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Current State of Environmental Education and Education for Sustainable Development in Primary and Secondary (K-12) Schools in Boyacá, Colombia

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Abstract: Environmental education (EE) trains individuals to preserve ecological balance and understand the link between humanity and environmental protection. On the other hand, education for sustainable development (ESD) addresses social, cultural, political, and quality of life factors, and promotes the sustainable evolution of the planet. In Colombia, EE is more recognized compared to ESD, and this situation relates the objective of this research, to investigate the strategies applied in EE and ESD in the official primary and secondary (K-12) educational institutions in the department of Boyacá. This study used a Likert scale survey with numerical values from 1 to 5 to evaluate each category of choice among a targeted population. The results indicate that topics such as water resource conservation and protection of fauna and flora are covered in EE, while ESD issues are less prominent. The findings of this research suggest interventions to improve the implementation of ESD and contribute to the advancement of quality education in the country. It is appropriate to explore different methods to integrate environmental, economic, and social aspects in educational contexts, with the implementation and updating of curricula to improve ESD.

Keywords: environmental education; environment; education for sustainable development; K-12

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1. Introduction

Human activities such as deforestation, industrialization, and consumerism have led to the degradation of the environment and its resources. The increase in carbon emissions due to the use of fossil fuels has led to global warming, which in turn has led to climate change, extreme weather conditions, and rising sea levels. It is essential to encourage environmentally friendly behaviors and values that can help preserve the natural resources and prevent further damage to the environment. Individuals can start by using energy-efficient appliances, reducing water consumption, and recycling waste.

Governments can also implement policies such as renewable energy programs and emissions regulations to promote a sustainable environment. The interlinked factors of the natural environment and ecological balance are fragile and complex, and therefore efforts must be made to ensure that humanity does not disrupt it further. By adopting environmentally friendly behaviors and values, it is possible to work for a cleaner, healthier, and more sustainable planet [1]. In recent years, there has been a growing recognition that education should be more than the traditional transmission of knowledge and skills but should also emphasize the development of critical thinking skills, problem-solving abilities, creativity, and social and emotional skills. To achieve this, many innovative educational approaches have emerged, such as project-based learning, inquiry-based learning, and experiential learning, which aim to engage students actively in learning and provide opportunities to

apply knowledge and skills in real-world contexts. Furthermore, educators are increasingly recognizing the importance of technology in education, as it has the potential to enhance learning experiences and improve access to education for marginalized populations. Overall, education is a crucial intervention that plays a vital role in shaping individuals, societies, and the world at large [2]. Education plays a significant role in raising awareness about the natural environment and sustainable living practices. By teaching students about the importance of protecting the environment, educators can inspire behavior changes that will help protect the planet for future generations. Environmental education helps to foster a sense of responsibility and ownership among students for the natural world. Students learn about the importance of biodiversity, the impact of climate change, and the role that humans play in shaping the environment. This knowledge can motivate action to reduce the impact on the environment and advocate for more sustainable practices in communities. Environmental education can be delivered in a variety of ways, including through classroom instruction, field trips, and experiential learning programs.

By incorporating hands-on activities and real-world projects, educators can help students to develop a deeper understanding of environmental issues and to feel more connected to the natural world. Overall, by delivering environmental knowledge through education, people can be inspired to become more aware of the impact on the environment and to take actions to promote a more sustainable future [1]. Education is not just about conveying knowledge and skills to individuals, but it also plays a crucial role in shaping the environmental consciousness of the community. Therefore, it is important to develop educational methods that are sensitive to the ecological needs of the community and can promote sustainable practices. The first step in this process is to recognize the diverse learning needs of different individuals and communities. This requires educators to consider the cultural, social, economic, and environmental factors that shape the community's knowledge and perceptions of the environment. For instance, in rural areas, where people depend on agriculture and natural resources for their livelihoods, the focus should be on promoting sustainable agriculture and natural resource management practices. On the other hand, in urban areas, the focus should be on promoting awareness about waste management, energy conservation, and alternative transportation modes. Next, educators need to adopt a multidisciplinary approach that integrates knowledge from different disciplines, such as ecology, biology, social sciences, and economics. This will help learners to understand the complex interrelationships between humans and the environment and recognize the implications of actions.

Finally, it is important to promote community engagement and participation in environmental education programs. This can be achieved by involving local organizations, community leaders, and policymakers in designing and implementing educational initiatives. Through active community participation, including experiential learning and problem-solving activities, learners can develop a deeper understanding of the environmental challenges facing the community and become more committed to sustainable practices. In conclusion, the ecological perspective highlights the importance of developing educational methods that are culturally sensitive, multidisciplinary, and community centered. By adopting this approach, a more informed and engaged community dedicated to promoting sustainable practices that benefit present and future generations can be created [3]. This can be achieved through various means such as incorporating environmental education in the school curriculum, organizing outdoor activities that teach children about the environment, and involving them in community service projects related to conservation. By instilling these values in children from an early age, it induces a generation that prioritizes environmental protection and understands the importance of sustainability. Moreover, by introducing them to concepts such as climate change, biodiversity loss, and pollution, they will be equipped with the knowledge to make informed decisions about their actions that have an impact on the environment. Ultimately, investing in environmental education for children is not only crucial for their own future but also for the future of the planet. As children grow up to become responsible adults, they can become

advocates for the environment and drive meaningful change that will benefit the planet for generations to come.

