analysis (quantitative) and content analysis (qualitative). To this end, a series of items was designed, which were evaluated and tabulated. The coding of the data was done by only one of the researchers and a reliability test was performed by checking 20% of the sample by two encoders according to the Guetzkow algorithm [54]. The result is about 95%.

The analysis was conducted using a specially created coding sheet Table 1. Its design considered contributions from previous studies [15,19,20,23,25,29,41,43–45,48,55,56] and the current Spanish legislation. The coding sheet has two different parts, one devoted to format analysis, with a quantitative focus (Table 1), and the other dedicated to content analysis, drawing on a qualitative perspective (Table 2). This blended methodology has been used in previous research, such as that used in [25,29,43,45,48,55].

As regards the format of the textbooks, we found the following elements: topics, pages, tasks, diagrams, maps, tables, statistics, and images on environmental education. We also classified the images by the environment portrayed (natural, urban, or rural), the human impact on the environment shown (positive or negative) and we analyzed whether they transmit an idea of nature as a source of resources and means to be exploited (the utilitarian value of nature). The quantitative evaluation was conducted through the frequency with which items appeared, regardless of the quality of the content.

Content analysis can be defined as a technique to interpret texts involving the classification of certain types of content [56]. This was systematized under the selection of environmental topics and questions, as well as capacities and attitudes required to provide a solution. This section of the questionnaire comprises four categories: objectives, competences, content, and assessment. The sections on objectives, competences, and content were drawn up by studying the current legislation, namely, the Organic Law on the Improvement of Education (LOMCE) [42] (MECD, 2013), Royal Decree 126/2014 (which establishes the basic curriculum for primary education) (MECD, 2014), and Royal Decree 1105/2014 (which establishes the basic curriculum for secondary education) (MECD, 2015).

In the objectives section, we included those necessary to raise students' awareness of environmental problems and to boost their interest in actively attempting to solve these problems. The items refer to the use of sources of information, critical thinking, entrepreneurial spirit, personal initiative, participation, planning, decision-making, and accepting responsibilities.

The rapid changes in knowledge, its increasingly complex nature, and the globalized and digitalized society in which we now live require future citizens have an all-round education that focuses not just on transmitting information, but also on developing skills and attitudes [57], leading to the need for competence-based learning [58]. We included the curricular competences whose acquisition is essential to learn about the causes and consequences of environmental problems and to act ethically to ensure. These are learning to learn, digital competence, and social and civic competences. The selected competencies are those that the authors have considered to be most relevant to environmental education after reviewing each of them. The mathematical, linguistic, awareness, and cultural expression competences were the ones that were most distant thematically. All the competencies can address sustainable development and environmental education, but they are perhaps the most tangential. On the other hand, there is civic and social competence, even more so when approached from the perspective of geographic discipline. Learning to learn and digital competence are incorporated from the perspective of the time we have had to live in a digital and changing world where these competences are transversal and fundamental in this and many other issues. Finally, the competence that had the most debate, and that finally was not incorporated in a visible way, was that of initiative and entrepreneurial spirit. It was considered that these skills could be analyzed from objectives of the attitudinal and procedural contents.

The current importance of learning by competencies to form citizens in the dimensions of knowledge, knowing how to be and knowing how to do is evident. UNESCO itself [59] promotes competencies that lead to a constant redesign of the teaching-learning process with new proposals [60], proposals that are more and more valid in the face of the constant international push in this direction [12]. These dimensions show the anthropic importance in its relationship with environmental education. This issue is collected in a transversal way in attitudinal and procedural contents, in the evaluation of human beings in their relationship with the problems and solutions in the environment and in an explicit way in the epigraph on sustainable development of the conceptual contents.

In addition, the qualitative analysis includes a general evaluation section, which includes items to assess whether the books present human beings as causing the environmental problems or being responsible for solving them. Finally, we intended to

examine whether the tasks in the textbooks propose discussion or invite students to produce and express their own opinions, and the level of cognitive demand involved in the exercises (this item is the only one within the qualitative section with its own assessment criteria, as shall be seen below).

The content was evaluated using a simple, ordinal Likert-type scale [61] (evaluating the intensity of each item compared to previously established criteria). The item was rated according to the following levels of development:

0-It is not developed.
1-It is scantily developed.
2-It is superficially developed.
3-It is developed in detail.
4-It is fully developed.

The attachment to one or another value depends on the degree of fulfillment of the concept being valued, usually going from less to more based on the presence of three elements. It must have explanatory text and incorporate images, graphics, photographs, cartography, or any other element that reinforces the message with visual communication. Finally, the maximum value is when, in addition to the theoretical approach in a textual and visual way, it is reinforced with tasks. Thus, when the concept is approached in passing or simply mentioned or intuited in some image, a value of 1 is assigned. On the opposite side and with the maximum qualification, it is when a theme, objective, or competence is profusely developed with the three valued elements.

In the last item of the evaluation section, three criteria were used according to the level of cognitive demand, similarly to those used by [62]:

1. Involves locating and repeating information in the book.
2. Involves understanding information in the book, and then summarizing it, paraphrasing it, mapping it, establishing similarities and/or differences, associating concepts, etc.
3. Involves analyzing, applying and/or evaluating information in the book, as well as creating new information.

This classification is largely similar to the categorization of standards for learning, which are an element of curricular assessment introduced in the LOMCE, serving to specify the assessment criteria and facilitating their grading by means of achievement levels. The standards for learning are divided into three categories according to complexity: basic, intermediate, and advanced. Both are related to Bloom´s taxonomy. This taxonomy is an attempt to organize hierarchically the cognitive processes.

Table 1. Quantitative coded sheet. Number of times that the item appears.

