HUELLAS revista

21

ISSN en línea: 2382 - 4875

University of Nariño
Faculty of Education
Department of Pedagogical Studies

University Directives

Dra. Martha Sofía González Insuasti
Rector

Dr. Giraldo Javier Gómez Guerra
Academic Vice-Rector

Dr. William Albarracín Hernandez
Vice-Rector of Research and Social Interaction

Dr. Miltón Oswaldo Ospina Ospina
Vice-Rector for Administration and Finance

Dr. Hernan Modesto Rivas Escobar
Dean of the Faculty of Education

Dr. Omar Armando Villota Pantoja
Director of the Department of Pedagogical Studies

Editor académico revista Huellas

Dr. Omar Armando Villota Pantoja

Comité Editorial

Dr. Roberto Ramirez Bravo

Dr. Alvaro Torres Mesias

Mg. Monica Vallejo

Mg. Hernan Rivas

Mg. Jairo Ortega

Mg. Carlos Pantoja

Comité Científico

Dr. Antonio Miñan Espigares

Dr. Nelson Torres Vega

Dra. Marina Vela Escandón

Dra. Amanda Juárez

Diseño Centro de Comunicaciones Udenar

Dolly Lizeth Benavides- Santiago Lopez

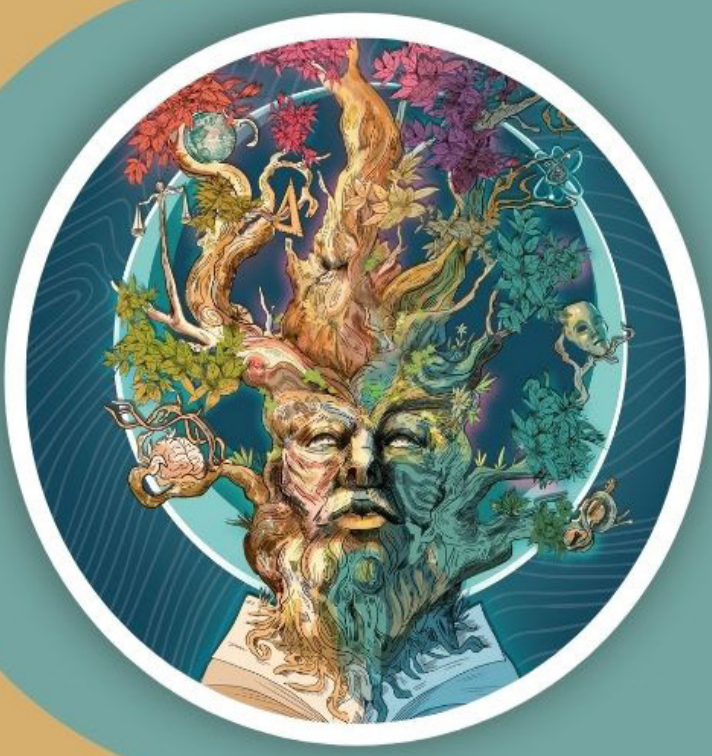
Monitora Revista Huellas

Julieth Katherine Lorza Erazo

Maquetación y edición de estilo

ISSN
En línea: 2382-4875
Digital: 2389-9360

DOI REVISTA HUELLAS
https://doi.org/10.22267/huellas



DR. OMAR ARMANDO VILLOTA PANTOJA

Director of the Department of Pedagogical Studies and academic editor.

In this 21st issue of Huellas Magazine, we enthusiastically celebrate the commitment, rigor, and passion of our authors, whose contributions bring each of these pages to life. Each article presented here represents much more than an academic exercise: it is the result of a process that combines observation, critical reflection, and the courage to share knowledge with the community.

The act of writing science—beyond formulas and structures—is, in essence, a constant rebirth. In a rapidly changing world, scientific writing remains not only a vehicle for information, but also a tool for understanding, questioning, and transforming reality. Facing the challenge of writing for science is also a gesture of ethical responsibility, openness to debate, and love for knowledge.

To each author who has placed their trust in this editorial space, we offer our profound gratitude. Their work not only enriches this edition but also actively contributes to the collective construction of knowledge. Huellas is honored to be the conduit for these voices who, with discipline and creativity, are leaving their mark on the fabric of academic and social thought.

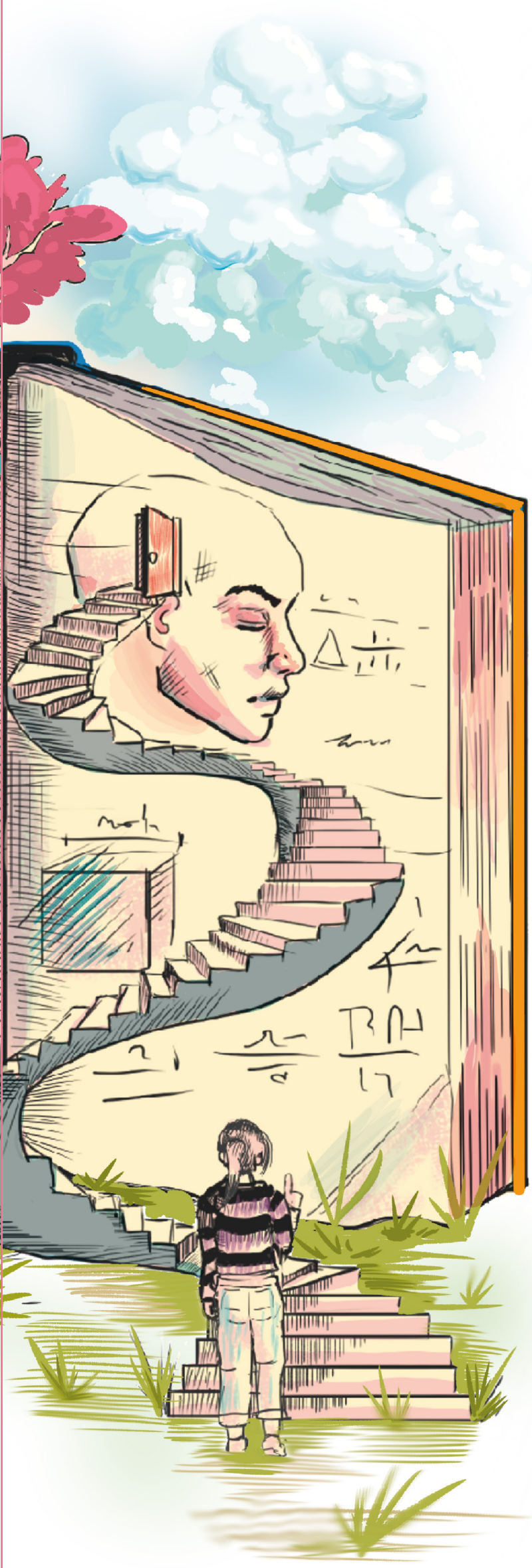
We invite you, dear readers, to explore these pages with the same curiosity with which they were written. May these traces inspire you, move you, and perhaps inspire you to embark on the beautiful and challenging path of scientific writing.

Dr. Omar Armando Villota Pantoja

Content

Pág.

Content



Pág.

THEORETICAL PERSPECTIVES ON TEACHING STYLES IN PHYSICAL EDUCATION.

Anderson Ricardo Rodríguez Burbano

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.23

Traducción: Andrés Eduardo Gavilanes Santander

Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 12 de enero 2024

Abstract.

This article identifies the conceptions of teaching styles held by faculty members within the Physical Education Bachelor's Program (PEBP) at CESMAG University. Guided by a qualitative paradigm, this research adopts a hermeneutic approach and employs educational ethnography as its methodological framework. Key findings reveal that teaching styles function as didactic tools or processes, adaptable to the objectives and content of instruction, which facilitate deeper engagement with knowledge. Furthermore, these styles bridge theoretical and practical dimensions, thereby fostering the development of learning styles. Similarly, they influence curricular content, strengthen critical and reflective thinking, and enhance pedagogical coherence. Conceptualizing teaching styles enables progress and differentiation in instructional practices, empowering educators to implement them effectively. Such intentional application, in turn, stimulates the cultivation of efficient learning styles among students, tailored to the unique dynamics of each classroom session.

Key words: Teaching styles, teachers, concepts, teaching processes, physical education.

Resumen.

Este artículo identifica las concepciones sobre estilos de enseñanza de los docentes del Programa de Licenciatura en Educación Física (PLEF) de la Universidad CESMAG. Se rige bajo un paradigma cualitativo, con enfoque hermenéutico y el método etnográfico educativo. Dentro de los hallazgos se encontraron que los estilos de enseñanza son una herramienta o proceso didáctico, que se adapta a los objetivos y contenidos de la clase, y que permite profundizar en el conocimiento. De igual manera, permiten la relación entre teoría y práctica, potenciando los estilos de aprendizaje. Del mismo modo, inciden en los contenidos curriculares, en el fortalecimiento de ideas críticas y reflexivas. La conceptualización de los estilos de enseñanza permitirá el avance y diferenciación en los procesos de enseñanza, además, por parte del docente llevarlo a la práctica adecuada y eficaz; para así, motivar los estilos de aprendizaje eficientes en los estudiantes, desde la dinámica de cada una de las sesiones de clase.

Palabras clave: Estilos de enseñanza, docentes, concepciones, procesos de enseñanza, educación física.

APROXIMACIÓN TEÓRICA DE LOS ESTILOS DE ENSEÑANZA EN EL CAMPO DE LA EDUCACIÓN FÍSICA.

I. INTRODUCTION.

One prominent strand in contemporary pedagogical and didactic research centers on the idealization of educators, specifically their personal attributes, attitudes, and beliefs, and their impact on classroom organization, social dynamics, and curricular outcomes. The teaching style adopted by an instructor shapes their interaction with didactic elements. According to Agudelo-Gómez (2016), this underscores the growing imperative to enhance teaching quality—a quality intrinsically linked to educators' actions and determined by two critical factors. Firstly, it hinges on their existing and ongoing training, as well as the conceptual frameworks they construct regarding the academic disciplines they teach. Secondly, it depends on the teaching styles employed within pedagogical processes, particularly within the realm of educational praxis.

Within pedagogical discourse, challenges surrounding teaching methodologies remain a subject of debate. Collantes (2016) observes that it is paradoxical for students to acquire concepts such as meaningful learning, leadership, critical thinking, and dialogic culture through linear instruction—devoid of opportunities to critique ideas or apply knowledge in practice. These learners emerge from schooling systems that prioritize mechanical reading, often divorced from its intended purpose: cultivating analytical and critical thought. Tamayo, Zona, and Loaiza (2015) contend, therefore, that a central aim of education must align with fostering critical thinking. Broadly speaking, schools are tasked with contributing to students' holistic development across multiple dimensions. Among these, nurturing intellectual rigor—particularly domain-specific critical thinking—stands as a foundational educational objective.

This study was conducted at CESMAG University, located at Carrera 20A No. 14-54 in Pasto, Colombia, with a primary focus on the Physical Education Bachelor's Program. The program is housed on the second floor of the San Francisco de Asís building within the university's

main campus and it is staffed by forty-two faculty members, the majority of whom hold degrees in Physical Education.

This article seeks to identify educators' conceptions of teaching styles. A priori, it will exert a transformative influence on students, as they stand to benefit directly. By clarifying the pedagogical approaches employed by individual instructors, learners will be empowered to tailor their own learning strategies in alignment with their teachers' classroom methodologies. Consequently, Fustero (2021) argues that the findings aim to foster a paradigm shift in educators' roles—moving beyond mere knowledge transmission toward a commitment to understanding students' learning preferences. Such awareness enables teachers to critically evaluate the teaching methodologies they employ within instructional processes and, through this reflexivity, refine their educational practices.

Within the scope of prior research on this subject, the analysis reveals that CESMAG University has not undertaken contemporary studies addressing teaching styles. This gap underscores the necessity of updating the educational community on concepts central to pedagogical methodologies within instructional processes. Consequently, this article serves to bridge this lacuna by elucidating current frameworks relevant to teaching styles and their implications for modern education.

In closing, the article delineates the methodological approach employed in the investigation, presents findings on educators' conceptualizations and perceived significance of teaching styles in their academic praxis, and synthesizes conclusions derived from the research. Furthermore, it provides a comprehensive bibliography to substantiate the scholarly contributions of this work, ensuring alignment with rigorous academic standards.

II. METHODOLOGY.

This study was conducted under the qualitative paradigm. As posited by MacMillan-Schumacher (2005), the qualitative paradigm seeks to interpret social phenomena through the lived experiences and subjective perspectives of participants. Building on this perspective, Lerma (2016) elucidates that qualitative research explores the everyday practices of individuals, prioritizing their thoughts, emotions, and actions. Such inquiry emphasizes the interconnectedness of interpersonal dynamics, environmental interactions, and the processes through which individuals ascribe meaning to their realities.

On the other hand, the approach employed is hermeneutic, which furnishes a pedagogical theory by elucidating the role of education in shaping individuals as human beings. In this regard, Rebolledo (2020) asserts that hermeneutics delineates the procedure for conducting a profound interpretation of cultural practices within pedagogical action, encompassing both theoretical and methodological dimensions. Consequently, this framework may be applied to educational content, fostering an analytical attitude that interrogates realities marked by difference and singularity. Such realities stem from historically intertwined cultural convergences, yet remain characterized by unequal opportunities for validation within educational systems.

Finally, the supporting methodological framework is educational ethnography, as it facilitates the establishment of meaningful connections that enhance the gathering of reliable and accessible data. This approach enables both the systematic description of contextual dynamics and their critical interpretation, thereby fostering nuanced comprehension, the dissemination of insights, and, ultimately, the advancement of educational realities. Moreover, it ensures sustained observation of instructional practices while promoting effective dialogue between researchers and participants through structured interviews or focus groups.

A. Sample.

To achieve the research objective and streamline the participant pool, an inclusion criterion was applied, limiting selection to instructors affiliated with the Bachelor's Program in Physical Education for a minimum of three years. This process yielded a final cohort of 24 educators.

Table I. Sample selection was conducted through the application of inclusion and exclusion criteria.

Objective	Population			Inclusion criteria	Sample	
	Focus group	Quantity	Total		Quant ity	Total
To identify the conceptions of teaching styles held by faculty members affiliated with the Bachelor's Program in Physical Education at CESMAG University,	Full-time and part-time teachers.	42	42	Teachers affiliated with the Bachelor´ s program for more than three years.	24	24

Source: author's own elaboration.

B. Procedure.

To fulfill the data collection objectives of this study, three focus groups were organized, engaging 20 of the 24 educators initially identified as the analytical unit based on predefined inclusion criteria. The remaining three faculty members were unable to participate due to scheduling conflicts with prior professional obligations.

Concerning participant demographics, the first focus group included 4 female and 9 male educators, whose ages ranged from 32 to 60 years. The second group comprised 3 male and 1 female participant, aged between 35 and 55 years.

The final group consisted of 4 male educators, all within the 40-to-55-year age bracket. This structured approach not only ensured methodological transparency but also captured diverse perspectives across gender and generational cohorts within the faculty body.

C. Category and subcategories.

Figure 1. Research category and subcategories.

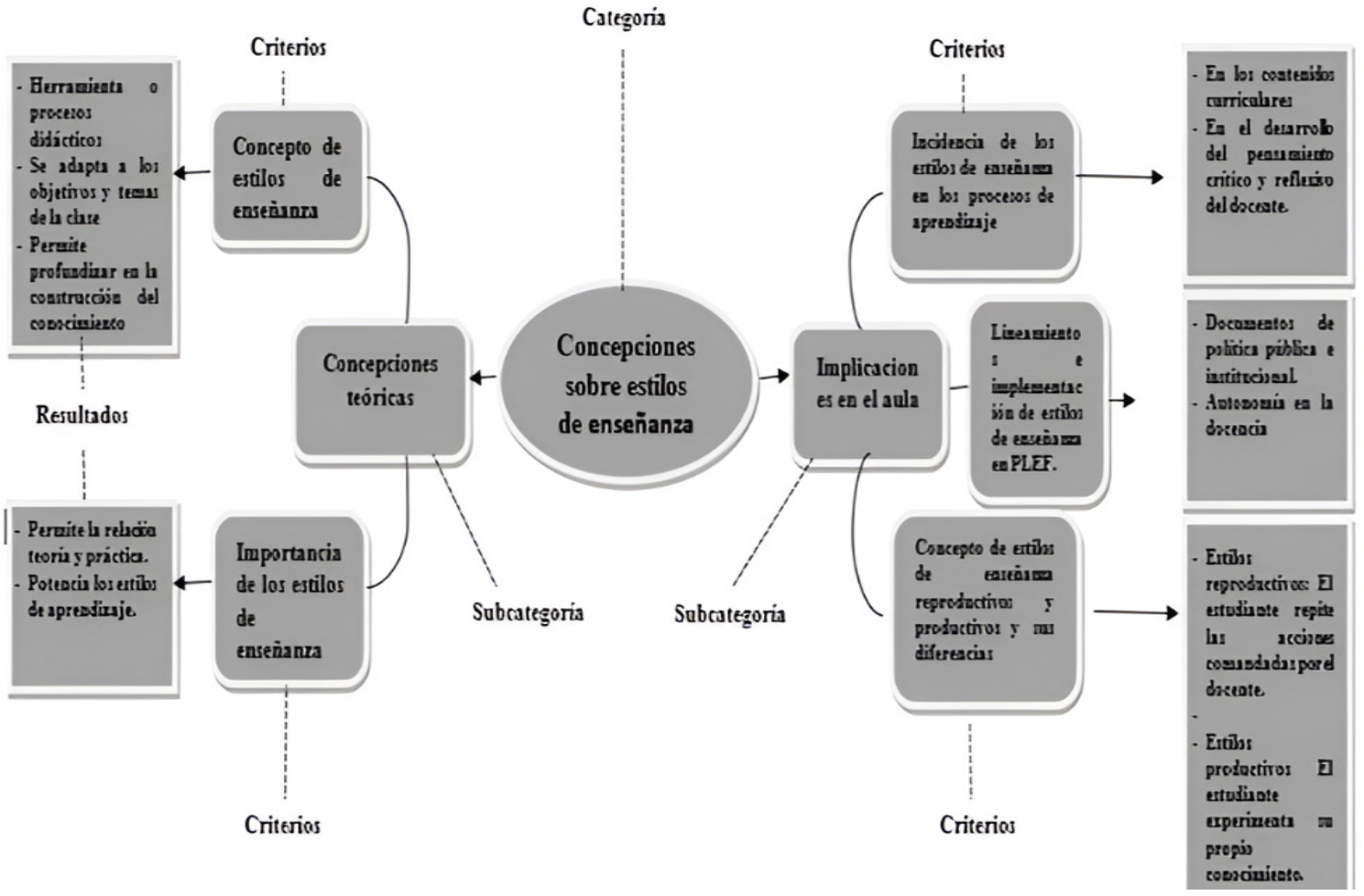
Source: author's own elaboration.

This section delineates the categories and subcategories that constitute the foundational framework for establishing distinct criteria. These criteria guided the systematic design of the question script employed in the focus group sessions.

III. RESULTS.

Drawing upon the compiled data, the findings are shared in alignment with the conceptual frameworks articulated by participating educators regarding the diverse criteria examined during the focus group sessions.

Figure 2. Prevailing conceptions of teaching styles in the physical education program at CESMAG University. Focus group.



A. Theoretical conceptions on teaching styles.

According to data gathered in the focus groups regarding the conceptual criterion of teaching styles, faculty members of the Bachelor's Program in Physical Education define teaching styles as a didactic tool shaped by method and technique within the teaching-learning process. Each educator adopts these styles in alignment with their instructional objectives and subject matter, thereby enabling them to deepen and transcend the transmission of knowledge while modulating communicative strategies with students.

According to inductive categories derived from the significance of teaching styles, educators assert their importance in bridging theory and practice. Teachers distinguish which styles to apply during theoretical instruction and which to employ in practical contexts, thereby fostering alignment between pedagogical approaches and learning objectives. Furthermore, teaching styles enhance students' learning styles, with the explicit aim of strengthening meaningful learning. This requires adapting instructional methods to the educational context's specific needs. Finally, educators emphasize the role of teaching styles in students' social development, particularly in how individuals engage, orient themselves, or integrate diverse educational experiences through these methodologies.

B. Teaching style implications in the classroom.

Regarding the influence of teaching styles on learning processes, faculty members of the Physical Education Bachelor's Program assert that these styles shape curricular content—specifically, the manner in which such content is assimilated. Absent intentional teaching styles, guiding curricular content within instructional practices becomes inherently challenging, devolving into didactic disarray. In such contexts, educators would struggle to implement appropriate didactic strategies and their corresponding resources, inevitably resulting in fragmented and ineffective student learning outcomes.

Teaching styles also influence the advancement of students' critical and reflective thinking, provided such styles actively foster this cognitive development. Monotonous pedagogical approaches, however, render these methods ineffective. When critical and reflective thinking is cultivated, students gain the capacity to adapt their learning styles, thereby achieving an optimal educational process and acquiring knowledge applicable to their lifelong professional and personal endeavors.
According to findings on the guidelines and implementation of teaching styles within the Physical Education Bachelor's Program, teachers confirm the existence of institutional frameworks aligned with educators' pedagogical approaches. These include public policy documents, such as Document 15, which outlines instructional orientations for Physical Education, as well as competencies tailored to the educational context. Institutional mandates, such as the Institutional Educational Project, further establish a humanizing-personalizing philosophical foundation. Consequently, educators are granted autonomy to select teaching styles congruent with thematic content, provided these choices align with the program's pedagogical model. Specifically, selected styles must foster active communication between instructors and students, ensuring coherence between methodology and educational objectives.

Deriving the inductive categories stemming from the concept of reproductive and productive teaching styles, within this framework, Physical Education Bachelor's Program educators conceptualize reproductive styles as pedagogical approaches wherein students replicate procedures prescribed by the instructor. These styles, they argue, fail to cultivate active student participation; rather, they are predominantly employed to assert institutional authority and enforce compliance, thereby prioritizing order and control within classroom dynamics.

Conversely, productive teaching styles emerge as pedagogical frameworks in which students actively construct knowledge through experiential learning. Here, instructors present open-ended problems to solve, and learners—collaborating with peers and leveraging resources—devise solutions by experimenting, investigating, and innovating. These conceptualizations, articulated by PEBP educators, align coherently with established scholarship on teaching methodologies in Physical Education, reflecting both clarity of definition and fidelity to theoretical underpinnings.

IV. DISCUSSION.

A. Teaching style concepts.

CESMAG University PEBP educators assert that teaching styles function as pedagogical tools that orchestrate didactic processes by integrating instructional methods, techniques, and the instructor's personal pedagogical elements. Each educator tailors their adoption of teaching styles in alignment with curricular objectives and thematic foci; this adaptive approach enables them to deepen and transcend the transmission of knowledge while flexibly

adapting their communicative strategies to student needs. Scholarly findings underscore this perspective: Renes (2018) identifies teaching styles as the educator's idiosyncratic manner of structuring instructional sessions and engaging with learners. Building on this, Martínez and Renes (2019) position teaching styles as dynamic frameworks that position educators and students as dialogic partners within a communicative exchange mediated by curricular content.

B. Teaching style relevance.

PEBP educators emphasize that teaching styles facilitate the integration of theoretical knowledge and practical application, fostering a conducive environment for the development of thematic content. In this regard, González and Pino (2016) contend that such styles hold pedagogical significance provided that a deliberate equilibrium between theory and practice is maintained—achieved through the adoption of active strategies and techniques implemented within the classroom. Furthermore, instructors assert that teaching styles amplify students' learning modalities. Substantiating this perspective, Telles and Rangel (2017) posit that educators who critically understand their own teaching styles, alongside their students' learning preferences, can tailor didactic strategies to optimize the teaching-learning process, thereby motivating learners to attain their academic objectives.

C. The Impact of Teaching Styles on Learning Processes.

According to the findings, PEBP educators assert that teaching styles significantly influence curricular content. In this context, Chiang, Diaz, and Arriagada (2016) posit that teaching styles are shaped by the interplay between curricular content and learner characteristics; consequently, this triad—educators, students, and content—is profoundly affected by instructional variables such as objectives, activities, methodologies, resources, and evaluative criteria. Furthermore, educators emphasize that teaching styles play a pivotal role in fostering critical and reflective thinking. Aligning with this perspective, Renes (2018) underscores the necessity for educators to adopt a deliberate pedagogical approach—one that prioritizes responsiveness to students' specific needs and interests while cultivating their intellectual and reflective capacities through targeted academic tasks.

D. Guidelines and Implementation of Teaching Styles in the PEBP.

According to findings from focus groups, PEBP educators assert that the term guidelines for implementing teaching styles refers to both public policy and institutional documents. However, they also acknowledge pedagogical autonomy in employing diverse teaching approaches, provided these align with the university's philosophical framework. This duality, however, contrasts sharply with Duran's (2015) study, which contends that educators have historically been denied professional autonomy—rendering them mere conduits for preformulated information rather than agents of intellectual agency. The educator-as-individual paradigm, proponents argue, is essential to safeguarding autonomy: it affirms that educators, first and foremost, are human beings entitled to exercise their vocation through a personalized lens. Substantiating this view, Rojas (2016) posits that autonomy empowers educators to strategically deploy didactic tools during instruction, drawing on leadership, experiential knowledge, and expertise to enhance students' formative processes. Collectively, these findings underscore that PEBP educators retain significant agency in selecting contextually appropriate teaching styles, contingent upon thematic content and institutional alignment.

E. Concept of Reproductive and Productive Teaching Styles.

Findings from PEBP educators indicate that reproductive teaching styles entail students replicating instructor-prescribed actions, with these approaches most frequently employed to enforce procedural order in classroom settings. Delgado's (2015) research critiques such styles as pedagogically stagnant and alienating to learners, highlighting their limited capacity for innovation. In contrast, educators characterize productive teaching styles as frameworks enabling students to engage in self-directed knowledge construction through individualized interpretations of subject matter. Moro (2016) corroborates this view, asserting that productive styles foster active, meaningful learning by prioritizing autonomous problem-solving. Similarly, Rengifo (2015) conceptualizes productive styles as pedagogical strategies that promote intellectual liberty—encouraging innovative methodologies for both learners and instructors through unfettered creative expression and collaborative experimentation.

IV. CONCLUSIONS.

The conceptualization of teaching styles by educators and students within CESMAG University's PEBP is poised to catalyze the advancement and differentiation of pedagogical processes. By foregrounding the dynamism inherent in classroom sessions, this conceptual framework

will further incentivize the cultivation of efficient learning modalities among students, fostering environments where intellectual engagement and adaptability thrive.

For CESMAG University's Physical Education program, the implications for accreditation, professional development, and humanistic formation are profound. The identification of teaching methodologies, educator philosophies, and student perceptions provides critical axes for deciphering evolving higher education landscapes—landscapes marked by the exigencies of modernization. Such insights position this research as a vital contributor to refining teaching-learning paradigms in contemporary academia.

The study revealed that theoretical and practical frameworks prioritize the adaptation of instructional sessions and student environments as foundational imperatives. Educators must confront didactic barriers that disrupt learning processes, particularly those stemming from external factors influencing teacher-student communication. Notably, the abrupt transition to remote instruction—a complex, hastily implemented shift—exposed how academic, social, and personal variables profoundly shape higher education dynamics, underscoring the fragility of traditional pedagogical structures.

The interactive teaching-learning process originates in the classroom, a nexus of transformation for both students and educators. The reciprocal roles of instructor and learner, central to the cognitive evolution of each, demand deliberate reexamination to reimagine educational bonds, enhance pedagogical rapport, and elevate the caliber of knowledge dissemination and acquisition.

An education model anchored in stylistic intentionality must emphasize the educator's dual orientation: their relationship to disciplinary knowledge and their engagement with learners. From this foundation, educational systems can construct coherent profiles of teaching competencies, enriched by systematic classifications of teaching styles, to optimize pedagogical efficacy and align with the demands of professional practice.

V. REFERENCES.

Agudelo-Gomez C. (2016) Caracterización de los estilos de enseñanza en la educación superior. *Revista Principia Iuris. 12* (23). Universidad Santo Tomas. Pp.85-103. Disponible en: https://acortar.link/RBOElK.

Álvarez, C. (2011) El interés de la etnografía escolar en la investigación educativa. *Revista Estudios Pedagógicos. 37*(2). Universidad de Cantabria. Pp. 267-279. Disponible en: http://bit.ly/3oQR1QZ.

Arrieta, E (2017) Concepto y definición. *Revista lengua y literatura. 1* (SN). Bogotá. Recuperado de: http://bit.ly/3oQQXkd.

Barite, M. (2011) La definición de conceptos y su impacto sobre la representación del conocimiento con fines documentales. *Revista ISKO. 1* (SN). España. Págs. 14. Disponible en: https://bit.ly/36GqbVF.

Campos, A. (2015) *Los estilos de enseñanza en educación física como herramienta educativa en primaria.* (tesis de maestría). Facultad de educación. Universidad Internacional de la Rioja. Recuperado de: https://bit.ly/3jig3Hy.

Chiang, M,. Diaz, C Y Arriagada, P.(2016). Estilos de enseñanza y aprendizaje: ¿cómo dialogan en la práctica? *Revista De Estilos De Aprendizaje, 9*(17). Chile. Pp. 1-24. Recuperado a partir de https://n9.cl/ce9e.

Collantes, J. (2016) *Estilos de enseñanza de los docentes universitarios de la facultad de educación de la Universidad Nacional Federico Villarreal, Universidad Nacional Pedro Ruiz Gallo y el Departamento de Matemática de la Universidad Nacional Agraria La Molina.* (Tesis de maestría) Maestría en Educación con Mención en Gestión Educativa. Universidad de Piura- Perú. Recuperado de: https://acortar.link/ZkOptS.

Delgado, M. (2015) Los estilos de enseñanza de la Educación Física y el Deporte a través de 40 años de vida profesional. *Retos, 28* (1) Granada-España. Pp. 240-247. Disponible en: https://n9.cl/e3qyi.

Duran, J. (2015) Atropellos a la autonomía de los docentes: Desde la abolición de la tarima hasta la extorsión de los profesores. *Revista VIEI, 10* (1) Bogotá. Pp. 182-203. Recuperado de: https://n9.cl/93jhi.

Escobar, J y Bonilla, F. (2015) Grupos focales: una guía conceptual y metodológica. *Cuadernos Hispanoamericanos de Psicología, 9* (1). Bogotá. Pp. 51-67. Recuperado de: https://bit.ly/2Lixcof.

Fustero, A. (2021) *Enseñanza y aprendizaje de las técnicas de estudio en secundaria.* (Tesis de maestría) Facultad de educación. Universidad de Zaragoza- España. Recuperado de: https://acortar.link/3safVF.

González, M & Pino, M. (2016) Los estilos de enseñanza: construyendo puentes para transitar las diferencias

individuales del alumnado. R*evista Complutense de Educación. 27*(3). Vigo-España. Pp. 1175-1191. Disponible en: https://n9.cl/329u7.

Lerma, H. (2016). *Metodología de la investigación*. Bogotá. Colombia: Ediciones ECOE. Quinta edición. Disponible en: https://bit.ly/2YFSRtB.

Loredo, J,. García, B y Cobo, M. (2017) Estilos de enseñanza de los profesores, un estudio sobre la planeación, conducción y evaluación que realizan en el aula. *Revista Tendencias Pedagógicas, 30* (SN) Madrid- España. Pp. 17-37. Disponible en: http://bit.ly/3rlKRtS.

Maturana, G Y Garzón, C. (2015) La etnografía en el ámbito educativo: una alternativa metodológica de investigación al servicio docente. R*evista de Educación y Desarrollo Social, 9* (2). Bogotá. Pp. 192-205. Recuperado de: http://bit.ly/3rfleK0.

Martinez, I, Renes, A y Martinez, G (2019) Estilos de aprendizaje y de enseñanza: análisis y diagnostico en educación superior de centro internacional de estudios superiores del español, CIESE- Comillas. *Revista de estilos de aprendizaje. 12* (24). España. Pp. 28-41. Disponible en: https://n9.cl/ys8oc.

McMillan, J. & Schumacher, S. (2005). *Investigación educativa.* Madrid. España: 5ta edición. Pearson Educación S.A. Disponible en: http://bit.ly/39NIUAK.

Moro, H. (2016) *Estilos de enseñanza que persiguen una formación integral en la Educación Física.* (Tesis de Maestría) Facultad de Educación y Trabajo Social. Universidad de Valladolid. Págs. 61.

Ramirez, M., Ocampo, D., Forero, C. y García, L. (2015) El significado de enseñar y aprender para los docentes. *Invest. Educ. enferm, 33* (1). Medellín. Pp. 8-16. Disponible en: http://bit.ly/3ayLnhy.

Ramos, G., Lopez, A (2015) La formación de conceptos: una comparación entre los enfoques cognitivista e histórico-cultural. *Revista Educ. 41* (3). Sao Paulo, Brasil. Págs. 615-628. Recuperado de: https://bit.ly/3jg43GB.