1.1. Theoretical Contexts of Environmental Education

UNESCO defines environmental education (EE) as "a well-established discipline, which focuses on the relationship of humanity with the natural environment and on ways to conserve and preserve it and properly manage its resources" [4] (p. 177). EE has become increasingly important amidst the current environmental crises facing the world. It is not only about teaching individuals about the environment, but also about creating awareness and action to address environmental challenges. The principles of EE have to be incorporated in different aspects of society, including education, policymaking, community engagement, and environmental management. Educational institutions have a crucial role to play in EE by incorporating it in their curriculum and promoting sustainable practices. In this way, students are not only equipped with knowledge about the environment but also become conscious of their actions and responsibilities towards the planet. They become agents of change who can influence the wider society and bring about a positive impact on the environment. In conclusion, EE is a valuable tool in addressing environmental challenges and creating sustainable futures. It plays a fundamental role in building environmentally conscious individuals who can bring about positive change in communities and the world. The incorporation of EE principles in education can contribute to a more eco-friendly future and a better world for all [5].

Environmental education (EE) aims to train individuals to adopt responsible and sustainable behaviors, while promoting awareness and disseminating of information about the importance of preserving ecological balance in society. It also emphasizes the role of young people as future leaders and key contributors to a sustainable future [1]. EE is a powerful tool used to respond to environmental challenges and achieve the objectives of protection and conservation of nature. Additionally, it can lead to the development of effective teaching methods that integrate an understanding of the impacts generated by human activities on the environment and the role of individuals in addressing impacts [5].

EE intends to encourage citizens in the principles of sustainability, attending to the context in which they live and achieve better environmental care conditions. Besides inquiring into the environmental realities related to the implementation of humanitarian activities and their impacts on the environment, it focuses on biodiversity of particular and general categories [6]; in turn, to apply a purpose, the generation of changes in social behavior, ensuring the restoration, defense and protection of the environment [7].

EE is the method to preserve through perception, understanding, valuation, and specific strategies. It is still deeply rooted in the culture of societies and has not changed its conservationist principles; it takes steps around conservation and invites individuals to be conquered by the system, to know and care for it [8].

1.2. Approaches to Education for Sustainable Development

In the 21st century, sustainable development (SD) is a set of complex doubts and concerns to solve. Therefore, the continuous search of historical facts, updating theories and concepts in research carried out by authors from all over the planet, generates decisive information to support initiatives, actions, proposals, and projects. Hence, SD is related to achieving the fundamental needs of humans [9]. Sustainable development (SD) has deep roots, historical background, and guiding principles that enable its application in diverse fields, including academia, work, social settings, and education, among others. This concept is rooted in an understanding of the dynamic relationships that exist in nature between individuals and how these relationships can be strengthened through effective communication. As such, SD encourages exploration of knowledge by various stakeholders, and it provides a framework for interpreting and managing natural resources in ways that promote long-term sustainability [10].

The conceptions of sustainability and SD have formulated essential approaches in the global panorama associated with the environment, setting the impetus for the decade of ESD of the United Nations [11], allowing us to know the information to achieve each of the sustainable development goals (SDGs) proposed in 2015, which generate a global interrelationship with the intention of favoring nature and human assistance [12]. In addition, ESD generates a shift in the culture of humanity and empowers the evolution of the new future of the planet. To achieve the SDGs proposed and projected for 2030, it is advisable to involve ESD, which is the genesis of this issue. Moreover, it was defined as the way to provide learners with the knowledge, understanding, skills, and qualities, to act and live in a way that ensures environmental balance (socially and economically), in both the present and the next progeny [7]. It will also support the international education agenda to emphasize learning and its contribution to the sustainability of individuals and the world [13].

UNESCO identifies ESD as "the main framework of sociocultural factors, sociopolitical issues of equity, poverty, democracy and quality of life" [4] (p. 177). In addition, it indicates that aspects of SD, climate change, and biodiversity should be included, both in education and in practice, in order to motivate humanity to carry out conscious actions that generate competences, admire the cultural variety, and cooperate in creating a lasting planet [14].

ESD is vital to everyday life and the contribution of particular measures developed by youth, such as "pro-environmental actions" [15], is subject to a set of social, cultural, and political ideas and issues [11]. The actions taken with respect to the environment are subject to reason and conscience, since it is up to individuals to determine the impact. The decisions made in the present will have a direct impact on the future of all species in the world.

Therefore, it is essential that the long-term consequences of actions are taken into account and responsibility for the environmental impact is assumed. By doing so, a sustainable future can be guaranteed for all living beings on the planet.

1.3. EE and ESD Studies in Colombia

In Colombia, EE has been the exclusive teaching instrument for environmental sustainability at primary and secondary levels as well as at university levels, and it will to guide the educational regulations in EE [7]. Especially in the regulatory framework of the country, the General Law of Education 115 of 1994 indicates the obligation of EE in educational establishments [16], even though EE does not change in its conservationist principles and is deeply rooted in different cultures.

