HUELLAS revista

20

ISSN en Línea: 2382 - 4875
ISSN Digital: 2389 - 9360

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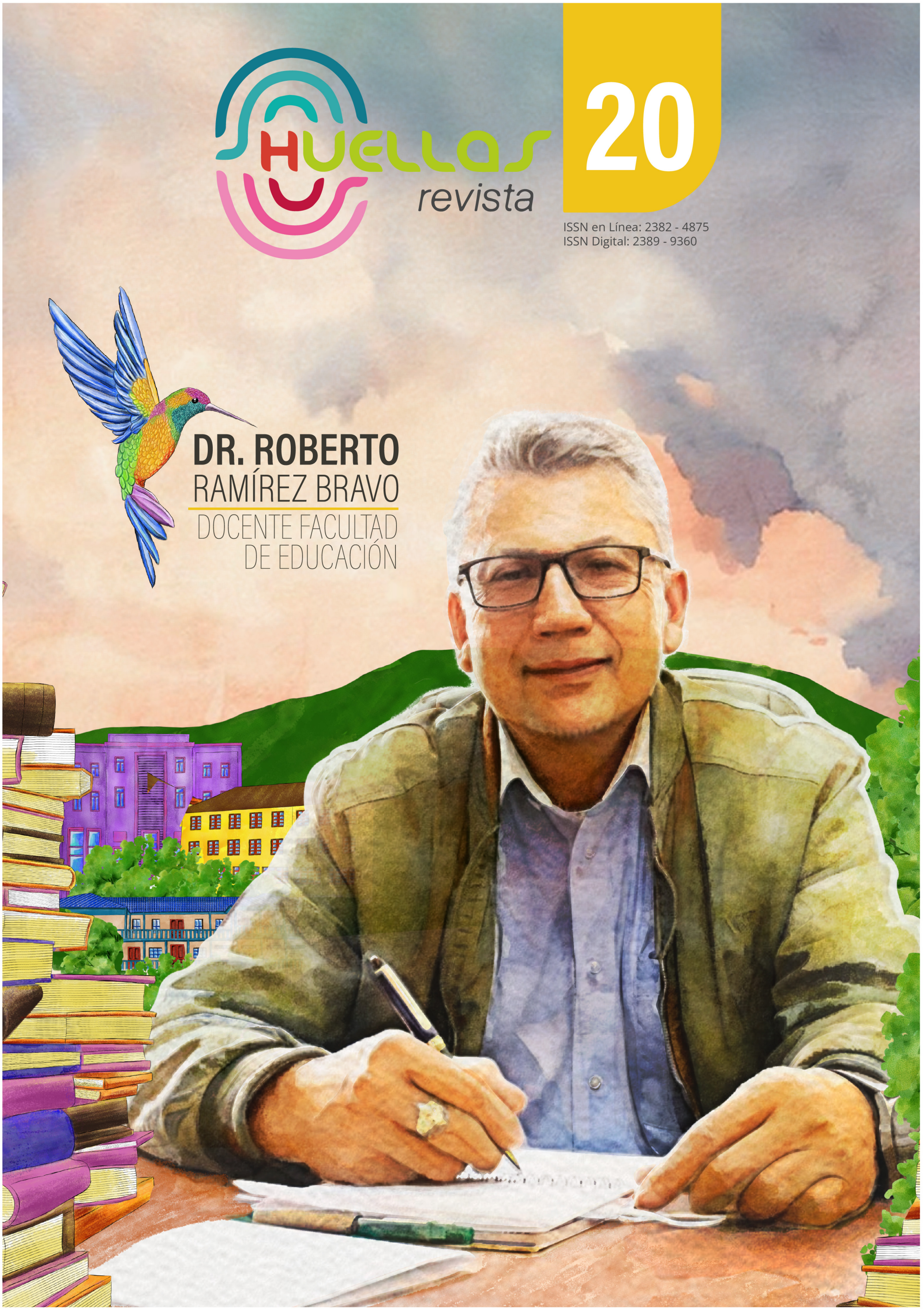
DOCENTE FACULTAD DE EDUCACIÓN



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

Dr. OMAR ARMANDO VILLOTA
Director y Editor Académico

On this occasion, we are proud to dedicate a special space to exalt the indelible marks that our teachers leave in education and in our lives.

