

ORIGINAL

## Environmental education for schoolchildren with intellectual disabilities in inclusive educational settings

### La educación ambiental de escolares con discapacidad intelectual en condiciones de inclusión educativa

Elianne de la Caridad Carrazana Guerra<sup>1</sup>  , Mavel Moré Estupiñán<sup>2</sup>  

<sup>1</sup>Universidad Central “Marta Abreu” de Las Villas. Villa Clara, Cuba.

<sup>2</sup>Universidad de Ciencias Médicas de Villa Clara. Villa Clara, Cuba.

**Cite as:** Carrazana Guerra E de la C, Moré Estupiñán M. Environmental education for schoolchildren with intellectual disabilities in inclusive educational settings. Environmental Research and Ecotoxicity. 2025; 4:209. <https://doi.org/10.56294/ere2025209>

Submitted: 03-02-2025

Revised: 18-06-2025

Accepted: 20-10-2025

Published: 21-10-2025

Editor: PhD. Prof. Manickam Sivakumar 

Corresponding author: Elianne de la Caridad Carrazana Guerra 

#### ABSTRACT

Environmental education, a fundamental pillar for the formation of a global citizenry committed to sustainable development, is promoted in Cuba through the school curriculum. However, challenges remain in forming critical environmental awareness and adopting sustainable practices in the younger generations. Accordingly, the objective of this study is to propose a program of interest groups to strengthen environmental education among schoolchildren with intellectual disabilities in inclusive educational settings. To achieve this, scientific methods based on theoretical and empirical knowledge are used, as well as statistical and/or mathematical processing methods. Starting from a diagnosis that reveals limitations related to environmental education, the “Natural Explorers” interest circle program is designed, structured in modules and activities with a multisensory approach and individual adjustments that favor the acquisition of knowledge in an experiential way, the development of skills for action, and the education of responsible attitudes towards the environment, from an inclusive perspective. The assessment by specialists certifies the relevance and appropriateness of the interest circle program. Its partial application in practice demonstrates its positive impact in the educational context. The interest circle program is the scientific result of a thesis for the Master’s Degree in Pedagogical Sciences at the Marta Abreu Central University of Las Villas and constitutes a modest contribution to the fulfillment of Sustainable Development Goal 4, “Quality Education,” of the 2030 Agenda.

**Keywords:** Environmental Education; Educational Inclusion; Diversity; Special Educational Needs; Sustainable Development.

#### RESUMEN

La educación ambiental, pilar fundamental para la formación de una ciudadanía global comprometida con el desarrollo sostenible, se promueve en Cuba desde el currículo escolar. No obstante, persisten desafíos en la formación de una conciencia ambiental crítica y en la adopción de prácticas sostenibles en las nuevas generaciones. En correspondencia, el objetivo del presente trabajo es: proponer un programa de círculo de interés para el fortalecimiento de la educación ambiental en escolares con discapacidad intelectual en condiciones de inclusión educativa. Para su cumplimiento, se emplean métodos científicos del nivel del conocimiento teórico y empírico, así como estadísticos y/o de procesamiento matemático. A punto de partida de un diagnóstico que revela limitaciones relacionadas con la educación ambiental, se diseña el programa de círculo de interés “Exploradores Naturales”, estructurado en módulos y actividades con enfoque multisensorial y ajustes individuales que favorecen la apropiación de conocimientos de forma vivencial, el desarrollo

de habilidades para la acción y la educación de actitudes responsables ante el medio ambiente, desde una perspectiva inclusiva. La valoración de los especialistas certifica la relevancia y pertinencia del programa de círculo de interés. La aplicación parcial en la práctica evidencia su impacto positivo en el contexto educativo. El programa de círculo de interés es resultado científico de una tesis de la Maestría en Ciencias Pedagógicas de la Universidad Central “Marta Abreu” de Las Villas y constituye un modesto aporte al cumplimiento del Objetivo de Desarrollo Sostenible 4 “Educación de calidad” de la Agenda 2030.

**Palabras clave:** Educación Ambiental; Inclusión Educativa; Diversidad; Necesidades Educativas Especiales; Desarrollo Sostenible.