Different investigations in the country focus their attention on EE (see [7] as an example), with the objective of "identifying the presence of EE in the training of environmental engineers, to contribute to the knowledge of whether education is deficient or appropriate". Authors mention that the curricula of environmental engineering are not enough for the near conditions of the environment, nor for the current processes of the students, for EE. An analysis of [17] specifies that the environmental issue offers relevance at the time that issues such as the management and conservation of natural resources were promoted in the category of the constitutional norm (Political Constitution of 1991). In this sense, Acosta et al. [7] refers that EE provides a usual, certain, and determined axis, since it presents the precision of encouraging a variation of behavior with respect to the medium, in addition to the perspective and methodology used. A study of [16] proposes to develop a strategy for the qualification of EE in primary school and to understand the reality of the environment to enhance the integration of knowledge and in this sense, to improve the integration of knowledge. It conducts a review to promote EE learning at the academic level. In [6], authors highlight the interest of proposing ideas and activities of EE in relation to sustainable development, connecting environmental guidelines with student's planning, in the categories and types of teaching, from preschool to university.

Regarding Colombia, ESD is still a general issue and is not well known [7]. It is oriented to the theme of EE, in which trends in normative issues are presented, to a large

extent and the search for a modern perception. Additionally, ESD involves development to provide progress to the countries that have implemented it. In this aspect, it is necessary for the country to transform the current EE to a current vision and with application in ESD, to start by positioning the ESD in the context of EE and to know the possible potentialities [11] and continue working on the modification of EE, to encourage and generate a progress in environmental policy. This transition, which must be made, is directed toward an idea of the world where humans are part of the environment, in the way that EE changes in ESD, directed in the daily life of humankind [4].

1.4. Characteristics of Primary and Secondary Education in Colombia

Article 11 of Law 115 of 1994 indicates the levels of formal education existing in the country, which are: preschool that integrates at least one mandatory degree, basic education with a validity of nine degrees formulated in two cycles (primary education with five and secondary basic education with four), and middle education with a period of two grades. For each of the degrees of basic education (identified in Article 356 of the Political Constitution as primary and secondary education), there are some general objectives set out in Article 20 [18,19].

Thus, education in Colombia is a "citizen right and a priority of the government". As well as being a strategy that allows achieving objectives linked to the learning and training of each human being, it is the principle to promote development, it is fundamental to personal growth, and gives individuals capabilities and merits to act critically, conclusively and changeably [20]. In addition, it is the way to promote and build decisive ideals as citizens belonging to a society, in which positive changes are generated for continuous improvement.

From this analysis, the department of Boyacá with the Departmental Plan of EE 2016–2025 [21], establishes several reasons for advance studies and research that allow an understanding of the current state and the process of transition of EE towards ESD. Particularly, the present research aims to learn the different strategies applied in EE and ESD in official educational institutions of primary and secondary education (K-12) of the department of Boyacá, to present contributions on the perceptions of directors, teachers, and students toward the implementation of ESD in classrooms, educational contexts, and in different stages, as a basic strategy for an integrated quality education from the 4th SDG.

2. Materials and Methods

2.1. Type and Structure of the Survey

The survey questions were designed in an understandable and positive way, in short lines, recording a specific explanation for their understanding and diligence, providing information for the privacy of the opinions of the respondents. The data were evaluated using the Likert scale (consisting of a series of items presented as affirmation or judgment, asking individuals their position regarding the categories of the scale, which can be three, five or seven [22]). It uses a set of statements to acquire a solution by the individual and is widely applied in the quantification criteria. This scale makes use of expressions or proposals, that is, ideas expressed by the subject [23]. In the questionnaire statements, each election category has a numerical value of 1 to 5, where 1 indicates "definitely not" and 5 indicates "definitely yes".

For the collection of data in the analysis unit of the 2049 official primary and secondary educational institutions (K-12) of Boyacá, a virtual survey was carried out (due to the situation related to the COVID-19 epidemic declared by the World Health Organization) that allowed access to directors, teachers, and students, of which individuals (n = 341) participated, with the purpose of ascertaining the strategies applied with regard to EE and ESD. The formula for calculating the sample size required in the simple random sample method depends on several factors, such as the desired confidence level, the required accuracy level, and the variability of the population [24]. The level of trust used for this sample was 95%.

The survey consists of 30 statements, which were conducted empirically, visualizing research on the different topics, aspects, and characteristics of the two fundamental research approaches: the EE from Q1 to Q15 and the ESD starts in Q16 and ends in Q30 (Table 1).

2.2. Survey Reliability

In regard to reliability, Cronbach's alpha coefficient was used for the 28 items with Likert scale. This facilitates the calculation of reliability of a measuring instrument by means of a series of sections with Likert numerical values from 1 to 5. Thus, reliability is ideal when the value of the alpha coefficient is closer to 1.0 [25] and is used to estimate the level at which the categories of a tool are related. This coefficient is known as a practical and safe way to support the formation of some categories and as a way to estimate the connection presented between the levels that form it [26]. In the same way, it calculates the internal consistency of a measuring instrument when several items are included [27].

2.3. Statements without the Likert Scale

The survey includes two open-ended questions that are related to the perception of respondents for the two research approaches. In Q2 participants record words linked to the concept of EE and in Q17 they record terms associated with ESD. For the statements, a collection of the most representative concepts corresponding to each topic was made and was expressed through two word clouds. These figures broadly reflect the words most frequently used.

By virtue of the above, the concepts linked to the two research approaches were grouped according to their similarity, to identify the keywords and adjust them into categories in which the respondents related the concepts of EE and ESD.

Table 1. Survey statements linked to the research topic in EE and ESD.