	Anaya 3rd Primary	Santillana 3rd Primary	SM 3rd Primary	Anaya 6th Primary	Santillana 6th Primary	SM 6th Primary	Anaya 3rd Secondary	Santillana 3rd Secondary	SM 3rd Secondary
Format									
Complete units devoted to environmental education	0	0	0	1	1	0	0	1	1
Units that partially include environmental education	4	5	2	5	3	6	7	7	8
Pages	11	18	17	25	27	31	50	51	51
Diagrams	0	0	0	2	1	3	9	10	5
Maps	0	1	2	1	2	6	17	13	5
Tables and statistics	0	0	0	1	2	0	11	6	1
Tasks	21	26	23	66	64	37	68	53	113
Images									
Natural	10	10	10	19	27	16	13	13	14
Urban	9	14	9	8	8	7	10	12	8
Rural	0	3	0	3	4	5	12	3	13
Positive impact of humanity	7	10	5	14	3	5	13	12	9
Negative impact of humanity	3	6	5	7	15	21	15	22	20
Nature as a source of resources	1	3	0	1	2	3	21	4	12

Source: own preparation.

Table 2. Qualitative coded sheet. Likert scale of one to four, evaluating the intensity of the item, except assessment where Likert scale is one to three.

	Anaya 3rd Primary	Santillana 3rd Primary	SM 3rd Primary	Anaya 6th Primary	Santillana 6th Primary	SM 6th Primary	Anaya 3rd Secondary	Santillana 3rd Secondary	SM 3rd Secondary
Objectives									
To generate basic skills in the use of sources of information	1	1	2	4	3	3	3	3	3
To develop critical thought	1	1	1	2	2	2	2	2	2
To promote entrepreneurial spirit and personal initiative	1	2	1	2	2	2	1	3	1
To encourage participation	1	1	1	1	1	1	1	1	1
To promote planning and decision-making	1	2	2	3	3	3	4	4	2
To encourage the taking of responsibility	1	2	1	3	3	2	1	3	1
Competences									
Learning to learn	2	2	2	3	3	3	3	3	3
Digital competence	2	2	3	4	3	4	3	4	4
Social and civic competences	3	3	2	3	4	3	1	4	2

Conceptual content									
General	0	0	0	3	3	3	2	4	4
Climate change	1	1	1	2	3	4	3	4	4
Environmental degradation	2	2	2	2	2	3	4	3	4
Sustainable development	1	1	1	1	3	1	3	2	1
Governance	0	0	0	3	3	3	2	4	4
Atmosphere									
Greenhouse effect	0	0	0	3	0	1	4	4	4
Air pollution	1	1	1	3	2	2	3	4	3
Ozone layer	0	0	0	3	0	0	1	3	4
Acid rain	0	0	0	0	0	0	3	3	4
Lithosphere									
Soil pollution	0	2	1	3	2	2	1	4	1
Erosion	0	0	0	0	0	1	3	4	1
Hydrosphere									
Overexploitation of groundwater	0	0	1	1	0	2	3	4	4
Water pollution	1	1	0	3	2	3	4	4	3
Biosphere									
Deforestation	1	3	1	1	3	2	4	4	2
Protected areas	3	3	4	4	4	4	4	1	2
Desertification	0	0	0	3	0	2	3	3	2
Attitudinal									
Encourage appropriate use of natural resources	2	3	1	3	3	1	2	4	2
Promote responsible consumption	2	3	1	4	3	4	1	3	4
Favor sustainable dietary habits	0	0	0	1	0	1	0	1	3
Promote recycling habits	1	3	2	4	2	2	1	3	2
Stimulate respect for nature. Develop sensitivity and interest in environmental problems	2	2	1	2	2	2	2	3	3
Procedural									
Solving environmental problems	3	3	2	4	4	2	2	4	3
Translating and interpreting messages	0	0	0	1	2	0	2	2	3
Transforming, creating, or inventing	3	2	3	3	3	3	3	4	3
Judging and evaluating	1	2	1	2	2	1	2	3	2
Choosing and deciding in different situations	1	2	1	1	3	1	4	4	1
Summarizing or generalizing information	1	1	1	1	1	1	2	3	3
Communicating experience or results	1	1	1	2	3	3	2	3	3
Assessment									
The learning objectives are explained to students	2	3	3	2	3	3	2	4	4
Students are encouraged to think about their interests	1	2	3	2	2	2	2	3	3
Human beings are presented as the cause of environmental problems	1	2	1	4	2	3	4	4	4
Human beings are presented as being responsible for solving environmental problems	2	3	1	4	3	3	2	4	4
Predominant level of cognitive demand in exercises	1	2	2	2	2	3	2	3	3
The exercises propose discussion and/or allow the students to develop and express their own opinions	1	3	2	3	3	3	3	4	4

Source: own preparation.

3. Results

The results were organized from two perspectives: by publisher and by grade. We were able to establish the main strengths and weaknesses of the books and whether the

variety and complexity of environmental knowledge grew progressively across the course of compulsory education in geography.

It is worth noting that the numerical values derived from the scores given have numerical significance in the case of format analysis. The figures that appear in graphs, tables, and paragraphs where content analysis is discussed have an ordinal value, as they are qualitative in nature. The numerical qualitative evaluations including decimals indicate the median value.

3.1. Results by Publisher

All the textbooks analyzed had positive and negative points as regards environmental education. Due to issues of space, we discuss only the most significant, which are then compared with previous research in the discussion section.

When structuring the materials, *Anaya* distinguishes between content and tasks in primary school, while in secondary school the materials are organized according to contents, techniques, and competencies. *SM* is organized into contents and complementary sections where it establishes the tasks. *Santillana* chooses to refer directly to the concepts of know, know-how, and knowing how to be in primary school, extending it to other elements in secondary school (ways of thinking, compromise, etc.) In all cases, this separation does not imply that small activities are incorporated throughout all the contents, but they remain centralized at the end of each chapter.