Rebolledo, N. (2020) Línea Hermenéutica y Educación Multicultural. *Revista UPN. 1* (SN). México. Disponible en: https://bit.ly/3cB2ySh.

Renés, P. (2018). Planteamiento de los estilos de enseñanza desde un enfoque cognitivo-constructivista. *Tendencias pedagógicas.31.* 47-68. Recuperado de: https://n9.cl/2k9no.

Rengifo, M. (2015) La globalización de la sociedad del conocimiento y la transformación universitaria. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud. 13* (2). Manizales- Colombia. Disponible en: https://acortar.link/ofWXyn.

Rojas, M. (2016) La autonomía docente en el marco de la realidad educativa. *Educere, 8*(24), 26-33. https://n9.cl/yjmux.

Ruiz, C. (2011) La investigación cualitativa en educación: crítica y prospectiva. *Telématique. 10* (1). Zulia, Venezuela. Pp. 28-50. Recuperado de: https://bit.ly/36FL3MB.

Tamayo, O., Zona, R. Y Loaiza, Y. (2015) El pensamiento crítico en la educación. Algunas categorías centrales en su estudio. *Revista Latinoamericana de Estudios Educativos. 11* (2). Manizales. Pp. 111-133. Disponible en: https://n9.cl/72rdb.

Telles, F Y Rangel, M. (2017) Caracterización de la relación estilos de enseñanza aprendizaje en la estadística, a propósito de un estudio en México. *Revista Iberoamericana para la Investigación y el Desarrollo Educativo. 8* (15). Guadalajara- México. Pp. 18. Disponible en: https://n9.cl/w6ay7.

PARTICIPATORY EVALUATION OF THE SCHOOL ENVIRONMENTAL PROJECT OF THE MORASURCO MUNICIPAL EDUCATIONAL INSTITUTION IN PASTO.

Dayana Patricia Rosero Chamorro
Hernán Modesto Rivas Escobar
Gloria Cristina Luna Cabrera

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.24

Traducción: Diego Fernando de la Portilla Guerrero
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 19 de febrero 2024

Abstract.

School Environmental Projects (PRAE), in the formal education sector, aim to promote actions through the curriculum that address socio-environmental issues in their context by fostering awareness, knowledge building practice , and action within the educational community. This research was conducted to evaluate the contributions of the PRAE "Training of environmental managers for the comprehensive management of solid waste" to the environmental education of students at the Morasurco Educational Institution in Pasto, Colombia. Due to the qualitative nature of this research process, an evaluative research design was adopted. It revealed the relevance and coherence between institutional documents such as the PEI and PMI and classroom activities. The active participation in the design and implementation of the school environmental project fostered environmental awareness regarding the protection of ecosystem services, evidenced by changes in waste management behavior, the acquisition of new knowledge, skills development, and increased self-management. One of the identified weakness was the limited involvement of parents in the project's development, along with a moderate level of commitment from some teachers in their respective disciplines. It is concluded that the PRAE is oriented toward solving the institution's environmental challenges and has the potential to foster interdisciplinary work.

The findings highlight the relevance and coherence among institutional documents such as the PEI and PMI and classroom activities.

Key words: Evaluation, environmental education, relevance, significance, solid waste management.

Resumen.

Los Proyectos Ambientales Escolares (PRAE), desde el sector formal proponen adelantar acciones a través del currículo que permitan superar las problemáticas socio-ambientales del contexto, mediante la sensibilización y concienciación, la construcción de conocimientos y la acción de la comunidad educativa. Esta investigación se adelantó con el fin de evaluar los aportes del PRAE "formación de gestores ambientales para el manejo integral de los residuos sólidos" en la formación ambiental de los estudiantes de la Institución Educativa Morasurco de Pasto, Colombia. Dada la naturaleza cualitativa de esta indagación se optó por una investigación de tipo

EVALUACIÓN PARTICIPATIVA DEL PROYECTO AMBIENTAL ESCOLAR DE LA INSTITUCIÓN EDUCATIVA MUNICIPAL MORASURCO DE PASTO.

evaluativa, donde se encontró pertinencia en la estructura y coherencia entre los documentos institucionales como el PEI y PMI, con las acciones de aula, donde la activa participación en el diseño e implementación del proyecto ambiental escolar, generó seres conscientes de que los servicios ecosistémicos deben protegerse, se pudo evidenciar cambios en el comportamiento referente a la correcta disposición y reutilización de residuos, de igual manera, la incorporación de nuevos conocimientos, el desarrollo de habilidades y autogestión. Una de las debilidades encontradas, es la ausencia de padres de familia en el desarrollo del proyecto, y el aceptable compromiso de algunos docentes desde su área de trabajo. Se concluye, que el PRAE está orientado a la solución institucional de la problemática ambiental, y puede fortalecer el trabajo interdisciplinario.

Palabras Clave: Evaluación, significancia, pertinencia, educación ambiental, residuos sólidos.

I. INTRODUCTION.

Addressing the global environmental crisis requires fundamental changes in how we, as a species, relate to our life -sustaining environment. A transformation in worldview is needed, as Carrizosa (2014, p. 215) suggests, moving from reductionist to complex thinking. It is also crucial to recognize the missteps that have led to ecosystem degradation, in other words, to identify the root causes of socio-environmental problems. This underscores the need for deep solutions: changing the way goods and services are produced within a new cultural framework where consumption supports the common good rather than individual hedonistic well-being (Morin, 1994). Undertaking this transformation requires the emergence of a new kind of citizen, and is where environmental education becomes essential.

Environmental education must contribute to the construction of a renewed sense of citizenship, one grounded in an ethics centered on the well-being of our common home, as emphasized by Pope Francis in his encyclical Laudato Si' (2015).

In this context, it is important to highlight that within the Morasurco community, the high levels of solid waste generation and its improper disposal have significantly affected both institution and the surrounding society. As a result, environmental education emerges as a crucial process that should contribute to improving the region's environmental conditions and fostering a culture of sustainability, beginning with guidance within the family nucleus and be reinforced through the comprehensive education provided by schools.

Accordingly, it is appropriate to evaluate, in a participatory and formative manner, the contribution of these processes within the educational community, using indicators such as impact, relevance, significance, coherence of objectives, and participation in the construction and implementation of the PRAE (Visual Guide for the Policy Evaluation Process based on Carol H. Weiss, 1998).

It is worth noting that no prior research has been found on the evaluation of school environmental projects in the municipality of Pasto, making this study an important contribution in that regard.

Considering the above, this research aimed to evaluate the contributions of the PRAE to the environmental education of students at the Morasurco Municipal Educational Institution in the department of Nariño, Colombia. This was carried out by analyzing the formulation and implementation process of the PRAE "Formación de gestores ambientales para el manejo integral de residuos sólidos," currently in effect at the institution, describing the integration of the environmental dimension into the curriculum of the participating institution, and identifying the most significant contributions of the school environmental project to the development of a new environmental culture.

II. METHODOLOGY.

An interpretative qualitative research approach was adopted, as the study described a real situation within the school context. However, both qualitative and quantitative data collection and analysis techniques were used, resulting in a mixed-methods approach. The study followed an evaluative research design to determine the contributions of the PRAE to students' environmental education at the Morasurco Municipal Educational Institution in the department of Nariño. This evaluation went beyond simple measurement: as proposed by Herrera, J. (2017), it incorporated value judgments agreed upon with the educational community to generate information that could inform and improve curricular and academic processes, as noted by Rivas (2010).

The evaluative research followed key characteristics: it provided relevant information for transforming the school reality and improving the PRAE; the conclusions drawn were actionable and contextually grounded; and the interests and principles of institutional educational projects—mission and vision—were valued through a transdisciplinary process (Scriven, 1994).

The unit of analysis consisted of 208 participants, including teachers, students, and parents. Data was collected through surveys and interviews and analyzed using a categorization process based on recurring themes.

III. RESULTS.

Formulation of the PRAE

Documentary Review of the School Environmental Project (PRAE): to structure a School Environmental Project, a minimum set of conditions must be met as established by decree 1743 of 1994, which outlines guidelines that include conceptualization, contextualization, systematization, and projection, all grounded in in the principles of meaningful learning.

The written document of the environmental project at the Morasurco Educational Institution in Pasto features a social, transdisciplinary, and cross-curricular approach. It emerged from a socio-environmental issue identified through a participatory process, that take into account the specific context and interests of the Morasurco community. This issue was prioritized using the Vester matrix, and the document reflects the participation of a significant percentage of students and teachers who have contributed to its development and design.

It was determined that the project meets the required components, clearly describing the general references, including natural, social, and cultural aspects. It also outlines specific references which the prioritized socio-environmental issue is identified. Furthermore, its basic elements incorporate the integration of environmental education throughout the institution's curriculum.

Its objectives are clearly stated, with achievable and relevant goals for mitigating the identified issue, and environmental education is embedded within the Institutional Educational Project (PEI).

Weaknesses include the absence of a matrix that displays agreements with institutions and specifies the type of collaborations involved. Additionally, it is necessary to appropriately attach to the annexes the records of activities and progress made. The reading of the document does not reflect the actions taken during implementation and fails to adequately demonstrate the work accomplished or the outcomes achieved through its development.

Review of Improvement Plans (PMI): Annexes 2 and 4 under "Management" in the Institutional Culture item consolidate the identification and dissemination of good practices through activities conducted by the various institutional projects, making them known to all members of the educational community. Similarly, under community management, the transversality of institutional pedagogical projects is planned, including the School Environmental Project (PRAE).

Review of the Institutional Educational Project (PEI): The institutional vision sets a short-term goal: to establish itself as a leading institution in environmental education through the integration of the PRAE. Collaborative efforts by all community members have contributed significantly to improving the socio-environmental culture among its stakeholders.

The documentary review made it possible to establish the relationship between academic documents and revealed curricular coherence, which is essential for achieving an integrated vision of what should be taught and assessed (Herman et al., 2007).

"Curricular coherence is a central principle in the context of educational reform in any disciplinary field. Consequently, the analysis presented here enabled effective comparison of existing documents to detect their integrality and shared meaning" (Herman et al., 2007).

Regarding participation in the formulation of the PRAE, in response to the question about the environmental situation or central theme addressed by the PRAE, 90% of secondary students reported knowing or having some idea of the prioritized environmental situation identified in the diagnostic phase. A smaller percentage, 26%, specifically referred to the proper disposal of solid waste. Notably, most of these responses came from 11th-grade students. Very few students indicated unfamiliarity with the PRAE. These findings align with Silva (2018), who noted greater PRAE participation among students in upper secondary education.

Regarding teachers, they were asked: How did the PRAE at Morasurco Municipal Educational Institution originate? The responses were relevant, mentioning the foundational principles used to develop the school environmental project. Teachers referred first to Decree 1743 of 1994 and MEN policy. They also recognize the diagnostic work done with the support of the PIFIL research group from the Universidad de Nariño and emphasize the responsibility to address environmental issues by incorporating mandatory cross-curricular projects.

Similarly, to the question: What is the environmental situation or topic addressed by the institution's school environmental project? 43% of parents mention some implemented activity such as recycling, waste separation, and reforestation—these being the most frequently cited. However, 57% of parents state that they were unaware of the prioritized environmental issue.

Development of the PRAE: To determine participation in the development of the PRAE, primary-level students were asked: Have you recycled at school? 85% of students responded that they had participated in recycling at school. This indicates a high level of student participation. Additionally, students showed a positive disposition when discussing the topic, immediately recognizing the importance of waste separation for protecting and preserving the environment. They also demonstrated conceptual understanding by using appropriate terminology and attempting to replicate what they had learned with their families, reflecting the significance the project has had on them.

Students were also asked to describe an activity developed by the PRAE in which they had participated and that had attracted their attention. 74% mentioned the disposal of solid waste, referring broadly to the socio-environmental issue being addressed. Some students specifically mentioned activities programmed by grade level in the curriculum grids, such as eco-bricks, paper reuse, and vermicomposting—activities that were more frequently cited in the grades where they were specifically implemented.

Regarding the question: Are students' ideas considered in the construction of the PRAE? Sixty-one percent of

students responded that their contributions and ideas were indeed considered, particularly by the teacher leading the PRAE. This highlights an effort to empower students as protagonists and future environmental managers of their community.

As for the environmental component, results indicate that 73% of students know what an environmental problem is, with higher levels of understanding observed among upper-secondary students. These students were able to identify types of socio-environmental problems in their school environment and recognized the importance of protecting the environment and contributing to its care through their daily habits.

Regarding the question Does the IEMM have agreements with private or public institutions that support the resolution of socio-environmental problems?, teachers mentioned existing partnerships with the Corporación Autónoma Regional de Nariño – Corponariño, which was cited by 71% of respondents. The SENA and the Universidad de Nariño followed. Teachers highlighted these institutions' support and guidance on various aspects of environmental education.

Similarly, teachers were asked: Have the didactic materials used in the PRAE been relevant? Please explain. Responses included: "They are relevant because they have generated meaningful learning among students." "They are relevant because students understand and have taken ownership of environmental topics, and awareness has been raised in various subject areas." "They are consistent with the active pedagogical model, encourage student participation, are contextualized, and promote meaningful learning." "They are relevant because they have allowed for participation and exploration." These statements demonstrate that teachers recognize the importance of using diverse didactic resources and their contribution to meaningful learning during PRAE implementation. These insights are closely related to the ideas of Ausubel (1963), who defines meaningful learning as a teaching-learning model based on discovery.

Teachers at IEMM reported that the strategies implemented to provide environmental education have generated spaces for integration through collaborative work and innovative activities led by the PIFIL research group.

Based on this, it was determined that 60% of teachers are well-informed and show willingness and interest in working collectively to improve the school's environmental project.

In contrast, parental involvement in the development of the PRAE is minimal, as 83% of parents reported not having participated in PRAE-related activities. This suggests that the implemented activities have not adequately included parents.

In this regard, the PRAE at Morasurco has a well-structured written document with achievable objectives and clear generalities, aligned with institutional documents. In terms of its design, the document reflects the participation of students and teachers in the diagnostic and prioritization processes related to the socio-environmental issue but does not show the involvement of parents or the broader community.

During the project's implementation, a high level of cooperation and significant effort from most teachers was evident. These teachers are aware of the regulations, regularly attend training sessions, incorporate environmental topics into their lessons, and generally demonstrate interest in the project.

Likewise, students are aware of environmental issues, have acquired new knowledge related to the prioritized issue, understand the importance of protecting ecosystem services, and are motivated to participate in the project. In fact, a group of students has formed the "Gestores ambientales Morasurco" (Morasurco Environmental Managers) to develop future environmental leaders.

However, a key weakness is the limited integration of parents and the Morasurco community. The PRAE faces the challenge of improving collaboration with the community and strengthening relationships with community leaders and local action committees to align efforts based on their perspectives and interests.

This implies a need to improve community ownership of the prioritized socio-environmental issue. This situation is partly explained by parents' demanding work schedules, which make participation difficult. For instance, Parent 1 (PF.1) stated: "I haven't had the opportunity to participate in the PRAE because of work." Similarly, Parent 13 (PF.13) shared: "Not directly, but I help my son with the assignments he gets."

Consistent with the above, in terms of environmental relevance, it was found that the projects worked on have an environmental component recognized by students

and teachers, though not by parents. This suggests that the path taken by the institution is appropriate, but efforts must be made to include both parents and the wider community (Lenis & Arboleda, 2015).

Development of Transversality

Regarding the development of transversality in pedagogical practice, the following question was posed: Why is it important to work on environmental education at the Morasurco Municipal Educational Institution? Responses included: "It considers the territory, comprehensive education, sustainable use, and conservation of natural resources.""It fosters awareness among children and young people in the institution, as well as the conservation and sustainability of the environment." "Environmental culture in the community." "Sustainable use and awareness regarding natural resources." These responses reflect an eco-centric perspective on the environment, highlighting ethical principles, the recognition of an eco-systemic balance between nature and society, and an awareness of the importance of conserving and mitigating impacts on natural resources (Flórez et al., 2019).

Sepúlveda, G. L. (2009) notes the existence of a gap between conceptual advances in environmental education and the practical knowledge involved in environmental educational processes—evidence of a lack of training and professional updating among administrators and teachers.

However, the findings of this study contrast with that assertion, as both the PRAE document and the results of the teacher surveys reflect a strong sense of relevance, preparation, and use of training opportunities to approach environmental issues in an integrated and meaningful way.

According to Paz & Avendaño (2014), environmental education should be understood as a process of cultural construction and transformation, encompassing knowledge, behaviors, beliefs, and more; centered on the rational use and care of all environmental elements to safeguard the conditions necessary for a dignified life. This vision of a dignified life aligns with the paradigm of buen vivir (good living), as opposed to the consumerist-driven notion of well-being that equates individual success as the purpose of life.

By comparing these findings with the curriculum grids designed as a strategy for environmental transversality, it was found that teachers coded as "preschool and primary 1" and "natural sciences " were able to thoroughly describe one of the lessons they had implemented, and their descriptions aligned precisely with what was planned in the curriculum. For grades six and seven, the curriculum grids included: classification of solid waste, microscopic properties of solid waste, and craft projects using paper. One example, described verbatim by the natural sciences teacher at IEMM (2023), is as follows:

"Class: Mixtures – Grade 7. Topic motivation: a video about solid waste pollution. Questions about the video: What is a mixture? What are the types or classifications of mixtures? Enriched knowledge: videos and examples linking the topic (solid waste) with the three Rs: reduce, reuse, recycle. Separation of solid mixtures, methods for separating liquid mixtures. Let's practice: exercises classifying waste, separating it using urgent color-coding methods.

Let's apply it at home: separating solid waste, recycling paper for use in the project. Evaluation: ongoing, including feedback and reinforcement."

For preschool to third grade, the curriculum proposed a general waste information guide across all subjects. For example: in mathematics, counting and sorting solid waste; in natural sciences, raising awareness about waste degradation time; in art, crafts using collected paper, and so on. The following results were provided by a teacher coded as "preschool and primary 1" at IEMM (2023):

"In the birthday project for the children, we worked on environmental awareness by recycling all solid waste to make toys and door decorations. The activity was integrated across all subjects.

In math, we used counting, literacy, and dimensional concepts; in natural sciences, we discussed natural resources; in social studies, personal identity and care; and in art, among others."

There is clear relevance in terms of the content incorporated into classes and the environmental curriculum designed by the institution as a strategy for strengthening environmental education. The topics proposed are coherent with classroom implementation, and the teaching strategies used are innovative and engaging for students. This demonstrates strengths in the integration of the PRAE into the curriculum, although it is not applied by all teachers.

According to Fonseca (2011), a globalized and interdisciplinary curriculum becomes an instrument for

a wide variety of classroom practices, which is especially meaningful when seeking to improve teaching and learning processes.

These results align with those of Silva (2018), who identified strengths in the design and development of PRAEs—specifically, the incorporation of PRAE content into institutional curricula, the promotion of collaborative work among teachers, the use of creative and innovative methodologies, and the beginning of environmental awareness among the student population.

Curricular integration enables the establishment of more flexible and open curricular structures, with learning environments that accommodate cross-cutting themes and promote complex knowledge relationships that result in classroom projects.

Regarding students' perceptions of teacher methodology, the question was posed: Do teachers in different subject areas consistently discuss and provide examples related to solid waste in their classes? The majority of students (55.7%) responded affirmatively, saying that teachers often integrate the environmental issue into their lessons. A smaller percentage (13.4%) said their teachers did not address the topic in their classes.

Another question asked was: Has the education received in different subjects helped you better understand and reflect on the current environmental issue at school (proper solid waste management)? A small percentage (3.8%) said it had not encouraged reflection on proper waste disposal, while the majority (61.7%) affirmed that their teachers had helped them reflect and incorporate new knowledge regarding this issue.

These findings show that about 60% of teachers at Morasurco Educational Institution include environmental education activities in their lesson plans as part of the cross-curricular framework. It is noteworthy that this process does not take place in a dedicated subject; rather, environmental education through the PRAE is conducted in alignment with the goal of improving the identified environmental situation and raising awareness among the educational community about its long-term consequences.

In this regard, Law 1549 of 2012 seeks to strengthen the institutionalization of the national policy on environmental education and its implementation in territorial development. Based on this, the integration of environmental education has been proposed, starting from the diagnosis of local socio-environmental problems and the design of integral and interdisciplinary projects that allow formal institutions to adopt a systemic vision of the environment, enabling understanding of the problem and the implementation of solution-oriented actions to train true environmental managers.

In contrast, Casteblanco (2017) argues that "these activities are not organized, nor are improvement plans established; this is due to a lack of knowledge about the activities in the operational plan, which results in merely activist practices without any impact." This contrasts with the findings at IEMM, where activities are properly planned based on students' grade levels and aligned with the central theme. However, parents do not attend the activities due to their many obligations.

Thus, it is relevant to note that environmental education implies the school's acceptance of its social responsibility toward the educational community, which can only be achieved to the extent that the school opens itself to collaborative work and moves beyond isolated classroom activities to engage with students' social realities and adopt a holistic perspective on current environmental issues (Sepúlveda, 2009).

In this regard, to achieve the purpose of transversality, the willingness of all teachers from their different areas of knowledge is necessary, committed to the project, constantly interacting with the articulating axis through different didactic-pedagogical strategies that foster spaces or mechanisms enabling collaborative work around reflection-action, in all the formative dynamics of the PRAE, which encourage love for the natural and sociocultural heritage of the region (Min Ambiente, 2001).

Contributions of the PRAE

The evaluation criteria were considered in relation to the significance, relevance, and impact of the project throughout its implementation. Regarding this, Luna et al. (2020) affirm that in order to assess the conceptual and knowledge-based developments within institutions—specifically those related to PRAEs—it is essential to deepen monitoring and evaluation processes to ensure they address the real and specific needs of the educational community and its environmental context.
For primary school students, in response to the question: Do you separate the waste generated in your home? The majority, 76%, reported that they do carry out waste separation at home.

When asked: Do you believe that recycling helps improve the environment? all students (100%) responded affirmatively. These findings reflect behavioral changes or improvements among students, the assimilation of new knowledge, and a significant improvement in the prioritized environmental situation. These results highlight the meaningful impact that the PRAE has had on primary students at IEMM in Pasto.

For secondary school students, the question was: Do you apply in your home or community what you learned in class about the correct separation of solid waste? Why? A small percentage (8%) answered that they do not, with 3% stating that their households lack proper waste bins. However, the majority—72%—said they consistently apply what they learned in class. They justified this mainly by their desire to protect the environment, and to a lesser extent to instill new habits in their homes.

In relation to this, most students confirmed that the processes implemented through the PRAE included a participatory component. The activities were relevant and consistent with the prioritized environmental issue, generating significance, that is, students demonstrated the ability and willingness to apply what they had learned independently and with the intention of creating environmentally friendly habits (Naidorf, 2007).

Additional questions were asked: Do you think the PRAE has changed environmental behavior in your surroundings? Over half of the students—57.7%, believed that the PRAE has positively influenced their behavior toward environmental care and protection. A smaller portion—10.6%—felt the project had not impacted their environmental behaviors.

When asked: Do you think the implementation of the PRAE at IEMM helps to raise awareness about the care and conservation of the environment in your community?, the majority—80.7%—said yes. They viewed the PRAE as a tool for fostering awareness and addressing socio-environmental problems in their community. Awareness is understood here as a subcategory of significance, as it represents a path to meaningful environmental learning. While only 3.8% of students did not consider the PRAE a viable alternative for addressing environmental problems.

Significance aims to integrate the cognitive, emotional, affective, and ethical dimensions that emerge in students through holistic education. It relates to the potential to shape future environmental leaders. As Moreno et al. (2017) state: "An active and reflective learning process that holds meaning and significance for the student." Significance determines the capacity to establish relationships between prior and new knowledge.

On the other hand, teachers' perceptions of the PRAE's contributions to student development were examined. When asked: How does the PRAE promote values that help the educational community strengthen environmental ethics?, teachers mentioned: responsible care, sense of belonging, improvement of the environmental situation, environmental values, preservation and conservation of natural resources, environmental ethics, and respect for nature. These responses are consistent with those provided by students, confirming the meaningfulness of the processes led by teachers and facilitators and the relevance of the curriculum grids and the implementation of the PRAE.

Lenis and Arboleda (2015) argue: "Evaluating the relevance of a School Environmental Project implies understanding that teaching must be present as a broad set of conceptual components, habits, skills, and attitudes that span across different subjects, fostering connections between them and promoting a transdisciplinary approach."

We understand relevance as the connection between the conceptual and knowledge constructions developed within institutions—in this case, the PRAE—and the environmental needs identified and prioritized by the educational community. Relevance is social, economic, and cultural, and implies the necessity of changes in educational institutions. These changes are both pedagogical and curricular and aim at new ways of appropriating knowledge (Naidorf et al., 2007).

When asked: From your perspective, how has the PRAE contributed to solving the socio-environmental problems identified in the participatory diagnosis?, the most frequent response—at 41%—was raising awareness and fostering consciousness regarding proper solid waste management. This was followed by the incorporation of new knowledge and noticeable improvement in the environmental situation, at 17%.

With respect to the PRAE's contributions, it can be inferred that the emerging subcategories from the teacher questionnaires included awareness, conceptualization, and attitudes. Together, these contribute to the significance of the PRAE, as students have come to

understand the importance of protecting ecosystem services and adopting environmentally responsible practices and attitudes. Moreover, the project has led to the strengthening and appropriation of environmental knowledge concerning the comprehensive management of solid waste, and to changes in students' behavior and attitudes. The evaluation in this study was based on an analysis of both the documented project and the PRAE's implementation. It was found that the project generated significant contributions among students, who developed environmentally responsible behaviors and adopted values and attitudes that benefit the environment (Silva, 2018). Furthermore, the development of ethical awareness and environmental consciousness was the most notable achievement throughout the project, as this progress was made possible thanks to the support, methodology, commitment, and creativity of certain teachers and environmental facilitators (Silva, 2018). Similarly, the project had a positive impact on teachers, who gradually acquired values, beliefs, attitudes, and environmental behaviors that in turn, they taught, promoted, and co-constructed with students through innovative activities (Silva, 2018).

Nonetheless, despite these positive outcomes, the low participation of parents in PRAE activities was evident. During personal interviews, some parents acknowledged familiarity with the project because meetings—whether academic or informational—included segments devoted to discussing PRAE activities. These meetings also provided opportunities to train parents on the topic being addressed.

Additionally, through their children's verbal interventions and their indirect participation by assisting with assigned tasks, parents were involved in meaningful ways. One parent responded to the question Have you participated in PRAE activities? by saying, "Not directly, but I help my child with what he's assigned."

Considering that 43% of parents are aware of the progress being made at Morasurco to strengthen the PRAE, and in order to verify whether students were transferring their classroom learning to their homes, the following question was asked: Do you separate solid waste at home? All respondents (100%) said yes.

When asked: Where do you dispose of the organic waste generated in your home? the most common response (63%) was composting, with the resulting organic fertilizer used in crops. The second most common response (37%) was feeding organic waste to animals, mainly pigs and cows.

While it was found that parents do separate organic waste, not all of them dispose of it appropriately. Still, the high percentage of those engaging in composting, a practice encouraged by the institution and incorporated into households, represents a viable environmental and productive solution with economic benefits.

To the question: Do you reuse inorganic waste generated at home? Give an example, the most common subcategories included reusing plastics in crafts and collecting plastic, cardboard, and scrap metal for sale. A smaller group did not separate inorganic waste, and a few reported burning it.

These findings show that for various reasons, parents in Morasurco separate inorganic waste, whether for financial benefit or to extend the life of certain items. Nonetheless, there is a clear need to include parents more directly in PRAE development. Some parents interviewed expressed a strong interest to collaborate with the institution and the community to contribute gradually to environmental conservation. One parent suggested: "More projects should be done with children, youth, and parents, going door to door to show how to reuse waste and recycle—so that everyone becomes aware and sets an example in their homes and make a correct disposition of waste so not to harm our planet ."

Another added: "It shouldn't just be for students, but also for parents, because responsibility belongs to everyone. That's why I think it's important to include parents in this environmental awareness effort."

The literature reviewed reflects that neither teachers nor parents typically recognize the School Environmental Project as a tool for diagnosing and solving environmental problems. Instead, it is often seen simply as an academic and administrative requirement (Casteblanco, 2017).

When asked: Since the PRAE was implemented, have you observed behavioral changes in your neighbors or community regarding waste disposal? 60% of parents said yes—changes were noticeable among some community members. Meanwhile, 33% believe everything remained the same. This was evidenced in comments such as: "Yes, I've noticed several changes. People are more careful with nature and more aware to avoid harming water sources." "Yes, because through these talks, one learns. Before,

we would eat and throw things out, but not anymore. Now it's more organized. Before, there was garbage everywhere; now, not so much. We are becoming more aware."

A key weakness in environmental projects is their focus on local issues that can be addressed by educational institutions and their communities through interinstitutional collaboration, often overlooking broader socio-environmental problems (Sepúlveda, G. L., 2009). These results are consistent with this study's findings: the lack of parental involvement turns the intervention into a purely local and intra-institutional matter.

Thus, while the environmental education strategies proposed in the PRAE are aligned with national policy and holistic education goals, they are limited to awareness and care for ecosystem components—falling short of achieving a systemic vision of the environment that addresses problem complexity, local environmental potential, and human impacts on natural and sociocultural systems (Mejía-Cáceres, Andrade & Freire, 2020).

IV. CONCLUSIONS.

This research acknowledges that the PRAE "Formación de gestores ambientales para el manejo integral de los residuos sólidos" at the IEMM, in both its formulation and implementation processes, demonstrates reasonable alignment with current regulations and the curricular guidelines of the Ministerio de Educación Nacional (MEN). Therefore, the project is deemed relevant in its formulation due to the coherence between institutional documents and the PRAE. However, it does not achieve full participatory implementation, primarily due to the low involvement of parents.

Among teachers, there is evidence of awareness of environmental legislation and a clear understanding of the concept of transversality. However, many lack knowledge on how to effectively integrate the environmental component across subject areas. This leads to the use of isolated, unplanned activities that deviate from the intended curriculum grids. Moreover, most of the project's activities are led by the Natural Sciences area and the PRAE leaders, with some teachers only contributing to the implementation of pre-established workshops. As a result, the PRAE lacks true interdisciplinary collaboration.

In terms of students' contributions to the PRAE, a significant impact was identified in approximately 70% of participants. This impact is reflected in the acquisition of new knowledge, increased awareness of the importance of protecting ecosystem resources, environmentally responsible behavior changes, and a better understanding of the identified environmental problem. However, there remains a noticeable absence of a holistic and integrative environmental perspective that could motivate the formation of environmentally responsible individuals.

V. RECOMMENDATIONS.

To ensure that the project is recognized as a meaningful educational experience, it is necessary to:

Seek arrangements that contribute to the final disposal of separated solid waste, particularly inorganic waste. The goal of environmental education is not only to correctly separate waste but also to give it a second life, thereby partially reducing consumerism and helping to create an environmental culture in society.

Improve the transversality process by fostering greater commitment from some teachers. This highlights the need for continued comprehensive guidance to avoid confusion and demotivation.

Involve parents more actively in the PRAE by linking them through the Escuela de Padres (Parents' School), utilizing their presence without disrupting their work schedules.

Another option is to create a committee representing parents, including community leaders, to promote socio-environmental education through collaborative work.

Finally, it is recommended to improve project documentation by including annexes of detailing the activities carried out during the environmental development process. It is also necessary to clarify institutional arrangements through a matrix detailing how each contributes to the project. Incorporate the results of this research into the Proyectos Ciudadanos y Comunitarios de Educación Ambiental – PROCEDAS to enhance societal impact and a broaden outreach.

VI. REFERENCES.

Ausubel, D. (1963). Psicología del aprendizaje significativo verbal. *México. Trillas.*

Carrizosa Umaña, J. (2014). Colombia compleja. Jardín Botánico de Bogotá José Celestino Mutis.

Casteblanco Cifuentes, J. A. (2017). Evaluación diagnóstica del proyecto ambiental escolar de la institución educativa "La Granja" de Buenavista Boyacá.

Flórez Espinosa, G. M., Pino Perdomo, F. M., Gálvez Cubides, D. J., & Velásquez Sarria, J. A. (2019). Caracterización de concepciones de educación ambiental en estudiantes de últimos semestres de licenciaturas en educación básica con énfasis en ciencias naturales y educación ambiental de tres Universidades de Colombia. Ibagué: Sello Editorial Universidad del Tolima, 2019.

Fonseca, C. (2011). Reforma integral de la educación media superior. Inventio, 7(13), 45-52.

Francisco, P. (2015). Laudato si': Carta encíclica sobre el cuidado de la casa común. Palabra.