## INTRODUCTION

Environmental education is a fundamental pillar for the formation of a global citizenry committed to sustainable development. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) recognizes the need to integrate sustainability at all levels of education, highlighting inclusion as a cross-cutting theme in Sustainable Development Goal (SDG) 4, which promotes quality education for all, leaving no one behind.<sup>(1)</sup>

Since its inception, environmental education has been conceived as a fundamental strategy for raising public awareness of the importance of conserving the natural environment and using resources responsibly.

Various authors have highlighted the need for this education to go beyond the transmission of scientific knowledge and also promote attitudinal changes and practical skills for sustainability.

In Cuba, it is considered a state and social priority, articulated with public policies aimed at protecting biodiversity and sustainably managing natural resources. For this reason, the school curriculum promotes environmental education as part of the general educational objectives, emphasizing the need to develop positive attitudes and behaviors toward the environment in schoolchildren. This is recognized in the Primary School Model<sup>(2)</sup> and in the Study Plan for the Third Improvement of the National Education System for Primary Education.<sup>(3)</sup>

This education, within the framework of the Third Improvement of the National Education System, seeks not only to transmit knowledge, but also to foster skills, attitudes, and values for sustainability, in accordance with the core curriculum.<sup>(4)</sup>

Similarly, it is essential to orient environmental education towards an inclusive approach, ensuring that all schoolchildren, regardless of their abilities, actively participate in environmental conservation.

Educational inclusion has gained prominence in the Cuban National Education System through curricular and methodological adaptations that guarantee equitable access to learning, in accordance with the standards of the Third Improvement of the National Education System<sup>(5)</sup> and the Methodological Guidelines for Attention to Diversity in General Education.<sup>(6)</sup>

In the context of educational inclusion, environmental education takes on an additional dimension: it must guarantee accessibility and full participation for all schoolchildren, regardless of their characteristics or needs. As Ainscow<sup>(7)</sup> points out, effective educational inclusion requires constant review of pedagogical practices to ensure that all schoolchildren have access to meaningful educational experiences.

However, the intersection of environmental education and educational inclusion remains an emerging field that warrants further study, especially in tropical and socioeconomically similar contexts to Cuba's. Despite advances, the educational inclusion of schoolchildren with special educational needs within this framework remains a challenge that is rarely addressed in pedagogical literature and daily practice. Cuban primary schools, therefore, face the challenge of ensuring that all schoolchildren, including those with special educational needs, have access to and actively participate in learning processes focused on environmental education to develop critical environmental awareness and adopt sustainable practices.

The limitations observed in this regard at the Zeneido Costa Llerena primary school have prompted this study, which aims to propose a circle of interest program to strengthen environmental education for schoolchildren with intellectual disabilities in inclusive education settings.

## METHOD

To address this issue, the study is based on the dialectical materialist approach, which understands educational reality as a constantly changing system, where contradictions and social relations influence the teaching-learning process.

This approach allowed us to analyze how pedagogical practices can be transformed<sup>(8)</sup> to strengthen environmental education in schoolchildren with intellectual disabilities in inclusive educational settings.

The research used theoretical knowledge methods such as synthetic analysis, inductive-deductive analysis, and systemic structural analysis to reveal the theoretical and methodological foundations of the research subject (environmental education with an inclusive approach), identify regularities, formalize inferences, reach conclusions, and organize the circle of interest program with the relationships between its components. Empirical methods, such as direct observation and semi-structured interviews, were also used to gather information on teachers' and students' perceptions and experiences of environmental education with an inclusive approach. Document analysis was also used to review updated study plans and programs, as well as current regulations, to evaluate the relevance and scope of the curriculum in relation to educational inclusion and environmental education. Analysis of the activity's output enabled systematic verification of the selected sample of schoolchildren's knowledge and skills in environmental education, as well as their attitudes and behaviors toward the environment. Furthermore, triangulation of sources strengthened the credibility, validity, and robustness of the research by contrasting multiple perspectives, methods, and data types to identify regularities. Among the statistical and/or mathematical processing methods, percentage analysis (procedure) and descriptive statistics were considered to quantify and present the collected data, allowing patterns and trends to be identified and facilitating qualitative interpretation.