#	EE	#	ESD
Q1	I am clear what environmental education is.	Q16	I am clear what education for sustainable development is.
Q2	Write words related to the concept of environmental education (minimum three words).	Q17	Write words related to the concept of education for sustainable development (minimum three words).
Q3	I know initiatives and research of environmental education linked to the conservation of species of flora and fauna carried out in my Educational Institution.	Q18	I know strategies or educational standards related to the theme of education for sustainable development carried out in my Institution.
Q4	I like to participate in events and activities that have environmental education as slogan.	Q19	I repeatedly hear the words education for sustainable development through media such as television, radio or social networks.
Q5	I continuously propose possible environmental education strategies for the care of the species of flora and fauna that I see daily.	Q20	I identify that the interaction of science, technology and research is necessary in education for sustainable development.
Q6	I have knowledge of the plans or strategies of environmental education, with student and teacher participation to face the environmental problems of the territory.	Q21	I am clear that the best path for the future of humans on planet Earth is a change in thinking, which can be learned through education for sustainable development.

Table 1. *Cont.*

#	EE	#	ESD
Q7	I carry out environmental education actions for the protection of flora and fauna, in the different ecosystems with which I have contact.	Q22	Development of education activities for sustainable development for the social, economic and environmental well-being of the environment, through the knowledge learned in classes.
Q8	I lead environmental education projects with actions related to environmental conservation.	Q23	It is clear to me that the future will depend largely on the actions of present generations, which are learned through education for sustainable development.
Q9	By learning environmental education, I support waste separation at my educational institution.	Q24	I am interested in learning that education for sustainable development, seeks that the knowledge of human facilitates actions such as the use of renewable energies, commitments in relation to the environment, purchase and use of ecologically labelled products separation at source (recycle), among others.
Q10	I am interested in consulting the characteristics of a plant or animal that I do not know, to expand my knowledge in environmental education.	Q25	I am interested in looking for the concept of ecological footprint, heard and disseminated in different theories, research and media of education for sustainable development.
Q11	In my home I carry out waste separation, an activity learned in the educational institution through environmental education.	Q26	I know that education for sustainable development involves issues such as social welfare, human development, planning, teaching, economics, politics, among others.
Q12	I actively participated in activities associated with environmental education, especially the care of the natural environment.	Q27	I know the importance of Sustainable Development Goals, applied today and in the next generations, for the construction of a new future.
Q13	I relate concepts of environmental education learned in my Institution, being surrounded by nature, plants, trees, animals, and insects, among others.	Q28	I investigate the issues of the use of clean-alternative energies (solar, wind, geothermal, among others) used as a measure of mitigation of climate change and mentioned in education for sustainable development.
Q14	I am clear that for the care of water, actions such as saving, turning off the tap, not polluting it with waste, or wasting it are environmental education activities.	Q29	I recognize that one of the ways of changing human thinking and acting with the environment is associated in education for sustainable development.
Q15	I identify that the protection of species of flora and fauna is an environmental education activity.	Q30	I know the concept of environmental impact, which describes natural effects or those made by humans on the environment and is a concept used in education for sustainable development.

3. Results

The samples of the research comprise 70% from students, in which 19 are primary students and 221 are between middle and secondary; 26% from teachers; and 4% from managers of the official institutions of primary and secondary education (K-12) of the department of Boyacá. In terms of gender, 196 (57.5%) were women, 142 (41.6%) were men, and 3 (0.6%) prefer not to say. In total, 38 municipalities in the department of Boyacá responded to the survey, in addition to the two municipalities of Cundinamarca and Santander.

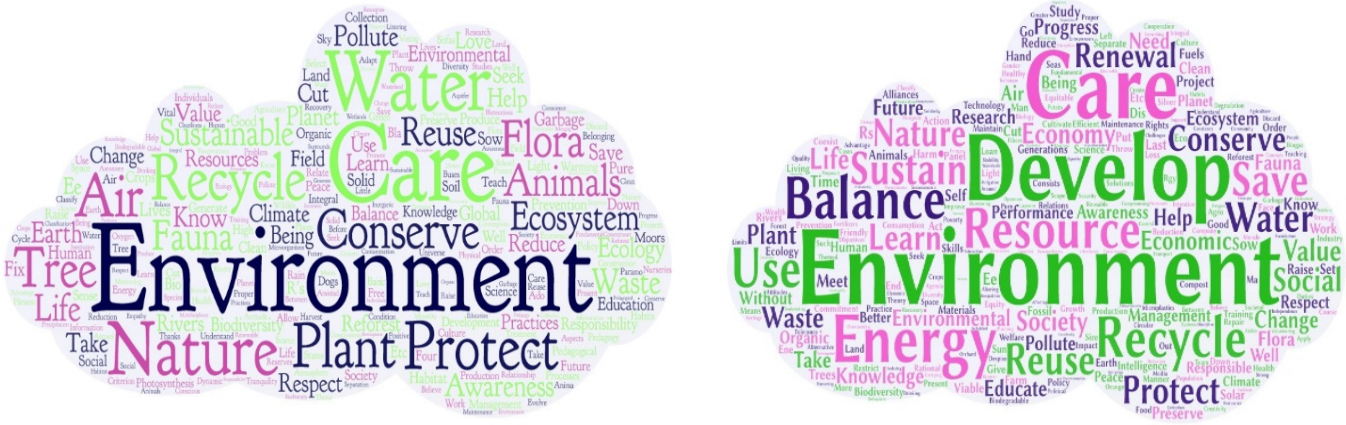
3.1. Survey Reliability

For the reliability of the survey, the Cronbach alpha coefficient registers a value of 0.95 of the 28 statements with Likert scale. Reliability values are between 0 and 1, where zero indicates no reliability and one exposes maximum reliability [22]. When values are found within the limit of 0.7 to 0.9, internal consistency is considered to be good [26]. As a result of the study, the reliability and consistency of the survey is high, according to the author's analysis.