As regards format, there are few differences between the publishers. The mean scores obtained on the different items are mostly similar, including those that are quantitatively more sizeable, such as pages or tasks (Figure 1).

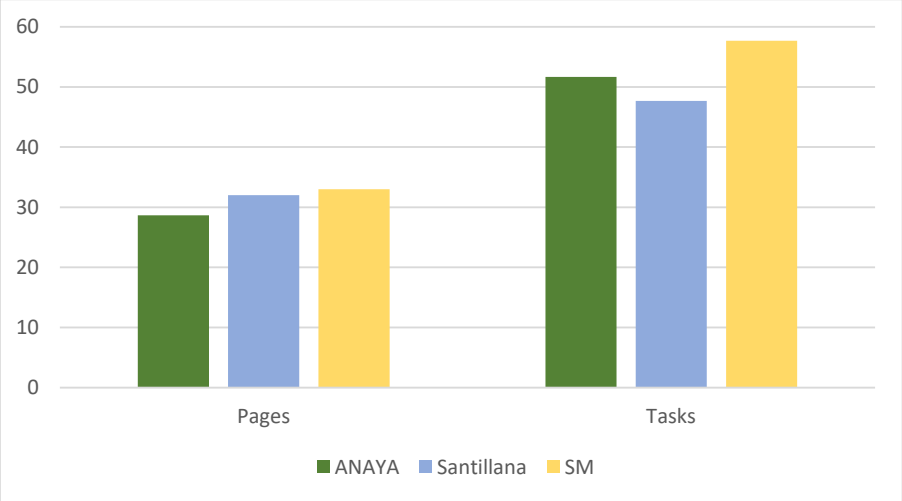

Figure 1. Comparison, by publisher, of the mean number of pages and tasks containing aspects related to environmental education. Source: own preparation.

The number of activities devoted to environmental education is the item that differs most between individual textbooks within the quantitative evaluation. While in the three primary 3rd grade books the number is similar (21 for *Anaya*, 26 for *Santillana,* and 23 for *SM*), the number of exercises of this type in the *SM* book for the 6th grade of primary education is much lower than in the books produced by its rivals (37 vs. 66 in *Anaya* and 64 in *Santillana*). However, in the 3rd grade of secondary education, the opposite occurs, with the numbers for *Anaya* (68) and *Santillana* (53) remaining similar, while those for *SM* increase significantly (113). There is a clear disparity between publishers and a lack of progressive focus on environmental education.

At format level, the proportion of images depicting a negative human impact on nature is especially greater in the higher grades in the books published by *Santillana* and

Anaya (Figure 2). Images that show the utilitarian value of nature are more numerous in *Anaya* textbooks (6th pri. *An*. p. 64).

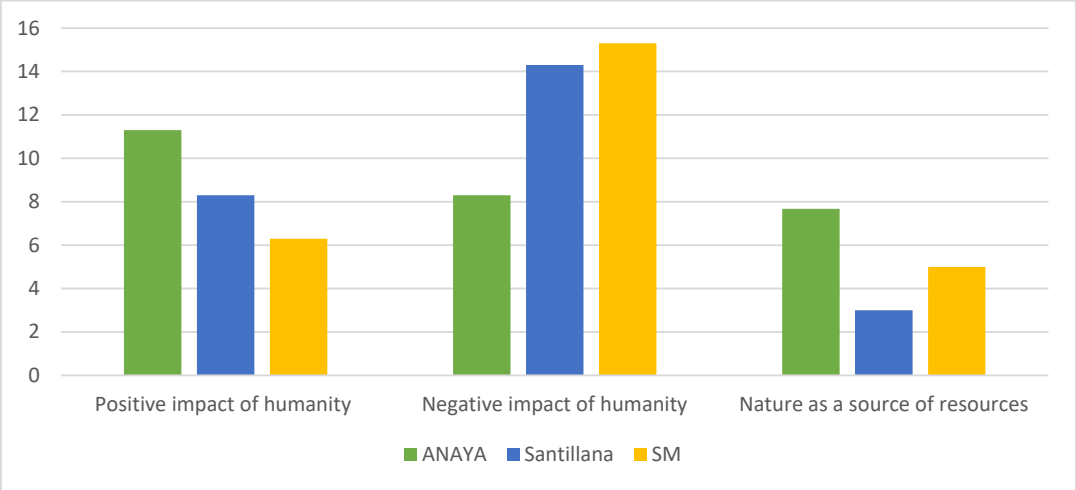

Figure 2. Comparison of the mean number of images related to environmental education that Scheme 3rd pri. *An*. p. 61; 3rd pri. *San*. p. 54; 3rd pri. *SM* p. 54) and activities such as commenting on photographs (3rd pri. *San*. p. 72). Visual information supported by maps, photographs, diagrams, and graphics is a constant at all levels and publishers. An example of this is the visual incorporation of the concept of sustainable development. In the third grade it does not appear; in sixth grade it is treated by *SM* and *Santillana*, although it is only visually incorporated by *SM* (6th pri. *SM*. p. 45), while it already appears in all the secondary school textbooks.

It is common to find activities such as map commentaries where visuality, spatiality, and the importance of "where" play an important role (6th pri. *SM*. p. 31; 3rd sec. *San*. p. 210; 3rd sec. *An*. p. 120). Activities based on maps that in many cases have different levels of complexity and number of activities among publishers. In the case of *Santillana* in secondary school it is consistent, with even comments of satellite images.

The settings most frequently addressed by all the publishers when addressing environmental education are natural environments, followed by urban and rural ones (Figure 3).