The use of these scientific methods, as a system, ensured the theoretical and methodological basis of the research topic, the identification of regularities in terms of strengths and needs, the design of the proposed solution, the assessment of its relevance and significance, and the evaluation of its application in educational practice.

## DEVELOPMENT

### Theoretical and methodological foundations of environmental education for schoolchildren with intellectual disabilities in conditions of educational inclusion

Among the theoretical and methodological foundations of the research, the criteria of scholars of environmental education and educational inclusion stood out, which have contributed to the conception of global and local policies in this regard. The requirements of the Third Improvement of the National Education System for Primary Education were also taken into account, as well as the regulations established for the conception of a circle of interest program.

In Cuba, environmental education and the improvement of the institutional curriculum are governed by fundamental regulatory documents, including the National Environmental Strategy 2021-2025<sup>(9)</sup> and Law 150/2022 on the Natural Resources and Environment System.<sup>(10)</sup>

The National Environmental Strategy provides the guiding framework for the systematic integration of environmental education at all levels of the Cuban education system, encouraging school and community participation in solving current and future environmental problems.

On the other hand, Law 150/2022 establishes principles and standards for environmental protection. It requires promoting environmental awareness and culture through education, sustainability, and social development, while also incorporating the country's international commitments.

Both documents promote curriculum improvement in schools, making environmental education and educational inclusion cross-cutting and strategic elements, especially in primary education.

Recent research suggests that incorporating multisensory, playful, and collaborative approaches can promote active participation and meaningful learning for schoolchildren with special educational needs.<sup>(11,12,13,14,15)</sup>

In Cuban schools with inclusive programs, the application of these strategies has been shown to improve students with disabilities' knowledge retention and facilitate their participation in environmental education activities.<sup>(4)</sup>

The critical approach to environmental pedagogy emphasizes that teaching sustainability must consider not only ecological aspects but also social and cultural dimensions, with an emphasis on environmental justice and equity.<sup>(8,16)</sup> This implies recognizing the social inequalities that affect communities' relationships with their environment. Consequently, environmental education with an inclusive approach promotes equity by ensuring that vulnerable groups also develop a critical awareness of environmental care and social justice. From this perspective, it is conceived as a praxis that promotes the appreciation of human diversity and the collective construction of care for the environment. The Third Improvement of the National Education System in Cuba constitutes a key stage of profound reforms aimed at improving the quality, comprehensiveness, and effectiveness of educational processes at all levels and types of education. It is a complex research project that seeks comprehensive, multifaceted solutions to transform the functioning and organization of educational institutions, with a focus on strengthening students' comprehensive training and improving the quality of the teaching-learning process.

The Third Improvement of the National Education System began its experimental implementation in 2014 in some provinces, and in 2017 it was extended to all the country's central municipalities. Today, it is implemented in all educational institutions in the country. It seeks to make schools more attractive places, more closely linked

to the community, and more oriented toward knowledge generation and collaborative work. It emphasizes the need for education to keep pace with the country's social and economic changes, diversifying educational opportunities and strengthening the comprehensive education of children, adolescents, and young people.

Among the most significant changes in the Third Improvement of the National Education System are the restructuring and updating of study plans and programs, with special attention to reducing curriculum overload and modernizing content to better align with contemporary needs. The training and preparation of teachers and administrators have also been enhanced, with a focus on their continuous pedagogical and professional development. The process also involves decentralizing decision-making to give schools greater autonomy and more efficient management.

According to the Standards for the Third Improvement of the National Education System,<sup>(5)</sup> educational inclusion involves developing flexible organizational, curricular, and methodological structures that respond to diversity and promote equity and equal opportunities.

The core curriculum and methodological guidelines propose eliminating barriers to learning and participation, universalizing the design of activities, diversifying teaching methods, and fostering joint work among families, teachers, and the community. Attention to special educational needs thus becomes a shared and comprehensive responsibility based on social co-responsibility and educational justice.<sup>(5)</sup>

According to the Methodological Guidelines for Addressing Diversity in General Education,<sup>(6)</sup> environmental education should incorporate inclusive practices that consider the functional diversity of schoolchildren and draw on innovative perspectives linked to educational inclusion.

Likewise, the Institutional and Group Educational Project, another of the most significant changes in the Third Improvement of the National Education System, serves as a transformative tool, allowing the inclusive proposal to be contextualized to reflect the specificities of the school environment and to enhance the talents and abilities of all schoolchildren.