Guía visual del proceso de evaluación de políticas públicas basado en Carol H. Weiss, 1998]. (2019). http://www.eval.fr/wp-content/uploads/2019/07/Gui%CC%81a-visual-del-proceso-de-elaboracio%CC%81n-de-poli%CC%81ticas-pu%CC%81blicas.pdf.

Herman, J. L., Webb, N. M., & Zuniga, S. A. (2007). Measurement issues in the alignment of standards and assessments. Applied Measurement in Education, 20(1), 101-126.

Herrera, J. (2017). La Investigación Cualitativa. Investigación Evaluativa. Bogotá, Colombia: ARFO Editores e Impresores Ltda.

Lenis, M., & Arboleda, L. (2015). Pertinencia De Los Proyectos Ambientales Escolares PRAE En La Zona Urbana De La Ciudad De Palmira. Universidad De Manizales.

Luna-Cabrera, G.C., Molina, A.A., Leonel, H: F. y Rivas-Escobar, H.M. Transversalidad de la Educación Ambiental. Universidad de Nariño. 2020. 126p.

Mejía-Cáceres, A., Andrade, M., & Freire, M.L. (2020). FORMACIÓN INICIAL DE PROFESORES EN CIENCIAS: UN ANÁLISIS DEL DISCURSO DE LOS PROGRAMAS DE EDUCACIÓN AMBIENTAL DE UNA LICENCIATURA COLOMBIANA. Revista Góndola, Enseñanza y Aprendizaje de las Ciencias, 15(3).

Ministerio de medio ambiente. (2001). Política nacional de investigación ambiental, 2001.

Moreno-Pijado, W. E. y Velásquez-Tejada, M. E. (2017) Estrategia Didáctica para Desarrollar el Pensamiento Crítico. revistas.uam.es/reice. doi:10.15366/reice2017.15.2.003. ISSN: 1696-4713. www.rinace.net/reice.

Morin, E., & Pakman, M. (2003). Introducción al pensamiento complejo (p. 167). Barcelona: gedisa.
Naidorf, J., Giordana, P., y Horn, M. (2007). La pertinencia social de la Universidad como categoría equívoca. Nómada, 22-33. Publications.

Paz, L., & Avedaño, W. (2014). Desarrollo Conceptual De La Educación Ambiental En El Contexto Colombiano. Revista Luna Azul, 39, 250-270.

Proyecto Ambiental Escolar, (2020). *"formación de gestores ambientales para el manejo integral de residuos sólidos"*

Institución Educativa Mundial Morasurco de Pasto.

Proyecto Educativo Institucional (2020). Institución Educativa Municipal Morasurco de Pasto.

Rivas-Escobar, H.M. y (2010). La investigación evaluativa una alternativa para la valoración de proyectos.

Scriven, M. (1994). Evaluation as a discipline. Studies in Educational Evaluation, 20, 1, 147-166.

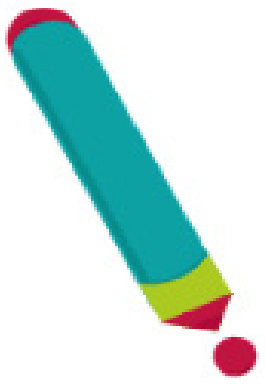
Sepúlveda G.L (2009) Una Evaluación de los Procesos Educativo-Ambientales.

Silva, M. (2018). Evaluación de resultados del Proyecto Ambiental Escolar en la I.E. El Principito del Municipio De Zipaquirá.

SYNTHESIS OF BIOCARBON FROM WASTE OF PHASEOLUS VULGARIS L. TO OBTAIN A SYSTEM OF WATER FILTRATION ENHANCED WITH SILVER NANOPARTICLES.

Gabriela Rocha Chauca,
Nataly Hidalgo Bermeo
Bryan Medina Rodriguez.

UNIVERSITY Yachay Tech



DOI: https://doi.org/10.22267/huellas.251121.25

Traducción: Jennifer Stephanie Pérez González
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 20 de febrero de 2024

Abstract.

The effective management of solid waste is paramount to safeguarding our environment and ensuring a sustainable future. Globally, the agricultural sector significantly contributes to soil and water pollution, despite its substantial contribution to the global Gross Domestic Product (GDP), particularly in developing countries like those in the Equator. Agricultural waste generated post-production is often inadequately managed and underutilized during processing and product collection. This study focuses on obtaining activated carbon from bean pod residues (Phaseolus Vulgaris L.) and its application for water purification. To obtain activated carbon, bean pods were collected, and subjected to carbonization and chemical activation with phosphoric acid (H3PO4) at 700°C, followed by washing. Samples were characterized using Fourier Transform Infrared Spectroscopy (FTIR) and X-ray Diffraction (XRD). A preliminary gravimetric analysis was conducted to assess the technical feasibility of the process. Furthermore, the properties of activated carbon were enhanced by integrating silver nanoparticles (NPs-Ag), thereby increasing its effectiveness in contaminant removal and bactericidal activity. This enhanced activated carbon was employed in water microbiological analysis filters, resulting in a pH reduction from 8.2 to 7.45 and a 70% decrease in microorganisms. The efficiency of activated carbon extraction reached 63.83%; however, process optimization was identified as necessary. Notably, the most promising results in water purification were observed with the incorporation of silver nanoparticles. These findings support the viability of a sustainable solution to address agricultural waste management challenges and improve access to clean water in vulnerable communities.

Keywords: bean, activated carbon, solid waste, sustainability, environmental, filtration, water.

Resumen.

SÍNTESIS DE BIOCARBÓN A PARTIR DE RESIDUOS DE PHASEOLUS VULGARIS L. PARA UN SISTEMA DE FILTRACIÓN DE AGUA POTENCIADO CON NANOPARTÍCULAS DE PLATA.

La gestión efectiva de los desechos sólidos es fundamental para proteger nuestro entorno y asegurar un futuro sostenible. A nivel mundial, el sector agrícola contribuye significativamente a la contaminación del suelo y el agua, a pesar de su importante aporte al Producto Interno Bruto (PIB) global, especialmente en países en desarrollo como Ecuador.

Los desechos agrícolas generados después de la producción no se gestionan adecuadamente ni se aprovechan eficientemente durante el procesamiento y la recolección de los productos. Este estudio se enfoca en la obtención de carbón activado a partir de residuos de las vainas y ramas pequeñas del frijol (Phaseolus Vulgaris L.) y su aplicación para purificación de agua. Para obtener carbón activado, se recolectaron vainas de frijol, las cuales fueron sometidas a carbonización mediante un proceso de pirolisis y activación química con ácido fosfórico (H3PO4) a 700°C, seguido de un proceso de lavado. Las muestras fueron caracterizadas mediante Espectroscopía de Infrarrojo por Transformada de Fourier (FTIR) y Difracción de Rayos X (XRD). Se realizó un análisis gravimétrico preliminar para evaluar la viabilidad técnica del proceso. Además, se mejoraron las propiedades del carbón activado integrando nanopartículas de plata (NPs-Ag), aumentando así su eficacia en la eliminación de contaminantes y su capacidad bactericida. Este carbón activado mejorado se utilizó en filtros para análisis microbiológico del agua, mostrando una reducción del pH de 8.2 a 7.45 y una disminución del 70% de microorganismos. La eficiencia de obtención del carbón activado alcanzó el 63.83%; sin embargo, se identificó la necesidad de optimizar el proceso. Los resultados del presente trabajo muestran la factibilidad de obtención de carbón activado a partir de los residuos del frejol, mostrando su utilidad para la purificación de agua, especialmente al incorporar nanopartículas de plata. Estos hallazgos muestran un posible camino sostenible para enfrentar los desafíos de gestión de residuos agrícolas y mejorar el acceso al agua pura en comunidades vulnerables.

Palabras Clave: frejol, carbón activado, desechos sólidos, sostenibilidad, ambiente, filtración, agua.

I. INTRODUCTION.

Within the framework of the 2030 agenda and its sustainable development goals, organic solid waste management is crucial for the health of the planet and community well-being. Population growth has increased agricultural production and, with it, the generation of

organic waste, aggravating soil and water pollution (De León Duarte, 2022).

Historically, waste disposal was not problematic due to low population density and vast areas of natural purification. However, modernization has increased the quantity and complexity of waste, making it difficult to manage. Overpopulation and consumerism have led to a massive accumulation of waste, creating an urgent need for effective alternatives for its management (Aylwin Ríos, 2017).

Among the main conventional methods of agricultural waste management are uncontrolled burning and disposal of waste in open dumps, which continue to cause serious problems of contamination, disease, and proliferation of vectors (Reina Orosco, 2015). Waste incineration, for example, produces toxic and carcinogenic substances, such as dioxins and furans. In addition, the decomposition of organic matter generates greenhouse gases, such as methane and carbon dioxide. It contributes to the presence of contaminants in the soil surface and groundwater sources (Vega Alonso, 2019).

The agricultural sector, which represents 3.6% of the world's Gross Domestic Product (GDP), is a major generator of organic solid waste (Salgado Ortiz, 2020). In Latin America and the Caribbean, production reaches approximately 430 thousand tons per day (Porras & González, 2016a). In Equator, the situation is similar, with about 7840 tons per day of organic waste (Salgado Ortiz, 2020).

It is essential to revitalize agricultural waste through reuse to preserve resources and minimize environmental impact. Implementing sustainable practices in agricultural sectors, such as bean production, is vital for environmental balance and future well-being.

The agricultural sector, which represents 3.6% of the world's Gross Domestic Product (GDP), is a major generator of organic solid waste (Salgado Ortiz, 2020). In Latin America and the Caribbean, production reaches approximately 430 thousand tons per day (Porras & González, 2016a). In Equator, the situation is similar, with about 7840 tons per day of organic waste (Salgado Ortiz, 2020).

It is essential to revitalize agricultural waste through reuse to preserve resources and minimize environmental impact. Implementing sustainable practices in agricultural sectors, such as bean production, is vital for environmental balance and future well-being.

Beans, Phaseolus vulgaris L., are an important crop in the Equator, especially in rural areas. Countries such as India, Brazil, Mexico, the United States, and Uganda account for 57.7% of global bean production and consumption (Torres Navarrete et al., 2013). In the Equator, about 35,000 hectares of beans are cultivated, being the Sierra Norte the main producer (Torres Navarrete et al., 2013). However, bean production generates solid waste that, if not properly managed, causes environmental problems (Mota Muñoz & Espinoza Rosales, 2019; Porras & González, 2016).

Activated carbon (AC) is used in various industries due to its adsorbent properties in liquids and gases, such as gas purification, gold extraction, and water treatment, and is produced from various carbonaceous precursors, including agricultural waste (Evwierhoma et al., 2018).

The procurement methods include a carbonization process followed by an activation process. Carbonization is a decomposition process by pyrolysis at high temperatures, in the absence of oxygen, with a temperature range of about 400°C to 600°C for about one hour (Pastor et al.,1999). Such activation can be performed by physical activation (PA) or chemical activation (CCA). In PA, the sample is prepared by washing and drying at high temperatures in an oven, followed by carbonization in an inert atmosphere and activation with water vapor (H2O), carbon dioxide (CO2), or air at high temperatures and pressure (Ukanwa et al., 2019; Demiral & Demiral, 2018). On the other hand, in AQ, a similar preparation process is followed, but with the addition of the impregnation of activating agents such as phosphoric acid (H3PO4), zinc chloride (ZnCl2), or potassium hydroxide (KOH), prior to carbonization at high temperatures (Kra et al., 2019).

Among the most effective methods, impregnation with agents such as ZnCl2 or KOH are found, followed by carbonization in a nitrogen atmosphere and washing with acid solutions and distilled water to remove impurities (Demiral & Demiral, 2018). Preliminary studies conducted by the Nigerian Journal of Technology showed that the most suitable method to obtain activated carbon from bean pods is the chemical method and that the best activating agent is ortho-phosphoric acid (H3PO4), the conditions used were carbonization at 500°C and activation at 700°C (Evwierhoma et al., 2018).

In short, activated carbon is a porous material obtained through carbonization and activation of organic materials, mainly of plant origin. This procedure is carried out with

the aim of achieving high porosity and extensive surface area. Its water filtration capacity is notorious thanks to its amorphous structure.

Its capacity for water filtration is notorious thanks to its amorphous structure and its large surface area with pores of various sizes. It is widely used in wastewater treatment and other industrial processes (Nartey & Zhao, 2014). However, adding additional value to it, such as silver nanoparticles, enhances the effectiveness of water filtration systems; by offering to remove pathogenic microorganisms present in water. (Poornima Parvathi et al., 2020; Ghaedi et al., 2012). This study contributes to the development of sustainable technologies for water treatment.

This research proposes the reuse of bean pod remains to produce activated carbon (AC) and evaluate its effectiveness in water purification. In addition, it also seeks to improve its properties by incorporating silver nanoparticles. The objectives of the present work are the following: (1) to obtain AC from bean pods applicable to water filtration, (2) to characterize the AC by FTIR and XRD, (3) to evaluate the technical feasibility of the process by gravimetric analysis, (4) to evaluate the effectiveness of the filtrate in the presence of silver nanoparticles to the AC.

II. METHODOLOGY.

A. Preparation of activated carbon.

I. Materials.

The materials used were: 118.1 g of bean pods, a glass stirring rod, crucibles, 2 beakers of 100 ml, a spatula, filter paper, digital balance, oven, muffle, stove, pH meter MW150 MAX, mill, phosphoric acid, and distilled water. To characterize the activated carbon obtained, FTIR and XRD were used for characterization. FTIR was used to identify the functional groups on the surface of the carbon, while XRD was used to analyze its crystal structure.

II. Procedure.

The chemical method was employed for the production of activated carbon from beans, it is composed of carbonization and chemical activation stages (Ukanwa et al., 2019; Zięzio et al., 2020). For the latter stage, H3PO4 was selected as the activating agent based on previous research published by the Nigerian Journal of Technology (Evwierhoma et al, 2018). The procedure is presented in Figure 1.

Figure 1. *Metodología utilizada para la obtención de CA., 2024.*

Adjustments were made to the process, such as modifying the initial drying time of the samples and the integral use of the pod residues, without going through a previous screening process, in order to take maximum advantage of the available raw material. Also, the amount of activating agent was adjusted, opting for a ratio of 10 g in 20 ml of H3PO4, in contrast to the 5 g in 20.4 ml of H3PO4 used by Evwierhoma et al., 2018.

The bean residues were washed and dried at 105°C for 4 h and subsequently crushed to obtain 90.5 g of material. In the carbonization stage, the shredded material was treated in a muffle at 500°C for 1 h, producing charcoal. In the activation stage, 10 g of this charcoal was mixed with a solution of 20 ml of distilled water and 0.41 ml of H3PO4 and dried at 105°C for 24 hours. The resulting sample was activated in a muffle at 700°C for 30 minutes, followed by cooling for 12 hours. The sample was then washed with 0.1 N HCl solution, filtered, and dried again for 24 hours. Finally, the sample was washed with distilled water to a pH between 6 and 7 and dried again.

B. Incorporation of Silver NPs.

I. Materials.

To carry out the in situ synthesis of silver nanoparticles on activated carbon, the following materials and reagents were used: 10 g of commercial AC (Control) and 10 g of bean AC, magnetic stirrer, universal stand and tweezers, beakers, burette, spatula, 2 falcon tubes of 15 ml, 200 ml and 50 ml volumetric flask, glass stirring rod, hot plate, centrifuge, oven, sodium borohydride (NaBH4), distilled

water and silver nitrate (AgNO3). For the characterization of the material, a UV-visible spectrophotometer was used to determine the presence of the nanoparticles in the AC.

II. Procedure.

First of all, silver nanoparticles were synthesized, and two solutions were prepared: one of sodium borohydride and the other of silver nitrate. 0.03024 g of NaBH4 was dissolved in a 200-ml balloon and 0.0345 g of AgNO3 was dissolved in a 50-ml balloon. A drip system was set up to gradually add the NaBH4 to the AgNO3 solution in a beaker on a cooled stir plate. In a burette, 10 ml of NaBH4 was loaded, and stirring was activated at 300 rpm for 20 min. The burette stopcock was opened until the solution changed to colloidal yellow. This methodology is based on previous research on the synthesis of Ag-NPs (Sodha et al., 2015; Badi'ah et al., 2019).

Finally, the incorporation of silver nanoparticles was carried out by immersing 10 ml of silver nanoparticle solution per gram of activated carbon. After stirring, it was allowed to stand for 24 hours, and then the aqueous phase was separated from the solid by centrifugation at 1500 rpm for 30 minutes. The liquid phase was decanted, and the residue was completely dried in an oven at 50°C on filter paper. The presence of silver nanoparticles on the activated carbon was examined by UV-vis spectra analysis (El-Aassar et al., 2013).

C. Water filtration system and microbiological analysis.

III. Materials.

Precipitation beakers, spatulas, funnels, sand, cotton, and universal supports with tweezers, commercial and bean activated carbon, as well as variants with NPs-Ag, and water samples, were used.

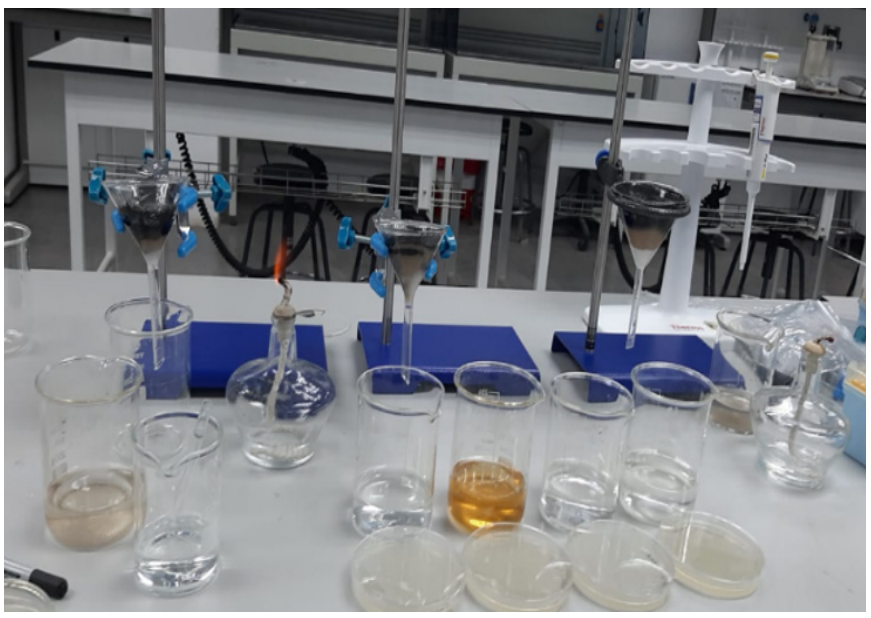
The water collected from an irrigation ditch in Imbabura, Urcuquí, had a pH of 8.2 and a brown color, indicating the presence of organic matter. In addition, it contained sediments and microorganisms, including Escherichia coli.

IV. Procedure.

Conventional filtration systems were assembled to compare the performance of bean-activated carbon, commercial-activated carbon, and its enhanced versions with silver nanoparticles.

The filtration systems were constructed with the same combination of materials: cotton, sand, and activated carbon (Figure 2). Only the type of activated carbon used varied. In the first system bean CA was used, in the second commercial CA (control), in the third commercial CA with NPs-Ag, and in the fourth bean CA with NPs-Ag. Figure 2.

Figure 2. *Ensamblaje de los sistemas de filtrado, 2024.*



Filtered water samples were characterized by pH measurement, color evaluation, and detection of visible solids. For microbiological analysis, they were seeded on agar plates and incubated for 24 hours at 37°C. Subsequently, a comparative visual analysis was performed to detect changes in bacterial growth.

III. RESULTS AND DISCUSSION.

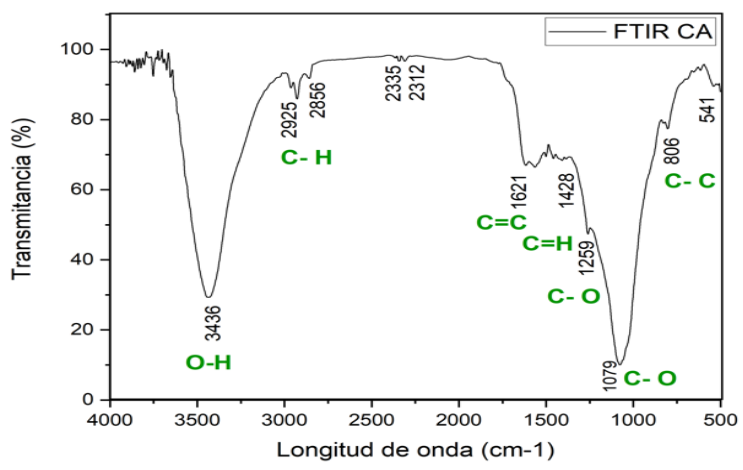
A. Characterization of bean activated carbon.

The FTIR analysis of activated carbon derived from bean pods reveals the presence of several characteristic functional groups (Figure 3) Vibrations of -OH groups are identified at 3436 cm^{-1}, aliphatic (C-H) at 2925 and 2856 cm^{-1}, possible carbonyl (C=O) or alkene (C=C) at 1621 cm^{-1}, and aromatic rings at 1567 and 1498 cm^{-1}, as well as C-O groups at 1259 and 1079 cm^{-1}.

In comparison, previous studies on activated carbon obtained from reed grass leaves show similarities in the functional groups identified. Vibrations of -OH groups at 3600-3200 cm^{-1}, aliphatic CH stretches at 2800-3000 cm^{-1}, possible C=C vibrations at 1630 cm^{-1}, and C-O stretches at 1000-1300 cm^{-1} are observed (Xu et al., 2014). Both studies employed the same activating agent, suggesting consistency in the

These findings support the efficacy of the activation technique used in this research and the feasibility of using bean pods as the main material for activated carbon production. Figure 3.

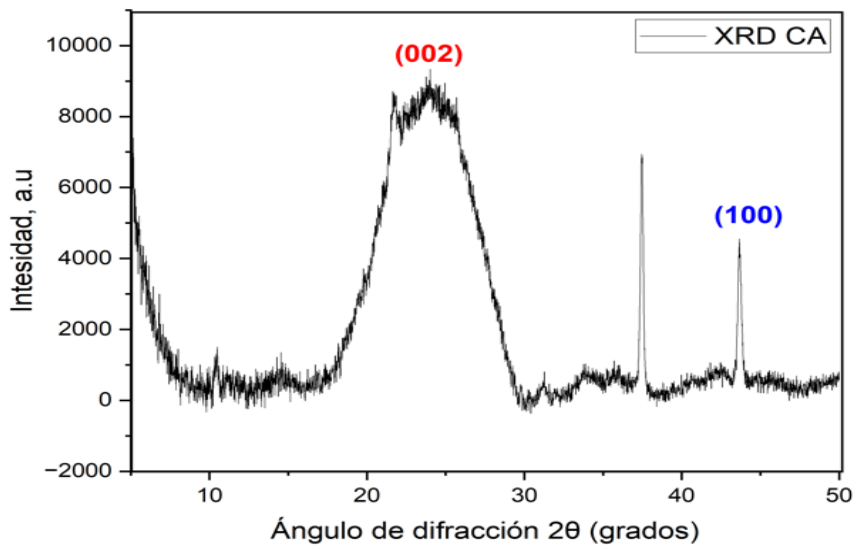
Figure 3.*FTIR de carbón activado de Phaseolus Vulgaris L., 2024.*



The XRD analysis reveals distinct peaks at 2θ = 21.65°, 23.77°, 37.47° and 43.66°. The peaks at 2θ = 21.65° and 23.77° are associated with amorphous carbon, while the peaks at 2θ = 37.47° and 43.66° indicate the presence of crystalline structures. Comparing these results with previous studies showing peaks in the (002), (100) and (101) planes of graphitic carbon confirms the formation of a well-defined crystalline structure (Kalagatur et al., 2017). Moreover, the sharp peak at 2θ = 26° corresponding to the turbostratic crystal structure suggests a better structural organization.

Similarly, according to Bedia et al.(2020), the XRD analysis reveals the presence of distinct peaks around 25° and 43°, consistent with the (002) and (100) crystalline planes of the carbon (Figure 4). These results suggest a well-defined crystalline structure in the bean-activated carbon, indicating higher structural stability and a larger active surface area for adsorption. The XRD results of this study show a mixture of amorphous and crystalline phases.

Figure 4. *XRD de carbón activado de Phaseolus Vulgaris L., 2024.*



B. Gravimetric analysis of sample composition.

The efficiency of obtaining activated carbon from bean bagasse was evaluated by gravimetric analysis based on APHA standard section 2540 G (Bridgewater et al., 2017). The results were:

Table 1.
Resultados de análisis gravimétrico, 2024.

Sólidos totales	40 **[mg/kg]**
Sólidos volátiles	9.0025 [mg/kg]
Sólidos fijos	75.32 [g/kg]
Porcentaje de humedad	18.17%

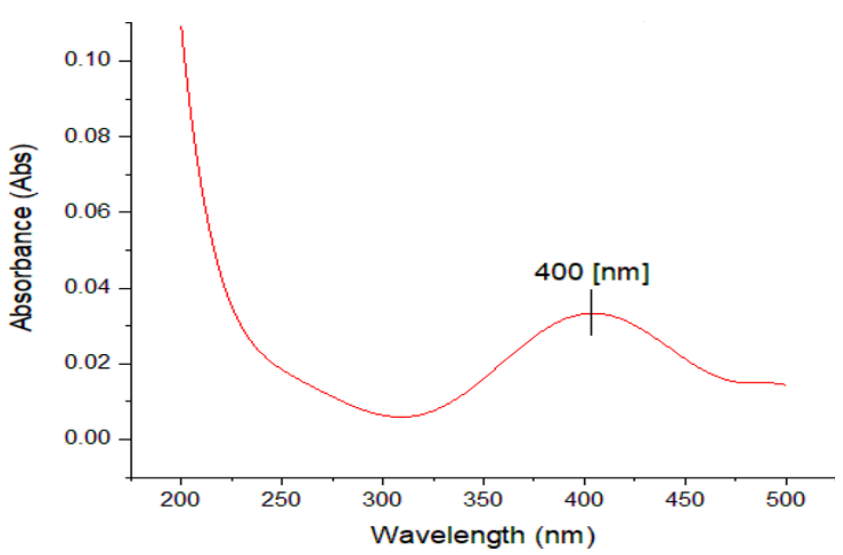
Activated carbon production efficiency reached 63.83%, with a total loss of 42.69 g from the initial sample of 118.1 g after the drying and pyrolysis process.

The high proportion of fixed solids indicates resistance to calcination, which benefits the quality of the activated carbon obtained. On the other hand, the low volatile solids content suggests a significant loss of organic matter during carbonization, which contributes to the formation of a porous structure of the activated carbon.

C. Characterization of activated carbon with silver NPs.

The Ag-NPs exhibit a characteristic absorption band between 400 nm and 500 nm, which causes a color change in solution from yellow to (Sodha et al., 2015; Mulfinger et al., 2007). The impregnation of these nanoparticles on activated carbon was confirmed by UV-vis spectrum analysis (Figure 5).

Figure 5. *Espectro de UV-vis de Carbón activado y NPs de Ag, 2024.*

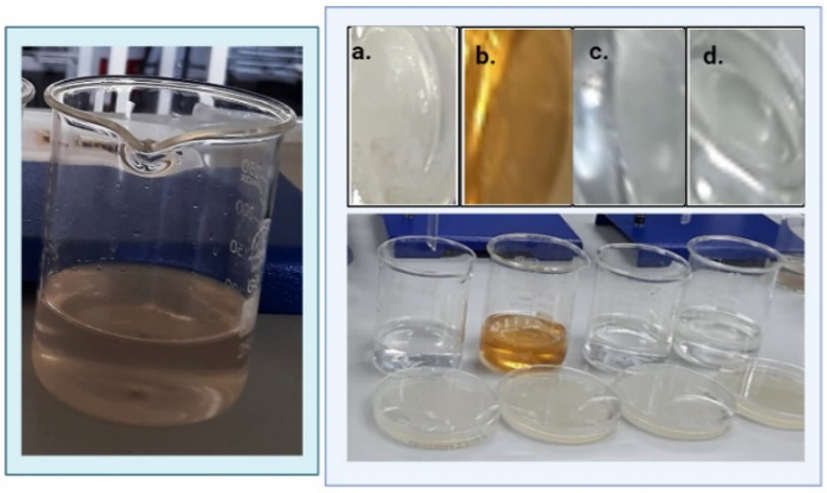


D. Microbiological analysis of filtered water..

1. Characterization.

Figure 6 depicts the color variation observed in the water samples after filtration using different types of charcoal: a) commercial activated carbon, b) charcoal, c) charcoal derived from beans (Phaseolus vulgaris), and d) charcoal with silver nanoparticles.

Figure 6.
Colorimetría del agua filtrada, 2024.



Despite the yellow-colored characteristic of the Ag nanoparticles, the filtered water shows a transparent and crystalline appeareance **(Figure 5.d)**, in contrast to the typical yellow color of Ag-NPs.

The characterization of the filtered water samples is described in detail in Table 2.

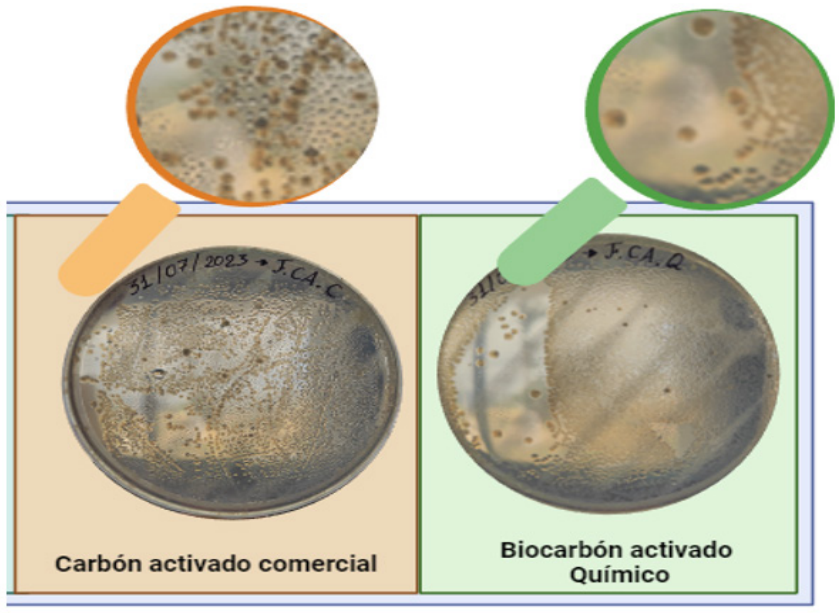
Table 2.
Caracterización de las muestras filtradas de agua, 2024.

Tipo de filtro	pH	Color	Sólidos presentes
Características de muestra de agua.	8.2	Marrón	Matéria orgânica Sedimentos Microrganismos *(Escherichia coli)*
***Control* (Carbón activado comercial)**	7.73	Transparente	No presenta Microorganismos
Carbón activado de Frejol	7.68	Transparente	No presenta Microorganismos
***Control* CA comercial con NPs - Ag**	7.41	Transparente Cristalino	No presenta Microrganismos
CA de Frijol*con NPs - Ag*	7.31	Transparente	No presenta Microorganismos

2. Invitro plate analysis

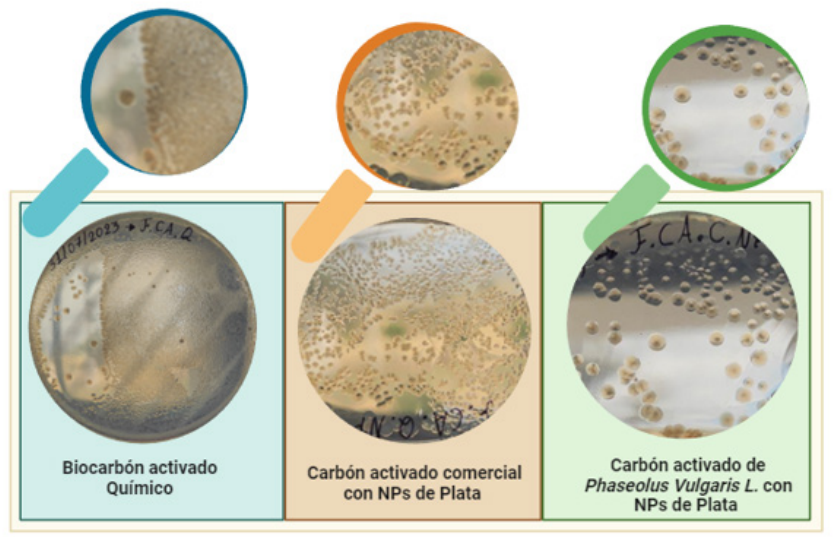
The microbiological analysis of filtered water samples showed that bean-derived activated carbon reduced the bacterial load more effectively than commercial activated carbon (Figure 7).

Figure 7.
Placas in vitro de muestras de agua filtrada, 2024.