Dr. Roberto Ramírez Bravo has not only left a significant impact through his teaching work, he has also contributed to the advancement of knowledge through rigorous research and influential publications in his field. His vocation for teaching and his academic leadership are pillars that will inspire colleagues, students and the entire educational community.

His legacy transcends the classroom, carrying with him the commitment to train not only professionals, but also integral, critical human beings committed to the transformation of society. Every lesson taught, every project led, and every student mentored reflects his passion for education and his tireless pursuit of excellence.

We invite our readers to learn more about his admirable career, since his contribution to the development of education and research makes this recognition a sign of gratitude and admiration for a teacher who, without a doubt, continues to build a great legacy in the University of Nariño.

Dr. Omar Armando Villota Pantoja

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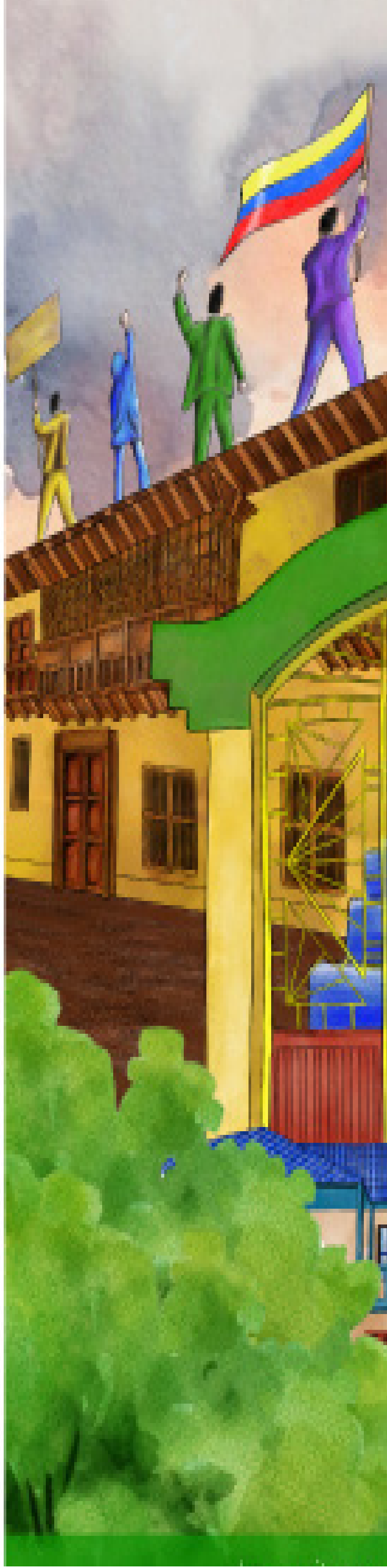