The implementation of the institutional and group Educational Project, in accordance with the Guide for the preparation and development of institutional projects,<sup>(17)</sup> ensures that schoolchildren with intellectual disabilities have access to environmental education experiences from multisensory, playful, and collaborative approaches, strengthening their sense of belonging and comprehensive training.

Among the actions that should be included in the institutional and group Educational Project are those related to teaching, extracurricular, and after-school activities.

For Labarrere et al.<sup>(18)</sup>, teaching activities are those carried out during teaching hours, within the framework of the class. On the other hand, extracurricular activities take place outside teaching hours, are organized and directed by the school, and are intended to achieve educational and instructional objectives. Extracurricular activities are activities that take place outside of teaching hours and are directed by institutions and social organizations.<sup>(19,20,21)</sup>

Interest groups are extracurricular activities. They are understood as educational spaces where children, adolescents, or young people who share a common interest explore a specific topic through research, reflection, and practice, with emphasis on the link between theory and practice.<sup>(22)</sup> It helps foster collaboration, mutual aid, scientific curiosity, collectivism, and a favorable emotional climate, moving away from harmful competition toward an atmosphere of teamwork. Members are motivated to develop knowledge, habits, and research skills that contribute to their autonomy in learning and the formation of critical and creative judgments.

The importance of interest groups lies in their motivational and vocational functions: they prepare participants for their future profession and expand their knowledge in technical and professional areas that will be useful in their social and economic context. These spaces contribute to comprehensive training, promoting qualities such as discipline, tenacity, collectivism, and social recognition, as well as career guidance and the development of research habits from an early age. In addition, they allow the content to be tailored to participants' interests and characteristics, promoting a more inclusive and participatory education.

An environmental education interest group is a fundamental educational space for promoting meaningful learning, especially for schoolchildren with intellectual disabilities, who require adapted methodologies that foster their educational inclusion and comprehensive development. It creates an environment where schoolchildren with diverse special educational needs can explore topics related to their environment and sustainability, tailored to their abilities and learning rhythms.

### **Diagnosis of environmental education in schoolchildren with intellectual disabilities in conditions of educational inclusion**

Based on these theoretical and methodological foundations, the instruments for the initial diagnosis were developed at the Zeneido Costa Llerena primary school to identify patterns in terms of strengths and needs in relation to the environmental education of schoolchildren with intellectual disabilities in inclusive education settings.

The strengths were as follows:



- The Mined's regulatory documents consider environmental education to be a training objective.
- Schoolchildren show a willingness to participate in activities related to environmental education.

The following needs were identified:

- The Mined's regulatory documents do not sufficiently specify the strategies to be applied for environmental education and how to adapt them to the particularities of schoolchildren with special educational needs.
- There is a shortage of adapted materials and specific teaching strategies that meet the needs of schoolchildren with special educational needs.
- Schoolchildren show gaps in their knowledge and skills related to environmental education, which manifest themselves in negative attitudes and behaviors toward the environment (littering, neglecting ornamental plants).

Based on the results of the initial diagnosis, the following circle of interest program was designed.

### Presentation of the circle of interest program

The interest circle program for strengthening environmental education in schoolchildren with intellectual disabilities in inclusive education settings is designed with reference to the Guide for the preparation and development of institutional projects,<sup>(23)</sup> adjusting its content and methodology to the demands of the institutional curriculum and complying with the regulations of the Third Improvement of the National Education System, which allows for the coherent integration of environmental education and attention to diversity under an inclusive approach.