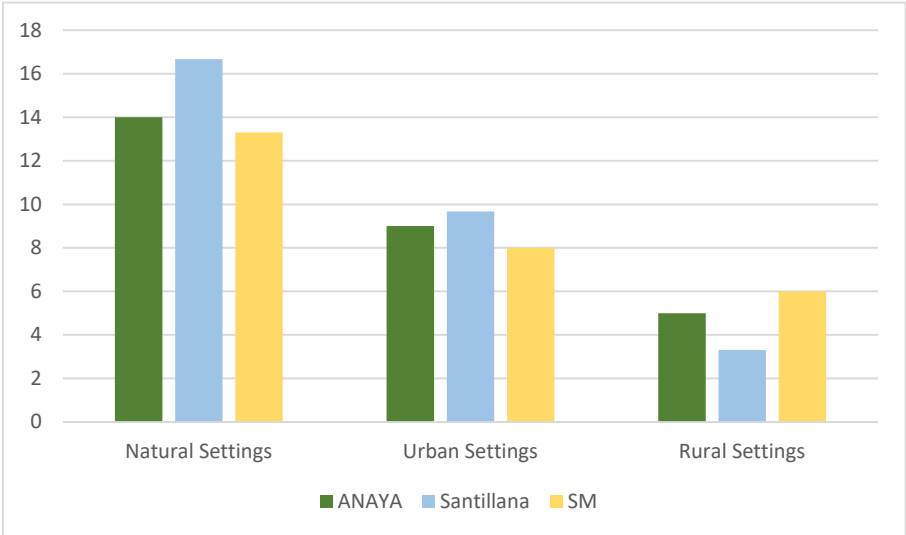

Figure 3. Comparison of the mean number of images related to environmental education that show natural, urban, and rural settings. Source: own preparation.

The data obtained through the content analysis yield conspicuous differences between publishers (Figure 4). All the publishers score above the mean on competences, attitudinal content, and evaluation. However, there are differences between publishers in the other three items. *Santillana* rates highest in all the sections, scoring above 2 in five of the six categories, with a score of 2 in the other category. *Anaya* and *SM* are weak on objectives and conceptual and procedural content. Conceptual content on environmental education is the weakest category across the three publishers.

In 3rd grade of secondary education, we can already see differences between publishers in how they approach sustainable development. While *Anaya* focuses more on environmental issues, *Santillana* and *SM* approach the concept in a more holistic way. There is a greater diversification of activities and student participation presenting the topic as international initiatives taken on by the countries and, by extension, by the society of each country.

From the perspective of procedures and attitudes, the books also achieve highly varied scores. Although it is true that all the types of procedural content chosen are necessary for a student's environmental education, the most important is that related to solving problems in the environment. This item is related with the core competences for sustainable development from UNESCO "such as critical and systemic thinking, collaborative decision-making, and taking responsibility for present and future generations" [49]. This is fully addressed or expressed in detail in all the books, except for the *Anaya* 3rd grade of secondary book and both *SM* primary education books. In the case of attitudinal procedures, we consider they all have the same importance in environmental education, yet there is a clear example of the disparity of criteria in this regard in the content on recycling habits, which are treated scantily in the *Anaya* book for 3rd grade of primary education, while in their 6th grade book, it is fully addressed (6th pri. *An*. p. 68). Figure 5 shows the scores for all the items of attitudinal content, where only awareness and interest in environmental problem have a mean score of more than 3. At the other end of the spectrum, we find sustainable dietary habits, which are only developed in detail in the *SM* secondary 3rd grade book, while, in the other books, they are either not addressed or are developed at a very superficial level (3rd sec. *SM*. p. 53).

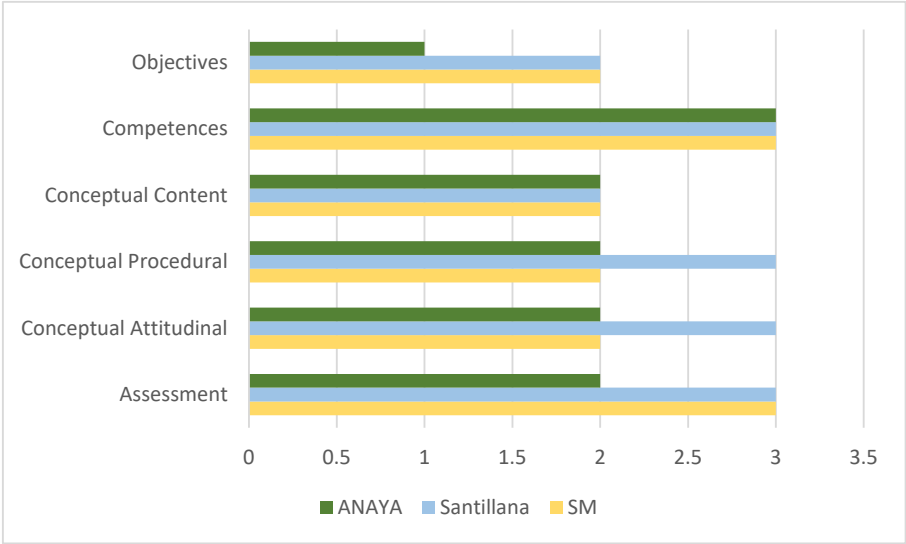

Figure 4. Median score from Likert scale results for each publisher on all the items in each section of the content analysis. Source: own preparation.