3.2. Statements without the Likert Scale

Figure 1 shows the word clouds designed for the two open-ended questions of the survey, with the keywords widely linked to the concepts of EE and ESD. Figure 1a highlights

statements such as environment, care, nature, water, recycling, protection, conservation, flora, fauna, and awareness. Figure 1b highlights terms such as environment, development, energy, care, resources, balance, recycling, economy, water, and sustainability.



(**a**) (**b**)

Figure 1. Word clouds. (**a**) Q2–Words linked to EE. (**b**) Q17–Words linked to ESD.

The keywords of the concepts of EE and ESD were organized into categories to identify how the respondents of the study interpret each approach. For the EE, the best-known aspects are the actions carried out by humans, such as conservation and protection of the environment, the field of ecology, adding the elements that integrate natural habitats such as fauna, flora, and ecosystems. However, for ESD there are categories such as the functions played by human society on the planet, the issue of economics with the activities of individuals and industries and the environment.

3.3. Analysis of the Likert Scale Statements

Table 2 presents the results of the statistical analysis performed on the application instrument used in this research. The mode for each question was identified, which refers to the category or score that appeared with the greatest frequency [22]. For the questions related to environmental education (Q1, Q4, Q9, Q11, Q14, and Q15), the mode was five, indicating that respondents mostly selected this score. For the questions related to education for sustainable development (Q16, Q24, Q25, Q26, Q27, and Q29), the mode was four. Additionally, the number of respondents who selected each numerical value on the Likert scale was determined and represented as a percentage. The highest percentage, 67.16%, was for Q14, where respondents selected the highest value of five, “definitely yes”.

Table 2. Statistical analysis of the survey applied in the official educational institutions of primary and secondary (K-12) of the department of Boyacá.

Question	Mode	(%) 5	(%) 4	(%) 3	(%) 2	(%) 1
Q1	5	36.95%	28.45%	26.98%	6.16%	1.47%
Q3	4	16.72%	28.15%	28.15%	14.37%	12.61%
Q4	5	31.96%	31.67%	22.87%	10.56%	2.93%
Q5	3	17.60%	26.10%	30.79%	16.72%	8.80%
Q6	3	18.77%	26.10%	31.09%	13.78%	10.26%
Q7	4	20.82%	31.09%	27.86%	14.66%	5.57%
Q8	1	12.32%	14.96%	26.69%	19.06%	26.98%
Q9	5	37.83%	33.43%	15.84%	8.50%	4.40%
Q10	4	22.87%	29.03%	27.27%	15.25%	5.57%
Q11	5	32.26%	29.33%	20.23%	11.44%	6.74%
Q12	4	22.29%	29.03%	27.27%	14.66%	6.74%
Q13	4	29.91%	32.26%	22.87%	11.73%	3.23%
Q14	5	67.16%	21.41%	9.09%	2.05%	0.29%
Q15	5	59.24%	24.63%	11.14%	4.40%	0.59%
Q16	4	25.51%	26.10%	24.93%	12.90%	10.56%
Q18	3	14.08%	28.45%	30.50%	16.13%	10.85%
Q19	3	15.25%	26.39%	33.72%	19.94%	4.69%
Q20	5	36.95%	30.50%	21.11%	9.68%	1.76%
Q21	5	49.85%	30.21%	14.37%	3.81%	1.76%
Q22	3	16.72%	26.10%	33.43%	14.96%	8.80%
Q23	5	47.51%	26.98%	15.84%	8.50%	1.17%
Q24	4	31.67%	31.96%	23.46%	11.73%	1.17%
Q25	4	15.84%	32.26%	32.26%	14.37%	5.28%
Q26	4	28.45%	32.84%	26.69%	9.97%	2.05%
Q27	4	25.81%	31.67%	24.93%	13.20%	4.40%
Q28	3	15.54%	25.51%	34.90%	16.42%	7.62%
Q29	4	32.26%	35.78%	23.46%	7.62%	0.88%
Q30	5	32.55%	29.62%	26.98%	9.09%	1.76%

3.4. Environmental Education

Figure 2 also shows that the majority of survey participants selected the Likert scale category "strongly agree" for statements related to water resource care, protection of fauna and flora species, and waste separation. However, the understanding of EE concepts had a more varied response, with a majority of participants selecting the categories "agree" and "strongly agree".

Overall, the results from Figure 2 suggest that the individuals surveyed have a positive attitude towards EE practices and concepts, particularly regarding water resource care, fauna and flora protection, and waste separation. However, there may be some room for improvement in understanding the overall concept of EE.