It is entitled “Natural Explorers” and its objective is to promote the emotional, cognitive, and behavioral connection of schoolchildren with special educational needs to the natural environment, fostering positive attitudes and behaviors towards the environment and providing opportunities for experiential learning and the development of practical skills for its care. (figure 1)

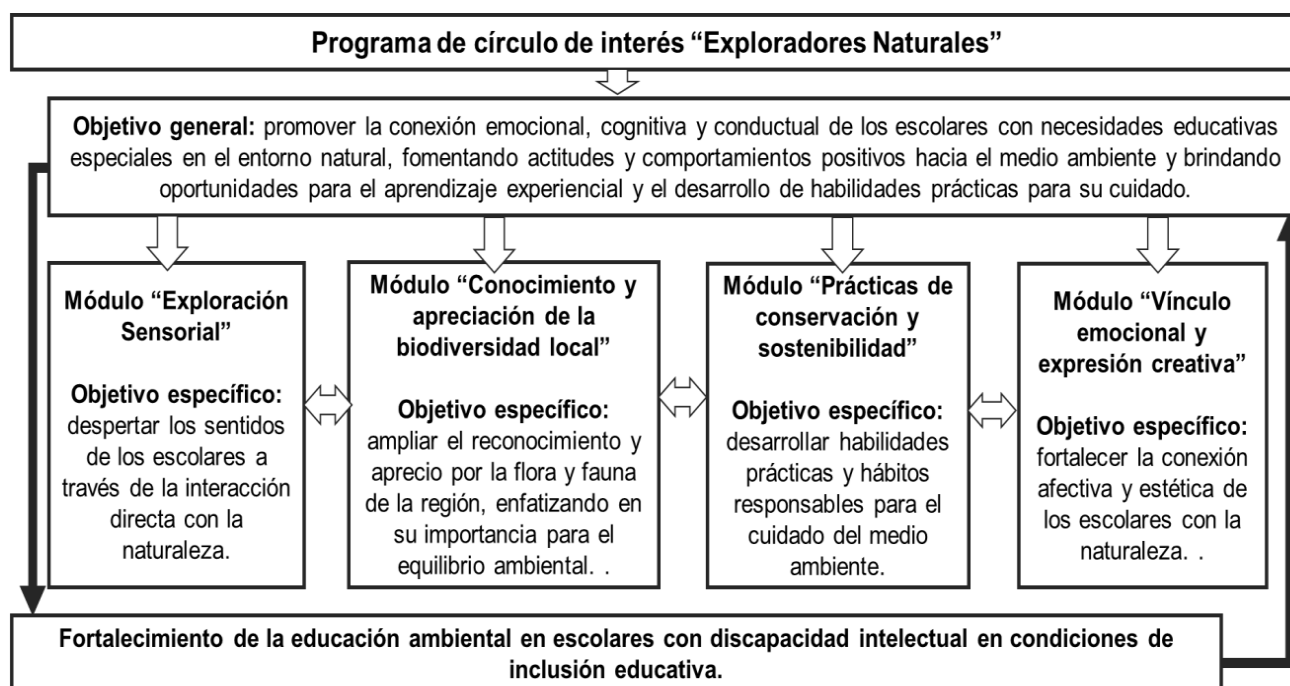


Figure 1. Graphical representation of the circle of interest program

It is based on the principles of accessibility and full participation to meet the need for a flexible, motivating educational space for schoolchildren. It seeks to overcome the methodological barriers identified in the initial diagnosis through a comprehensive approach tailored to the particularities of schoolchildren.

It seeks not only to adapt the institutional curriculum but also to encourage active collaboration among teachers, families, and specialists in environmental education and educational inclusion, so that each actor contributes their experience to strengthen learning.<sup>(7)</sup>

It is structured into modules with specific objectives, activities (recreational, experimental, collaborative), and resources adapted to the individual characteristics of the students.

The activities that make up the modules are adapted to students' individual characteristics, promoting the acquisition of knowledge through experience, the development of skills for action, and the cultivation of positive attitudes and behaviors towards the environment, from an inclusive perspective.<sup>(24,25,26,27)</sup> These include recycling workshops, educational games on caring for nature, guided tours of nearby green areas, and the creation of small environmental projects within the school and the community, such as planting and caring for ornamental plants, allowing schoolchildren to learn by doing in an environment of respect and appreciation for diversity.

The first module, "Sensory Exploration," has the specific objective of awakening schoolchildren's senses through direct interaction with nature. It includes activities that stimulate observation, touch, smell, and hearing in nearby natural environments, such as sensory walks, games with natural elements, and mindfulness exercises, thus fostering curiosity and a personal connection with the environment.