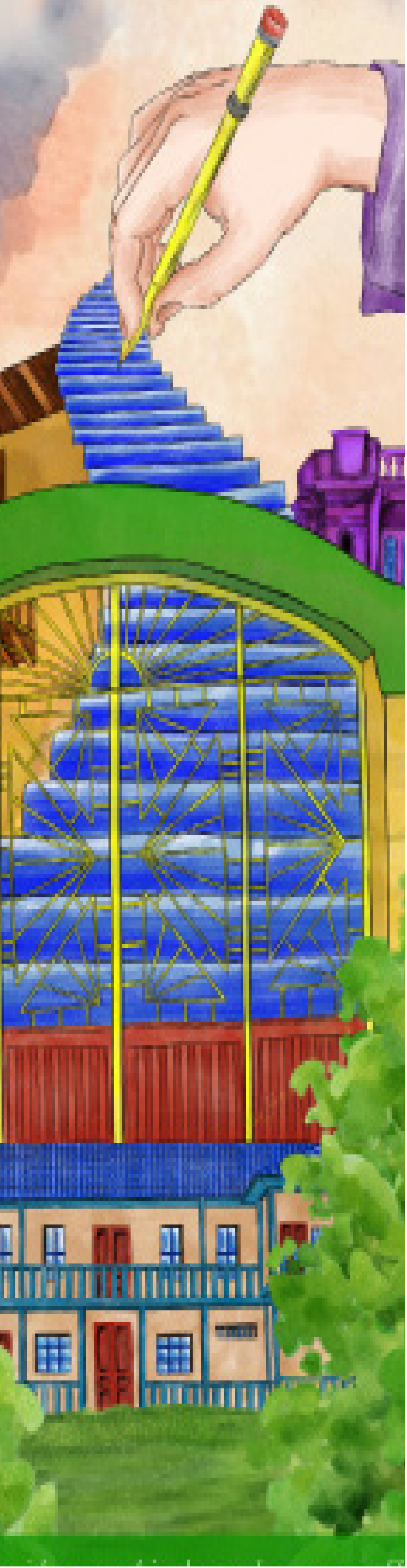

Content

PROMOTING ENVIRONMENTAL CONSERVATION THROUGH TECHNOLOGY: RESULTS OF PHASE V OF THE PEDAGOGICAL SUPPORT PROJECT IN THE SAN SEBASTIÁN COMMUNITY, MANIZALES.

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Reception Date: April 11, 2022

Acceptance Date: November 24, 2023

Abstract

This article is the result of a social project carried out in the city of Manizales. Through joint work, "Universidad Católica de Manizales (UCM)" and "Obras Sociales de Betania" foundation developed this fifth phase, which intended to promote environmental conservation culture among the children and youngsters who take part in the soccer and dance schools in the community of "San Sebastián Manizales" and participate in technological projects. In this regard, a qualitative methodology was implemented using the research-action educational approach, with the purpose of working together with the students involved in the project, parents, and UCM teachers. The research findings permitted to identify the students' qualities and skills in managing solid waste and recycling to construct the various proposed technological devices in different sessions. In conclusion, it highlights the involvement of families in the development of activities outlined by UCM and how students recognized the importance of environmental care for a better quality of life.

Keywords: environmental education, technological projects, pedagogical support, social projection, technological tools.

Resumen

El siguiente artículo es el resultado del proyecto social, el cual se ejecutó en la ciudad de Manizales, en articulación entre la Universidad Católica de Manizales (UCM) y la Fundación Obras Sociales de Betania. Siendo esta la quinta fase del proyecto, se propuso como objetivo de la investigación fomentar mediante los proyectos tecnológicos la cultura de la conservación del medio ambiente, en los niños, niñas y jóvenes de la escuela de fútbol y danzas de la comunidad de San Sebastián de la ciudad de Manizales. En ese sentido, se implementó una metodología cualitativa desde el enfoque de la investigación, acción educativa, con el propósito de trabajar en conjunto con los estudiantes que hacen parte del proyecto, padres de familia y docentes de la UCM. Los hallazgos fruto de la investigación permitieron identificar las cualidades y habilidades de los estudiantes con el manejo de los residuos sólidos y el reciclaje para la construcción de cada uno de los artefactos tecnológicos propuestos en las diferentes sesiones. A modo de conclusión, se resalta la vinculación de la familia para el desarrollo de las actividades planteadas desde la UCM y cómo los estudiantes reconocieron la importancia del cuidado del ambiente para tener una mejor calidad de vida.

FOMENTANDO EL CUIDADO DEL MEDIO AMBIENTE A TRAVÉS DE TECNOLOGÍA: RESULTADOS DE LA FASE V DEL PROYECTO DE APOYO PEDAGÓGICO EN LA COMUNIDAD DE SAN SEBASTIÁN, MANIZALES.

Palabras Clave: Educación ambiental, proyectos tecnológicos, apoyo pedagógico, proyección social, herramientas tecnológicas.

I. INTRODUCTION

In today's world education must focus on developing skills and competencies that students can use throughout their lives. For this reason, Delors (2013) states that teaching and learning processes need to be immersed on 4 fundamental pillars namely: learning how to know, a tool for understanding; learning how to do, being able to influence one's own environment; learning how to live together, to participate and cooperate with others in all human activities; and finally, learning to be, a fundamental process that integrates the first three elements. In this context, the importance of the articulation of technological projects to promote environmental care is recognized.