On the other hand, when comparing the reduction of bacterial load between commercial activated carbon (control), bean charcoal and its enhanced version with silver nanoparticles, it was observed that the best results were obtained when silver nanoparticles were implemented (Figure 8).

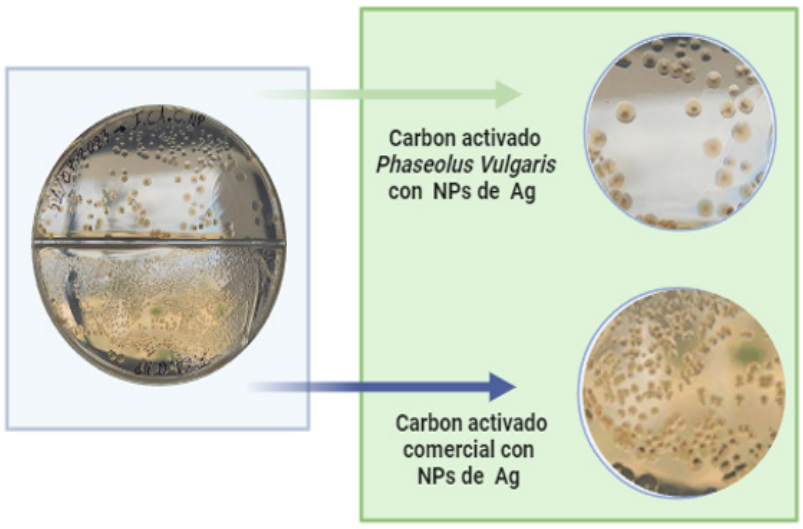
Figure 8.
Placas in vitro de muestras de agua filtrada, 2024.



Definitely, bean AC with NPs-Ag proved to be more effective in reducing bacterial colonies compared to commercial AC with silver nanoparticles. This suggests that when NPs are incorporated into bean activated

carbon, they improve its ability to kill microorganisms, possibly due to the higher porosity and specific surface area of bean activated carbon (Figure 9).

Figure 9.
Detalle del logo tipo de JITEL, 2013.



IV. CONCLUSIONS.

The FTIR analysis of activated carbon derived from bean pods reveals the presence of characteristic functional groups, such as hydroxyl, aliphatic, carbonyl, and aromatic groups, similar to those of conventional activated carbon. These results highlight the feasibility of producing activated carbon from bean pods, underscoring the potential of using agricultural residues as a sustainable and economical alternative.

The XRD analysis reveals a well-defined crystalline structure with ordered domains in the bean-activated carbon, indicating its high quality and potential for filtration and purification applications. Good crystallinity and large crystallite sizes suggest high structural stability and higher active surface area for adsorption.

The gravimetric analysis showed that bean bagasse is highly effective in the production of activated carbon, with a conversion rate of 63.83%. The presence of a significant amount of fixed solids indicates adequate resistance to calcination, while the low amount of volatile solids suggests minimal loss of organic matter during pyrolysis.

Activated carbon derived from Phaseolus Vulgaris, commonly known as “bean”, exhibits remarkable capabilities for the removal of impurities in water. However, its effectiveness is further enhanced when combined with silver nanoparticles, resulting in a significant reduction of microorganisms during the filtration process. This finding underscores the potential of bean-activated carbon as a promising tool for improving water quality.

This study has demonstrated the feasibility of obtaining activated carbon from bean pods using a carbonization and activation process. It was found that a carbonization process at 105°C for 4 hours and activation at 700°C for 30 minutes was effective in obtaining a quality product. In addition, it was observed that prolonging the activation time increased the amount of ash in the samples, suggesting not to modify the activation time.

For future research, it is suggested to explore more environmentally friendly activation methods and conduct detailed analysis using techniques such as scanning electron microscopy (SEM) and transmission electron microscopy (TEM) for better characterization of the obtained activated carbon. These efforts can provide a more complete understanding of the properties of the activated carbon and help to further improve the production process.

The study demonstrates that the production of activated carbon from bean (Phaseolus vulgaris L.) waste, enhanced with silver nanoparticles, is a viable and effective technical solution for water purification, sustainably addressing agricultural waste management and significantly improving water quality. This technology is aligned with the Sustainable Development Goals of the 2030 Agenda, promoting a circular economy, minimizing environmental impact, and contributing to community well-being.

V. ACKNOWLEDGMENTS.

We are grateful for the support of the laboratory technician in the Yachay Tech Laboratories of the School of Biological Sciences and Engineering, School of Chemistry and Engineering, School of Physics.

VI. REFERENCES.

Aylwin Ríos, C. (2017). *Evaluación de un plan de gestión de residuos sólidos domiciliarios en la comuna de Cochamó, ingeniería conceptual.* https://repositorio.uchile.cl/handle/2250/150305.

Badi'ah, H. I., Seedeh, F., Supriyanto, G., & Zaidan, A. H. (2019). Synthesis of Silver Nanoparticles and the Development in Analysis Method. *IOP Conference Series: Earth and Environmental Science, 217(1)*, 012005. https://doi.org/10.1088/1755-1315/217/1/012005.

Bedia, J., Peñas-Garzón, M., Gómez-Avilés, A., Rodriguez, J., & Belver, C. (2020). Review on Activated Carbons by Chemical Activation with FeCl3. C, 6. https://doi.org/10.3390/c602002.

Bridgewater, L. L., Baird, R. B., Eaton, A. D., Rice, E. W., American Public Health Association, American Water Works Association, & Water Environment Federation (Eds.). (2017). *Standard methods for the examination of water and wastewater (23rd edition).* American Public Health Association.

De León Duarte, M. (2022). *Retos en la gestión y valorización de los residuos en Canarias. Un paso hacia la economía circular.* https://riull.ull.es/xmlui/handle/915/26738.

Demiral, H., & Demiral, İ. (2018). *Preparation and characterization of carbon molecular sieves from chestnut shell by chemical vapor deposition. Advanced Powder Technology, 29(12)*, 3033-3039. https://doi.org/10.1016/j.apt.2018.07.015.

El-Aassar, A. H. M., Said, M. M., Abdel-Gawad, A. M., & Shawky, H. A. (2013). *Using Silver Nanoparticles Coated on Activated Carbon Granules in Columns for Microbiological Pollutants Water Disinfection in Abu Rawash area, Great Cairo, Egypt.*

Evwierhoma, E. T., Madubiko, O. D., & Jaiyeola, A. (2018). Preparation and characterization of activated carbon from bean husk. *Nigerian Journal of Technology, 37(3),* Article 3. https://doi.org/10.4314/njt.v37i3.17.

Ghaedi, M., Biyareh, M. N., Kokhdan, S. N., Shamsaldini, S., Sahraei, R., Daneshfar, A., & Shahriyar, S. (2012). Comparison of the efficiency of palladium and silver nanoparticles loaded on activated carbon and zinc oxide nanorods loaded on activated carbon as new adsorbents for removal of Congo red from aqueous solution: Kinetic and isotherm study. *Materials Science and Engineering: C, 32(4)*, 725-734. https://doi.org/10.1016/j.msec.2012.01.015.

Kalagatur, N., Karthick, K., Joseph Anthuvan, A., Ghosh Ph.D., O. S. N., Nayak, C., Gupta, V. K., Krishna, K., & Mudili, Dr. V. (2017). Application of Activated Carbon Derived from Seed Shells of Jatropha curcas for Decontamination of Zearalenone Mycotoxin. *Frontiers in Pharmacology, 8.* https://doi.org/10.3389/fphar.2017.00760.

Kra, D. O., Allou, N. B., Atheba, P., Drogui, P., & Trokourey, A. (2019). Preparation and Characterization of Activated Carbon Based on Wood (Acacia auriculeaformis, Côte d'Ivoire). J*ournal of Encapsulation and Adsorption Sciences, 9(2), Article 2.* https://doi.org/10.4236/jeas.2019.92004.

Mota Muñoz, S. del C., & Espinoza Rosales, A. D. (2019). *Caracterizacion y evaluacion preliminar de cuatro variedades locales de frijol comun (Phaseolus vulgaris L.) en las localidades Tamalapa, El Mojon, El Cristal y el Guineo del municipio Ciudad Dario, departamento Matagalpa postrera 2017*—Primera 2018 [Engineer, Universidad Nacional Agraria]. https://repositorio.una.edu.ni/3939.

Mulfinger, L., Solomon, S. D., Bahadory, M., Jeyarajasingam, A. V., Rutkowsky, S. A., & Boritz, C. (2007). Synthesis and Study of Silver Nanoparticles. *Journal of Chemical Education, 84(2), 322.* https://doi.org/10.1021/ed084p322

Nartey, O. D., & Zhao, B. (2014). Biochar Preparation, Characterization, and Adsorptive Capacity and Its Effect on Bioavailability of Contaminants: An Overview. *Advances in Materials Science and Engineering, 2014,* e715398. https://doi.org/10.1155/2014/715398.

Pastor, A. C., Rodrıguez-Reinoso, F., Marsh, H., & Martınez, M. A. (1999). Preparation of activated carbon cloths from viscous rayon. Part I. Carbonization procedures. *Carbon, 37(8),* 1275-1283.

Poornima Parvathi, V., Umadevi, M., Sasikala, R., Parimaladevi, R., Ragavendran, V., Mayandi, J., & Sathe, G. V. (2020). Novel silver nanoparticles/activated carbon co-doped titania nanoparticles for enhanced antibacterial activity. *Materials Letters*, 258, 126775. https://doi.org/10.1016/j.matlet.2019.126775.

Porras, Á. C., & González, A. R. (2016a). Aprovechamiento de residuos orgánicos agrícolas y forestales en Iberoamérica. *Academia y Virtualidad, 9(2), Article 2.* https://doi.org/10.18359/ravi.2004.

Porras, Á. C., & González, A. R. (2016b). Aprovechamiento de residuos orgánicos agrícolas y forestales en Iberoamérica. *Academia y Virtualidad,* 9(2), Article 2. https://doi.org/10.18359/ravi.2004.

Reina Orosco, P. S. (2015). La sostenibilidad social del plan del manejo de residuos sólidos del municipio de Concepción, Junín. *Universidad Nacional del Centro del Perú.* http://repositorio.uncp.edu.pe/handle/20.500.12894/4584.

Salgado Ortiz, G. S. (2020). *Valorización energética de residuos agrícolas: Cáscara de plátano, cascarilla de arroz y bagazo de caña mediante procesos de biodigestión y combustión* [bachelorThesis, Quito, 2020.]. http://bibdigital.epn.edu.ec/handle/15000/20707.

Sodha, K., Jadav, J., Gajera, H., & Rathod, K. (2015). CHARACTERIZATION OF SILVER NANOPARTICLES SYNTHESIZED BY DIFFERENT CHEMICAL REDUCTION METHODS. *International Journal of Pharma and Bio Sciences, 6,* 199-208.

Torres Navarrete, E., Quisphe Caiza, D., Sánchez Laiño, A., Reyes Bermeo, M., González Osorio, B., Torres Navarrete, A., Cedeño Briones, A., & Haro Chong, A. (2013). Caracterización de la producción de Frijol en la provincia de Cotopaxi Ecuador: Caso Comuna Panyatug. *Revista Ciencia y Tecnología*, 6(1), 23-31.

Ukanwa, K. S., Patchigolla, K., Sakrabani, R., Anthony, E., & Mandavgane, S. (2019). A Review of Chemicals to Produce Activated Carbon from Agricultural Waste Biomass. *Sustainability, 11(22)*, Article 22. https://doi.org/10.3390/su11226204.

Vega Alonso, C. (2019). *Estudio comparativo económico y ambiental de la gestión de RSU en vertedero e incineración.* https://idus.us.es/handle/11441/101403.

Xu, J., Chen, L., Qu, H., Jiao, Y., Xie, J., & Xing, G. (2014). Preparation and characterization of activated carbon from reedy grass leaves by chemical activation with H3PO4. *Applied Surface Science, 320, 674-680. https://doi.org/10.1016/j.apsusc.2014.08.178.*

Zięzio, M., Charmas, B., Jedynak, K., Hawryluk, M., & Kucio, K. (2020). Preparation and characterization of activated carbons obtained from the waste materials impregnated with phosphoric acid(V). *Applied Nanoscience, 10(12),* 4703-4716. https://doi.org/10.1007/s13204-020-01419-6.

THE TRANSFORMATIVE POWER OF LIBERATORY PEDAGOGY.

Rosmira Agreda Cabrera
Sandra Katherine Ochoa Larrota
Diana Paola Potosí Díaz.

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.26

Traducción: Jenny Rosario Pantoja Mallama
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 19 de marzo 2024

Abstract.

This study addresses the importance of improving interpersonal relationships within the educational setting with a particular focus on bullying and its impact on learning processes. Through a theoretical review that includes topics such as interpersonal relationships, teaching strategies and liberating pedagogy, it advocates for a more critical and humanistic approach to education. The impact of bullying between 9th and 10th grade students at the Nuestra Señora del Carmen School in Pasto was examined using the qualitative method incorporating research instruments such as observation, interviews and focus groups. The findings led to the implementation of a pedagogical proposal called "Closet zap bullying: for you and for others we are going to walk", designed to improve interpersonal relationships and learning processes like consequences of bullying, offering a practical approach, transformative and critical within educational context.

Keywords: Relationships, bullying, teaching strategies, learning and liberating pedagogy.

Resumen.

Este estudio aborda la importancia de mejorar las relaciones interpersonales en el ámbito educativo, centrando su atención en el bullying y cómo este afecta los procesos de aprendizaje. A través de una revisión teórica que incluye temas como relaciones interpersonales, estrategias de enseñanza y la pedagogía liberadora, la cual propone una enseñanza más crítica y humanista. Utilizando el método cualitativo utilizando instrumentos de investigación como la observación, entrevistas y grupos focales, se investiga el impacto del bullying entre estudiantes de 9º y 10º grado en el Colegio Nuestra Señora del Carmen en Pasto. Los resultados de la investigación apuntan hacia la implementación de una propuesta pedagógica denominada "Closet zapbullying: por ti y por los demás vamos a caminar", diseñada para mejorar las relaciones interpersonales y los procesos de aprendizaje ocasionados por el bullying, ofreciendo un enfoque práctico, transformador y crítico en el contexto educativo.

Palabras Clave: Relaciones interpersonales, bullying, estrategias de enseñanza, aprendizaje y pedagogía liberadora.

EL PODER TRANSFORMADOR DE LA PEDAGOGÍA LIBERADORA.

I. INTRODUCTION.

This research focuses on the phenomenon of bullying, a form of aggression or intimidation that seeks to exert power over others through hostile threats, whether physical or verbal, creating an environment of distress for the victim and a notable power imbalance. Particularly prevalent in the school settings, manifests itself both implicitly and explicitly, severely impacting students' sense of safety and well-being who often choose to remain silent for fear of retaliation or stigmatization as cowards. Despite the difficulty in detecting these situations of violence in a timely manner, it is essential for teachers to be equipped with the knowledge and pedagogical tools necessary to prevent and adequately address these violent behaviors, thus contributing to a safer and more supportive educational environment.

Colombia ranks ninth in the world in cases of bullying, according to a study by the international organization Bullying Without Borders. The urgency of addressing this problem effectively is evident. Although there is extensive research on bullying, there is a clear need to approach these studies from the perspective and daily reality of the classroom, where teachers and students directly face its consequences. This research not only addresses the recognition and prevention of bullying, but also the promotion of healthy interpersonal relationships and effective learning strategies.

Given this context, we propose to explore the potential of Paulo Freire's liberating pedagogy to enhance interpersonal relationships and learning processes caused by bullying among 9th and 10th grade students at Colegio Nuestra Señora del Carmen in Pasto. This private, Catholic school is owned by the Carmelite Missionary Sisters and grants the academic baccalaureate degree. The institution is located in the city of San Juan de Pasto, in the San Andrés neighborhood, in a predominantly commercial area surrounded by a variety of businesses and the parish of the same name. The students are characterized as cheerful, outgoing, creative, dynamic, and innovative. They are characterized by a climate of security and affection, where the family is considered as a foundational pillar, and communication is multidirectional, encouraging a sense of community The

school provides spaces that allow student participation in educational, cultural, sports, and recreational activities.

Through guiding questions, we seek to delve deeper into the existence and effects of bullying, the dynamics of interpersonal relationships, teaching-learning strategies, and the value of liberating pedagogy in building a more inclusive, transformative, and empathetic educational environment. According to Freire (2003): “One of the most beautiful and rewarding tasks we have ahead of us as teachers is to help students construct the intelligibility of things, to help them learn to understand and communicate that understanding to others” (Freire, El grito manso, 2003). This comprehensive approach not only advocates for a change in teaching practice, but also for a transformation in school culture, oriented toward mutual respect, understanding, and collective well-being.

II. METHODOLOGY.

This study used a qualitative approach, drawing on theoretical references from González, who stated: "The qualitative approach is ideal for social research, as it seeks to understand phenomena in their uniqueness, exploring the reasons for their current state. It emphasizes the importance of considering the specific and temporal context of the studies, focusing on the individual and recognizing the diversity of realities" (González-Morales, 2003).

To explore the complex dynamics of bullying and its impact on interpersonal relationships and learning processes in educational settings. A qualitative paradigm, rooted in understanding of social phenomena from the perspective of participants and their natural context, stands out for its ability to delve into the nature and root causes of the bullying problem. This approach focuses on describing specific individuals and situations acknowledges the existence of multiple realities, and values the contextual relevance of theoretical frameworks.

The choice of a qualitative paradigm allows for a richer and more detailed understanding of how bullying affects victims, perpetrators, observers, and educators, taking into account the emotional and cognitive effects, as well as the school group and cultural dynamics that influence these processes. Using qualitative methods such as interviews and observations, this study aimed to explore in detail how bullying interferes with learning, affects academic performance, self-esteem, and participation in educational activities.

The method’s design is developed in a dynamic process involving multiple phases, from idea generation and question formulation to data collection and analysis, and the interpretation and reporting of results. This flexible approach allows the researcher to move between data and theory, interacting with the phenomenon under study and building knowledge from participants’ experiences. The research aims to provide a deeper and more specific understanding of bullying behavior in order to identify effective prevention and intervention strategies and promote a safer and more empathetic educational environment.

The critical social approach analyzes bullying within a broader cultural and social framework, considering how prevailing social norms and cultural structures influence students’ interactions and perpetuate the problem. It promotes equality and social justice and encourages students to take an active role in identifying and combating bullying, empowering them to become agents of change. This approach also promotes the development of critical consciousness in students, encouraging them to question social norms, recognize diversity, and resist oppressive structures.

This critical social approach seeks to provide an in-depth analytical perspective that focuses on the underlying roots and structures of bullying and seeks not only to alleviate the symptoms, but also to change the social conditions that contribute to this phenomenon, with the ultimate goal of the research being to promote equality and social justice, leading to transformation through Paulo Freire’s Liberating Pedagogy.

Authors Carr and Kemmis will tell us: “Action research is a form of self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these and the situations within which they take place” (Sandin Esteban, 2003).

Action research can lead to cultural change in educational institutions by promoting values such as empathy, inclusion, and bullying prevention. This approach is characterized by its participatory nature, focusing on translating research into practical, sustainable interventions and actively involving the school community throughout the process.

In this research, the work unit is composed of students and teachers from Nuestra Señora del Carmen School in Pasto. It focuses specifically on 9th and 10th grades, encompassing a total of 107 students and 10 teachers.

Table 1

RELACIÓN CON LA INSTITUCIÓN	Estudiantes	Profesores	Total
Unidad de Análisis	21	5	26

Nota: unidad de trabajo es de tipo no probabilística y a su vez se rige por criterios de selección.

The selection of this unit is based on non-probabilistic criteria and is subject to certain requirements:

•Be part of the Our Lady of Carmen School - Pasto.
•Belong to the 9th and 10th grades.
•Show availability and willingness to participate in research activities.
•Students who have shown signs of being involved in bullying situations, either as aggressors or victims.
•Belong to the College's Piar program.

These selection criteria will help focus the research on a specific sample that will allow for a more precise approach to the phenomenon of bullying in the school context of Colegio Nuestra Señora del Carmen in Pasto.

To carry out the research, three data collection instruments were used:

Structured Interview: This technique will allow for the collection of relevant information through open-ended, standardized questions. Despite its rigidity, a more flexible approach will be adopted to balance structure and exploratory capacity. The interview will be conducted with teachers and students, with prior informed consent from parents for the participation of minor students.

Observation: Direct observation, conducted by the research group, will be used to identify, interpret, and analyze the environment, focusing on interpersonal relationships and learning processes affected by bullying. An observation guide will be developed to avoid bias and ensure the collection of relevant data.

Focus Group: This qualitative technique is used to gather in-depth data on the perceptions, opinions, and experiences of a group of people. Guided by a moderator, participants will exchange ideas and perspectives, allowing for the identification of common patterns and a diversity of opinions. Focus groups offer contextualized and complementary perspectives.

These carefully designed and validated instruments will provide detailed information on the effects of bullying on interpersonal relationships and learning processes, as well as the effectiveness of liberatory pedagogy in this educational context.

III. RESULTS.

The research results are obtained from the designed instruments and are organized according to the specific objectives suggested by the researchers.

In the first specific objective, it is sought to identify the characteristics of interpersonal relationships of 9th and 10th grade students of the Colegio Nuestra Señora del Carmen-Pasto, from 3 categories and each of them is accompanied by subcategories. As the first category we have interpersonal relationships, and the subcategory is the beginning of interpersonal relationships, the second category is characteristics of interpersonal relationships and it is accompanied by two subcategories the values that we possess as human beings and the characteristics of interpersonal relationships, and as the last category refers to the models of interpersonal relationships from two subcategories; typology of interpersonal relationships and social needs of adolescents.

The results of this first objective reveal the fundamental importance of relationships in an adolescent's life. Several categories and characteristics were identified that describe the nature of these interpersonal relationships. When it comes to the beginning of a relationship, it is important to emphasize that these relationships are generally formed in the family environment and in the broader environment (e.g., school or community). Young people view these relationships as centered around shared interests and self-expression, allowing them

to form meaningful connections based on trust and authenticity. Based on the characteristics of interpersonal relationships, students classified them as good, average, and poor.

A good relationship is characterized by empathy, reciprocity, and brotherhood; a poor relationship lacks frequent interaction and trust; and a poor relationship is characterized by misunderstandings and unresolved conflicts. Furthermore, it has been observed that young people's early friendships and relationships are often formed in a supportive and trusting family environment. As they grow older, they strengthen their bonds with peers and other groups, although relationships with teachers often face difficulties due to a lack of trust and intimacy. Overall, this study highlights the importance of fostering healthy and meaningful relationships for young people at home and at school to foster a sense of belonging, trust, and mutual support during this critical stage of human development.

The study's second objective was to describe the teaching strategies used by teachers to improve interpersonal relationships and student learning at the institution where the research was conducted. This was done through two categories: the first, teaching strategies, which is accompanied by four subcategories: conceptualization of teaching strategies, strategies in education and didactics and their contribution to school work, and types of teaching strategies. The second category delved into learning, working from three subcategories: the first, learning epistemology, the second, learning theory, and the third, learning strategies. Data collection was carried out through interviews, focus groups, and observations of five educators.

The analysis of the results for this objective shows that there are significant differences in teachers' understanding of the concept of "teaching strategies." While only two provided a clear definition and focused on adaptive strategies and flexible approaches, others confused the term with pedagogy or methodology. Despite this difference, the interviews show that teachers with a deep understanding also consistently use these strategies in their teaching practice, which is consistent with contemporary educational theory, especially constructivist approaches.

The observations supporting these findings emphasize that teachers with a clear understanding not only have a solid theoretical foundation but are also able to effectively apply these strategies in their teaching practice, demonstrating a deep understanding of content and teaching strategies. In summary, the main findings point to teachers' differing interpretations of the term "teaching strategies," the importance of clearly defining and understanding these strategies to improve pedagogical practice, and the need to integrate theory and practice in teaching to maximize teaching quality. Furthermore, the importance of developing greater theoretical and practical coherence in teaching strategies is emphasized, suggesting that teaching effectiveness can be significantly improved through reflection and ongoing training in innovative and adaptive teaching strategies tailored to the needs of young people. In their teaching practices, teachers differ significantly and require significant needs in their understanding and application of teaching theory.

The importance of further exploration of theory-based teaching approaches is emphasized, as well as the importance of adapting strategies to effectively support students and foster a stimulating environment that accommodates different learning styles and social realities.

In order to meet the third specific objective of establishing the impact of bullying on interpersonal relationships and the learning of students at the institution, where the research was conducted, data collection was conducted through individual structured interviews, a focus group, and an observation guide. Each meeting involved a group of 21 students between the ages of 14 and 17, using dialogue as a tool to initiate an approach and provide guidance on the research. The study is approached from the general category of bullying, exploring three key subcategories: Effects of bullying, Bullies and victims, and Types of bullying.

The in-depth analysis revealed a complex web of perceptions and experiences related to bullying among students. It highlights the urgency of a comprehensive educational approach that not only prevents bullying but also fosters empathy, mutual respect, and peer support. Early intervention and ongoing education are identified as key elements in changing the normal perception of bullying and cultivating a safer and more welcoming school environment for all students.

The instruments used provided a detailed analysis of the bully's characteristics, highlighting their need for dominance and control, and recognized the impact of group dynamics on the attackers' behavior. This broad

approach allows us to understand bullying not only as an individual problem but also as a social phenomenon. The diversity of approaches underscores the importance of adopting multifaceted strategies to address the academic and emotional difficulties caused by bullying, as well as the need for interventions at both the individual and structural levels to create safe school environments that foster learning.

IV. DISCUSSION.

The first objective of the current research highlights the importance of relationships in the personal and emotional development of young people and emphasizes the impact of relationships on emotional, psychological, and academic stability. Referring to a previous study by Yarlaque (2019), the study concluded that interpersonal relationships are the result of several experiential and cultural factors that play an important role in interpersonal relationships.

Melo Delgado and Rodríguez (2020) claims that interpersonal relationships are the social skills for life, which are learned through training, imitation and social molding throughout life, which are developed in the contexts that the adolescent plays as a family and in their relationship with peers. This concept coincides with what was found in the present study where interpersonal relationships are identified as that process that occurs from the first cycle of life, identifying as the first interactions of an individual as a member of a family: parents, siblings, cousins and people such as neighbors and classmates.

Furthermore, it emphasizes the idea that interpersonal relationships are social skills that are learned throughout life through imitation, training, and social modeling. These skills develop in different contexts, such as the family environment and interactions with peers. This concept is consistent with the results of the present study, which examines interpersonal relationships as a process that begins in childhood and includes family members, neighbors, and classmates.

The discussion of the second objective considers various aspects related to educational strategies and practices through four key subcategories. These subcategories highlight the importance of integrating theory and practice in teaching, following Paulo Freire's ideas about educational practice, " School is not a physical space. It is a work environment, a posture, a way of being" (Freire, 2005), in order to significantly impact the teaching and learning process.

Addressing differences of opinion regarding the implementation of educational strategies, highlighting the importance of active participation, cooperation, and the development of social skills, with a focus on reflection and personalization in the application of these strategies.

Focusing on pedagogy and its role in education, it reveals differences among educators regarding its value. While some recognize its importance in transforming teaching into meaningful learning, others view it as merely theoretical and lacking practical applicability. The lack of systematization of Latin American pedagogy and the uncritical adoption of foreign theories are criticized, although the role of pedagogy in fostering critical thinking and personal transformation is recognized, according to Paulo Freire; "True education is praxis, reflection, and action of humankind upon the world in order to transform it" (Freire, 1987).

Teaching strategies are examined, revealing a divide between teachers who adopt innovative methods, such as constructivist, cognitive, and problem-based approaches, and those who prefer traditional methods and resist change. This highlights the diversity of teachers' attitudes and practices toward teaching and suggests the need to promote educational innovation to improve the quality of education.

All in all, the text advocates for an education that effectively combines theory and practice, promotes active participation and the development of social skills, and adopts a critical and transformative pedagogical approach. It also points out the need to overcome resistance to change in order to adopt innovative teaching strategies that can significantly improve education. Clemente Lobato (2006) defines: "Strategies are conscious procedures for addressing a situation effectively, they involve a socially situated response, with a specific character and may include different procedures" which gives quality to education, together, these findings provide a comprehensive understanding of teachers' attitudes and practices towards teaching strategies and provide a valuable starting point for the development of effective educational interventions.

The fundamental key is competency-based training in education, highlighting how to prepare children and young people to face complex problems through the articulation of knowledge. The importance of

continuous assessment to improve and recognize skills is emphasized. In addition, different pedagogical strategies are mentioned. According to Díaz Barriga and Hernández Rojas (2002), "Learning strategies are procedures or sequences of conscious, voluntary, controlled and flexible actions, which become habits for those being taught, whose purpose is learning and problem solving both in the academic field and outside of it".

Some of these are Problem-Based Learning (PBL) and collaborative learning, emphasizing self-learning and the importance of group work to maximize individual and collective learning.

Offering historical and contemporary perspectives on learning, including contributions from Rousseau, William James, H. Ebbinghaus, Piaget, Vygotsky, Bruner, Ausubel, and Freire, each highlighting different aspects of the educational process, from the importance of experience and interaction with the environment to the conceptualization of learning as an active process of knowledge construction.

Finally, the categories of this objective examine learning strategies, highlighting the importance of adapting them to individual students' needs to motivate them and support them, especially those with low academic performance. Emphasis is placed on the goal of enabling students to be autonomous, independent, and capable of learning meaningfully.

The discussion of objective two provides a comprehensive analysis of various facets of modern education, from competency-based training to the application of learning theories and strategies, highlighting the need for an adaptive and reflective pedagogical approach that prepares students for the challenges of the future.

The third objective of the study, which explores the effects of bullying on interpersonal relationships and the learning of 9th and 10th grade students, reveals the complexity and profoundly negative impact of bullying. Through qualitative methods with 21 young people, the various dimensions and consequences of bullying were examined, emphasizing the gap in students' perceptions of bullying, the influence of sociocultural dynamics in perpetuating bullying, and the variety of forms it can take, including cyberbullying. In the study by Rengifo (2021) Rengifo de la Torre, TG (2021). Incidence of bullying on the learning of basic education students. (UT Maná, Ed.) Maná, Ecuador , highlights that "bullying and victims in the context of bullying exhibit distinct characteristics, which allows them to be classified based on their ability to use power, identify the victim, and subdue them. These conditions contribute to the construction of the bully's personality, which manifests itself through various forms of offensive and aggressive behavior".

The findings underscore the urgency of implementing early educational interventions that promote empathy, mutual respect, and peer support to prevent and counteract bullying. Theoretical references such as Gardner (1990), Goleman (1993), and Shapiro (1997) emphasize the importance of early emotional education. They emphasize the need to address the underlying causes of the phenomenon, such as the social and cultural structures that foster discrimination and abuse of power. They also mention the importance of adopting specific strategies against cyberbullying, given its impact on young people's well-being.

The discussion concludes that combating bullying requires a holistic and collaborative approach that involves the entire educational community and goes beyond treating the symptoms, aiming to change the cultural and social norms that normalize it. Values education, along with fostering an inclusive and safe school environment, are fundamental to students' well-being and comprehensive development. Furthermore, it emphasizes the need for psychological support services for victims and bullies, as well as digital skills training to effectively manage cyberbullying.

V. CONCLUSIONS.

In summary, the article highlights the importance that young people recognize and foster interpersonal relationships in order to reinforce positive values and skills acquired in their home and school environments. This approach is essential for preventing conflicts in the development of personality during adolescence, enabling them to face the challenges of daily life with responsibility and respect.

The research underscores the crucial need for a deep understanding of teaching strategies and the effective integration of theory and practice in education. It highlights the variability in pedagogical preferences and methods among educators, emphasizing the importance of reflective and personalized approaches to pedagogy to strengthen interpersonal relationships and foster meaningful learning among students in the study group.

The study emphasizes the critical need to treat bullying as a serious problem that impacts students' emotional well-being, academic performance, and ability to establish healthy relationships. It recommends the implementation of preventive strategies and psychosocial support to effectively address bullying in schools.

VI. ACKNOWLEDGMENTS.

We sincerely thank God for giving us the opportunity to conduct this research, secondly, our parents who gave us life, our families for supporting and sacrificing valuable time so we could advance in our research, and our advisor for accompanying this training process through research and love of education.

A special dedication to María Celeste Cabrera Agreda, a 16-year-old girl who, on September 10 2023, decided to fly to meet her supreme being and stop suffering on this earth to enjoy heavenly paradise.

VII. REFERENCES.

Díaz Barriga, F., & Hernández Rojas, F. (2002). Estrategias docentes para un Aprendizaje Significativo. México, México: Mc Graw Hill. Recuperado el 5 de marzo de 2023, de https://dfa.edomex.gob.mx/sites/dfa.edomex.gob.mx/files/files/2_%20estrategias-docentes-para-un-aprendizaje-significativo.pdf.