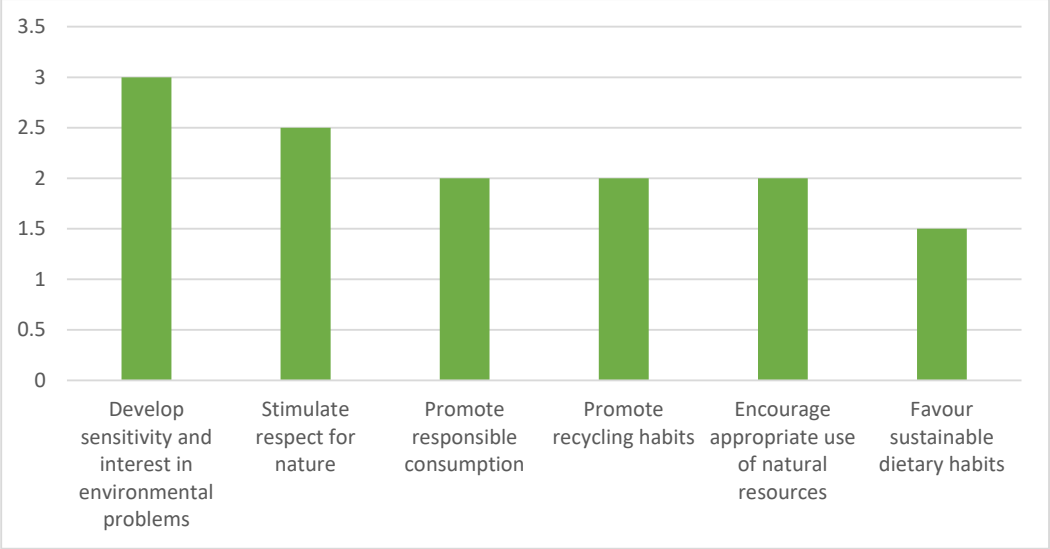

Figure 5. Median score from Likert scale results for all the books for each item in the section of attitudinal content. Source: own preparation.

Finally, in this evaluation section, we focus on whether the books address the idea that human beings are the cause of environmental problems and/or are responsible for solving them. Generally, the higher the educational grade, the more positive are the scores on the questions mentioned, except for *Anaya* in one of the cases in secondary education. It could also be suggested that the treatment of these questions in primary education could be improved. Fortunately, this issue is fully addressed in all the secondary education textbooks (Figure 6), highlighting the change in the trend of 3rd year of secondary school in *Anaya*. Although theme 12 "socio-economic inequalities and global conflicts" deals with "pending challenges to human development" (not only environmental), its approach is also fundamentally based on environmental problems and impacts rather than from a perspective of alternatives or solutions. It can be seen in theme 8 regarding cities (3rd sec. *Anaya* p. 168) or in the theme of economic activities with the problems of resources (3rd sec. *Anaya* p. 180).

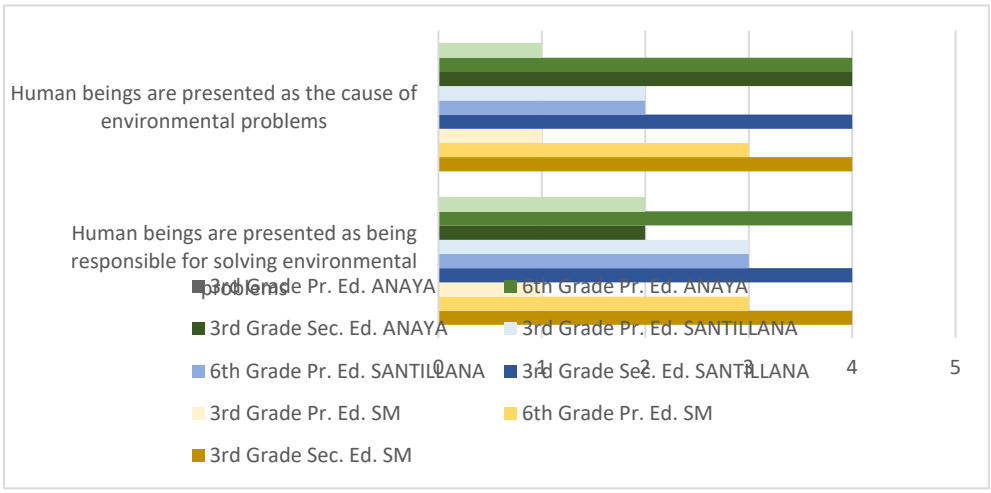

Figure 6. Evaluation of each textbook for the items "Human beings are presented as the cause of environmental problems" and "Human beings are responsible for solving environmental problems." Source: own preparation. Median score from Likert scale results.

3.2. Results by School Grade

In most of the items, the format evolves positively the higher we move through the education system. We believe, for example, that a smaller or larger number of diagrams, maps, or images of any of the previously mentioned types of environment does not determine the quality of the environmental education a textbook may provide, and hence, as regards the overall evolution by grade, the analysis of these items is irrelevant (not, however, if we compare publishers). Nonetheless, the quantity of other elements, such as pages, tasks, or images showing the positive or negative impact of humanity on the environment does greatly affect the efficacy of environmental education. All these elements increase in number as we move through the grades. For example, the number of pages devoted to environmental education is similar across the three books for each grade, but the number does increase as we move higher up the education system (Table 3).

Table 3. Number of pages devoted to environmental education and total number of pages (in brackets) in each book. Source: own preparation.

	3rd Grade Pr. Ed.	**6° Grade Pr. Ed.**	**3rd Grade Sec. Ed.**
ANAYA	11 (143)	25 (143)	50 (293)
	7.69%	17.48%	17.06%
SANTILLANA	18 (135)	27 (226)	51 (335)
	13.33%	11.95%	15.22%
SM	17 (142)	31 (230)	51 (263)
	11.97%	13.48%	19.39%

Source: own preparation.