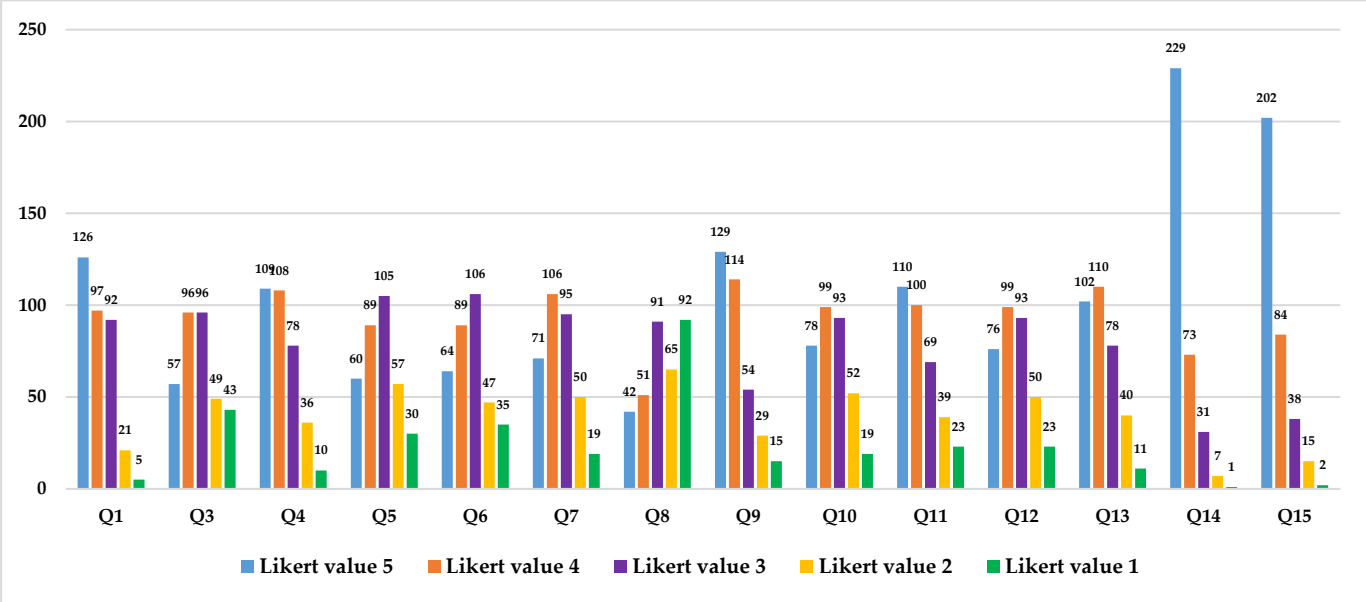


Figure 2. Answers of the statements of Environmental Education.

3.5. Education for Sustainable Development

The responses chosen in statements Q16 to Q30 are included in Figure 3, according to the selection of the participants of the research survey. The topics highlighted in ESD include changes in human thinking for life on the planet (170), participation of present generations for a sustainable future (162), and the integration of science, technology, and research into activities applied in the natural environment (126).

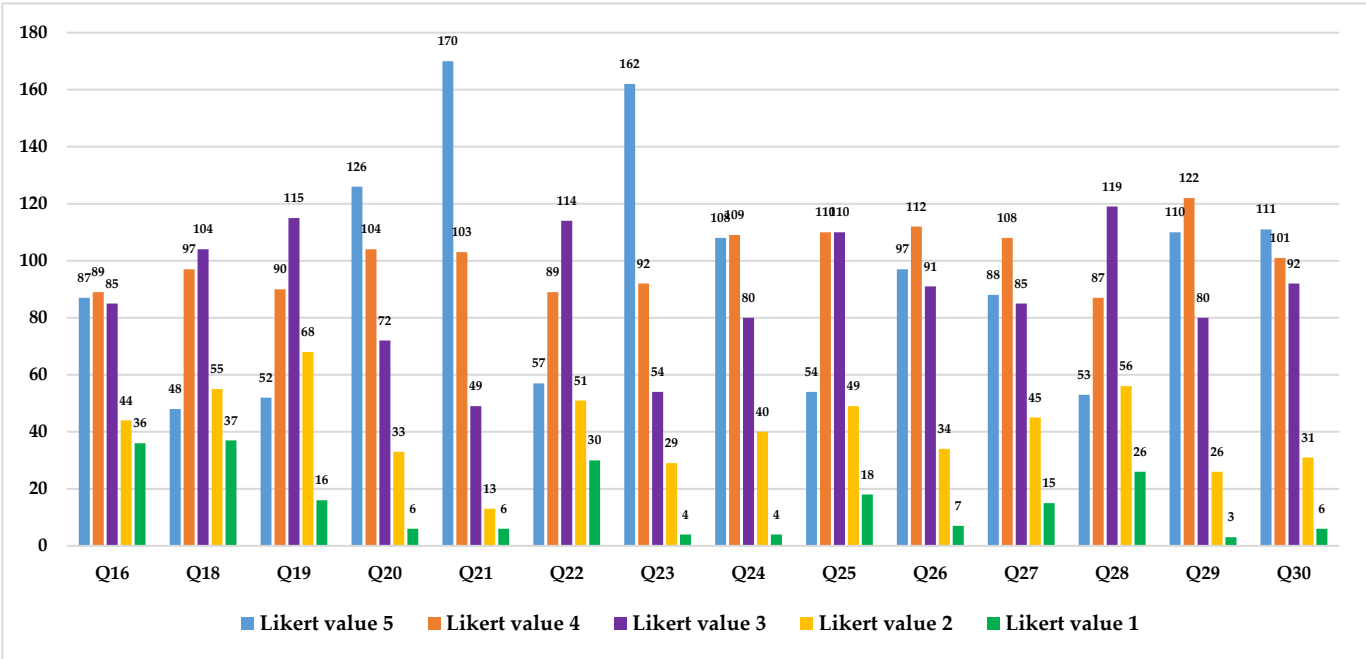


Figure 3. Data obtained in the education for sustainable development statements.