Freire, P. (1987). La educación como práctica de la libertad. México, México: Siglo XXI.

Freire, P. (2005). La educación en la ciudad. Mexico, Mexico: Siglo XXI.

Gardner, H. (1990). Inteligencias Múltiples. Nueva York, Estados Unidos: Basic Books.

Goleman, D. (1993). La inteligencia emocional: Por qué es mas importante que el coeficiente intelectual. BdeBolsillo. doi:ISBN13.

González-Morales, A. (octubre - diciembre de 2003). Paradigmas de investigacion en las ciencias sociales. 45(138), 125-135. Revista Islas. Recuperado el 12 de mayo de 2023, de https://studylib.net/doc/25905710/gonzalez-a.--2003-.-paradigmas-de-investigacion-en-las-ci.

Lobato, C. (enero de 2006). EL estudio y trabajo autónomo del estudiante. Métodos y modalidades de enseñanza centradas en el desarrollo de competencias. País Vasco, España: Alianza Universidad. Recuperado el 5 de marzo de 2023, de https://www.researchgate.net/publication/279506038.

Melodelgado Acosta, Angela Carolina; Rodríguez Martínez, María Alejandra. (2020). Habilidades sociales en niños y adolescentes Una Revisión Teórica. Pasto, Nariño, Colombia: Universidad Mariana.doi:https://revistas.umariana.edu.co/index.php/BoletinInformativoCEI/article/view/2200.

Sandin Esteban, M. P. (2003). Investigación Cualitativa en Educación. Fundamentos y Tradiciones. Barcelona, España: Mc Graw Hill. Recuperado el 24 de mayo de 2023, de https://luisdoubrontgschool.files.wordpress.com/2021/03/paz-sandin-esteban_investigacion-cualitativa-en-educacion_-.pdf.

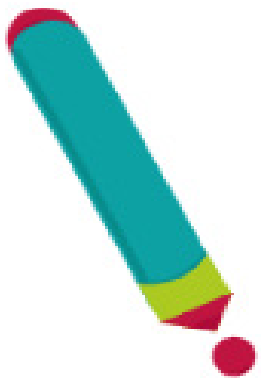
Shapiro, L. E. (1997). La inteligencia emocional de los niños. México, México: Vergara Editor, S.A.

Yarlaque Mori, M. M. (18 de Diciembre de 2019). Propuesta de Estrategias de Habilidades Sociales basada en la Teoría del Aprendizaje Social de Bandura, para Mejorar las Relaciones Interpersonales en las Estudiantes Universitarias de la Especialidad de Educación Inicial – Lemm – Fachse-Unprg-2017. Recuperado el 8 de marzo de 2024, de https://hdl.handle.net/20.500.12893/6153.

STUDIES OF ECOPEDAGOGY IN THE MANAGEMENT OF ORGANIC AQUACULTURE WASTE IN LA LAGUNA DE LA COCHA.

Jennifer Gómez Hernández
Lidia Mercedes Oviedo

UNIVERSITY OF NARIÑO



DOI: https://doi.org/10.22267/huellas.251121.27

Traducción: Cristina Eugenia Ortiz Serrano

Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 15 de abril 2024

Abstract.

Eco-pedagogy emerges as a promising strategy to raise awareness among producers and promote sustainable practices, while aquaculture is consolidating as an important economic activity in Cocha Lagoon or Lake Guamuez (Nariño). However, negative environmental impacts have arisen due to the inadequate management of organic aquaculture waste. This article is based on a literature review conducted through major academic databases such as Scopus, Web of Science, ScienceDirect, and Google Scholar, where principles of eco-pedagogy are presented, based on the harmony between humans and nature, ecological awareness, and the dialogue of knowledge. Additionally, concepts of a theoretical-practical methodology grounded in community environmental education, experiential learning, participatory research, and the training of environmental leaders are explored. Although specific literature is limited, the analyzed cases highlight the importance of involving communities and adopting public policies that complement eco-pedagogy to achieve profound cultural change and effective waste management. It is concluded that further research is needed to critically analyze the application of these approaches and their integration with innovative technologies to ensure the long term sustainability of aquaculture in Cocha Lagoon.

Keywords: Organic waste, rainbow trout, eco-pedagogy, Laguna de la Cocha.

Resumen.

La ecopedagogía emerge como una estrategia prometedora para sensibilizar a los productores y fomentar prácticas sostenibles, mientras que la acuicultura se consolida como una importante actividad económica en la laguna de La Cocha o Lago Guamuez (Nariño). Sin embargo, se han generado impactos ambientales negativos por el inadecuado manejo de residuos orgánicos acuícolas. Para desarrollar el artículo, se llevó a cabo una revisión bibliográfica en las principales bases de datos académicas, como Scopus, Web of Science, ScienceDirect y Google Scholar, donde se exponen principios de la ecopedagogía, basados en la armonía del ser humano-naturaleza, la conciencia ecológica y el diálogo de saberes. Además, se exploran conceptos de la metodología teórico-práctica sustentada en la educación ambiental comunitaria, aprendizaje experiencial,

ESTUDIOS DE LA ECOPEDAGOGÍA EN EL MANEJO DE RESIDUOS ORGÁNICOS ACUÍCOLAS EN LA LAGUNA DE LA COCHA.

investigación participativa y formación de líderes ambientales. Si bien la literatura específica es limitada, los casos analizados resaltan la importancia de involucrar a las comunidades y adoptar políticas públicas que complementen la ecopedagogía para lograr un cambio cultural profundo y una gestión integral de residuos. Se concluye que se requieren más investigaciones que analicen críticamente la aplicación de estos enfoques y su integración con tecnologías innovadoras para garantizar la sostenibilidad de la acuicultura en la Laguna de La Cocha.

Palabras Clave: Residuos orgánicos, trucha arcoíris, ecopedagogía, Laguna de la Cocha.

I. INTRODUCTION.

The Laguna de la Cocha or Guamuez Lake is located in the village of El Encano, municipality of Pasto, department of Nariño, Colombia. It is a valuable and emblematic ecosystem that faces environmental challenges due to anthropogenic activities in the region, especially aquaculture. The economic activity is constantly growing, becoming a source of food and economic income for the local communities, but, at the same time, it has generated negative impacts on the aquatic ecosystem.

Numerous studies (López and Madroñero, 2015; González et al., 2018; González et al., 2022; Burbano-Gallardo et al., 2021) have evidenced the detrimental effects of aquaculture on water quality, sediment acumulation, and bacterial proliferation, one of the main reasons is the inadequate management of organic waste created during production. This poor management can cause adverse impacts on aquatic ecosystems, which underscores the urgent need to implement strategies to optimize the management of aquaculture organic waste in aquacultural practices .

Faced with this problem, it is essential to implement environmental education strategies aimed at aquaculture producers in order to raise awareness about the importance of adopting sustainable techniques or

activities that minimize environmental damage and ensure the long-term sustainability of aquaculture. In this context, eco-pedagogy emerges as an educational approach focused on environmental awareness and sustainability, becoming a promising tool to address aquaculture organic waste management in La Cocha Lagoon.

The article presents a literature review that delves into the environmental challenges facing this valuable aquatic ecosystem, the research that has documented the impacts of aquaculture, and the potential of eco-pedagogy as an educational strategy to promote the sustainability of this growing economic activity in the region.

II. METHODOLOGY.

To carry out this literature review, a search was conducted in academic databases such as Scopus, Web of Science, ScienceDirect, and Google Scholar, using keywords such as "eco-pedagogy", "aquaculture organic waste", "Laguna de la Cocha" and "environmental education". Scientific articles, theses, technical reports, and official publications related to the topic of the study were selected, giving priority to those that specifically addressed the context of Laguna de la Cocha and the implementation of eco-pedagogical approaches in aquaculture waste management.

In addition, a manual review of the references cited in the selected documents was carried out in order to identify additional relevant sources. Studies published from 1998 to the most recent studies, the last one from 2023, were included, which present significant contributions to the research topic.

III. PRINCIPLES OF ECOPEDAGOGY.

Eco-pedagogy is based on the coexistence between human beings and nature, promoting a relationship of respect, care, and appreciation of the natural environment (Gadotti, 2008; Gutiérrez and Prado, 2015; Leff, 2004). This educational approach seeks to develop an ecological awareness in individuals, fostering the understanding of natural systems and their interdependence with anthropic activities. Likewise, eco-pedagogy promotes community participation, the dialogue of empirical knowledge, and the collective construction of knowledge to address local environmental issues (López, 2017, p. 24).

Eco-pedagogy is based on the following key principles:

1. **Coexistence between human beings and nature:** Recognizes the interdependence between human beings and the natural environment, promoting a relationship of mutual respect and care.

2. **Ecological awareness:** Promotes the understanding of natural systems, their cycles, and the importance of preserving them for human well-being and environmental sustainability.

3. **Community participation:** Involves local communities in the educational process, valuing their traditional knowledge and promoting their empowerment in decision-making.

4. **Dialogue of knowledge:** Promotes the exchange of knowledge between different actors, integrating scientific knowledge and traditional knowledge of the communities.

5. **Collective construction of solutions:** Encourages collaboration and the joint search for solutions to environmental challenges, through participatory and inclusive processes.

These principles constitute the philosophical and practical basis of eco-pedagogy, guiding its implementation in different contexts and environmental problems, including organic waste management in aquaculture.

IV. ECOPEDAGOGICAL METHODOLOGIES APPLIED TO ORGANIC WASTE MANAGEMENT.

Eco-pedagogy proposes various methodologies and strategies to address aquaculture organic waste management in a participatory and sustainable manner. Some of these methodologies are listed below:

1. **Community environmental education:** Involve fishermen, farmers, and surrounding communities in training programs on the impact of aquaculture organic waste and best practices for its management. These programs foster awareness and commitment to care for the lake ecosystem (Mayer, 1998; Sauvé, 2010; Castro and Gómez, 2019).

2. **Experiential learning:** implement practical organic waste management projects, such as composting, bio-fertilizers, or silage, in which participants can acquire knowledge and skills through direct experience (Espinar and Vigueras, 2019, p. 8-11).

3. **Participatory research:** involves local communities in the research and monitoring of the environmental impacts of organic aquaculture waste, encouraging the exchange of empirical knowledge and the collective development of solutions (Chevalier and Buckles, 2019).

4. **Training of environmental leaders:** guiding community leaders and producers in environmental management, eco-pedagogy, and organic waste management, enabling them to act as agents of change and multiply the knowledge they acquired (Rojas, 2013, p. 70-72).

These methodologies foster a participatory, experiential, and contextualized approach, tailored to the specific realities and needs of the communities involved in aquaculture in La Cocha Lagoon.

V. CASE STUDIES.

Although available information is limited, some studies carried out in the context of Laguna de la Cocha highlight the importance of environmental education, community involvement , and responsible management of economic activities to achieve a sustainable balance between the development and conservation of this ecosystem.

Ecopedagogy is significantly linked in different aquaculture studies, as suggested by the research of Molina, Andrade, and Bravo (2023) who have proposed guidelines and strategies for sustainable environmental management and management for sustainable aquaculture, as well as the efficient use of water and the use of waste for the production of compost. (p.5)

The researchers state that the implementation of these guidelines not only seeks to reduce the environmental impact in La Cocha Lagoon but also to promote ecological awareness and community commitment, fundamental principles of eco-pedagogy.

Complementing this vision, Portillo, Ruáles et al. (2021), explored alternatives to give value to the waste generated by the production of rainbow trout in the village of El Encano, finding the willingness and interest of the actors of the aquaculture chain for processes of the utilization of these wastes, which represents an opportunity to develop a more circular and sustainable economy around fish farming (p.49).

This approach is aligned with the eco-pedagogical methodology since it promotes the valorization of resources through practical learning in environmental management and strengthening of knowledge.

Similarly, Rúales, Portillo, Burgos et al (2020), analyzed in depth the potential of valorizing the various residues of trout production, such as skin, viscera, and skeletons, through the development of new products such as fishmeal and oil (p. 341-345). (p. 341-345).

He authors emphasize that these alternative uses could represent an important socioeconomic contribution for producer families, generating new income and jobs, so the practical and participatory approach is essential, as it seeks to empower communities through knowledge and joint action.

The integration of eco-pedagogical principles and methodologies in aquaculture activities not only allows for more sustainable resource management but also strengthens the social and economic fabric of the communities involved. The adoption of these practices can lead to a profound cultural change towards greater environmental responsibility and sustainable development in the region.

According to the above, Jurado (2020); proposes a comprehensive eco-pedagogical strategy that approaches environmental education from a community and participatory perspective, based on the creation of a community unit focused on eco-pedagogy, the development of leaders trained in sustainable environmental projects and the integration of pedagogical projects with an environmental approach in the educational curriculum. Likewise, Botina and Guerrero (2021) suggest promoting cooperative work by

incorporating topics related to the Laguna de la Cocha Ramsar wetland into the educational curriculum, along with the development of eco-pedagogical guides and outings (p.5).

These initiatives seek to foster community awareness and commitment to the conservation of the ecosystem.

On the other hand, the creation of an eco-educational ecotourism complex in Laguna de la Cocha has been proposed with the objective of harmonizing eco-pedagogy, environmental conservation, responsible tourism, and community development (Díaz del Castillo, 2015, p. 12). Although it faces funding and inter-institutional coordination challenges, this proposal seeks to contribute to the preservation of the natural and cultural heritage of the region.

Another relevant study was the classroom project "La Cocha, the Environment and Me" by Mora and Morán (2015) developed with eighth-grade students in Pasto. This research sought to sensitize participants on the importance of caring for and protecting La Cocha Lagoon, framed in a qualitative and action-research methodology, the project generated attitudes of belonging and valuing the natural and cultural spaces of the region (p. 54).

The authors highlight the need to promote ecological campaigns that raise awareness about the cycles of nature, helping to understand and manage environmental and social risks. These types of contextualized educational initiatives lay the groundwork for greater community awareness and commitment to the conservation of Laguna de la Cocha.

Finally, in the Burgos news story (2022) broadcast by Radio Nacional de Colombia, Professor Efrén Muñoz has implemented an innovative eco-pedagogical strategy in Laguna de la Cocha using photography as an educational tool. Students go on field trips to explore and document the biodiversity of the lake ecosystem, which has increased student and community awareness despite challenges such as access, resources and lack of awareness.

These studies highlight the importance of environmental education, community participation, and responsible management of economic activities to achieve a balance between the development and conservation of the Laguna de la Cocha ecosystem.

To achieve truly sustainable development, it is essential to promote collaboration and joint work among all stakeholders, including local communities, environmental authorities, the productive sector, and academia. The need for further research and responsible approaches to ensure the sustainability of activities without compromising the local ecosystem is emphasized.

VI. ANALYSIS.

Based on the literature review, it is possible to identify strengths and limitations in the implementation of environmental education through eco-pedagogy in the management of organic aquaculture waste in Laguna de la Cocha. The various studies propose an integral and multidimensional approach to achieve a balance between development needs and the conservation of this important ecosystem.

Based on the literature review, several strengths and limitations can be identified in the implementation of environmental education through eco-pedagogy for managing organic aquaculture waste in Laguna de la Cocha. The studies reviewed advocate for a comprehensive and multidimensional approach aimed at balancing developmental needs with the conservation of this vital ecosystem.

One of the key elements that emerges from the review is the relevance of strengthening the processes of environmental education and awareness, actively involving the local community; therefore, eco-pedagogical strategies are proposed that are distinguished by their participatory and contextualized approach, such research promotes the active participation of local communities and the valuation of their traditional or empirical knowledge. These strategies seek to create community units focused on education for sustainability, develop environmental leaders, and link wetland-related issues in educational programs. These initiatives aim to foster a greater sense of belonging and commitment of the population to the protection of the lagoon.

Based on the literature review, it is possible to identify strengths and limitations in the implementation of environmental education with the help of eco-pedagogy in the management of organic aquaculture waste in Laguna de la Cocha. The various studies propose an integral and multidimensional approach to achieve a balance between development needs and the conservation of this important ecosystem.

In addition, eco-pedagogy fosters ecological awareness and respect for the natural environment, fundamental

aspects to address the environmental challenges associated with aquaculture in Laguna de la Cocha by promoting a harmonious relationship between humans and nature, laying the groundwork for a deep and lasting cultural change, however, some limitations and challenges to consider are identified the lack of research makes it difficult to evaluate their effectiveness and learning from these eco-pedagogical approaches, Further study of these case studies and analysis of medium and long term results would allow extracting key lessons to strengthen and replicate these initiatives in other similar contexts, thus enriching knowledge about the transformative potential of eco-pedagogy in the sustainable management of fragile ecosystems such as La Cocha Lagoon.

At the same time, studies address the importance of implementing responsible management practices in the economic activities surrounding the ecosystem; in particular, the aquaculture activity has proposed guidelines and strategies for sustainable environmental management for fish farming, such as the efficient use of water and the use of the waste generated. Likewise, innovative alternatives have been explored to valorize these wastes, generating new products and income opportunities for the producing communities, in favor of a more circular economy.

Taken together, these studies reveal that an integrated approach, combining environmental education, responsible management of economic activities, and participatory governance, is essential to achieve the required balance between the demands of development and the conservation of the invaluable Laguna de la Cocha.

Consequently, it is necessary to consider the interrelationship between eco-pedagogy and aquaculture waste management, taking as a reference the works that coincide in pointing out the need to promote greater articulation and coordination among the various actors involved, including local communities, environmental authorities, the productive sector, and academia, who consolidate initiatives such as the creation of ecotourism and eco-pedagogical complexes that seek to harmonize different interests and approaches to achieve truly sustainable development in the region, the productive sector and academia, who consolidate initiatives such as the creation of ecotourism and eco-pedagogical complexes that seek to harmonize different interests and approaches to achieve truly sustainable development in the region, preparing future generations to face environmental challenges with responsibility and knowledge.

VII. RECOMMENDATIONS.

It is necessary to promote research that critically and rigorously evaluates the effectiveness of eco-pedagogical approaches in the management of organic aquaculture waste in Laguna de la Cocha. This will allow the identification of good practices, lessons learned and areas for improvement.

While eco-pedagogy promotes participatory and contextualized approaches, it is also important to explore the integration of innovative technologies that complement these strategies, such as waste treatment systems, and bio-reactors, among others. This can improve the efficiency and sustainability of the proposed solutions.

Environmental authorities and decision-makers must incorporate the principles of eco-pedagogy in the hands of environmental education in policies and programs related to aquaculture and waste management. This will ensure a sound policy framework to support and promote these initiatives in the long term.

Collaboration among key stakeholders such as local communities, environmental authorities, the productive sector, academia, and non-governmental organizations is crucial for the success of eco-pedagogical strategies. These alliances will make it possible to take advantage of diverse knowledge and resources.

It is essential to identify and train community leaders who can act as multiplier agents of eco-educational practices and sustainable management of organic aquaculture waste. These leaders will be fundamental in promoting long-term cultural change.

Incorporating content related to eco-pedagogy and sustainable waste management into school curricula and technical and university training programs will raise awareness among new generations from an early age.

VIII. CONCLUSIONS.

Eco-pedagogy has proven to be an efficient methodology to address the environmental challenges associated with the management of organic aquaculture waste in aquatic

ecosystems, and its educational approach can foster both environmental awareness and collective action within communities, promoting the adoption of sustainable practices that benefit the ecosystem and its inhabitants.

To achieve significant cultural change, it is essential to complement eco-pedagogy with rigorous scientific research, the adoption of innovative technologies, and the establishment of effective public policies. This integrated, multidisciplinary approach will not only allow environmental problems to be addressed more effectively but will also facilitate the long term sustainability economic development of the region.

Finally, local capacity building through the training of community leaders and the implementation of formal education programs is crucial to empower communities. This process will not only facilitate proper waste management but it will also contribute to the conservation of the Laguna de la Cocha ecosystem, ensuring its preservation for future generations and fostering a collective sense of responsibility towards the environment.

IX. REFERENCES.

Burbano-Gallardo, E., Duque-Nivia, G., Imues-Figueroa, M., Gonzalez-Legarda, E., Delgado-Gómez, M., & Pantoja-Díaz, J. (2021). Efecto de cultivos piscícolas en los sedimentos y la proliferación de comunidades bacterianas nitrificantes en el lago Guamuez, Colombia. Ciencia y Tecnología Agropecuaria,22(2), e1581.

Molina, V., Andrade, O., y Bravo Ibarra, C. (2023). Estrategias de gestión y manejo ambiental para empresas dedicadas a la producción acuícola en la laguna La Cocha, departamento de Nariño, Colombia. Letras ConCiencia TecnoLógica, (20), 5-14. https://doi. org/10.55411/26652544.238.

Burgos, D. (2022). Efrén Muñoz, el profesor que enseña la biodiversidad de Nariño a través de la fotografía. https://www.radionacional.co/actualidad/educacion/la-cocha-biodiversidad-que-un-profesor-ensena-con-la-fotografia.

Ruales, K., Portillo, D., Burgos, M., López, J y Tíos, L. (2020). Aporte socio económico y valorización de residuos de trucha en el Encano (Municipio de Pasto). Semestre Económico, 23(55). 331-352.

Jurado, M. (2020). Estrategia ecopedagógica que disminuye el daño ambiental por la acción antrópica en el corregimiento del Encano, municipio de Pasto, departamento de Nariño. [Tesis de maestría, Universidad de Manizales]. Repositorio institucional de la Universidad de Manizales https://ridum.umanizales.edu.co/xmlui/bitstream/handle/20.500.12746/4796/Jurado_Gamez_Osc ar_Jair_2020.pdf?sequence=1&isAllowed=y.

Diaz del Castillo, B. (2015). Eco-Encano: Complejo Educacional Turístico para la potencialización y recuperación del patrimonio ambiental y cultural en la Laguna de La Cocha, Nariño. [Tesis de pregrado, Pontificia Universidad Javeriana]. Repositorio Pontificia Universidad Javeriana. https://repository.javeriana.edu.co/bitstream/handle/10554/18079/DiazdelCastilloKochBibiana2015.pdf?sequence=3.

Portillo Melo, D. M., Rúales Suárez, K. J., Burgos Flórez, M. A., López Macías, J. N y Ríos, L. A. (2021). Estrategias de Planeación para la Valorización Sostenible de Residuos Truchícolas y Camaroneros en Nariño. Revista producción+Limpia, 16(1). 48-61.

Botina Jojoa, J. A y Guerrero Mora, E. Y. (2021). Aspectos educativos-ambientales respecto al humedal Ramsar-Laguna de la Cocha asociados a los servicios ecosistémicos, desde la ecopedagogía con la comunidad educativa de la básica primaria de la Institución Educativa El Encano del Municipio de Pasto. [Tesis Maestría –Universidad de Nariño]. Universidad de Nariño.

Mora, L., & Morán, J. (2015). Proyecto de aula: "La Cocha el ambiente y yo" como estrategia de sensibilización en estudiantes de grado octavo de la Institución Educativa "Luis Delfín Insuasty Rodríguez" INEM, Pasto para propender por el cuidado y protección de la Laguna de la Cocha Nariño. [Tesis Especialización – Fundación Universidad los

Libertadores.]. Repositorio Fundación Universidad los Libertadores. https://repository.libertadores.edu.co/server/api/core/bitstreams/18cdf978-7bad-4443-a355-464c16881f40/content.

González, C. G., Duque, A., & Ángel, D. (2022). Cambios ambientales en agua y sedimentos por acuicultura en jaulas flotantes en el Lago Guamuez, Nariño, Colombia. Acta Agronómica, 71(1). 22-28.

González Legarda, E. A., Burbano Gallardo, E., Aparicio Rengifo, R., Duque Nivia, G & Imues Figueroa, M. A. (2018). Impactos de la acuicultura en los nutrientes del agua y macro invertebrados bentónicos del lago Guamuez. Revista Medicina Veterinaria y Zootecnia Córdoba, 23, (S). 7035-7047.

López, M, y Madroñero, S. (2015). Estado trófico de un lago tropical de alta montaña: Caso Laguna de la Cocha. Ciencia E Ingeniería Neogranadina, 25(2), 21–42.

Gadotti, M. (2008). Educar para a sustentabilidade: Uma contribuição à década da educação para o desenvolvimento sustentável. São Paulo: Editora e Livraria Instituto Paulo Freire.

Gutiérrez, F., & Prado, C. (2015). Ecopedagogía y ciudadanía planetaria. México: Editorial de la Infancia.
Leff, E. (2004). Racionalidad ambiental. La reapropiación social de la naturaleza. México: Siglo XXI Editores.

López, L. (2017). Ecopedagogía. Bogotá: Fundación Universitaria del Área Andina.

Mayer, M. (1998). Educación ambiental: De la acción a la investigación. Enseñanza de las Ciencias: revista de investigación y experiencias didácticas, 16(2), 217-232. https://raco.cat/index.php/Ensenanza/article/view/21530.

Sauvé, L. (2010). Educación científica y educación ambiental: Un cruce fecundo. Enseñanza de las Ciencias: revista de investigación y experiencias didácticas, 28(1), 5-18.

Castro, J. J., Gómez Hernández, M. Y. (2019). “La Educación Ambiental”, un desafío en la construcción del Currículo pertinente para los territorios en Posacuerto. Revista Estudios Latinoamericanos, 44-45, 69-79. Doi: https://doi.org/10.22267/rceilat.194445.25.

Espinar, E y Vigueras, J. (2019). El aprendizaje experiencial y su impacto en la educación actual. Scielo, 1-14. http://scielo.sld.cu/pdf/rces/v39n3/0257-4314-rces-39-03-e12.pdf.

Chevalier, J.M., & Buckles, D.J. (2019). Participatory Action Research: Theory and Methods for Engaged Inquiry (2nd ed.). Routledge. https://doi.org/10.4324/9781351033268.

Rojas Andrade, R. (2013). El liderazgo comunitario y su importancia en la intervención comunitaria. Psicología para América Latina, 25. 57-76.

¿WHY TEACH ENVIRONMENTAL VALUES AT SCHOOL?

Diana Elizabeth Burbano Burbano
Ayleen Coralina Mideros Santacruz

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.28

Traducción: July Liliana Guerrero Espinosa
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 28 de agosto 2024

Abstract.

This article is contextualized within the field of education, establishing links of collaborative innovation with the environmental context; therefore, the main objective was to promote the experience of environmental values such as responsibility, respect and love through the formulation of a classroom pedagogical project in first to third grade students of the Municipal Educational Institution (IEM) Heraldo Romero Sánchez in the city of Pasto. The methodology used was qualitative, which included observation, interviews, information collection and document analysis. The main results show that students have a good attitude towards caring for the environment, particularly in the disposal of solid waste; however, their understanding of environmental care is limited only to this scenario. Regarding environmental values, positive trends were observed related to the values of responsibility, respect and love. Responsibility is associated with human action towards the environment; respect is related to coexistence among students; and love is linked to the care and protection of the natural environment. Finally, the conclusions indicate that it is necessary to strengthen the connection between different values such as respect, responsibility and love to promote a broader vision of environmental care in students throughout their school career; which is why it is important to think about, talk about and put into practice the teaching of environmental values at school.

Keywords: Environmental values, responsibility, respect, love, courage, care for the environment.

Resumen.

El presente artículo se contextualiza dentro del campo de la educación estableciendo vínculos de innovación colaborativa con el contexto ambiental; por lo tanto, el objetivo principal fue fomentar la vivencia de los valores ambientales como responsabilidad, respeto y amor mediante la formulación de un proyecto pedagógico de aula en estudiantes de grado primero a tercero de la Institución Educativa Municipal (IEM) Heraldo Romero Sánchez en la ciudad de Pasto. La metodología utilizada fue de tipo cualitativa que incluyó observación, entrevistas, recolección de información y análisis de documentos. Los principales resultados muestran que los estudiantes tienen buena actitud hacia el cuidado del ambiente, particularmente en la disposición de residuos sólidos; sin embargo, su comprensión del cuidado ambiental está limitada solo a este escenario. En cuanto a los valores ambientales, se observaron tendencias positivas relacionadas con los valores de responsabilidad, respeto y amor. La responsabilidad se asocia con la acción humana frente al ambiente; el respeto se relaciona con la convivencia entre los estudiantes; y el amor se vincula al cuidado y protección del entorno natural. Finalmente, las conclusiones señalan que es necesario fortalecer la conexión entre los diferentes valores como el respeto, la responsabilidad y el amor para fomentar una visión más amplia del cuidado ambiental en los estudiantes a lo largo de su trayectoria escolar; razón por la cual es relevante pensar, hablar y poner en práctica la enseñanza de los valores ambientales en la escuela.

Palabras Clave: Valores ambientales, responsabilidad, respeto, amor, valor, cuidado del ambiente.

I. INTRODUCTION.

Humanity is currently immersed in an unprecedented environmental crisis. In the face of accelerated climate change, pollution, and biodiversity loss, environmental education has become a fundamental tool for strengthening the values and attitudes necessary for building a better future. Addressing the question "Why teach environmental values at school?" reflects a strong participatory interest in the current environmental context, given that the school, as a space for holistic education, plays a crucial role in this transformation process. It is here where students spend a significant amount of time and are receptive to new ideas and behaviors.

Teaching environmental values at school is vital because it addresses a current global issue. Social problems affecting the environment have a global dimension; therefore, they impact not just one part of the world, but the entire planet. Improving environmental conditions is a shared responsibility among all social actors. Achieving the necessary transformation requires the involvement of each individual and the utilization of all their capabilities, demanding a global and organized action to promote

deep changes in human consciousness, thought, and behavior. Encouraging environmental values through environmental education focused on new generations is essential (Nuévalos, 2008).

Environmental values strengthened in school help students develop a sense of responsibility, respect, and love for the planet, and encourage them to take action to care for it (Caduto, 1996). Thus, fostering a culture of environmental awareness from an early age promotes a harmonious balance between human well-being and environmental quality. Additionally, this will allow for the reinforcement of environmental values from the school, an essential activity for defining collective strategies in favor of the environment.

Currently, there is a growing interest in education from a new perspective rooted in environmental values, fostering more responsible, critical, and reflective individuals. As Rojas (2018) states, there is a need to educate individuals who respect the rights of nature and who are capable of expanding their critical and ethical capacities regarding the environment, thereby shaping better individuals for the planet.

A review of the state of the art, from general to specific, shows that according to Castro et al. (2009), it is necessary to foster in children respect, affection, and reverence for nature. This results in adults who are respectful of ecosystem resources and seek solutions that benefit the entire community. Similarly, Eslava et al. (2018) emphasize that educational institutions are where respect and care for ecosystems and natural resources should begin, as these sustain the planet and all its living species.

However, Gómez et al. (2012) point out that educational institutions currently show weaknesses in environmental education and environmental conservation. Since this is a relatively new issue, immediate action is required. Therefore, Cerón et al. (2015) argue that new methodological strategies must be incorporated into teaching-learning processes, prioritizing play and recreational activities to create meaningful, creative, and enjoyable learning environments for individuals.

The theoretical foundation of this research focused on three main variables: teaching-learning processes in schools, the acquisition of values, and environmental education. For the first, Vygotsky (1979) is referenced with his theory of higher psychological processes, arguing that these originate in social life, specifically in the child's active participation in shared activities with peers, and proposes analyzing the development of these processes based on the internalization of specific social practices through dynamics, play, and group association.

Regarding the second variable, Cortina (1998) states that "there is an urgent need to educate in moral values, which can be achieved in various settings such as home, school, family, even on the street or through media" (p.18). Similarly, Trestini et al. (2009) argue that "the importance of education based on values, specifically environmental values, allows for the installation of ethical principles in children, fostering the growth and maturity of moral conscience, which enables individuals to develop habits and behaviors that support the environment" (p.32); these aspects are essential for human existence.

As for the third variable, Cerón et al. (2015) suggest that modern education should be framed as education that includes environmental values, where a new vision of the natural environment and the socioeconomic relationships between people and the environment is emphasized. Educational perspectives from an environmental education course should be transferred to schools under an emerging ecological paradigm. In this regard, Rojas (2018) affirms that environmental education has already acquired an essential dimension and should not be viewed as thematic education, as this would reduce and obscure the reality of everyday life.

Finally, Castillo (2010) emphasizes the need for teachers to propose sustainable ecosystem management plans to ensure dignified living conditions for the population. By understanding the historical interactions between knowledge, beliefs, and the environment, a holistic application of education can critically analyze current problems, achievements, and needs. This will make it possible to develop sustainable strategies that involve the community in preserving and improving their surroundings, thus ensuring a dignified life for all.

The school, as a space for holistic education, has the responsibility to instill environmental education based on values and the attitudes needed to protect the environment (Silva, 2023). Likewise, teachers play an active role in promoting environmental care, which is fundamental for driving the necessary educational transformation, especially within the framework of the competencies defined by the national curriculum regarding environmental education, aiming to form citizens committed to sustainability and socio-environmental balance.