In 3rd grade of primary school, the sequencing of the contents is very similar, beyond the size of the chapters and the number of them. In 6th grade only *Santillana* dedicates a specific topic, while the other two publishers continue to do so crosswise. In secondary school, *Santillana* and *SM* dedicate a specific chapter to the environment, placing it in last place of all the geographical contents. Furthermore, in each previous chapter they make some contribution to sustainability, either in activities, habits, or awareness-raising tasks. *Anaya* deals with the subject only in a transversal way in the topics dedicated to geography, which are also sequentially after those of history and in two volumes.

In contrast, learning by competences is developed at a similar level regardless of grade and publisher. Learning to learn receives superficial attention at the 3rd grade in primary and detailed attention in the books from other levels (3rd sec. *SM*. p. 138). Digital competence, meanwhile, is superficially addressed in the primary 3rd grade books published by *Anaya* and *Santillana* but is treated in a detailed or full way in the other cases (3rd sec. *San*. p. 37; p. 215). Finally, social and civic competences fail to follow this pattern, being developed scantily in 3rd grade of secondary education by *Anaya*, superficially by *SM* (3rd sec. *SM*. p. 149), and fully by *Santillana* (3rd sec. *San*. p. 213).

The case of conceptual content is complex. Firstly, it is worth underlining the complete absence of items such as climate change, greenhouse effect, ozone layer, and desertification in all the books for 3rd grade of primary education, despite these topics being explicitly included in the primary curriculum (Royal Decree 126/2014). Secondly, there are vast discrepancies across publishers. For example, desertification is addressed in detail in the 3rd and 6th grade primary education and is fully developed in the 3rd grade secondary education *Santillana* book, while, in the case of *SM*, it is scantily studied in 3rd grade of primary and superficially in the other two grades under analysis.

The explicit incorporation of the concept of sustainable development is carried out in a very progressive way in the Spanish educational system. The concept of sustainable development is fundamentally incorporated into secondary education with special significance in *Santillana* and *SM*, the latter being the most progressive in its incorporation into textbooks. The millennium goals are addressed by *Santillana* (3rd sec. *San*. p. 193). In

all the publishers there is an absence of the concept in 3rd grade of primary education. Environmental issues are raised that are more focused on individual habits, attitudes, and behaviors rather than group or societal awareness. These are activities or concepts such as pollution, recycling, or water use. It is not presented as a global strategy. In the sixth grade the concept is already defined. In addition, the idea is approached as a task for everyone. However, its implementation is reduced, and it is related to health and society. Its relationship with the economy is less emphasized, even though, paradoxically, there is a chapter dedicated to financial education. A chapter on environmental education is missing, or at least a merger or incorporation of initiation into economic practice. The publisher that deals somewhat more extensively with the subject is *Santillana*. It presents, already at this level, the different summits of the earth and international forums that are the seeds of the concept. Finally, at the secondary level, sustainable development has its own space in the form of a chapter (except for *Anaya*). It is presented as the final theme and synthesis of the block of geographical contents. Let us remember that, to a greater or lesser extent, the contents of these courses are shared with the discipline of History.

With respect to the level of cognitive demand in the activities proposed, analyzing, applying, and/or assessing or creating information, or, at least, understanding it, is present in all the cases except the primary 3rd grade book published by Anaya, where only locating and repeating is required. Most of the tasks in charge of evaluating the knowledge acquired by the students have an evolution if we take as a reference the six levels of increasing complexity determined by Bloom's taxonomy. There is a certain adjustment of the level of difficulty of the activities to be developed with the courses. We find in all the courses activities related to "remembering" and "understanding" (3rd pri. *An*. p. 63; 6th pri. *SM*. p. 30; 3rd sec. *San*. p. 202). In sixth grade, new activities are incorporated where "analyzing" already appears (6th pri. *San*. P. 81; 6th pri. *An*. pp. 66, 69). It is true that some exceptions can be found such as proposals to save water (3rd pri. *San*. p. 37;) or to make a presentation or a mural about sustainable development (6th pri. *San*. p. 82; 6th pri. *SM*. p. 55). In secondary schools, activities aimed at creating and introducing professional tasks "work like a geographer" with analysis of practical cases of impacts on the territory are more frequent (3rd sec. *SM*. p. 86), although there is still an important weight of memory and understanding activities.

The high scores obtained in competences by all the books for 6th grade of primary education and 3rd grade of secondary education mitigate the effects of the change of focus across the levels of secondary education (Figure 7).

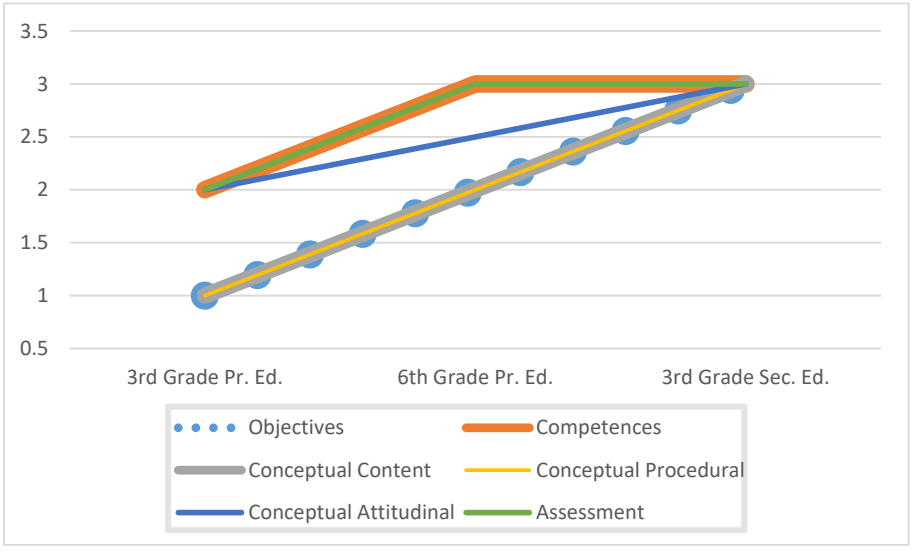

Figure 7. Median scores from Likert scale results by grade for all the items in each section of the content analysis. Source: own preparation.