Regarding this, educational institutions must promote spaces for reflection based on their own experiences and recognition of the context of each student, so that graduates have the ability to face the realities that life brings. In this sense, qualified professionals are required, and they need to show, not only discipline skills, but also the ability to give answers to global demands, generating in this way a positive impact on the society that surrounds them. They also need to maintain peaceful coexistence, and grant the presence of generations committed to the development of their country and who know their environment and immediate reality.

So, it is imperative to strengthen the education of learning by becoming because universities put knowledge first, and to a certain extent they ignore the fundamental basis of being a person. Due to this, companies recruit excellent professionals many times, but abandon them because they consider them to be mean. For that reason, they need a holistic presence that

needs to go hand in hand with their professional practice. Thus, we all should go back to the basics, and avoid the use of so much paperwork, and instead, promote strong verbal commitment.

The advent of technology in the 21st century has provided tools, not only to circulate and store data and information but also to ease communication posing a double requirement for education that, at first glance, seems almost paradoxical: education must disseminate, on a large scale and effectively, an increasing number of theories and knowledge by means of technology, adapted to civilization, since they are the basis of future skills. At the same time, it must find and define guidelines so as not to be overwhelmed by the more or less ephemeral flow of information that invades public and private spaces, and keeps individual and collective development projects on track. In certain way, schooling is forced to provide a nautical chart of a complex, constantly exciting world and, at the same time, a compass to navigate in it (Delors, 2013).

Additionally, Serna et al., (2017), remark the environmental conditions at "El Recreo" primary school branch. These conditions were presented in their research, and at the same time they proposed to find solutions to the environmental problem of the institution. It is worth considering that the students and the whole community were not used to recycling. Instead, all the materials they collected both at home and at school were burned near their homes. Sometimes, when a large amount of waste accumulated and its burning was delayed, this attracted flies, ants, mosquitoes and various rodents, which gave rise to diseases and unpleasant odors.

On the other hand, research works like those carried out by Largo-Taborda et al., (2022) and Gutierrez-Giraldo et al., (2023), have delved into pedagogical processes focusing on strengthening environmental sensibility by articulating technological inside the pedagogical ones. In this sense, the researchers highlight the importance of the use of technological tools in the teaching and learning processes aimed at reinforcing the recycling culture to take care of the environment.

In line with the above mentioned, it is worth commenting that several intervention projects have been developed since 2018 through joint work between "Obras Sociales de Betania" foundation and "Universidad Catòlica de Manizales" (UCM) aiming at collectively building formative spaces in San Sebastian neighborhood in Manizales. This work has been done with active participation of boys, girls and young adults who take part in the *"Apoyo Pedagógico para niños de la Escuela de Fútbol y Danzas de la Comunidad de San Sebastián Manizales." Program.*

II. METHODOLOGY

This research project is carried out using the qualitative approach to analyze both, the context and the relationships among the young population involved in dance and football at San Sebastian schools in Manizales Colombia. The main aims of this research project are to foster the culture of protecting the environment by means of technological projects, as well as to instill in these children the importance of preserving natural resources.

This research project employs a qualitative approach to analyze both the context and the relationships among the young populations involved in dance and football at San Sebastián schools in Manizales, Colombia. The primary aims of this project are to promote a culture of environmental protection through technological initiatives, as well as to instill in these children the importance of preserving natural resources.

Methodological procedure: This is carried through the following stages.

- First Stage: Research Baseline.

. Identify the actions that boys, girls and youngsters do regarding the protection of the environment, in order to determine and define the different technological projects that are going to be designed.

- Second Stage: Intervention Stage – Follow up.

- Environment technological protection projects will be designed and implemented.

- Third Stage: Evaluation, impact, sustainability.

- A post-test will permit to establish the extent of appropriation of boys, girls and youngsters regarding the protection of the environment, and in this way, it would be possible to analyze whether or not there was improvement on this issue thanks to the implementation of the technological projects used during the development of the study.