II. METHODOLOGY.

This research followed a qualitative approach, based on the observation and interpretation of reality, which allowed for the analysis and description of the behaviors of both students and teachers involved. According to Hernández et al. (2014), this type of study focuses on understanding social realities from individuals' development within their natural environment to better comprehend the variables and phenomena within their own context.

An action research process was conducted, which led to the implementation of changes and formed an integral part of the research cycle. This is in line with Elliot (2000), who considers action research as a method that gives voice and prominence to participants, enabling them to construct in-depth and contextualized knowledge about their social realities by describing and analyzing daily experiences.

The study population consisted of first to third grade students at IEM Heraldo Romero Sánchez, Carolina campus. These students are in early childhood, a stage when they begin their first interactions with their surroundings and peers, making them a highly relevant focal group for exploring their educational process in environmental values.

Various data collection techniques were employed, such as observation, interviews with students and teachers, classroom observation rubrics, and photographic records, to support and enrich the study for subsequent analysis and discussion.

III. RESULTS AND DISCUSSION.

The findings of this study were obtained after organizing and analyzing the data collected through the aforementioned instruments. In order to better understand the information, a matrix was developed to extract data from both student and teacher interviews. This matrix helped identify analysis categories, emerging themes, and trends, which led to a better understanding of the information gathered.

The first category addressed in this research was environmental values among students. The results show that first to third grade students from IEM Heraldo Romero Sánchez associate environmental care with the management of solid waste, the protection of water bodies, and the general environment. This trend was highly prominent within the first category.

This is a positive trend, suggesting that students are engaging in various activities related to environmental care. Moreover, the emphasis on solid waste disposal is a good indicator of the school community's commitment to the environment. However, a comparison across the three grades reveals that most students associate environmental care exclusively with waste disposal or "picking up trash".

Although associating environmental care with solid waste management reflects a positive shift in attitudes toward environmentally harmful human actions, it also indicates a limited understanding of the broader concept of environmental care. This suggests that students' knowledge may be influenced by the type of environmental education provided by the institution, which is often geared toward cleanup campaigns or reinforced by teachers who emphasize picking up litter to keep classrooms or playgrounds clean.

It is important to highlight that environmental care goes far beyond waste collection. As Matías (2019) notes, teachers can incorporate environmental education initiatives into their teaching practices, establishing strategic alliances with local organizations to promote the practice of environmental values both within schools and the wider community. This approach allows students to develop a more comprehensive understanding that extends beyond their immediate surroundings and includes concepts like ecosystem conservation, biodiversity protection, and sustainable development; dimensions that help expand the notion of environmental care within the school context.

Similarly, Castro et al. (2009) state that "environmental education encompasses knowledge of global issues such as pollution (of water and soil), deforestation, and rational water use" (p. 376). Therefore, teachers should not limit their instruction to theoretical knowledge about these issues but should foster critical and reflective thinking that encourages students to analyze and propose solutions to social problems affecting the environment and to act responsibly and sustainably.

Additionally, the variables of responsibility, respect, and love-core environmental values examined in this study emerge as initial steps toward environmental practices and behaviors within the school. Students are encouraged to adopt responsible habits and behavioral changes that could have long-term positive impacts. Nonetheless, innovative strategies are needed to strengthen students' commitment and empower them to become agents of positive change within their institution, neighborhood, and/or community.

Regarding the subcategory of responsibility, most students expressed negative perceptions of human actions that harm the environment through solid waste pollution. Once again, responsible action is primarily associated with waste collection. Moreover, there appears to be limited action and response concerning the idea of social responsibility for the environment.

In student testimonies, the subcategory of respect was mostly associated with social interactions and coexistence among peers. While it is true that respect begins with others, it should also encompass all forms of life and invite individuals to recognize and embrace differences, strengths, and weaknesses in both themselves and others. This enables individuals to value and be valued, to gain new perspectives, and to act accordingly without harming any living being. Therefore, the results show that respect is being taught more from a social perspective, detached from its environmental dimension.

Some students did link respect with actions against environmental harm such as not damaging plants or cutting down trees. This may reflect some environmental educational practices present in the school, but such practices should be deepened to foster stronger commitments to socio-environmental issues.

Finally, in the subcategory of love, students associated this value with peer relationships and, to a lesser extent, with caring for plants, animals, and the Earth. This indicates a budding connection with the natural environment through small environmentally conscious actions.

Thus, the value of love in schools should go beyond affection and focus on valuing what is loved because it is meaningful and important valuing freely and spontaneously chosen actions. Miranda (2022) emphasizes that within environmental ethics, the value of love motivates individuals to appreciate the interconnectedness of all life forms and to take responsibility for recognizing nature as a being with intrinsic value.

This approach helps reignite one of the most essential human traits: compassion, extending it to the natural world and promoting harmonious coexistence with the environment. In this sense, every life should be valued because it deserves dignity from every one of us; every place should be cherished because we enjoy being there; and the experience of existence and coexistence with other living beings must be respected.

IV. CONCLUSIONS.

In line with the findings, first to third grade students at IEM Heraldo Romero Sánchez demonstrated a favorable attitude toward environmental care, particularly regarding the disposal of solid waste. This was supported by environmental values such as responsibility and love. However, respect, although present, was primarily linked to social coexistence, suggesting a greater emphasis on social rather than environmental aspects.

Students associated love with environmental care, showing a connection with nature through small environmental actions. Therefore, environmental education must strengthen the value of love, encouraging students to value life, freedom, coexistence, and the natural world.

This finding highlights the need to reinforce environmental values like responsibility, respect, and love, to promote a broader vision of environmental education within schools.

V. ACKNOWLEDGMENTS.

We express our deepest gratitude to all the teachers and students of IEM Heraldo Romero Sánchez who actively participated in this research. Thank you for your enthusiasm, commitment, and willingness to share your experiences and knowledge. Your collaboration was fundamental to the development of the project and the achievement of meaningful results.

We also extend our sincere appreciation to the school's administrators and support staff. Your openness, unconditional support, and commitment to environmental education and the promotion of environmental values in the school were key pillars for the success of this research.

V. REFERENCES.

Caduto, M. (1996). *Guía para la enseñanza de valores ambientales.* UNESCO. Libros de la Catarata.

Castillo, R. (2010). *La importancia de la educación ambiental ante la problemática actual.* Revista electrónica educare, 14(1), 97-111.

Castro, A., Cruz, J. y Ruiz, L. (2009). Educar con ética y valores ambientales para conservar la naturaleza. Convergencia, Revista de Ciencias Sociales, 16(50) 353-382.

Cerón, A., Delgado, G. y Benavides, E. (2015). *Desarrollo de valores ambientales a través de una didáctica creativa* [Tesis de Especialización, Fundación Universitaria Los Libertadores]. Repositorio institucional Libertadores. http://hdl.handle.net/11371/634.

Cortina, A. (1998). *El mundo de los valores. "Ética mínima" y educación.* Editorial El Búho: segunda edición.

Elliot, J. (2000). *Investigación acción en educación.* Ediciones Morata: primera edición.

Eslava, R., Zambrano, M., Chacón, E., Gonzales, H. y Martínez, A. (2018). Estrategias didácticas para la promoción de valores ambientales en la educación primaria. *Revista de Investigación, Administración e Ingeniería*, 6(1) 62-69. https://revistas.udes.edu.co/aibi/article/view/1705.

Gómez, A., Ledezma, A. y Robles, Y. (2012). *Fomento de valores ambientales, la responsabilidad, la actitud, el respeto, la tolerancia, el liderazgo, la capacidad de diálogo y escucha a jóvenes entre 12 y 14 años de la institución educativa técnica Tomás Cipriano de Mosquera (iettcm)* [Tesis de especialización, Universidad Católica de Manizales]. Repositorio institucional UCM. https://repositorio.ucm.edu.co/bitstream/10839/514/1/Aura%20Lidia%20Gomez.pdf.

Hernández, R., Méndez, C. y Baptista, P. (2014) *Metodología de la investigación.* Editorial McGraw Hill: sexta edición.

Matías, N. (2019). *Prácticas de valores ambientales y actitudes de conservación del medio ambiente de los estudiantes del nivel secundaria en la I.E "Hans Víctor Langemak Michelsen" del distrito de José Crespo Castillo - Aucayacu 2019 [*Tesis de maestría, Universidad Nacional Hermilio Valdizán]. Repositorio institucional HDL. https://hdl.handle.net/20.500.13080/5885.

Miranda, S. (2022) Ética ambiental: reconocer la otredad de la naturaleza desde el biocentrismo, el amor y la compasión. *Revista Académica Arjé, 5(1)*, 334-352. https://revistas.utn.ac.cr/index.php/arje/article/view/526.

Nuévalos, C. (2008). *Desarrollo moral y valores ambientales* [Tesis doctoral, Universitat de València]. Repositorio institucional UV. http://hdl.handle.net/10550/15379.

Rojas, W. (2018). Formación de valores ambientales: una necesidad irrenunciable. *Naturaleza y sociedad,* 1(1) 26-29.

Silva, L. (2023). *Una mirada a la educación ambiental en el ámbito educativo.* Instituto de Formación Docente de Salto, Rosa Silvestri.

Trestini, M., Talavera, M., y Inojosa, N. (2009). Valores Ambientales en la Formación Axiológica del Venezolano. *Revista Educación en Valores,* 2(12), 49-60.

Vygotsky, L. (1979). El desarrollo de los procesos psicológicos superiores. Editorial Grijalbo: segunda edición.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE DIDACTICS OF DISCIPLINES.

Omar Armando Villota Pantoja
Luz Dary Males Rosero

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.29

Traducción: David Samir Martínez Ortega
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 20 de agosto 2024

Abstract.

Artificial Intelligence (AI) has transformed numerous aspects of society, including education. Its application in the didactics of various disciplines has opened new possibilities for enhancing the teaching-learning process by providing advanced tools that can personalize education, heighten accessibility, and offer new ways to interact with knowledge.

It is essential to recognize that the ethical use of AI requires a restructuring of the communicative relationship between teacher and student. This process must establish a shared linguistic and pedagogical framework that enables education, as a dialogical and formative process, rather than merely a transmission of information. The ethical training of those who use it is crucial, making it important to analyze the impact of artificial intelligence on the didactics of disciplines. This will influence how students acquire knowledge and skills, achieving more personalized and effective learning tailored to each student's individual needs. It is vital to understand how artificial intelligence can transform educational processes by providing new teaching and learning opportunities, and to overcome any fear regarding its use by teachers, students, administrators, or parents.

This article aims to explore the impact of artificial intelligence on the teaching of various disciplines and to analyze the advantages and disadvantages of its implementation in the educational field. First, it provides a brief introduction to Artificial Intelligence and its relationship with education. Then, it explores the different approaches and applications of artificial intelligence in teaching specific disciplines. Next, it analyzes the benefits and challenges of its integration in the classrooms. Finally, it presents conclusions regarding the impact of artificial intelligence on the didactics of disciplines.

Keywords: Artificial intelligence, didactics, teaching, advantages, education.

Resumen.

La Inteligencia Artificial (IA) ha transformado numerosos aspectos de la sociedad, y la educación no es una excepción. Su aplicación en la didáctica de diversas disciplinas ha abierto nuevas posibilidades para mejorar el proceso de enseñanza-aprendizaje, proporcionando herramientas avanzadas que pueden personalizar la

EL IMPACTO DE LA INTELIGENCIA ARTIFICIAL EN LA DIDÁCTICA DE LAS DISCIPLINAS.

educación, mejorar la accesibilidad y ofrecer nuevas formas de interacción con el conocimiento.

Necesariamente, se debe reconocer que el uso ético de la IA, requiere de la reestructuración de la relación comunicativa entre el profesor y el estudiante, proceso en el cual, debe establecerse un código lingüístico en común, que permita educar, no transmitir información. La formación ética de quien la utiliza del tal manera que es importante analizar el impacto de la inteligencia artificial en la didáctica de las disciplinas, ya que esto influirá en la forma en que los estudiantes adquieren conocimientos y habilidades, para lograr un aprendizaje más personalizado y efectivo, adaptado a las necesidades individuales de cada estudiante, en el cual se reconozca la importancia de comprender cómo la inteligencia artificial puede transformar los procesos educativos, brindando nuevas oportunidades de enseñanza y aprendizaje y no tener mido a la utilización que se haga de ella por parte de profesores, estudiantes, directivos o padres de familia.

Este artículo tiene como propósito explorar el impacto de la inteligencia artificial en la enseñanza de diversas disciplinas, así como analizar las ventajas y desventajas de su implementación en el ámbito educativo, presentando inicialmente una breve introducción a la Inteligencia Artificial y su relación con la educación, para posteriormente abordar los diferentes enfoques y aplicaciones de la inteligencia artificial en la enseñanza de disciplinas específicas y así lograr un análisis de los beneficios y desafíos que conlleva su integración en las aulas y finalmente, se expondrán algunas conclusiones acerca del impacto de la inteligencia artificial en la didáctica de las disciplinas.

Palabras Clave: inteligencia Artificial, didacticas, enseñanza, ventajas, educación.

Didactics and its relation to Artificial Intelligence.

Artificial Intelligence (AI) refers to an activity within the field of Cognitive Sciences that focuses on the study of knowledge acquisition and how this knowledge relates to intelligence. Didactics, on the other hand, is the theoretical domain of Pedagogy that deals with the strategies and models used to make teaching and learning processes effective and productive.

It studies teaching systems from both an internal perspective (analysis of the processes that generate learning) and an external perspective (the social, cultural, and institutional factors surrounding educational institutions). It models comprehension and the ways in which we learn; it prescribes techniques, strategies, and instructional procedures that have positive effects on learning. Fundamentally, it constructs knowledge by means of the analysis, interpretation, and, where possible, generalization of ideas contributed by numerous sciences or diverse disciplines (Mieles Barrera, 2024).

If both fields are compared, their similarities and differences, their limits of application, their potentialities, and their specific contributions, as well as the limitations of their reciprocal contributions, become clear. AI focuses on modeling and creating intelligent artifacts without implementing a specific approach to the problem of teaching. In contrast, didactics is the discipline that focuses on the methods and techniques for teaching and learning in different educational contexts, which allows for the efficient integration of AI into the educational process (Reynosa et al., 2020).

Both fields have often been used inversely: There have been attempts to solve teaching problems by creating artificial subsystems with well-crafted cognitive processes, without understanding education, the theories that explain the educational process, or the didactics used in the communicative process that are consolidated through the practice of didactics. Nowadays, the integration of artificial intelligence into the didactics of disciplines represents a significant challenge for education.

Principles of didactics.

Didactics exist, in part, because people cannot be taught elements in a disorderly form. Besides, they not only need to know things but also how to use and apply them in practice. In other words, it is not only instructional training that is required but also formative training, as Comenius stated in the 17th century in his work Didactica Magna (1638) when he spoke of the need to holistically educate the future young citizen within the bosom of their family and community. In fact, one of the first great pedagogues and didacticists, Jean Pleynet (1499–1558), titled his work: "True and Clear Instruction for Educating Children and Beginners in Morality, No Less Beneficial for Teachers than for Students."

The goal of any discipline or subject is for individuals to learn and understand its complexities, engage in critical reasoning, and develop creativity. Achieving this requires more than the mere accumulation of information. It involves the integration of various dimensions of knowledge. In this context, Bloom's Taxonomy offers a valuable framework, it begins with knowing (the initial level), proceeds with various types of knowing how (observing, applying, analyzing, synthesizing, generating, and behaving in a certain way consistently), and finishes with knowing how to be (the highest level, where both knowing and knowing how have been successfully integrated). Additionally, we must consider the values that arise and act in accordance with them. Above all, we must manage our emotions to achieve this.

The Intersection of Didactics and Artificial Intelligence.

Didactics is defined as a scientific and pedagogical discipline applied in the classroom; thus, pedagogy and didactics maintain a close complementary relationship, although there are significant differences. According to C. Pérez, didactics is: "A distinct discipline with its own characteristics: it focuses on the education of individuals and is particularly concerned with the methods and processes through which learning occurs, and with how to organize teaching resources to achieve greater effectiveness in this co-education, taking into account the intellectual characteristics of the students, the content, and the instructional process as a whole".

From an active-participatory perspective of didactics, the teacher, derived from "docere" (to teach), is the one who teaches but also the one who learns the most in this process of continuous improvement through co-learning with colleagues and students. The term "dicere" refers to the learner, who can take advantage of quality teaching to understand themselves and respond to the ongoing challenges of a constantly changing world.

From this perspective, didactics is a discipline of a pedagogical nature, guided by educational purposes, committed to improving all human beings through the understanding and continuous transformation of socio-communicative processes, with the appropriate adaptation and development of the teaching-learning process.

Artificial Intelligence (AI), that is, the intelligence and techniques of cybernetics, is used to create entities capable of solving problems that require mental activity or manifest within the same paradigm as human beings (Salazar-Reyes et al., 2024). The best current applications of AI are expressed through its ability to support teachers

in planning and reorganizing their actions and facilitating personalized learning. Depending on the various approaches taken throughout the history of pedagogy, there exist different teaching methods, four of which include: responding to the formulation of educational objectives, the content to be taught, the procedures and teaching methods, and the conditions under which teaching will take place.

From the perspective of the contributions that artificial intelligence can make to didactics, the fact that new tutorial systems are intelligent enough to represent learning from an appropriate diegetic perspective will enable their use in a wide variety of learning situations (Niebles Carbonó, 2024).

Current Applications of Artificial Intelligence in Teaching.

The starting point is the following question: Is artificial intelligence useful in teaching? On the one hand, it could be affirmed that it is, as it "assists in the search and selection of information based on the user's actions with relevance and personalization, supports the process of knowledge inquiry, and diagnoses the technological and didactic situation, typically through the explicit representation of knowledge from various domains" (Lara, 2011).

Once a pattern is identified, AI can respond to situations by making decisions. Currently, a range of applications coexist across different educational levels. For example:

1.Puzzles. There are numerous websites such as "mathematical puzzles" (UNED) or "ACERTIJOSPARECEBONITOCOM" that stand out among others, like Antitesis, due to the variety of themes available (matchstick problems, logic problems, some involving ingenuity, some mathematical, interactive activities, easy puzzles, among others).

2. C-PAK (Computer-Based Program for Introduction to Acceleration and Kinematics). It was developed at Texas A&M University and is aimed at university students from various programs related to the scientific and technical branches of agri-food studies.

Ultimately, as will be discussed further later, tools like artificial intelligence pose, in the opinion of the authors of this work, exciting challenges to overcome in their application to the didactics of any discipline. However, on the other hand, the immediacy and personalization they must provide may cause them to "compete" with the true formative "spark" that must be guided by those who lead: the teachers.

3. Intelligent Tutoring Systems.

It has been demonstrated that one of the most effective learning methods with new technologies is the use of Intelligent Systems (I.S). For this to occur, opportunities must be provided through the S4 framework, which is based on the feedback provided by the S.I. Not all S.I. are suitable for generating learning opportunities; only those that utilize the theory of intelligent tutoring, known as Intelligent Tutoring Systems (ITS), are effective. ITS play the role of a human tutor and interact with the student to offer maximum pedagogical support for the development of the learning process within a specific system or environment, adapting to the student's needs and characteristics. Therefore, an ITS consists of two fundamental modules. First, there must be a pedagogical model that helps control the flow of learning, detect problems, and adapt the system to the student. Second, there must be a domain model (Task Model), which encompasses the knowledge about the content to be taught.

The system interprets the student's knowledge through prior experimental validation which determines the meaning attributed to the "signals" obtained through the techniques used in the interface (from verbalization to navigation patterns). Hence, ITS are based on theories such as the study of student models (profiling and monitoring), tutoring models (which organize interventions and thus directly influence the learning flow), and expert systems (due to their tutoring nature and other aspects involving the learner, the system and a shared plan of objectives).

Adaptive Learning Platforms.

Descriptive and predictive analyses from a learning perspective enable the analysis of data related to a specific educational context using various sources (PBL, self-assessment questionnaires, eye-tracking techniques, learning analytics), including both general demographic data (age, gender, score ranges in different disciplines) and highly specific procedural data from the learning process itself. The platform is responsible for conducting an initial descriptive and predictive analysis using different sources, considering two types of methodologies, as data mining techniques are limited if prior data is not available for the design of the hyper-object.

Once information is obtained through a methodology inverse to the traditional paradigm, such as Problem-

Based Learning (PBL), the platform automates and enriches it, analyzing users' procedural records and assisting the tutor in making meaningful inferences about the learning process that would not be feasible through mere observation of classroom behavior. This approach provides the tutor with a richer and deeper understanding of the activities and the learning process itself. Underestimating this approach would be equivalent to disregarding the potential of technology to collect and analyze large amounts of complex information, as well as neglecting the research aspect of learning science through a wide range of techniques associated with adaptive learning, which are abundant in this application.

Benefits and Challenges of Integrating Artificial Intelligence in Didactics.

A study published in the international journal Computers in Human Behavior has explored what teachers know about the pros and cons of this type of work and how their knowledge affects their decision-making regarding the importance of developing students' communicative competence. The data obtained show that 91% are aware of the benefits of implementing these exercises, although 63% are accustomed to using automated tools. However, 81.5% of teachers believe that non-face-to-face quality meetings do not influence students' transversal competencies, and only 10.6% disagree with this statement. In summary, 45.4% of teachers predominantly choose the online format (with a lower teaching load in the blended online modality), 33.6% select the blended online modality, and 21.0% represent teachers who choose only the face-to-face modality for delivering their subjects. No teacher selects the solely blended face-to-face modality.

Research. Instructors spent an average of 5 hours to planning and designing the practice ($M = 5.32$; $SD = 4.44$) and 4 hours to its execution. There was no evidence of a statistically significant effect between the hours dedicated to planning and the results of the evaluated indices. The variety of multimedia resources used had a significant impact ($t = 2.68$; $p = .008$) on the satisfaction shown by students. One of the main conclusions is that teachers rarely use the possibilities offered by AI to consider students' characteristics when designing learning materials, including different responses, recommendations, adaptations, and risk predictions. In this area, the use of information collection and processing techniques by teleodidactic environments for adaptation does not offer advantages beyond traditional study, nor, consequently, for the individualized adaptation of students with learning difficulties or slower learning paces.

Advantages for Students and Teachers.

Officially, a collaboration agreement was signed in 2006 between the Master's Degree in Teacher Training for Secondary Education, Baccalaureate, University, and Compulsory Secondary Education – Specialization in Technology and Computer Science – and the Didactics and Multimedia for Training research group at the University of Santiago de Compostela. These training courses, whether restricted to a specific area of knowledge, such as in this case the didactics of disciplines, or broader, such as the development of knowledge in ICT tools for pedagogical use in the classroom, or even oriented toward the development of research projects from practice, contribute to improving teachers' technological competence.

Out of responsibility, teachers must seek, from the resources available in their context, the tools and methodologies that best suit the specific characteristics of the learners, the subjects and content to be taught, and the family and social contexts. Failing to do so risks undermining the competence in their formative role for future sustainability: obtaining resources through production, adaptation, new uses, or transfer; or not supporting innovation through research jeopardizes the progress of teacher and social improvement. Carrying out activities that promote effective learning and authentic, competency-based assessments, and documenting the results obtained to compare, interpret, and justify the decisions made in planning, implementation, and evaluation for potential external reviewers or future self-assessment, are essential.

Ethical and Privacy Challenges.

Enhancing creativity, autonomy, and so on, as already mentioned in previous sections. In this regard, it is essential not to lose sight of the connection between technology, teaching practices, and shared ethical values. For instance, it presents an ethical challenge to address the longstanding dilemma of how intrusive profiling students' academic paths should be, while ensuring the right to privacy and the protection of personal information.

Under no circumstances should guiding students toward a particular discipline become an irrational obsession with knowledge. As the director of the Media Lab at the Massachusetts Institute of Technology points out, despite the proliferation of devices capable of recording and analyzing all kinds of data, it remains a pedagogical challenge to respect students' timing and learning pace. An excessive obsession with mapping a student's academic trajectory based solely on the quantitative aspects of their progress may lead to neglecting the importance of active learning—an activity carried out independently by the student, in which he or she decides not only when to undertake the task, but also how and with what resources to do so. Likewise, trying to exploit digital media for the sake of maximizing the planning, execution, and dissemination of knowledge without considering the necessary requirements can be counterproductive.

Models and Strategies for the Successful Implementation of Artificial Intelligence in Education.

Once the stakeholders involved in the process have been identified, a diagnostic has been conducted, and a theoretical model has been defined to guide the implementation of artificial intelligence in the teaching-learning process of a particular discipline, it becomes necessary to establish a series of strategies for AI development as proposed by Ray McAleer. These include automatically generating statements based on a set of axioms, rules, and facts; deducing results from those statements; and transforming the results in ways that can be directly or indirectly applied in building the Tutorial System. This involves domain modeling and selecting and implementing pedagogical and didactic decisions. The model is based on implementing a process of anticipation regarding each learner's knowledge and, at the same time, consists of three components:

Thus, the use of an Expert System (known as ES) enables the construction of knowledge repositories that have become the standard systems for developing expert applications across various technical domains. The exponential growth of mobile and portable devices in the educational field allows for the use of different types of devices that can utilize artificial intelligence in education. Allowing students to use the device they prefer helps them feel more "comfortable" when engaging in adaptive artificial intelligence processes. University selection systems, for instance, serve as a good example of current trends and types of applications. However, despite the development of AI applied to education, there are still very few projects that make use of this technology.

Legal and Political Framework.

The right of individuals to be educated encompasses two essential subjects: the individual and society. The freedom to teach and to learn (Art. 27, UNESCO) is preserved as a true guarantee of pluralism in both public and private education, while also ensuring respect and dignity for both teachers and students. UNESCO states that AI must be oriented toward empowering individuals and conscious groups, supporting a human-centered education.

Objectives, principles, and commitments of the academic community with the General Curricular Guidelines (CGU), the curriculum, and author programs. The CGU aim to ensure that the University Community is competent and aware of its social function. The university facilitates access to information and promotes critical reflection on the scientific, humanistic, political, social, and economic environment. AI is applied to the Community Commitment Charter (ACG), which is supported politically by the Governing Council and technically by the Rectorate. This includes the organized transition of the entire infrastructure to a selected teaching mode, chosen through informed decision-making. Theoretical foundations and a possible process design must be assessable, considering goals and, where applicable, principles for managing supervised practices, continuous assessments, reflections, and reports.

1. Background and research experiences in the use of artificial intelligence in early educational areas: – Content semanticization, prediction algorithms, and decision-making in e-learning projects.

2. Sufrescuela: A system for prediction and automation of online didactic resources.

3. SCALA: A system for the approximation of educational resources on the web.

4. PASO: Predictive and assistive interpretation of student interactions in an automated manner.

5. Aula-Esfera: A formal descriptive environment for the CLUSTER LMS.

6. Analysis of international scientific literature on the use of artificial intelligence in teaching.

7. The Use of AI and Teachers: More than Just Techniques – Disciplinary Challenges and Passions.

8. A Specific University Context: InterAmerican Open University – A Total of 39 Steps! – Didactic supports for preparing flipped face-to-face classes!

Teacher Training in the Use of AI Tools.

The current gap in AI education between data science professionals and teachers worldwide highlights the need to support and enhance existing specialists while also encouraging the formation of new teams. At the same time, efforts must contribute to the development and strengthening of methodological and attitudinal professional skills related to addressing issues from diverse contexts. This allows students to develop research skills, both within their specific discipline and in related areas tied to their professional performance.

It has been observed that students are beginning to include the term "artificial intelligence" in their project reports. This situation should prompt reflection among teachers and course organizers in several directions. Among these: Do students really understand what they mean by that expression? Will the discipline (or at least some of its core themes) actually benefit their current training, or is it merely a passing trend that, like all trends, will eventually fade? Does it create "false expectations" about the professional realities they will face? And if they choose to research a particular technology—or the digitization of scientific thinking—will it be useful to them, even if that technology is already considered outdated?

Research and Future Trends in the Application of Artificial Intelligence in Teaching.

Another noteworthy study was conducted by Banjare and Malik (2017), who identified a total of 32 tools, all highly useful, including various Google tools and extensions, such as Formative. Other emerging trends in the application of AI in education highlight cognitive technologies, some of which are already in use across diverse fields.

Generalized cognitive methods began to take shape in the late 1950s, originating from work linked systems for (cognitive) instruction. This approach led to the creation of cognitive machines such as THEMIS, EHE, JEIDA, and WEI—all derived from US Cortex to simulate the human "smooth cortex"—and Helios I and II, which aimed to simulate the "highly versatile stratified cortex" (coactive intelligence). The design of these replicating systems with a specific emphasis must simultaneously consider analytical, empirical, ethical-aesthetic aspects, as well as collaboration and the necessary processes.

The future of education presents itself as a complex scenario with challenges that have acquired an innovative dimension due to the outbreak of the digital revolution within the Knowledge Society. All of this demands a shift in the current ways of teaching and learning. Critical pedagogical theory brings us closer to new educational keys. Advancements in specific disciplines, the development of computer science, and the emergence of robotics and so-called artificial intelligence are moving us toward complex and unpredictable contexts.

These new approaches to the teaching-learning process require changes in planning methodologies, design, and implementation of educational actions, in teacher training, in staff qualifications, in school organization and leadership, and in educational-social coordination, interaction, and collaboration in a globalized context. Recognizing the potential of these scenarios and the role of the post-Fordist educator, where tradition remains predominant in formative contexts, and belief in oneself and the allure of tradition (problem, discipline, theory, method) persists, is essential. An analysis of the pedagogical dimension reveals the need to break away from the approach traditionally associated with Educational Technology.

Studies on Effectiveness and Efficiency.

Garzón, M.C. (2008) presents a review of teaching practices by educators in a study of ethnographic and micro sociological nature, focusing on the integration of ICT (Information and Communication Technologies). She highlights the following teaching actions: encouraging, guiding, and sustaining students' interest until specific objectives are met; making content explicit and "solidifying" it through ICT to enhance understanding and learning; provoking and guiding student work through ICT; supporting and enriching learning both during and after the use of ICT; conveying content and economically assessing students' technical skills with computers—particularly as reflected in participants' perceptions of the computer, the student, and the teacher.

According to Choi (2003), the presence of a virtual tutor brought significant benefits in terms of academic performance, perceived social support, and satisfaction

outcomes. These positive impacts of virtual tutoring were especially pronounced in terms of effectiveness and efficiency for students with dual family and professional responsibilities—making the results particularly meaningful for such groups. Learning objects can enhance learning efficiency by providing students access to essential and basic content information (Valdivia, 2006), and by enabling more efficient acquisition of algorithms and data (Friedman, 2005).

Guitert Gené, M., Romero Lastra, B., et al. (2008) conducted a study to analyze whether the efficiency and effectiveness of autonomous learning in the subject Psychopedagogical Intervention could be improved in different contexts through two types of videos: one with a human speaker in front of a static background (Experimental Condition, EC) and another with a narrator giving the same explanations but without a human presence (Control Condition, CC).

Emerging Technological Developments.

Today, we see a rapid shift in how we understand technologies and their impact on professional tasks related to education. This change is clearly reflected in how mobile devices are transforming our habits. Industry professionals have labeled this trend a point of no return, where mobile computing is replacing tasks that were previously carried out on desktop PCs. Coupled with advances in the manufacturing and sale of increasingly sophisticated and energy-efficient devices, this shift is creating challenges for traditional desktop computers.

This document explores the emerging market of ed-tech designed to enhance education across different levels. While there is a history of technology entering education, this study moves away from the traditional flipped classroom model and instead focuses on the rise of Massive Open Online Courses (MOOC) and the development of adaptive learning. It takes into account the broader educational process and the technologies involved.

If today's mobile devices are to offer new learning experiences (where learning is defined as a behavioral change achieved through a set of structured activities and memories stored in long-term memory), as desktop computers once did, then techniques must be developed to enable machines to observe, emulate, and enhance learning. One approach to create a MOOC within a reasonable timeframe is to use computing techniques or intelligent systems, as well as participatory computational intelligence from the community.

CONCLUSIONS.

1. The teacher's expertise in the subject area under study is essential to ensure that educational process remains relevant and grounded in the specific context of the discipline.

2. Disciplinary micro-curricular structuring enables the teacher to bring into their teaching practice the object of study for which they are academically prepared, along with empirical, epistemological, theoretical, and methodological elements to propose a relevant and coherent instructional approach.

3. Pedagogical micro-curricular structuring provides the teacher with the "how" of teaching. This requires grounding their professional practice in a pedagogical theory that allows for understanding the educational act, a didactic method that enables assertive communication within the classroom, and didactic techniques to foster student interaction and the collective construction of learning environments.

4. Artificial intelligence must have a meaningful role in educational practice, with the teacher deciding what type of AI to use, when to use it, and for what purpose, ensuring that grasp the significance of AI in shaping their own learning process.

V. REFERENCES.

Amado, R. J. C., & Mosquera-Ayala, A. M. (2022). La Inteligencia Artificial y la producción académica. Ingeniería y Competitividad, 24(02). univalle.edu.co.