Finally, while the progression in content and evaluation increases as we move upwards through the education system, competences are levelling off. The cross-cutting nature of environmental and sustainable development issues is very limited in the area of geography. It hardly appears in 20% of the pages and in general with qualitative evaluations, which, apart from a few situations, does not reach the maximum score in the qualitative scale. This fact is common to almost all levels and publishers. The problem of this fact is found more in the treatment of this topic in the curriculum than in the better or worse transposition made by the publishers in the different courses. In the third grade of secondary school, the geography curriculum mentions "Use and future of natural resources. Sustainable development."

The sustainable development goals (2015–2030) are basically not addressed by the date of the book's publication but references to the millennium goals (2000–2015) are also very limited. This agenda of commitments for fifteen years of the United Nations is taking prominence in recent years and neither educational legislation nor textbooks incorporate these important changes in the way environmental education is approached. The vast and abundant traditional content of geographical knowledge makes it difficult to incorporate these current and essential themes. They are relegated to a more complementary than transversal level in the teaching of geography.

4. Discussion

Our findings suggest that environmental education in Geography textbooks in the Spanish compulsory education system could be improved. This is consistent with all the previous literature reviewed. Nonetheless, the aspects in need of being developed and enriched differ depending on the source country of the textbooks. The textbooks in Spain show to a high degree the transposition of the current legislation. Some of the detected deficiencies come from the treatment of environmental education and sustainable development in the current curriculum. It is recommended that educational legislation shows in a clearer way the importance of the environment in the educational system in all its levels. It is advisable to increase its relative importance with respect to other geographic contents, as well as a major transversal incorporation of the subject in other aspects such as economy, demography, etc.

The notion that humanity is responsible for our current environmental problems is, drawing on the data collected, watered down in the early grades of compulsory education but grows in focus as we go up through the education system. Nonetheless, despite these elements being treated as fact, this is not done as rigorously as an objective vision requires. This is because many books strive to counter these circumstances by showing an image of humanity as committed to solving these environmental questions and transmit the idea that their actions have a positive impact, which, in practice, presents an unreal scenario. This coincides with the conclusions drawn in [44,45], although, as mentioned, as the education system progresses, at least in the case of Spain, the viewpoint becomes more objective.

Pictures of natural environments are those that most frequently feature in the teaching units dedicated wholly or partially to environmental education, compared with those showing urban or rural settings. According to Carvalho et al. [16], this is a positive development, although their own results run counter to the findings of the present study, since images of urban and rural environments were more common than natural landscapes in the six countries of Western Europe covered in their research (Spain was not included).

In addition, the images reflecting a negative impact of human activity only exceed those showing a beneficial effect on the environment in five of the nine books analyzed. This perception clashes with both the sad reality [9] and the findings of [16], who reported that images transmitting negative environmental scenarios outnumbered those with a positive message in the textbooks used in the 14 African and European countries they analyzed. In Spain, geography textbooks aimed at the early years of primary education

tend to play down the harmful effects of human beings and the critical state of the environment. This is consistent with the study of Korfiatis et al. [45], where it was found that primary school textbooks in Greece attempted to tone down information on the negative impact of human actions on nature and our social responsibility to protect it.

The main shortcoming of the books as regards content lies in the focus on attitudinal learning as it is treated on a par with knowledge, practical skills, and motivation. Attitudes towards key aspects of environmental education, such as respect for nature, recycling, or the appropriate use of natural resources, are dealt with insufficiently. This suggests that the textbooks under study promote a form of environmental education that errs in the cornerstone of motivating students and future citizens to become actively involved in solving the problems of the environment. This is similar to findings on geography textbooks as regards sustainable development and their limited approach to moralizing [32]. Similar shortcomings in the treatment of attitudinal content were also reported by [25,30,46]. The attitudes and habits of citizens must be clearly reinforced from the first levels. In environmental matters, the dimension of knowing how to be is as important as knowledge and knowing how to do.

Finally, mention should be made of the level of cognitive demand in the textbook activities on environmental education. The vast majority of these only require the content presented to be understood through repeating this information in different forms (summaries, mind maps, paraphrasing, relationships, etc.). Some exceptions (6th grade primary by *SM* and 3rd grade secondary by *Santillana* and *SM*) have a battery of exercises that require students to analyze, apply and/or assess data, and to create new information. It can be said, then, that a shift is in progress in environmental education in Spain from rote learning to a teaching-learning process that cognitively engages students and requires them to understand what is taught (regardless of the quality, quantity, and adequacy of the knowledge). This contrasts with the conclusions which suggest that textbooks encourage rote learning based on repetition of content [20,56].

5. Conclusions

5.1. Contribution

In view of our findings and the documented dramatic situation of the environment, the environmental education received by Spanish students during the compulsory stages of the education system could clearly be much improved. Mistakes are made, such as playing down the seriousness of the environmental problems and the vision of humanity's responsibility for these problems. Highly important conceptual content is ignored (although this varies according to educational stage and publisher) and there is an inadequate focus on the attitudinal content required by Spanish legislation, some being as important as respect for nature, recycling habits, or the appropriate use of natural resources. We consider that without improvement in these aspects, students will fail to acquire awareness of the extreme significance of the environmental problems we face and will thus also fail to develop the environmental sensitivity required to encourage them to develop attitudes that favor sustainable development. In short, the environmental education acquired by the future citizens of Spain is insufficient and inadequate to confront one of the greatest challenges of the 21st century.