The second module, "Knowledge and Appreciation of Local Biodiversity," aims to expand recognition and appreciation of the region's flora and fauna, emphasizing their importance to environmental balance. This includes illustrated talks with adapted visual resources, creative drawing or model-making workshops, and field trips for species identification, all of which promote participatory and meaningful learning. The third module, "Conservation and Sustainability Practices," aims to develop practical skills and responsible habits for caring for the environment. Practical workshops on planting, composting, recycling, and clean-up campaigns are held to promote positive attitudes and behaviors toward the environment and a practical understanding of environmental conservation and sustainability. Finally, the fourth module, "Emotional Connection and Creative Expression," focuses on strengthening students' emotional and aesthetic connection with nature. Activities in this module include artistic expressions such as painting, poetry, music, and storytelling that facilitate the expression of emotions and aesthetic appreciation of the natural environment, contributing to the development of positive attitudes and behaviors toward the environment.

This interest circle program is implemented gradually and flexibly, with a total duration of approximately 48 hours spread over six months, integrating methodological strategies adapted to the particularities of schoolchildren with intellectual disabilities.

The evaluation process combines continuous observation, individual portfolios, and self-assessments, with an inclusive approach that promotes full participation, collaboration with teachers and families, and respect for each student's learning pace and needs.

Thus, the circle of interest is an effective tool for promoting environmental education from an inclusive, experiential perspective.

### **Evaluation of the circle of interest program**

Before its implementation, the circle of interest program was evaluated by a panel of four specialists, selected for their years of experience, teaching category, academic or scientific degree, and professional performance in environmental education and the educational inclusion of students with special educational needs.

All specialists (100 %) were graduates and had in-depth knowledge of the characteristics and needs of schoolchildren with intellectual disabilities, enabling them to provide informed opinions on the proposal. Seventy-five percent hold a Master's degree in Education Sciences, and 50 % hold a Doctorate in Pedagogical Sciences. 100 % have teaching status: 3 are Assistant Professors (75 %) and 1 is a Full Professor (25 %).

The specialists agreed that the proposal significantly promotes the educational inclusion of schoolchildren by offering opportunities for learning through direct experience and collaborative work, in line with the recommendations of the specialized literature on the subject Booth et al.<sup>(23)</sup>, they highlighted the originality and novelty of the activities designed, especially their approach, which is sensitive to the particularities of schoolchildren with special educational needs and their connection with nature.

Among the suggestions for improving the interest circle program, they recommended expanding the diversity of adapted teaching materials, incorporating more visual and tactile communication strategies to facilitate understanding, and strengthening the articulation between activities inside and outside the classroom to enhance the continuity of learning. In addition, they emphasized the need to further flexibilize the timing and pace of activities to suit the individual abilities of schoolchildren better. They also suggested expanding family and specialist involvement and training to ensure comprehensive support. The favorable opinions expressed by specialists regarding the "Natural Explorers" interest circle program confirm its relevance and effectiveness as an answer to the research objective.

### **Evaluation of the implementation of the interest circle program**

The partial implementation of the circle of interest program in teaching practice demonstrated its feasibility, as progress was observed in the understanding of basic concepts related to the environment and environmental education; an increase in active participation and collaboration among peers; the education of

positive attitudes and behaviors towards the environment, manifested in the correct use of trash cans and the care of green spaces, as signs of respect and responsibility towards the environment.

In addition, it promoted collaboration between teachers, families, and specialists, which was essential to ensuring the accessibility and relevance of the planned activities. The experience demonstrates that environmental education from an inclusive perspective not only contributes to the comprehensive development of schoolchildren but also strengthens the school and community culture around sustainability.<sup>(28,29,30)</sup>

However, preliminary results also reveal the need to strengthen teacher and specialist training in inclusive strategies and environmental education, as well as to involve families and the community more actively in the educational process.

## CONCLUSIONS

The integration of adaptive approaches and pedagogical strategies focused on diversity is key to ensuring the active and meaningful participation of all schoolchildren. This theoretical-methodological framework, grounded in principles of educational inclusion and sustainability, enables the design of multisensory, playful, and collaborative educational strategies, such as the interest circle program presented here.

Analysis of the regularities of the initial diagnosis revealed that, despite the needs identified, schoolchildren are willing to participate in environmental education activities, which supports the viability of implementing flexible, experiential educational proposals that enhance their individual strengths and address their particularities.