4. Discussion

Knowing the foundations of environmental education (EE) and developing initiatives that align with the purpose of EE is significant, as it promotes changes in social behavior and ensures the restoration, protection, and safeguarding of the environment [7]. Thus, it is

evident that over 50% of respondents clearly identify the concept of EE in various academic spaces, as indicated by the Q1 answers, with values of 36.95% in Likert 5 and 48.45% in Likert 4.

The dissemination of terms related to the concept of EE facilitates the interpretation of the environment through formal education [1]. Therefore, the categories that emphasize EE, such as conservation and protection of the environment, are presented in Q2, reflecting the importance of continued formulation and learning in the classroom.

Conservation initiatives for flora and fauna are crucial for the appropriate care of species in different ecosystems and aim to conserve various components of nature [6]. Therefore, the statements in Q3, Q5, Q7, and Q15, with over 100% in Likert 5, indicate the priority given to knowing, raising awareness, identifying, and implementing measures for the preservation of these types of life.

Students need teachers who promote attention to science, starting from early childhood stages [1,20]. In this regard, the joint participation of both groups in activities connected to environmental education (EE) in caring for the natural environment is highlighted in Q4, Q6, and Q12. Based on the opinions expressed in Q8, where only 26.98% of respondents chose Likert 1, it is necessary to strengthen the leadership in formulating EE projects and strategies.

Optimal understanding of the use and implementation of methodologies related to curiosity and everyday events can be acquired by students [20]. Waste separation, for example, becomes necessary when it becomes part of individuals' daily lives. The implementation of waste separation by respondents is reflected in the results of Q9 (37.83%) and Q11 (32.26%), indicating that this methodology is being practiced in common spaces such as homes and educational institutions.

The words of care and conservation of environmental components are interconnected with the concept of EE [5], indicating empathy towards animals, plants, and ecosystems and establishing a link with the planet. Various natural factors spark curiosity in individuals and seeking information through bibliographic consultations on EE subjects is common. Similarly, the responses of the participants in Q10 and Q13 relate to the initiative of obtaining appropriate environmental knowledge through search and consultation, which is based on preservation and awareness [8] and integrates environmental understanding to guide human actions in dealing with situations [5]. The group of respondents included in Q14, with 67.16% (the highest value in the survey results), highlights the importance of taking actions to care for water resources, such as closing the tap and not contaminating it with waste.

Education for sustainable development (ESD) is a continuous process of training and an integral element of effective learning that encompasses intellectual, collective, affective, and behavioral aspects of education. It is a dynamic and evolving pedagogy that incorporates themes, concepts, and achievements of teaching, didactics, and a wide range of scientific content [13]. Therefore, it is crucial to understand and implement the concept of ESD. Q16, with a percentage of 25.51% in Likert 5, emphasizes the need to deepen the knowledge of ESD in primary and secondary educational institutions (K-12) in order to incorporate sustainability into learning and provide guidance.

Teachers play a vital role in providing students with diverse environmental experiences to encourage motivation and participation in these spaces, which serve as the starting point for knowledge acquisition [20]. As they are continuously connected with ESD themes, concepts related to it are assimilated in Q17, where terms such as environment, development, energy, and care are frequently mentioned. Researching and understanding the current regulations in educational institutions allows for the integration of ESD aspects, aligning with the focus of different countries on including it in educational guidelines, teacher education, and training plans [13]. However, the results of Q18, with a low clarity in the concept of ESD, indicated by a value of 14.08% (Likert 5), suggest that academic standards are not well understood, which may limit the incorporation of ESD-related aspects.

In Colombia, according to Law 115, the national government promotes the integration of media and knowledge in the system of continuous learning and dissemination of tradition. These materials currently attract the attention of young people through the continuous use and visualization of social networks. In this context, Question 19 stands out with a value of 15.25% on the Likert scale of five, indicating that media are not being used in the reception of education for sustainable development (ESD) by the different stakeholders.

On the other hand, Question 20, with percentages of 36.95% (Likert 5) and 1.76% (Likert 1), indicates that informational tools are being linked as a tool in the topics of science, technology, and research, which are aspects of inclusion in ESD.

ESD, also known as education for sustainability, integrates learning, a community perspective, and training close to sustainable progress. It provides individuals with tools to apply and develop lasting intentions in the environment, in relation to their lifestyle [14]. The answers to Question 21, with a percentage of 49.85%, and Question 23, with 47.51%, on the Likert scale of five, align with the notion that ESD fosters changes in thinking and possible actions for a sustainable future on planet Earth.

ESD encompasses issues related to sustainability and sustainable development, such as the environment, society, and the economy [8,14]. These are translated into behaviors, expertise, and skills of individuals, with the aim of promoting environmental behaviors [14,28]. Therefore, it is crucial to reflect on the low values recorded in Question 22, with only 16.72% in the category of "definitely yes" response, in order to intensify the implementation of ESD in primary and secondary educational institutions (K-12), and to develop activities aligned with the pillars of sustainability.

The implementation and development of strategies such as the use of renewable and clean energies, environmentally labeled products, and calculation of ecological footprint are employed to reduce and mitigate the impacts on planet Earth. The integration of these practices fosters appropriation of the concepts of ESD, as evidenced by the high percentages (91.50% on the Likert scale of five) in responses to Questions 24, 25, 26, and 28. These responses reflect the attention and timely knowledge of these issues, highlighting the implementation of transformative measures for the benefit of sustainable development, with the aim of bringing about positive change in the world [13].