The quality of this environmental education varies depending on the company that publishes the textbook used. There is an important correlation between the contents and the order in which they are presented in the three editorials. There is a high degree of linkage in the transposition of content from the curriculum. This fact makes it difficult to incorporate current and changing topics such as environmental education, sustainable development, or development goals. Although all three publishers analyzed in this study present strengths, our findings show that Santillana is the publisher that offers a more complete education based on the items selected in this work. It is worth noting that the treatment of conceptual content is a weakness shared by all three publishers' books. The

progression of environmental education across age levels is, broadly speaking, adequate. There is an increase in the range of knowledge and the depth which it is addressed. However, this progress starts from a very low level, which conditions the books in the successive grades. The concept of sustainable development is reserved for secondary education. In primary school, it is presented in the last year, and students are trained in individual actions and behaviors for already in the higher grades is raised as a commitment and group action as a society or as an aspiration of humanity as a whole.

The review of the scientific literature in this area shows that numerous studies have addressed the analysis of textbooks. This number declines notably in the question of environmental education and is even more reduced if we concentrate on geography and an analysis across the entire range of compulsory education. In addition, no study of this type has been conducted in Spain. The present study is the first to examine the treatment of environmental education across the full compulsory education spectrum in Spain from the perspective of geography.

The findings of the analysis conducted in this study coincide, in general terms, with previous research in a similar line. The exploration of such previous studies and the results of the present work suggest that the way environmental education is taught could be improved, although it is true that some of the aspects in need of improvement vary depending on the country, publisher, and educational stage. The elements that stand out as needing enhancement are the objective transmission of the size and severity of environmental problems, the development of appropriate awareness of these problems in students, and the promotion of attitudes of progress, responsibility, and care for the environment. It is important to note the difficulty of extrapolating conclusions and making comparisons with different countries because they have different legislation and flexible ways of implementing its contents in textbooks.

The aforementioned analyses of both the provisions for environmental education in the current educational legislation and the methodologies used in previous research enabled us to develop a method of our own to conduct the present work. This methodology used a coding sheet including a format analysis of a quantitative approach and a content analysis of a qualitative nature. This contribution facilitates future, broader studies on topics, discipline, or the countries of origin of textbooks.

Our review of the current educational legislation confirms that geography is the subject area that is one of the most suitable for a holistic, comprehensive approach to environmental education, without forgetting, given the cross-curricular nature of the issues involved, that it can, and should, be partly addressed by other disciplines. According to Royal Decrees 126/2014 and 1105/2014, which set out the curricula, respectively, for primary and secondary education in Spain, the subjects that should directly deal with environmental education are social sciences in primary and geography and history in secondary education. The traditional contents of geography continue to be prioritized in the face of the new challenges that human beings have in their relationship with the environment. A change in the focus of the topics addressed from geography in compulsory education can help in the training of citizens in the 21st century. Likewise, it can and should help to increase the value and usefulness of the discipline of geography in the perception that citizens have of it.

5.2. Limitations and Open Issues

The work has the limitation of the sample. Although they are prestigious publishers and widely distributed in the Spanish educational system, there are other publishers. In addition, the geographic focus is necessary, but as we have said, other disciplines must also address the multifaceted concept of environmental education and sustainable development. Therefore, several critical open issues are raised, such as a broader review of the concept of sustainable development in the Spanish curriculum and the weight of the different disciplines in the study of the subject. This refers to the contents, but it is no

less true that there is a need to go deeper into the way in which these contents are taught and what their relationship is with the competences, habits, and attitudes.

This work is a first approach to environmental education, especially in the whole scope of the formal educational system in Spain. Its general approach has shown the need to deepen in the evolution of the multiple aspects dealt with contents, competences, objectives, etc. Each of them is a fundamental element in the teaching-learning process and their detailed analysis requires an individualized approach. An important field of possibilities is opened on different aspects to be evaluated with a temporal perspective throughout the educational system.

As future work, it is considered necessary to update this research due to changes in educational laws and curricula, as well as to update international initiatives (12). It is suggested that research be undertaken with a larger sample of courses analyzed, publishers consulted, and if possible, other disciplines such as natural sciences or economics. Likewise, and as can be seen from the limitations, it is necessary to explore in greater depth how each of the elements cited are approached throughout the entire educational system.

Finally, if we consider that the choice of publisher is the responsibility of each school, and in light of the conspicuous differences, such a decision should be taken after examining the various options. Studies like the current one seems necessary to equip all the members of the educational community with the knowledge required to analyze one of the key tools in the education of our future citizens, namely, textbooks. Although this study was intended to include the complete range of compulsory education in Spain with relation to environmental education, it is worth noting that the findings cannot be fully extrapolated to the population as a whole, since the work is a case study with a representative example of the textbooks most widely used in Spanish schools. It would thus be of interest to develop lines of research to delve deeper into this question, which is fundamental for the improvement of environmental education, in particular, and the future of humanity and our planet, in general.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

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  - Benítez, J. K., Cano, J. A., Fernández, E. y Marchena, C. (2015). Ciencias Sociales 6. ANAYA. Proyecto Aprender es crecer. Edición Castilla-La Mancha. ISBN: 978-84-678-8117-2.
  - Burgos, M. y Muñoz-Delgado, M.C. (2015). ESO 3. Geografía e Historia. ANAYA. Proyecto Aprender es crecer en conexión. ISBN: 978-84-678-5233-2.
- *Santillana (San)*

- Moral, A., Verger, T. y Echevarría, E. (2014). Primaria 3. Ciencias Sociales. Santillana. Proyecto Saber Hacer. ISBN: 978-84-680-1343-5.
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