This understanding led to the design of the “Natural Explorers” interest circle program as an educational strategy that promotes experiential learning, the development of practical skills, and the consolidation of positive attitudes and behaviors toward the environment from an inclusive perspective, demonstrating an important contribution to curriculum improvement and the pedagogical approach in diverse educational contexts.

The assessment by specialists and the partial implementation of the interest circle program confirmed the proposal’s relevance, significance, and feasibility. Evaluating its effectiveness is a task for future research.

The interest circle program is the scientific result of a thesis, currently in progress, for the Master’s Degree in Pedagogical Sciences at the Marta Abreu Central University of Las Villas, which makes a modest contribution to the fulfillment of Sustainable Development Goal 4, “Quality Education,” of the 2030 Agenda.

## REFERENCES

1. Unesco. Educación para los Objetivos de Desarrollo Sostenible: objetivos de aprendizaje. 2017. Available from: [https://unesdoc.unesco.org/ark:/48223/pf0000252423\\_spa](https://unesdoc.unesco.org/ark:/48223/pf0000252423_spa)
2. Rico P, Santos E, Martín-Viaña V, Recarey S, Addine F. Modelo de Escuela Primaria. Pueblo y Educación; 2008.
3. Sánchez ME, Planas E, Lemus LE, Rodríguez M. Plan de Estudio. Educación Primaria. Pueblo y Educación; 2008.
4. Ministerio de Educación. Currículo base del tercer perfeccionamiento del sistema nacional de educación. 2021.
5. Ministerio de Educación. Normas para el tercer perfeccionamiento del sistema nacional de educación. 2021.
6. Ministerio de Educación. Orientaciones metodológicas para la atención a la diversidad en la educación general. [date unknown].
7. Ainscow M. Making schools more inclusive: lessons from international research. *Revista de Educación Inclusiva*. 2012;5(1):39-49. Available from: <https://revistaeducacioninclusiva.es/index.php/rei/article/view/220>
8. Sauvé L. Environmental education and sustainable development: An historical perspective. In: Fien W, editor. *Environment and education: A historical review of educational approaches to sustainability*. Unesco; 2006. p. 35-56.
9. Ministerio de Ciencia, Tecnología y Medio Ambiente. Estrategia Ambiental Nacional 2021-2025. 2021. Available from: <https://www.citma.gob.cu/estrategiaambienta>