Álvarez, J. J. G. (2023). Las Fintech y la Inteligencia Artificial: una alianza estratégica en la financiación de las entidades del Tercer Sector. REVESCO: revista de estudios cooperativos. unirioja.es.

Sánchez, J. S. P., Pardo, I. D. T., & de Meriño, C. Y. M. (2023). Personalización de recursos para la enseñanza de matemáticas universitarias usando inteligencia artificial.

Revista Interamericana de Investigación Educación y Pedagogía RIIEP, 16(1), 319340. usantotomas.edu.co.

Simonutti, B. (2021). Comunicación digital en la era de la inmediatez: inteligencia Artificial aplicada en una empresa 2.0. unr.edu.ar.

Goin, M. M. J., & Gibelli, T. (2020). La relación de los ingresantes de ciencias aplicadas con el saber tecnológico. Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, (25), 50-56. scielo.org.ar.

Mieles-Barrera, M. D. (2024). Aportes de la ciencia cognitiva a la comprensión de la cognición. Entretextos: Revista de Estudios Interculturales desde Latinoamérica y el Caribe, 18(34), 316-324. unirioja.es.

Reynosa Navarro, E., Serrano Polo, E. A.,
Ortega-Parra, A. J., Navarro Silva, O., CruzMontero, J. M., & Salazar Montoya, E. O. (2020). Estrategias didácticas para investigación científica: relevancia en la formación de investigadores. Revista Universidad y Sociedad, 12(1), 259-266. sld.cu.

Salazar-Reyes, E., Luis-Trejo, J., ReyesNava, A., & López-González, E. (2024). Identificación de autores y análisis polarizado de notas mediante el uso de inteligencia artificial. Pädi Boletín Científico De Ciencias Básicas E Ingenierías Del ICBI, 12(Especial), 101-108. uaeh.edu.mx.

Niebles Carbonó, L. A. (2024). Diseño de un sistema integral de ejercicios y práctica adaptativa de la programación soportado por el nuevo modelo PFA+ y un componente de generación de …. uninorte.edu.co.

SOCIAL REPRESENTATIONS IN THE PERSPECTIVE OF SEXUALITY OF ADOLESCENTS IN EDUCATIONAL INSTITUTIONS IN PASTO.

Lizeth Ximena Eraso Rosero
Nadia Maritza Rosero Moran
Leidy PAola Zambrano Orbes

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.30

Traducción: Henry Franco Yánez

Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 24 de abril 2024

Abstract.

The research focuses on analyzing the social representations of sexuality in adolescents from two educational institutions in the city of Pasto. It investigates knowledge and interests about sexuality and the influence of family, school and social networks. Specific objectives are proposed to identify and understand these representations, with the intention of contributing to sexual education processes in educational institutions; applying a qualitative study.

Keywords: Social representations, human sexuality, adolescents, sexual education, social networks.

Resumen.

La investigación se enfoca en analizar las representaciones sociales sobre la sexualidad en adolescentes de dos instituciones educativas de la ciudad de Pasto. Se indaga sobre los conocimientos e intereses sobre la sexualidad y la influencia de la familia, la escuela y las redes sociales. Se plantean objetivos específicos para identificar y comprender estas representaciones, con la intención de aportar a los procesos de educación sexual en las instituciones educativas; aplicando un estudio cualitativo.

Palabras clave: Representaciones sociales, sexualidad humana, adolescentes, educación sexual, redes sociales.

I. INTRODUCTION.

The research focuses on exploring the social representations of sexuality in a group of adolescents belonging to two educational institutions, one official and the other unofficial, in the city of Pasto. The origin of the sexual information of young people is investigated, considering relevant aspects such as the family, school and social environment.

The research question posed is: What are the social representations in the perspective of sexuality that adolescents from two educational institutions in the city of Pasto have? In order to develop this question, some objectives are established to guide the study. Starting from the main objective of analyzing the social representations in the perspective of sexuality in adolescents of these institutions.

LAS REPRESENTACIONES SOCIALES EN LA PERSPECTIVA DE LA SEXUALIDAD DE LOS ADOLESCENTES EN INSTITUCIONES EDUCATIVAS DE PASTO.

During adolescence, sexuality becomes a relevant topic, since it is a crucial period in sexual identity. In this context, social representations play a fundamental role in influencing the understanding of how sexuality is experienced by young people. These representations are shared mental constructs that shape attitudes, behaviors and decisions related to sexuality.

Therefore, it is important to investigate how these representations are formed, transmitted and internalized in adolescents, since this has an impact on their perception of sexuality and on their affective relationships and decision making. The research seeks to explore the sources of information on sexuality of adolescents, both the family and educational context, society, which are their friends and, nowadays, the media, as well as to understand the implications of these representations on their values, beliefs and emotional wellbeing.

Through the collection of qualitative data, it is expected to obtain a broader and contextualized understanding of how social representations influence the perspective of sexuality in adolescents.

The results could contribute inputs to sex education programs in educational institutions, as well as identify areas for improvement in promoting informed and healthy sexuality among adolescents in educational institutions.

II. THEORETICAL FRAMEWORK.

Social Representations and Adolescent Sexuality.

Social representations are mental constructs shared by individuals in a community, which allow them to interpret and interact with the world around them (Moscovici, 1979: 27). The representations that adolescents construct

or interpret about sexuality may be influenced by values, beliefs and cultures that influence how young people understand and experience their sexuality.

Social representations, according to (Moscovici 1979: 27), consider affective, mental and social elements. These elements are articulated through cognitive processes, language and communication. In addition, social relations that influence representations, as well as material, social and ideal reality, must be taken into account. This approach, presented by (Gutiérrez, 2013: 23), suggests that social representations are complex constructs that are formed and affected by various interrelated factors.

Characteristics of social representations.

For (Cruz, 2006: 22) a social representation is associated with a specific object; therefore, the concept of representing stands out as the act of giving form to something that may not be physically present, which implies the ability to create new concepts based on the perceptions held about that object. In other words, it is pointed out that social representations are mental constructions that allow us to give form to reality, even through imagination and perception.

Social representations in adolescents.

Social representations in adolescents are essential for their cognitive and social development, as they allow them to interpret and construct meanings about various aspects of their environment, including sexuality, influenced by family, social and educational factors. These representations help them make sense of the world and their own experiences, shaping their behavior, attitudes and decision-making.

Sexuality.

For (Vargas, 2007: 6) "sexuality is a construct that represents everything that a person can say about his/her sexual dimension when describing him/herself". This being a complex and varied topic that should be treated in a personalized way according to individual needs. She stresses the importance of students understanding social representations and how these influence the information they receive in educational institutions. In addition, it emphasizes the integral development of students, including their relationship with themselves and how they represent attitudes and behaviors towards others.

Human sexuality.

According to (Cruz, 2011: 71), human sexuality cannot be separated from the person, because it contains the capacity to express love and allow him/her to be fully realized as a man or a woman, therefore, its care requires that it be integrated through a timely education, understood as a formation that considers it as a being composed of body, mind and spirit.

It therefore highlights the need to integrate sexuality education within a broader framework of personal development and well-being that takes into account the totality of the human experience.

Sex education.

Sexuality education goes beyond the transmission of biological knowledge about reproduction. It emphasizes the importance of acquiring and transforming knowledge, attitudes and values in relation to sexuality in all its dimensions, including eroticism, identity and social representations in their various facets in an inclusive and respectful manner.

(Palacios-Jaramillo, 2008: 7) considers that it is the vital process through which knowledge, attitudes and values regarding sexuality in all its manifestations are acquired and transformed, formally and informally, including from the biological aspects and those related to reproduction, to all those associated with eroticism, identity, and social representations of them.

Influence of Family and School.

Family and school are central to the formation of social representations about sexuality in adolescents, and the type of influence they exert can have a lasting impact on individuals' sexual perception and behavior. As can a lack of open communication about sexuality issues and prejudice in the family, or inappropriate sex education at school, can contribute to the formation of limited or biased representations about sexuality.

Socio-cultural processes.

According to (Luisi, 2013: 432), all human beings are born into a family environment that not only provides basic and affective needs, but also plays a fundamental role in education. This educational function of the family nucleus is crucial to provide the individual with the necessary tools for an integral formation from an early age. The

early learning acquired in this context is considered to be the most significant and enduring, and many of them have a permanent influence on the individual's life.

Influence of social networks on social representations.

Social networks and digital media play an increasingly relevant role in the formation of social representations about sexuality in adolescents. Exposure to sexualized content on social networks can influence young people's perception and experience of sexuality, as well as their affective and sexual relationships.

(Arab and Díaz, 2015: 9) Digital media generate multiple new contexts to express and explore aspects of identity. Individuals act in different spaces, creating diverse identities that are changing at very fast speed and that can generate enriching or destructive interpersonal and intrapersonal experiences, depending on how online communication is used (time of use, type of virtual social group chosen, among others).

III. CONTEXTUAL FRAMEWORK.

The research will be carried out in two educational institutions in the city of Pasto in the Department of Nariño - Colombia, one of them is the Liceo Integrado de Bachillerato de la Universidad de Nariño. Institutional Educational Project (PEI 2023:8) official educational institution that offers formal education at the levels of transition, elementary school, junior high school and high school. Oriented to the formation of emotionally and academically competent people, with social sensitivity, critical spirit, leadership skills and committed to the destiny of their environment that contributes to the training of university professionals from different programs in teaching activities, academic practices, research and social interaction, as related to the educational levels that precede higher education.

The other institution in which this research is framed is the San Felipe Neri School, a private Catholic educational institution that offers formal education committed to the integral formation of the person capable of promoting his life project; in addition, committed to society from the values of the Gospel, its qualifying, liberating and evangelizing axes. The pedagogical proposal is carried out through classroom pedagogical projects, which allow the integration of knowledge through themes that arise from the interests of the students, through which they develop cooperative work, improve bonds of friendship, support and companionship, solve difficulties, integrate families and the educational community, in the different themes worked on each year.

Based on the Sexuality Education and Citizenship Building Project of the San Felipe Neri School Institution (PESCC. 2023: 12), it is organized on an annual basis with a projection for the academic school year, working on the preparation of material and development of workshops on the topic of sexual and reproductive health, approaching protective and risk factors.

The focus of these workshops will include the practice of values related to self-care and co-responsibility, as well as the analysis of the physiological aspects of sexuality. To guarantee the success of these workshops, qualified human resources, work guide formats and audiovisual resources will be available to enrich the learning experience.

IV. METHODOLOGY.

A qualitative study will be conducted in two educational institutions in Pasto, using in-depth interviews and focus groups to collect data on the social representations of sexuality in adolescents. A purposive sampling will be used to select the participants, ensuring the representativeness of different age groups, gender and socioeconomic level.

The in-depth interviews, according to (Martínez, 2020: 33) are structured with questions organized according to study categories and subcategories, as well as research components. This allows the construction of an instrument that guides the questions according to the purposes of the study. The importance of leaving space for emerging questions that may arise during the interaction between interviewer and interviewee is emphasized.

And focus groups are a technique that allows the collection of detailed and meaningful information about adolescents' knowledge, attitudes, beliefs, values and perceptions regarding sexuality, as stated by Hamui and Varela (2013), such technique is effective in collecting information about the feelings, thoughts and experiences of the participants.

The results expected to be collected from this research will provide a detailed and in-depth view of the social representations of sexuality among adolescents in the educational institutions where the research is being conducted. Through the analysis of the data collected, it will be possible to identify a wide range of perceptions, beliefs and attitudes that young people have regarding sexuality, and how these are influenced by various factors of the social and cultural environment in which they develop.

In addition, a considerable influence of social networks in the formation of these representations will be observed. It is possible that adolescents are constantly exposed to a wide range of messages and images related to sexuality through platforms such as: Instagram, Snapchat and TikTok, which may significantly influence their perception and understanding of sexuality. For example, exposure to sexualized content on social media can contribute to the objectification of the body and the perpetuation of gender stereotypes, which in turn can negatively affect adolescents' self-esteem and perception of body image.

The results of this research will highlight the complexity and diversity of social representations about sexuality among adolescents, as well as the significant influence of contextual factors such as family, school and social networks. The findings will have important implications for the design and implementation of sexuality education programs and for the development of intervention strategies aimed at promoting a more informed, healthy and positive understanding of sexuality among adolescents in the city of Pasto.

The findings to be obtained in this research may reveal several areas for action and reflection that could have important implications in the promotion of healthy and well-informed sexuality among adolescents in the Educational Institutions of the city of Pasto.

It is essential to highlight the need to contribute to sex education processes in educational institutions. The results of this study will help to detect any gaps that exist in the sexuality education provided in these institutions, since it will be possible to observe a variety of social representations on sexuality among the participating adolescents.

In addition, the importance of promoting open and nonjudgmental communication in the family setting is highlighted. The family plays a crucial role in the formation of social representations about sexuality in adolescents, and the results of this study will suggest that lack of effective communication in the home may contribute to the formation of limited or biased representations about sexuality. Therefore, it is critical that parents and caregivers maintain an open and respectful dialogue with their children about issues related to sexuality, providing them with accurate information and emotional support so that they can develop a healthy and positive understanding of their sexuality.

On the other hand, it is important to take into account the influence of social networks on adolescents' perception of sexuality. Easy and constant access to sexualized content on social networks can influence the way young people perceive and live their sexuality, as well as their affective and sexual relationships. In this sense, it is necessary to develop digital and media education strategies that promote responsible use of social networks and help adolescents discern reliable information from false or harmful information. In addition, it is important to foster critical thinking and analytical skills in young people so that they can question and reflect on the messages and stereotypes present in the media and online.

The research can mark the importance of improving sex education processes in educational institutions, promoting open and non-judgmental communication in the family and school environment and addressing the influence of social networks on adolescents' perception of sexuality.

The research highlights the importance of understanding and developing social representations on sexuality in adolescents, in order to promote a more informed, empowered and healthy sexuality at this stage of life. Recommendations will be suggested to improve sexual education processes in Educational Institutions, as well as to promote open and non-judgmental communication in the family environment. In addition, the need to develop digital and media education strategies to counteract the negative influence of social networks on adolescents' perception of sexuality is highlighted.

In order to develop the first specific objective, the main category was sexuality, and the subcategory: human sexuality. The eighth-grade students of the two educational institutions referenced were used as a source and an in-depth interview was used as an instrument.

Similarly, in order to develop the second specific objective, the category: education for sexuality, and the subcategory: training, were used to apply to students through focus groups.

In relation to the third specific objective, the category taken was: the functions of sexuality, with the following subcategories: relational communicative, reproductive, erotic and affective, and as research instruments the interviews to be applied to the people in charge of the sexuality education projects (PESCC).

Finally, with regard to the development of the fourth specific objective, the category of social networks is taken as: social networks with the following subcategories: attitudes, beliefs and behaviors, by means of data collection through in-depth interviews.

In this way, the information will be organized in a clear and detailed manner, indicating the guiding questions, specific objectives, categories and subcategories, as well as the sources, instruments and other considerations used in the research.

V. BIBLIOGRAFÍA.

Aliaga, F. et al., (2018). Imaginarios y representaciones sociales. Estado de la investigación en Iberoamérica Bogotá: Universidad Santo Tomás, primera edición.

Arab, E., & Díaz, A. (2015). Impacto de las redes sociales e internet en la adolescencia: Aspectos positivos y negativos. Revista Médica Clínica Las Condes.26, p 9.

Colegio San Felipe Neri (2013). Proyecto Educativo Institucional (PEI) secretaria Colegio San Felipe Neri, p.7.

Colegio San Felipe Neri (2023). Proyecto de Educación para la Sexualidad y construcción ciudadana (PESCC) de la Institución colegio San Felipe Neri Pasto, p.12.

Cruz, F. (2006). Teoría de las representaciones sociales. Una aproximación al estado del arte en América Latina. Recuperado de https://www.miteco.gob.es/ministerio/pags/biblioteca/fondo/pdf/87506_6.pdf, p.22.

Cruz, M. (2011). Educación de la Sexualidad para Alumnos y Alumnas Escolares del Bicentenario Análisis y Propuesta, p. 71.

Gómez, Y., y Villalobos, F. (2014). Competencias para la formulación de un proyecto de investigación- Guía metodológica del proyecto INVESTIC para docentes investigadores. San Juan de Pasto: Editorial Universidad de Nariño.

Gutiérrez, Silvia. (2013). Emociones y representaciones sociales. México: Metropolitan Autonomous University, p. 23.

Hamui, A., & Varela, M. (2013). La técnica de grupos focales. Investigación en educación médica, pp. 55-60.

Liceo Integrado de Bachillerato de la Universidad de Nariño (2023). Proyecto Educativo Institucional (PEI). Secretaria Colegio Liceo de la Universidad de Nariño, p. 8.

Liceo Integrado de Bachillerato de la Universidad de Nariño (2023). Proyecto de Educación para la Sexualidad y Construcción Ciudadana (PESCC), p 10.

Luisi Frinco, V. D., (2013). "Educación de la sexualidad en el contexto familiar y escolar". Educere. Tomado de: Educación de la sexualidad en el contexto familiar y escolar (redalyc.org) pp. 429-435.

Martínez, T. (2020) La investigación cualitativa, una mirada Universidad de La Guajira Primera edición, ISBN: 978-958-5178-23-6, p. 72.

Ministerio de Salud (1998) Resolución Ni 8430 DE 1993 Por la cual se establecen las normas científicas, técnicas y administrativas para la investigación en salud. Santafé de Bogotá D.C.

Moscovici, Serge. (1979). El psicoanálisis, su imagen y su público. Buenos Aires: editorial: Editorial Huemul S. A, p. 18.

OMS (2020). Prevención de la violencia en la escuela. Manual Práctico. Recuperado de https://apps.who.int/iris/bitstream/handle/10665/331022/9789240000254-spa.pdf?sequence=1&isAllowed=y.

Palacios-Jaramillo. (2008). "Educación para la sexualidad: derecho de adolescentes y jóvenes, y condición para su desarrollo". Revista Altablero No. 47, p.7.

Vargas, E. (2007) Sexualidad... mucho más que sexo: una guía para mantener una sexualidad saludable – Bogotá: Universidad de los Andes, Facultad de Ciencias Sociales, Departamento de Psicología, Ediciones Uniandes, p. 6.

ARGUMENTATION: A MEANS FOR TEACHER TRAINING FROM TUTORING.

Mónica Esmeralda Vallejo Achinchoy

UNIVERSITY OF NARIÑO

DOI: https://doi.org/10.22267/huellas.251121.31

Traducción: Helcy del Carmen Obando Matabajoy

Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 16 de abril 2024

Abstract.

The topic of argumentation in Higher Education has been gaining more and more relevance in the formation of students, in that order it is necessary to favor from the classrooms strategies that strengthen this competence.
In the Faculty of Education of the Universidad de Nariño, the formative research processes assumed by students are a space to promote written argumentation, since it presents the construction of academic texts in which students engage in a dialogical relationship with knowledge in the disciplines, an aspect that involves the management of argumentative strategies; However, in the course of their formative plan, there is evidence of a weakness in the foundation of this competence, especially when writing degree works and other types of academic texts that involve taking a position, adhering to a thesis or solving a problem; students are unaware of the rules, types of argumentation and specific structure of this type of texts, making it necessary to propose an improvement plan in these writing processes.

Therefore, this article deals with the subject described from a qualitative paradigm, with a descriptive and interpretative orientation, which seeks to characterize the importance of academic argumentation as a necessary competence to generate new disciplinary knowledge within the research processes that can be enriched from tutorials to facilitate the evaluation of academic writing and the methodological and conceptual foundation in the training areas of the students.

The topic of argumentation in Higher Education has been gaining more and more relevance in the formation of students, in that order it is necessary to favor from the classrooms strategies that strengthen this competence.

Keywords: Argumentation, tutoring, autonomous learning, research, pedagogical communication.

Resumen.

El tema de la fundamentación en argumentación en la Educación Superior ha ido tomando cada vez más relevancia en la formación de los estudiantes, en ese orden hay que favorecer desde las aulas estrategias que fortalezcan esta competencia.

En la Facultad de Educación de la Universidad de Nariño, los procesos de investigación formativa que asumen los estudiantes son un espacio para fomentar la argumentación escrita, ya que en ella se presenta la construcción de textos académicos en los cuales los educandos entablan una relación dialógica con los conocimientos en las disciplinas, aspecto que implica el manejo de estrategias argumentativas; sin embargo en el curso de su plan formativo, se evidencia una debilidad en la fundamentación de esta competencia, sobre todo al adelantar la escritura de trabajos de grado y otros tipos de textos académicos que implican la toma de postura, la adhesión a una tesis o la resolución de un problema; los estudiantes presentan desconocimiento de las reglas, tipos de argumentación y estructura específica de este tipo de textos, haciéndose necesario plantear un plan de mejoramiento en estos procesos escriturales.

Por lo anterior en este artículo se trata la temática descrita desde un paradigma cualitativo, con una orientación de tipo descriptivo e interpretativo, en el que se busca caracterizar la importancia de la argumentación académica, como una competencia necesaria para generar nuevo conocimiento disciplinar dentro de los procesos investigativos que pueden enriquecerse desde las tutorías para facilitar la evaluación de la escritura académica y la fundamentación metodológica y conceptual en las áreas de formación de los educandos.

Palabras clave: Argumentación, tutoría, aprendizaje autónomo, investigación, comunicación pedagógica.

LA ARGUMENTACIÓN: UN MEDIO PARA LA FORMACIÓN DE MAESTROS DESDE LA TUTORIA.

I. INTRODUCTION.

During the pandemic process, where the roles of teachers and students changed, as well as the means of pedagogical communication, the tutoring-based teaching method became a fundamental component in the training of professionals. This process entailed the development of additional competencies in both teachers and students to effectively.

Tutoring, as an alternative teaching approach, requires the development of skills to organize, prioritize, and select information effectively. It also involves encouraging

independent thinking so that students can progress in their learning through academic argumentation, which serves as a key tool for understanding and internalizing knowledge.

Therefore, this paper aims to elucidate the didactic process of tutoring implemented with higher education students at the University of Nariño during the pandemic period. Throughout the teaching-learning process, the need to strengthen students' critical thinking skills for managing their autonomous learning became increasingly evident. Critical thinking is a complex, multifaceted process that involves a series of skills such as analysis, synthesis, information selection, and the ability to develop argumentative reasoning that fosters self-regulation of knowledge acquisition, as pointed out by Díaz (2014) and Ramírez (2013).

In this context, designing a class based on tutorials meant moving away from traditional, lecture-based teaching. It involved adopting a new approach to guide students, which required strengthening their research and argumentation skills.

Argumentation in communication, as pointed out by Díaz (2014); Gilbert (2017), implies empowering in students critical reasoning, thorough documentation about a topic, appropriate rhetorical organization to present ideas and an effort to examine, understand, interpret, analyze, question or evaluate any belief or form of knowledge, therefore, in a class its promotion and evaluation in the treatment of curricular topics or contents is fundamental.

As a result, for tutoring to effectively support meaningful learning in students, it is essential to implement a set of strategies connected to the development of critical thinking. This is because the exposition of critical reasoning inherently involves a communicative purpose—such as arguing for or against a particular point of view, persuading others of the truth or falsity of a thesis or conclusion, justifying an evaluation of a process, or pointing out the implications of a perspective that is not fully or partially shared (Díaz, 2014, pp. 23–24).

Therefore, this article describes the importance of argumentation to improve the autonomous learning process of students, since it is a fundamental competence associated with the practice of reading and writing different texts with which learning is evaluated.

II. DISCUSSION.

Adopting a tutoring-based approach required teachers to rethink how they delivered and exchanged information, shifting towards more interactive and flexible methods. A key part of this transition was the emphasis on pedagogical innovation, particularly through the integration of information and communication technologies (ICTs). These technologies supported the implementation of virtual learning environments and enabled the design of instructional materials tailored for both synchronous (real-time) and asynchronous (self-paced) learning. ICTs—including digital platforms, communication apps like WhatsApp, and social media also contributed to the development of classes which shifted from a traditional lecture-based approach to a tutoring-based support model.

During the tutorials, we attempted to incorporate engaging technological tools to support the 'student-as-reader-and-interpreter' in the learning process. The goal was to help students organize, select, and manage relevant knowledge in order to internalize the core concepts of their academic training. This aimed to foster meaningful learning—not only in terms of content acquisition, but also in developing interpretative skills and the ability to reflect on and transform the realities addressed within each discipline. As a result, during the pandemic, it became essential to continuously evaluate and validate these resources to better understand the implications of integrating tutoring into the instructional process".

"The shift from a traditional classroom setting—characterized by lecture-based instruction and face-to-face interaction—to a tutoring model supported primarily by information and communication technologies (ICTs), required educators to adapt to various pedagogical, social, and cultural challenges. These factors significantly influenced the development of the teaching and learning process".

In Colombia, and specifically at the Universidad de Nariño, implementing tutorial-based education presented a significant challenge. Teachers needed to promote a learning culture that embraced virtual tools and encouraged the regular use of self-evaluation as key strategies for understanding and assessing student learning.

Teachers had to take on the role of learners themselves, exploring various teaching strategies to meet the

objectives of their micro-curricula. This required a process of self-training to ensure effective communication in the classroom. In addition, they began to adopt other essential elements in their teaching practice especially the use of learning support resources to organize course content in a pedagogically sound way. These tools were important to avoid overloading students with tasks and information presented in a mechanical or uncritical manner during their training".

Tutorial sessions made it easier for teachers to understand their students' individual characteristics and learning conditions. These interactions helped educators to recognize the life contexts of their students, including economic, social, and cultural factors that influenced academic performance. Challenges were not only related to limited access to appropriate technological tools for learning, but for the socio-affective aspect that is vital to generate motivation in learning.

For instance, in the training of future educators in the Bachelor's Degree in Spanish Language and Literature, particularly in the course Integral and Investigative Pedagogical Practice, students were supported through various strategies. These included independent study, individual work, collaborative group activities, and both (individual and group tutoring) sessions. This methodological approach intended to support learning and maintain interaction with students. Additionally, depending on each student's specific circumstances, other resources such as printed modules or study guides were provided to support those facing difficulties with internet access.

The tutorials were structured using both synchronous and asynchronous interaction systems, along with methodological guidance aimed at supporting student learning. In this context, tutoring was understood as a form of academic support provided by the teacher, who acted as a learning advisor by guiding students in the use of methods and tools that enhance learning and promote meaningful dialogue between teachers and students. Thus, tutoring was seen as an ongoing process that supports students in managing their own knowledge.

In the field of education, the tutor-teacher is responsible for guiding and supporting an individual student (or a group of students) throughout their learning process. In addition to their regular teaching duties, the tutor also takes on a formative and advisory role, aiming to support student learning in a more holistic way. This support must be comprehensive—it should not be limited to the acquisition of knowledge, but should also include cognitive, emotional, and attitudinal dimensions. These areas are essential for developing key competencies that involve not only knowledge, but also skills, abilities, and attitudes" (Delfino, 2016, p. 4).

These new ways of organizing classes through tutorials were the result of a responsible, committed and critical exercise of the professors, who with effort and commitment provided the means and resources to guarantee the training of professionals in an ideal way. The tutorials became the resource to cover the development of the subjects, an aspect that not only marked a change in the didactic-methodological order, but also in the evaluation approach. The systematic evaluation model gave way to a process-based evaluation, regulated by the implementation of co-evaluation and self-evaluation, where the actors assumed the responsibility of evaluating their formative process.

Tutorials were not just meant to deliver course content. They aimed to consistently support students in their learning and personal development. Through these sessions, students were encouraged to think critically about their own learning, especially by developing skills in interpretation, argumentation, and proposing ideas. In this setting, tutorials became a space for meaningful dialogue between teachers and students, where argumentation played a key role in understanding how students build meaning in both spoken and written work.

Tutorials required guiding the development of curricular content in a more flexible and efficient manner. To achieve this, teachers adopted content selection principles based on critical thinking standards highlighted by Richard (1986), as cited by Diaz (2014, p. 24). These standards emphasize the importance of evaluating the relevance, depth, and scope of the content, along with clarity, precision, and clear objectives in lesson planning. Such criteria are essential for fostering critical thinking and, consequently, effective argumentation.

In this context, the evaluation of students' argumentation began with an analysis of the teaching methods used in the activities they completed to achieve their learning goals. This involved assessing their cognitive engagement through questioning of course content, drawing inferences, and identifying key topics and their real-world implications. Such evaluation helps students apply the knowledge gained and understand the relevance of these topics within their own context. As Gilbert (2017):

(...) We advance all the time through disagreement, controversy, discussion and decision making: we are always arguing, discussing, clarifying, dissenting, exploring, testing, questioning and, generally speaking, trying to make sense of a dense and confusing world. (p. 16).

The depth, breadth, and logical coherence of the activities submitted by the students were used as indicators of their ability in argumentation and critical thinking. Various academic texts—particularly written ones—were analyzed to assess whether students were effectively incorporating elements of critical reasoning in their reflections.

III. RESULTADOS.

The shift from traditional lecture-based classes to a tutorial-centered approach required teachers to develop didactic resources that promote argumentation as a key component of students' critical thinking. According to Díaz (2014, pp. 18–19), some of the most important of these resources include the following.

Table 1. Argumentation and critical reasoning processes

Procesos de razonamiento crítico	Acciones
Comprensión lectora	Inferir el significado de los textos
	Identificar información faltante en un texto
	Parafrasear un texto o resumirlo
	comparar hechos, eventos o situaciones
Manejo de la información	Contrastar dos cosas o situaciones que parecen similares
	Analizar situaciones, hechos o temas y asumir una posición
	Identificar problemas y proponer soluciones
	Evaluar y cuestionar información
	Explicar el por que
Razonamiento reflexivo	Argumentar a favor de una tesis
	Anticipar o predecir consecuencias de un hecho o evento
	Entablar relaciones de causa - consecuencia
	Formular hipótesis
	Definir conceptos abstractos

Note. Adapted from critical thinking processes. Source: Diaz (2014). Rhetoric of academic writing.

Based on the above, the tutorials revealed certain challenges faced by students in developing critical reasoning related to the course content, particularly concerning the following processes:

Comprehension, selection, and interpretation of information: students showed weaknesses in contextualizing specialized disciplinary knowledge and integrating information from texts related to their fields of study. They also faced challenges in fully understanding and strengthening the epistemological foundations of their courses.

Literature search: Although students are often considered digital natives, it was observed that they lacked sufficient skills to effectively select sources and integrate information to answer the questions posed in class assignments.

Textual skills (writing): students presented difficulties in the production of different types of expository and argumentative texts, together with a limited management of textual properties and processes of reference and correlation of complementary sources to support their explanations.

There was a noticeable weakness in the development of academic argumentation, particularly in incorporating others' perspectives and deepening concepts. A descriptive and narrative style predominated in their written work.

Rhetorical skills: connected to the previous challenges, the tutorial monitoring process revealed limited abilities among students to persuade and construct logical arguments related to the class topics. Students generally tended to present opinions about what they had read or researched, rather than critically engaging with the information.

Information management: As noted earlier, the pandemic revealed weaknesses in students' ability to share knowledge through the use of ICTs during tutorials. Although students frequently interact with digital tools, there was a lack of applications specifically designed to support learning development.

Emotional intelligence: strategies were needed to promote autonomous learning and to create suitable environments for collaborative and cooperative work. Students showed limited tolerance when it came to understanding the factors affecting group learning and the gradual progress of the assigned activities.

Oral expression: students demonstrated difficulties in presenting and defending their ideas across various academic settings, such as class discussions. When

expressing their ideas, they often failed to adequately address the questions with strong theoretical support. Their oral and written work requiring argumentation was generally limited in depth and development.

All these experiences in the student support process highlighted that tutoring, as a form of pedagogical guidance, requires rethinking the evolving roles of both teachers and students. It also demands innovation in didactic resources, transformation in teaching methods, deeper conceptual understanding, and the construction and transfer of knowledge, all of which depend on developing critical thinking skills.

"Critical thinking goes beyond merely gathering and rephrasing information. Having a good memory does not automatically make someone a critical thinker. A true critical thinker can draw conclusions based on their knowledge, apply that knowledge to solve problems, and independently seek out relevant sources for further learning" (Díaz, 2014, p.7).

The above highlights the necessity in higher education to develop argumentation skills, not only for evaluating course content but also for fostering reflective thinking about the declarative knowledge assessed in classes. Engaging in academic argumentation within a tutoring context involves cultivating abilities to use techniques and strategies that ensure the credibility and strength of one's statements, aiming at persuading an audience to accept or challenge a thesis. This thesis may take the form of a concept, theory, fact, or problem that requires thorough explanation supported by well-founded justification.

Argumentation involves acknowledging disagreement and conflict, recognizing that the perspectives of others are essential for discerning diverse interpretations. It also refers to 'the ability of an individual to persuade, dissuade, convince, or demonstrate the truth or falsity present in an idea or specific phenomenon'" (Ramirez, 2012, p.10).