The sustainable development goals (SDGs) are an initiative aimed at addressing poverty, protecting the planet, and ensuring the well-being of humanity, including peace [29]. ESD promotes the full attainment of these objectives and ensures their meaningful integration by fostering innovation in humanity, with reflections on shaping a world that prioritizes environmental protection. The inclusion of SDGs in curricula is fundamental for achieving a sustainable future in various fields [13]. However, the low percentage (4.40% on Likert 1) in response to Question 27 indicates the need to further include SDGs in academic programs to strengthen the path towards a more sustainable environment.

The current environmental circumstances are crucial in changing human habits, and ESD provides the necessary tools and actions to address these issues. This is reflected in the Likert 5 responses of 32.26% for Question 29 and 32.55% for Question 30, indicating that ESD fosters a transition in the thinking and actions of participants towards understanding the effects on the environment and generating solutions for environmental conservation and ecosystem protection. This allows for a balanced approach to addressing environmental, social, economic, and cultural aspects.

In order to effectively integrate education for sustainable development (ESD) into the curriculum of primary and secondary educational institutions (K-12) in Colombia, it is crucial to implement a comprehensive curriculum update strategy. This strategy could involve several key elements:

Curriculum review: Conduct a thorough review of the existing curriculum to identify areas where sustainability principles can be incorporated across different subjects and grade levels. This may involve revising existing learning outcomes, content, and assessments to align with ESD concepts and approaches.

Teacher training: Provide professional development opportunities for teachers to enhance their knowledge and skills in delivering ESD content and pedagogical approaches. This may include workshops, seminars, and training sessions on ESD concepts, methodologies, and best practices.

Resource development: Create or adapt educational resources, such as textbooks, lesson plans, and teaching materials, that integrate ESD themes and activities. These resources should be easily accessible and user-friendly for teachers to incorporate into their daily lesson planning and instruction.

Cross-curricular integration: Foster interdisciplinary connections between different subjects to promote a holistic understanding of sustainability issues. For example, integrating environmental, economic, and social aspects of sustainability into science, social studies, mathematics, and language arts can help students develop a comprehensive understanding of the interrelated nature of sustainability challenges.

Experiential learning: Incorporate practical and hands-on learning experiences that allow students to apply sustainability concepts in real-life contexts. This may include field trips, community projects, and other experiential learning opportunities that promote active engagement and critical thinking about sustainability issues.

Community engagement: Foster partnerships with local communities, NGOs, and other stakeholders to involve students in real-world sustainability initiatives. This can provide students with opportunities to take action and make a positive impact on their local environment, promoting a sense of ownership and responsibility towards sustainable development.

Monitoring and evaluation: Implement a system to monitor and evaluate the effectiveness of the curriculum updates in promoting ESD outcomes. This may involve ongoing assessment of student learning, teacher feedback, and continuous improvement based on feedback and results.

By implementing a comprehensive strategy for curriculum updates, educational institutions in Boyacá can effectively integrate ESD into their teaching and learning processes, promoting sustainability awareness, critical thinking, and informed decision-making among students, and contributing to the achievement of sustainable development goals at the local and global levels.

5. Conclusions

The inclusion of education for sustainable development (ESD) topics in the official primary and secondary education (K-12) institutions in Boyacá, Colombia, is in line with the country's Law 115, which governs education. Issues, such as the conservation of water resources and the protection of fauna and flora, are crucial to promote sustainable practices and address environmental challenges in the region.

The incorporation of ESD in the educational curriculum aims to contribute to several sustainable development goals (SDGs) established by the United Nations' Agenda 2030. For example, by promoting environmental awareness, critical thinking, and informed decision-making on sustainability issues, SDG 4 on quality education is being advanced. Furthermore, teaching about the importance of water conservation and pollution mitigation aligns with SDG 6 on clean water and sanitation. The promotion of biodiversity and conservation of terrestrial ecosystems, fauna and flora in the region contributes to SDG 15 on life on land.

Likewise, fostering behaviors associated with care and conservation of the environment, promoted through ESD, is in line with SDG 12 on responsible consumption and production. In addition, the promotion of active participation of teachers, students and the community in sustainable actions, in line with SDG 17 on partnerships for the goals, highlights the importance of establishing collaborations and partnerships among different stakeholders. However, it is important to note that the integration of ESD in Boyacá's educational institutions is still limited, indicating the need for more comprehensive inclusion in the curriculum to generate changes and transformations in learning and the implementation of sustainable actions in daily life. This requires a review and update of

the curriculum to incorporate sustainability principles into all areas of knowledge. In this regard, it is crucial to use educational methodologies and tools that facilitate the effective integration of ESD approaches in teaching and learning. This may include the implementation of practical activities, research projects, teamwork, and community participation, among other innovative pedagogical approaches.

Colombia still has a lot of work to do in terms of integrating education for sustainable development (ESD) into the curriculum and early stages of education. Understanding sustainable development (SD) is crucial, but equally important is knowing how to achieve it and what tools can be utilized to do so. Additionally, it is essential for the national and local governments to prioritize ESD and invest in teacher training, enabling them to effectively communicate the principles of sustainability to students. This, in turn, will empower students to generate transformative ideas for sustainable development within their communities.

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