10. Asamblea Nacional del Poder Popular. Ley No 150 de 2023: Del Sistema de los Recursos Naturales y el Medio Ambiente. Gaceta Oficial de la República de Cuba. 2023 Sep 13;(GOC-2023-771-O87). Available from: <http://www.gacetaoficial.gob.cu/>
11. Aparicio DE. La educación ambiental en educandos con discapacidad intelectual leve desde el proceso de comprensión lectora. *Revista Lengua y Literatura.* 2024;10(1):58-70. Available from: <https://revistas.unan.edu.ni/index.php/RLL/es/article/view/4189>
12. Jamal A, Jamal AM, Yusof SM. Young authors & the Anthropocene: What story books reveal about the place-ecological meaning constructed by schoolchildren of Chennai. *The Journal of Environmental Education.* 2024;55:480-93. <https://doi.org/10.1080/00958964.2024.2364190>
13. Poje M, Marinić I, Stanisavljević A, Rechner Dika I. Environmental Education on Sustainable Principles in Kindergartens—A Foundation or an Option? *Sustainability.* 2024;16:2707. <https://doi.org/10.3390/su16072707>
14. Fabela FC, Silva RFD, López RC. Creation of environmental awareness through aviation and education for children between 8-11 years old. *EDULEARN24 Proceedings.* 2024;10661-6. <https://doi.org/10.21125/edulearn.2024.2653>
15. Shabani Isenaj Z, Moshammer H, Berisha M, Weitensfelder L. Determinants of Knowledge, Attitudes, Perceptions and Behaviors Regarding Air Pollution in Schoolchildren in Pristina, Kosovo. *Children.* 2024;11:128. <https://doi.org/10.3390/children11010128>
16. Freire P. *Pedagogía del oprimido.* Siglo XXI Editores; 1996.
17. Ministerio de Educación. *Guía para la elaboración y desarrollo de proyectos institucionales.* 2020.
18. Labarrere G, Valdivia GE. *Pedagogía. Pueblo y Educación;* 1988.
19. Dapari R, Muniandy K, Azman AZF, Bakar SA, Desa MNM, Hwa LC, et al. Effectiveness of the Integrated Dengue Education and Learning (iDEAL) module in improving the knowledge, attitude, practice, environmental cleanliness index, and dengue index among schoolchildren: A randomised controlled trial protocol. *PLOS ONE.* 2024;19:e0302736. <https://doi.org/10.1371/journal.pone.0302736>
20. Darchashvili M. Environmental Education a Vital Challenge of Global World: Case of Georgia. In: *Globalization, Global Security, and New International Realities for Modern Democracies.* IGI Global Scientific Publishing; 2025. p. 499-518. <https://doi.org/10.4018/979-8-3373-1355-9.ch019>
21. Zonta ML, Servián A, Virgolini B, Garraza M, Minardi G, Navone GT. Malnutrition and intestinal parasitosis: Current prevalences and risk factors among schoolchildren in Misiones (Argentina). *American Journal of Human Biology.* 2024;36:e24140. <https://doi.org/10.1002/ajhb.24140>
22. Ministerio de Educación. *Orientaciones para el trabajo en círculos de interés.* 2017.
23. Booth T, Ainscow M. *Guía para la educación inclusiva: desarrollando el aprendizaje y la participación en los centros escolares.* FUHEM Educación y OEI; 2015.
24. Ballantyne RR, Uzzell DL. A Checklist For The Critical Evaluation Of Informal Environmental Education Experiences. In: *A Sourcebook for Environmental Education: A Practical Review Based on the Belgrade Charter.* CRC Press; 1996.
25. Bucht C, Bachner J, Spengler S. Environmental attitude and affective-motivational beliefs towards sustainability of secondary school children in Germany and their associations with gender, age, school type, socio-economic status and time spent in nature. *PLOS ONE.* 2024;19:e0296327. <https://doi.org/10.1371/journal.pone.0296327>
26. Giancola M, Pino MC, Zacheo C, Sannino M, D'Amico S. The Intergenerational Transmission of Pro-Environmental Behaviours: The Role of Moral Judgment in Primary School-Age Children. *Social Sciences.* 2024;13:318. <https://doi.org/10.3390/socsci13060318>



27. Faganel A, Kovač B. Inquiring and strengthening the environmental awareness among elementary school children. *International Journal of Innovation and Learning*. 2025;37:439-73. <https://doi.org/10.1504/IJIL.2025.146510>

28. Irimia O, Tomozei C, Panainte-Lehadus M, Chitimus D, Nedeff F, Barsan N, et al. Understanding Primary School Students' Knowledge and Attitudes Towards Water Management: Insights from Environmental Education. *Societies*. 2025;15:109. <https://doi.org/10.3390/soc15040109>

29. Dzhumabayeva GA, Amanova GM. The Role of Spiritual Education of Schoolchildren in the Development of Society. In: Popkova EG, editor. *Lifelong Learning in Central Asia: Relevance of the Fourth Industrial Revolution*. Singapore: Springer Nature; 2025. p. 209-15. [https://doi.org/10.1007/978-981-96-1941-2\\_20](https://doi.org/10.1007/978-981-96-1941-2_20)

30. Wang Y, Shi D, Ye X, Dang J, Guo J, Lian X, et al. Spatiotemporal Patterns of Indoor Air Pollution and Its Association with Depressive Symptoms Among Schoolchildren in China. *Toxics*. 2025; 13:563. <https://doi.org/10.3390/toxics13070563>

#### **CONFLICT OF INTEREST**

None.

#### **FUNDING**

None.

#### **AUTHOR CONTRIBUTION**

*Conceptualization:* Elianne de la Caridad Carrazana Guerra, Mavel Moré Estupiñán.

*Research:* Elianne de la Caridad Carrazana Guerra, Mavel Moré Estupiñán.

*Writing - initial draft:* Elianne de la Caridad Carrazana Guerra, Mavel Moré Estupiñán.

*Writing - review and editing:* Elianne de la Caridad Carrazana Guerra, Mavel Moré Estupiñán.