Arguing involves not only cognitive and linguistic skills but also reflects a process of scientific literacy that empowers students to generate reasons and explanations about theories or experiences within their specific fields. As Zubiría (2006) emphasized, 'ideas must be argued; otherwise, they are no more than opinions" (p.108).

In short, it was essential to guide students through tutorials to validate and asses their argumentative competence, not only with the issuance of texts typical of this discursive plot such as essays, reviews or scientific articles, but to stop in the process of this production to review the sources of information, the capacity of analysis and synthesis against the contents updated during the classes.

"Argumentation, like all other forms of organization, narrative, expository, descriptive and dialogical, is based on a specific situation of enunciation whose primary characteristic, within the dialogical dimension, is intersubjectivity. However, argumentation emphasizes even more this intersubjective process of convincing the other" (Martínez, 2002, p.166).

Therefore, argumentation requires students to develop the ability to analyze specialized texts critically and to make informed judgments about their content, thereby promoting critical thinking.

"Before writing, (...) it is essential to compile a set of relevant sources that support our argument, along with a theoretical framework that demonstrates our understanding of the subject and gives us the authority to present our own perspective or discovery. In essence, producing written academic work requires familiarity with the key theses that frame the topic we aim to address" (Castaño, 2020, p.122).

In this regard, it is essential to train students in argumentation processes, as highlighted by Gilbert (2017), Ramírez (2012), and Weston (1998). This competency is key to helping them engage critically with course content. It involves developing skills for justifying theories, explaining concepts, and comparing authors, using various types of arguments—such as rational, factual, example-based, or authoritative. Additionally, incorporating complementary tools like summaries, keywords, illustrations, tables, charts, and diagrams can support students' gradual development of knowledge".

Consequently, tutoring—as a didactic strategy designed to support students in their learning process—should focus on developing their argumentative skills through a pedagogy of argumentation. This involves encouraging students to question the foundations of a lesson, the relevance of concepts and theories, and the significance of the content guiding their academic development.

Fostering argumentative competence is one of the key challenges of 21st-century education. As teaching evolves

and the volume of disciplinary information grows daily, it becomes increasingly important to strengthen students' critical reading and thinking skills to help them navigate and interpret the specific knowledge areas within each field".

IV. CONCLUSION.

Encouraging argumentation as part of students' training in higher education—particularly through tutorial-based teaching that reflects the changes in 21st-century education—should help students form critical perspectives on academic topics. This pedagogical approach supports the integration of knowledge, promotes interdisciplinary thinking, and strengthens critical thinking skills, enabling students to question dominant cultural, social, and political ideas related to the production and dissemination of knowledge.

V. REFERENCES.

Alarcón, L. y Fernández, J. (2008). Las tutorías de estudiantes: Una experiencia de la benemérita Universidad Autónoma de Puebla. Revista Mexicana de Orientación Educativa, 6 (15), pp. 30-36.

Andreucci, P. y Curiche, A. (2017). Tutorías académicas: desafíos de un programa piloto entre pares en una universidad no selectiva Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud, vol. 15, núm. 1, enero-junio, 2017, pp. 357-371. Disponible en: https://www.redalyc.org/articulo.oa?id=77349627023.

Arbizu, F.; Lobato, C. y Del Castillo, L. (2005). Algunos modelos de abordaje de la tutoría universitaria. Revista de Psico didáctica, 10 (1), pp. 7-22. Doi: http://dx.doi. org/10.1387/RevPsicodidact.367.

Castaño, D. (2018). La comprensión de textos argumentativos como estrategia para el aprendizaje significativo y el desarrollo del pensamiento crítico. En: Actualidades pedagógicas. 2018;(72):29-47.

Calsamiglia, H. y Tusón, A. (2002). Las cosas del decir. Editorial Ariel, S.A las-cosas-del- decir.pdf (wordpress.com).

Delfino, J. (2016). Teoría de la tutoría. Disponible en: https://www.academia.edu/38784977/Teor%C3%ADa_de_la_tutor%C3%ADa.

Díaz, A. (2014). Retórica de la escritura académica: pensamiento crítico y argumentación discursiva. Universidad de Antioquia.

Eemeren, F. y Grootendorst, R. (2011). Una teoría sistemática de la argumentación la perspectiva pragmadialéctica. Biblos.

Gilbert, M. (2017). Argumentando se entiende la gente. México: Universidad de Guadalajara Martínez, M. C. (2001). Aprendizaje de la argumentación razonada: La producción de la argumentación razonada en el adolescente 3, 29-48. Cali: Universidad del Valle, Cátedra UN Meneses, X . (2018). La comprensión de textos argumentativos como estrategia para el aprendizaje significativo y el desarrollo del pensamiento crítico. Actualidades pedagógicas. (72):29-47.

Posada, P. (2010). Argumentación teoría y práctica, introducción a las teorías de la argumentación. Cali: Universidad del Valle.

Ramírez, R. (2012). Breve historia y perspectivas de la argumentación. Bogotá: Case

Zubiría, J. (2006). Las competencias argumentativas la visión de la educación. Bogotá: editorial magisterio.

Weston, A. (1998). Las claves de la argumentación. Barcelona: Ariel

RISKS AND VULNERABILITIES: AN ANALYSIS OF SOCIO-ENVIRONMENTAL RISK MANAGEMENT IN RIO GRANDE DO NORTE, BRAZIL.

Flávia Alessandra Souza de Andrade
Zoraide de Souza Pessoa

FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

DOI: https://doi.org/10.22267/huellas.251121.32

Traducción: Oscar Eduardo Mueses Llano
Departamentolinguistica e Idiomas - Facultad de Ciencias Humanas - Universidad de Nariño

Fecha de recepción: 20 de febrero 2024

Resumen.

For some years now, the tripod of risk management in Brazil has been the subject of concern. In general, the country has focused its socio-environmental agenda on crisis management, that is, public policies and actions developed after the occurrence of harmful events or events that cause damage to society and the environment. The lack of inclusion of risk management on government agendas is not limited to the federal level, as state and municipal agendas have also neglected this issue. In this sense, the main objective of this research is to analyze how socio-environmental risk management is configured in the state of Rio Grande do Norte/RN, in the context of building a planned and fair state. Methodologically, a quantitative approach was taken, through the production of graphs, based on the database made available by the Municipal Basic Information Survey (MUNIC), published in 2020. The results of the survey showed that socio-environmental risk management is not very high on the government agenda in the 167 municipalities of Rio Grande do Norte/RN. Therefore, from reading the data, it can be concluded that the majority of municipalities in RN do not have planning, forecasting and prevention instruments to deal with the possibility of events occurring that could be harmful or cause damage to Potiguar society and the environment.

Keywords: Risk management, MUNIC, Municipalities, RN, socio-environmental, Vulnerability.

Abstract.

Desde hace algunos años, el trípode de la gestión de riesgos en Brasil es objeto de preocupación. En general, el país ha centrado su agenda socio-ambiental en la gestión de crisis, es decir, en las políticas y acciones públicas desarrolladas tras la ocurrencia de eventos perjudiciales o que causan daños a la sociedad y al medio ambiente. La falta de inclusión de la gestión de riesgos en las agendas gubernamentales no se limita al ámbito federal, ya que las agendas estatales y municipales también han descuidado este tema. En este sentido, el objetivo principal de esta investigación es analizar cómo se configura la gestión de riesgos socio-ambientales en el estado de Rio Grande del Norte/RN, en el contexto de la construcción de un estado planificado y justo. Metodológicamente, se adoptó un enfoque cuantitativo,

RIESGOS Y VULNERABILIDADES: UN ANÁLISIS DE LA GESTIÓN DE RIESGOS SOCIOAMBIENTALES EN RÍO GRANDE DEL NORTE, BRASIL.

mediante la elaboración de gráficos, a partir de la base de datos puestos a disposición de la Encuesta Municipal de Información Básica (MUNIC), publicada en 2020. Los resultados de la encuesta mostraron que la gestión de riesgos socio-ambientales no ocupa un lugar destacado en la agenda gubernamental de los 167 municipios de Rio Grande del Norte/RN. Por lo tanto, de la lectura de los datos, se puede concluir que la mayoría de los municipios de RN no tienen instrumentos de planificación, previsión y prevención para hacer frente a la posibilidad de que ocurran eventos que puedan ser perjudiciales o causar daños a la sociedad de Potiguar y al medio ambiente.

Palabras clave: Gestión de riesgos, MUNIC, Municipios, RN, Socio-ambiental, Vulnerabilidad.

I. INTRODUCTION.

The scale of this study is the state of Rio Grande do Norte/RN, located in the Northeast region of Brazil, and the aim is to analyze how socio-environmental risk management is configured in this territory. It discusses how RN acts, through municipal management, on socio-environmental issues, and how they are being implemented, in the context of building a planned and fair state. To this end, it is expected to have a socio-environmental risk management system.

Before getting into the discussion about socio-environmental risk management in Rio Grande do Norte/RN, it is necessary to define the concepts related to this issue. It should be noted that:

The concept of risk refers to the perception of an individual or group of individuals of the possibility of a harmful event occurring. Therefore, the concept of risk is a human (or social) notion that only exists if there are people who perceive it and/or are likely to suffer from the occurrence of a harmful event (Almeida & Pascoalino, 2009, p. 2).

It is worth noting that risk is a polysemic concept, with meanings associated with conditional aspects. From this perspective, risk management corresponds to managing

the possibility of a harmful event occurring. In other words, it is implied that this concept incorporates the management of something that has not happened and demands its prediction and prevention (Almeida & Pascoalino, 2009). However, according to the authors, Brazil's risk management tripod has been the subject of concern for some years now. In general, the country has focused its socio-environmental agenda on crisis management, i.e. actions taken after the occurrence of events that cause damage to society and the environment (Almeida & Pascoalino, 2009).

Another concept related to risk management is vulnerability. The term vulnerability is not new, but it was only at the beginning of the 1980s that it began to be applied in studies evaluating specific groups that are more susceptible to certain harmful or damaging events (Almeida & Pascoalino, 2009).

In the socio-environmental context, vulnerability is conceptualized as the inability of a person, group or territory to anticipate, cope with, resist and recover from the impact of a natural hazard; it involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or society (Blaikie et al., 1994).

In this way, socio-environmental vulnerability makes environments more sensitive and exposed to risks. As such, the concept of socio-environmental vulnerability becomes essential in the approach to risks and dangers, and central to the development of strategies for predicting and preventing harmful events or those that cause damage to society and the environment, helping to cope with and mitigate the consequences of these events.

This article consists of four (4) sections: Introduction, Methodology, Results and Discussions and Conclusions. The first section introduces what this study is about and its objective. The second section describes the methodological procedures used in the research. The third discusses the results extracted through the implementation of the methods. The fourth and final section presents the conclusions about what was studied and analyzed, as well as the acknowledgements.

II. METHODOLOGY.

In terms of methodology, this article took a quantitative approach, based on the database provided by the Municipal Basic Information Survey (MUNIC). The Brazilian Institute of Geography and Statistics (IBGE) has been carrying out the Municipal Basic Information Survey (MUNIC) since 1999, providing information on Brazil's 5.570 municipalities. The aim of this survey is to establish a municipal information base, with periodically updated statistical and registration data on local public administration. The information provided indicators for evaluating and monitoring the institutional framework of the country's municipalities, contributing to the planning and improvement of municipal management.

The information collected by MUNIC is obtained from questionnaires applied to local managers in the various sectors and/or institutions investigated, who have information on public bodies and other municipal instruments (IBGE, 2023). The questionnaire provides answers of the following types: Yes, No and Cannot provide information. In addition, municipalities in which it was not possible to contact the town halls and those that had not responded by the closing date of the collection are considered to have refused. In view of this, the MUNIC is important in the analysis proposed in this study, as it encourages the managers of all Brazilian municipalities to reflect on the risk and disaster management of the municipality they administer.

This article used data from MUNIC 2020, which collected information for the years 2017, 2018, 2019 and 2020. Only the data relating to the topic "Risk Management", which is within the section "Risk Management and Disaster Response", was analyzed. This topic looked at the existence of risk planning, prevention and management instruments, which are responsible for reducing the degree of vulnerability in municipalities, as they are elements that increase society's resilience and ability to respond to the dangers that exist in the states.

MUNIC 2020 presents seven (7) variables to categorize risk in Brazilian municipalities, however, this article used the results of these variables only in the 167 municipalities of Rio Grande do Norte/RN. The seven (7) variables mentioned were used to produce seven (7) graphs, built using Google Spreadsheets.

The graphs are divided into Fig. 1: Municipalities in Rio Grande do Norte that have Urban Planning Instruments; Fig. 2: Municipalities in Rio Grande do Norte that have specialized risk management corporations; Fig. 3: Municipalities in Rio Grande do Norte that have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization; Fig. 4: Municipalities in Rio Grande do Norte that carry out activities aimed at civil defense protection; Fig. 5: Municipalities in Rio Grande do Norte

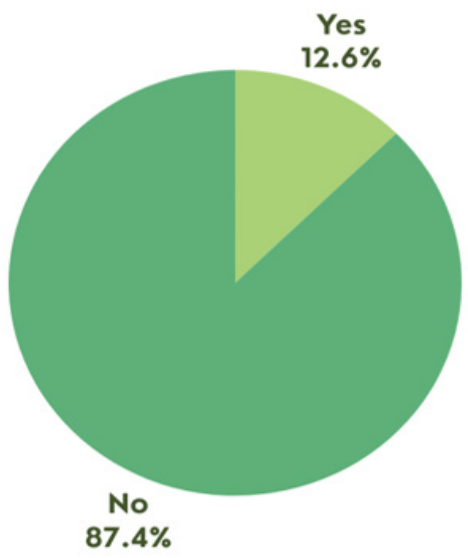
that periodically clean the city's storm drains, especially before the rainy season; Fig. 6: Municipalities in Rio Grande do Norte that have risk management in relation to disasters resulting from floods or gradual inundations, or torrents of water or steep inundations; and Fig. 7: Municipalities in Rio Grande do Norte that have risk management for disasters resulting from landslides or slope slides.

III. RESULTS AND DISCUSSIONS.

The lack of inclusion of risk management on government agendas is not limited to the federal level, as state and municipal agendas have also neglected this issue. In this sense, reading the data from MUNIC 2020 showed that socio-environmental risk management is not very high on the government agenda in the 167 municipalities of Rio Grande do Norte/RN. The data analyzed showed that the majority of municipalities in RN do not have planning, forecasting and prevention instruments to deal with the possibility of events occurring that could be harmful or cause damage to Potiguar society and the environment.

According to Villaça (1999, p. 173), urban planning is defined as "the action of the State on the organization of intra-urban space". When applied concretely, urban planning is an important instrument when it comes to preventing environmental disasters. Risk management is therefore directly linked to urban planning, and these processes complement each other.

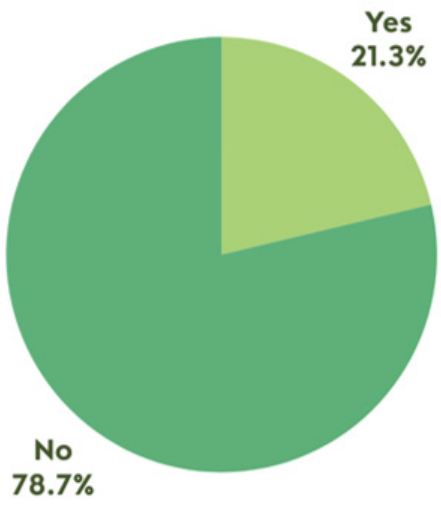
Figure 1.
Municipalities in Rio Grande do Norte that have Urban Planning Instruments.



Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Despite the fact that approximately 80% of the Brazilian population already lives in urban areas (National Household Sample Survey, 2022), Fig. 1 shows that when asked if the municipalities in Rio Grande do Norte/RN have urban planning instruments, only 12.6% of the municipalities answered Yes, and the rest, 87.4%, answered No.

Figure 2.
Municipalities in Rio Grande do Norte that have specialized risk management corporations.



Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

In addition, Fig. 2 shows that when asked if the municipalities in Rio Grande do Norte have specialized risk management corporations, the majority of municipalities, 78.7%, again answered No, and only 21.3% of municipalities answered yes.

As a result, even though the municipalities of Rio Grande do Norte/RN are responsible for concentrating most of the population and economic activities in the state, they do not have urban planning instruments incorporated into their municipal agendas, such as specialized risk management bodies.

Risk areas are characterized as less valued territories, such as floodplains and steep slopes; historically, these areas have been occupied by socioeconomically vulnerable populations (Ribeiro, 2010). The concept of social vulnerability is multidimensional, as it can occur due to issues related to social inequality, low schooling, unemployment or underemployment, poor health and difficulty in accessing public policies (Vignoli, 2001). In view of this, it can be concluded that this issue is related to individuals who are in a process of social exclusion, lack of representation and opportunities, and without

access to basic social rights, in other words, who are on the margins of society.

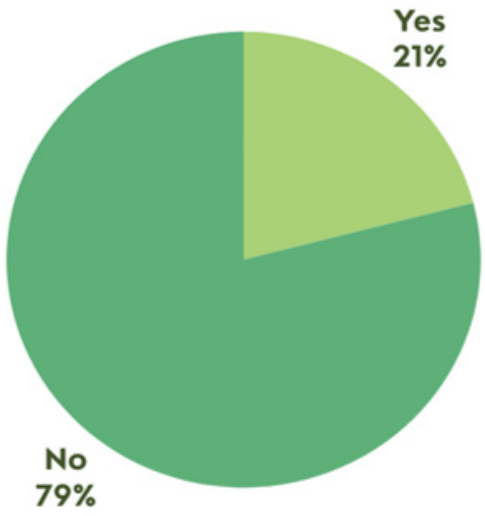
In most cases, Brazil's risk areas are located far from the urban centers of cities, due to the country's rapid urbanization process, coupled with the expropriation of land in the countryside, especially between the 1970s and 1980s (Ribeiro, 2010). According to the author, this process resulted in masses of migrant workers who, without job opportunities or with jobs that provided low pay, were unable to afford to house in urban centers. In addition, Ribeiro (2010) points out that, as an alternative, this population was left to occupy the peripheral areas of the cities, which were of no interest to people with great purchasing power, precisely because they were located far from the urban centers, and because they were areas susceptible to risk situations, such as disasters resulting from floods, inundations, torrents of water, landslides or slope slides.

In these areas, which are considered to be at risk, factors such as low levels of education, combined with the absence of concrete risk management, with measures to predict and prevent socio-environmental disasters, only tend to increase the risk of the individuals who occupy these zones, or intensify the consequences if these events actually happen.

At the federal level in Brazil, civil defense was institutionalized in the late 1940s, in the context of the ideological polarization after the Second World War (Valencio, 2010). In his bibliography, Valencio explains that civil defense consists of a set of prevention, mitigation and emergency preparedness measures designed to prevent disasters or minimize their impact on the population. These actions take place before, during and after disasters, with the aim of reducing the risks and damage suffered by the population in the event of these events, which mainly affect the most vulnerable individuals or social groups. In recent decades, with the increase in socio-environmental disasters, civil defense has come to play a strategic role in emergency situations.

Figure 3.

Municipalities in Rio Grande do Norte that have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization.

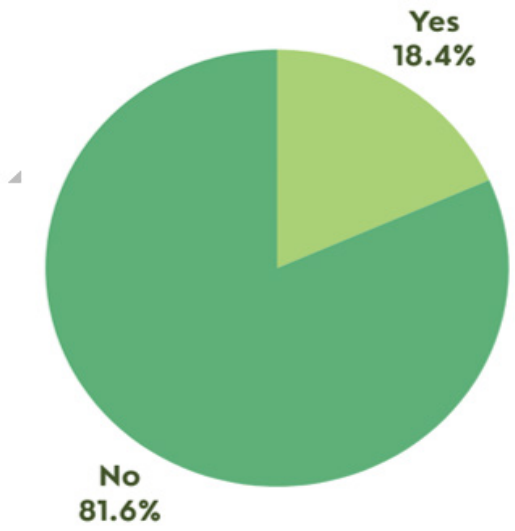


Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 3 and Fig. 4 analyze the civil defense situation in Rio Grande do Norte/RN. Fig. 3 shows that when asked if the municipalities in RN have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization, only 21% of the municipalities answered Yes, and the remainder, which is the majority of municipalities, 79%, answered No.

Figure 4.

Municipalities in Rio Grande do Norte that carry out activities aimed at civil defense protection.



Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 4 shows whether the municipalities in RN carry out civil defense activities. Fig. 4, on the other hand, shows that when asked whether the municipalities of RN carry out activities aimed at civil defense protection, only 18.4% of the municipalities answered yes, and the rest, 81.6%, again the majority, answered No.

In this way, because it plays a strategic role in emergency situations, civil defense contributes to territories with less vulnerability. However, with regard to this issue, the data shown in Fig. 3 and Fig. 4 show that the state of RN does not have an effective civil defense incorporated into the government agendas of its municipalities.

Modern society's way of life, which has led to the unbridled use of fossil fuels worldwide, is a major contributor to greenhouse gas (GHG) emissions, accelerating global warming and thus changing the global climate (Garcias & Silva, 2011). The authors point out that these climate changes are strongly influenced by anthropogenic action.

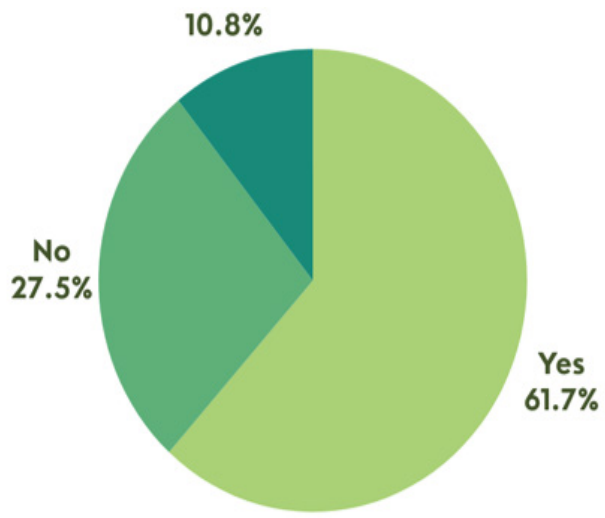
Because they concentrate most of the population and economic activities, cities have been experiencing changes in their climate, which imply a rise in temperature, generating an increase in rainfall, which can potentiate the occurrence of socio-environmental disasters, especially in areas most vulnerable to risks (Teixeira & Pessoa, 2017).

From this perspective, Chaves (2009) points out that individuals or groups in situations of socio-economic vulnerability tend to also be in situations of socio-environmental vulnerability. In general, the author considers that economic aspects are one of the determining reasons for vulnerability to socio-environmental risks.

An important measure for preventing disasters resulting from floods, inundations, torrents of water, landslides or slope slides is the periodic cleaning of storm drains, especially before the rainy season. This measure consists of cleaning the inlet, cleaning the inside of the drainage device, as well as checking and repairing, if necessary, any infiltrations and erosions that may occur (Salomão et al., 2019). Periodic cleaning of storm drains allows rainwater to drain properly, contributing to the prevention of disasters, among other inconveniences that can be caused by clogged storm drains.

Figure 5.

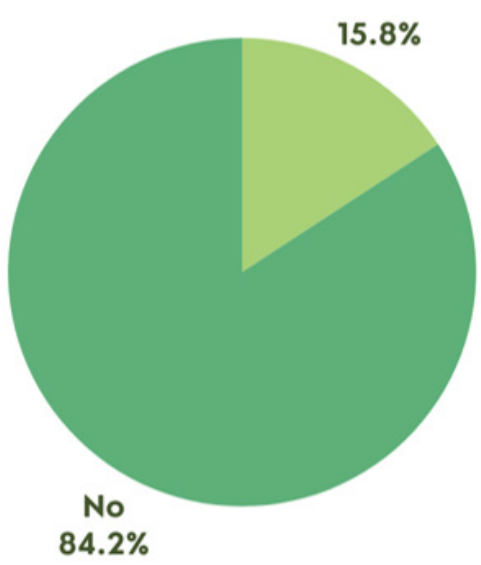
Municipalities in Rio Grande do Norte that periodically clean the city's storm drains, especially before the rainy season



Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 5 shows that when asked whether the municipalities of Rio Grande do Norte/RN periodically clean their storm drains, especially before the rainy season, the majority of municipalities, 61.7%, answered Yes; 27.5% answered No; and 10.8% answered Cannot provide information.

Figure 6.
Municipalities in Rio Grande do Norte that have risk management in relation to disasters resulting from floods or gradual inundations, or torrents of water or steep inundations.

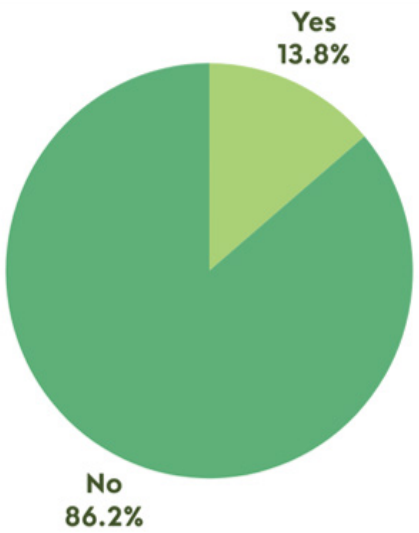


Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

However, even though the periodic cleaning of storm drains is an important measure for the prevention of disasters resulting from floods, inundations, torrents of water, landslides or slope slides, and Fig. 5 is the only category of the seven (7) analyzed that showed a higher percentage of Yes answers than No, Fig. 6 shows that

the percentage of municipalities in RN that have risk management, with specific instruments to deal with these disasters, is low. When asked if the municipalities have risk management for disasters resulting from floods or gradual inundations, or torrents of water or steep inundations, only 15.8% of the municipalities answered Yes, and the remaining municipalities, 84.2%, answered No.

Figure 7.
Municipalities in Rio Grande do Norte that have risk management for disasters resulting from landslides or slope slides.



Fuente: Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 7 shows that when asked if the municipalities have risk management for disasters resulting from landslides or slope slides, only 13.8% of the municipalities answered yes. Again, the majority of the municipalities, 86.2%, answered No.

The data shown in Fig. 6 and Fig. 7 leads us to reflect on the importance of public interventions, especially in recognizing areas considered to be at risk in Rio Grande do Norte/RN, as these are territories that need greater attention from government officials. Furthermore, recognizing areas considered to be at risk is necessary for effective risk management to take place. Thus, this research reaffirms the importance of strategies for predicting and preventing socio-environmental disasters, which can be harmful or cause damage to society and the environment, helping to cope with and mitigate the consequences of these events.

In short, this study does not intend to state that only areas occupied by individuals or social groups in conditions of vulnerability are susceptible to risk, however, based on various readings on this subject, it is believed that the occurrences of socio-environmental disasters are largely related to the occupation of irregular areas, generally occupied by more vulnerable populations.

IV. CONCLUSIONS.

During its three phases, this scientific research sought to promote discussion and reflection on the socio-environmental impacts that the absence of risk management causes in territories that do not have this instrument incorporated into their governmental agenda. The problem of environmental issues is a global one, but territories, both urban and rural, bear a great deal of responsibility, especially cities, since they concentrate most of the population and productive activities.

This article analyzed how Rio Grande do Norte/RN acts, through municipal management, on socio-environmental issues, and how they are being implemented in the local government agenda, in the context of building a planned and fair state that has socio-environmental risk management. The results obtained through the database of the Municipal Basic Information Survey (MUNIC) showed that socio-environmental risk management has a low level of incorporation in the governmental agenda of the municipalities of RN.

Based on these considerations, it can be concluded that this study is of the utmost importance for understanding the concepts of risk management and its dimensions, as well as the concepts of types of vulnerability. In this context, the relevance of this research is notable, as it exposes how the absence of risk management affects the most vulnerable individuals or social groups, and from this, alternatives can be found to intervene against vulnerabilities (social, environmental or socio-environmental).

This study also contributes to reflecting on how socio-environmental risk management is essential and central to dealing with and mitigating the consequences of harmful events or those that cause damage to society and the environment, at the various scales of analysis (municipal, state, national and global).

V. BIBLIOGRAFÍA.

Almeida, L., & Pascoalino, A. (2009). Risk, development and (environment) management in Brazil – A case study on natural disasters in Santa Catarina. Brazilian Symposium on Applied Physical Geography, Viçosa, Minas Gerais, Brazil. Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014). At risk: natural hazards, people's vulnerability and disasters. (2nd ed.). Routledge.

Brazilian Institute of Geography and Statistics. (2023, May 5). Profile of Brazilian municipalities 2020. Research of basic municipal information. Rio Grande do Norte, 2023. https://www.ibge.gov.br.

Chaves, S. (2009). Socio-environmental Vulnerability in Teresina. [Master's dissertation, Federal University of Piauí]. Public Domain. http://www.dominiopublico.gov.br/pesquisa/DetalheObraForm.do?select_action=&co_obra=159728.

Garcias, C. M., & Silva, C. M. da. (2011). Urban environment and climate change – case study from the municipality of Castro, PR. Risco Journal of Research in Architecture and Urbanism (Online), (14), 28-40. https://doi.org/10.11606/issn.1984-4506.v0i14p28-40.

National Household Sample Survey. (2023, May 5). National Household Sample Survey: 2022 indicators. Rio de Janeiro: IBGE. https://ftp.ibge.gov.br/Trabalho_e_Rendimento/Pesquisa_Nacional_por_Amostra_de_Domicilios_continua/Trimestral/Novos_Indicadores_Sobre_a_Forca_de_Trabalho/pnadc_202204_trimestre_novos_indicadores.pdf.

Ribeiro, W. (2010). Urban risks and vulnerability in Brazil. Scripta Nova, (14), 65. https://www.researchgate.net/profile/Wagner-Ribeiro-2/publication/47559346_Riscos_e_vulnerabilidade_urbana_no_Brasil/links/00463534da1ad41c9f000000/Riscos-e-vulnerabilidade-urbana-no-Brasil.pdf.

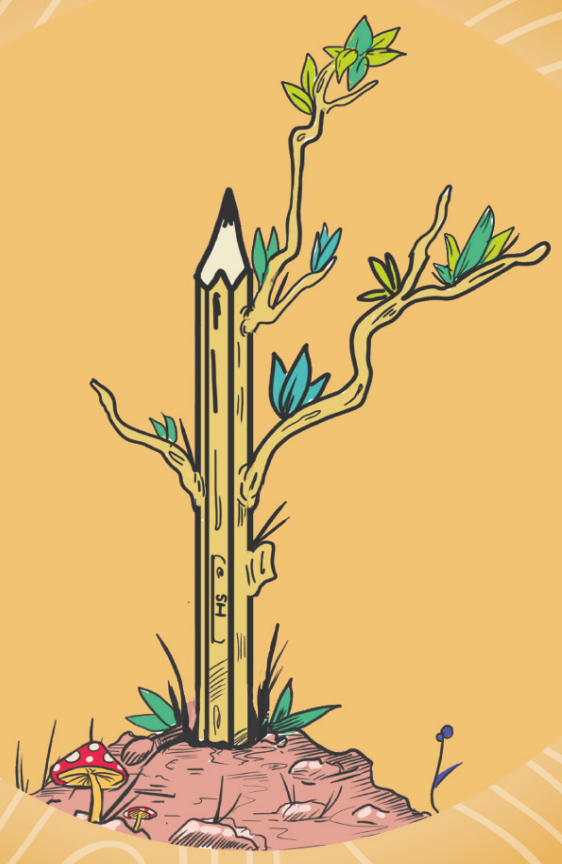
Salomão, P., Pereira, R., Carvalho., & Ribeiro, P. (2019). The importance of conservation services on paved highways. Research, Society and Development, 8 (8), 11. https://www.redalyc.org/journal/5606/560662199016/560662199016.pdf.

Teixeira, R., & Pessoa, Z. (2017). Cities, climate change and socio-environmental conditions: a case study of municipal urban management in the city of Natal/RN. Proceedings of the ReACT-Anthropology of Science and Technology Meeting, 3 (3), 99. https://ocs.ige.unicamp.br/ojs/react/article/view/2821/2683.

Valencio, N. (2010). Disasters, social order and civil defense planning: the Brazilian context. Health and Society, (19), 752. https://doi.org/10.1590/S0104-12902010000400003.

Vignoli, J. (2001). Vulnerabilities and vulnerable groups: a conceptual framework for young people. CEPAL.

Villaça, F. J. M. (2010). A contribution to the history of urban planning in Brazil. In O processo de urbanização no Brasil. São Paulo: EDUSP.



HU revista

Universidad de Nariño
FUNDADA EN 1904

Universidad de Nariño
ACREDITADA EN ALTA CALIDAD
RESOLUCIÓN MEN 000022 - ENERO 11 DE 2023

Facultad de Educación

latindex

Departamento de Estudios Pedagógicos