In order to carry out our research proposal, we have conceived an educational action research (IAE). This methodology allows us to identify and analyze the moments of reflection that arise in the interactions between the teacher-researchers, the students and the parents that make up our study community (Duque & Largo, 2021).

III. RESULTS

With the implementation of the project, it was possible to carry out the intervention with the community through support using the ZOOM platform. These meetings took place every 15 days, applying technical sheets in which support was given in the construction of the technological projects.

At first, a robotic hand was built, then a booklet was designed and finally, a picture frame was created. For each of the previous activities, the materials had to be recycled or reused in order to mitigate and reduce the environmental impact and, make students more aware of its importance but especially to the parents.

Each developed activity took a month, and followed the sequence shown in figure 1.

Fig. 1. Work sequence with boys, girls and youngsters.

As a final process, a socialization exercise was carried out in which the students-participants had the opportunity to present their activities with the participation of teachers, leaders of the foundation and, mainly, parents who were able to demonstrate the results obtained during the accompaniment that took place in the first semester of 2021.

It is important to emphasize that, through the support given to the children and the young people, who take part of the San Sebastian football and dance schools at the foundation called "Obras Sociales de Betania", various activities, which focus on several areas of knowledge like: Mathematics, language, environmental education and critical thinking, have been implemented, and these have always been permeated by the use of ICT tools.

Environmental care and technological projects

Environmental education and environmental care are topics of great importance at schools and other educational institutions, especially in the teaching of natural sciences. It is essential that students understand how these concepts relate to their daily lives and their educational process. Environmental concepts have traditionally focused on natural resources, such as biodiversity, water, flora and fauna. However, environmental education goes beyond nature and relates directly to human interactions in society.

In this context, technology plays a fundamental role in today's education. Technology influences the way we teach and learn. The implementation of technological projects in environmental education can motivate students and promote habits that contribute to the protection and preservation of the natural environment. Technology becomes a key tool for solving environmental problems and improving the quality of life.

The emergence of property and its relationship with the State are crucial factors in understanding the interaction between humans and the environment. Property leads to the creation of the State as a means of ensuring the preservation of property and wealth. This often leads to the exploitation of some individuals by others. Technology becomes a solution to address this problem, while promoting environmental conservation. Governments have established regulations to protect the environment and promote technological advancement.

Promoting environmental care through technological projects in educational settings is essential to motivate students and enable them to understand the importance of preserving the natural environment. Technological projects encourage student motivation and connect them with their environment, allowing for a greater understanding of the importance of environmental education.

Environmental education in primary schools is essential for students to strengthen their environmental awareness and develop skills that enable them to address environmental issues. Technological projects help students interact and develop skills for recycling and reusing materials.

The use of information and communication technology (ICT) allows us to identify students' prior knowledge and adapt teaching to their needs. In addition, it allows to encourage the development of their entrepreneurial skills and abilities.

In conclusion, the implementation of technological projects in environmental education in the community of San Sebastián has proven to be an effective strategy to motivate students, promote environmental awareness and develop technological and entrepreneurial skills. These projects have allowed students to understand the importance of preserving the environment and contributing to society from a sustainable perspective.

Technological projects and the environment: A contribution from vulnerability

Environmental education is an essential tool to safeguard the sustainability of development and to promote skills aimed at caring for and preserving the environment. It is essential to understand how the implementation of educational alternatives contributes to the sustainable development of regions. Educational processes are intertwined with social problems to propose solutions and strategies for change.

As technology advances, environmental problems become more complex and urgent. Education becomes a key agent of change to address these challenges and transform society. The speed of development and the multiculturalism of today's society bring about significant challenges for educational systems, which must adapt to an uncertain and complex future.

Education becomes the connection point between technological progress and social and environmental responsibility. Students become active agents of change, contributing to peacebuilding and promoting environmental awareness. Technology and innovation play an important role in this process, motivating students and improving the quality of education.

Society is immersed in an interdependent cycle, where nature, technology and education are related to maintain balance and stability. Education must be contextualized and relevant so that each member of the educational community is aware of their role in preserving the planet.

The articulation of environmental education with technological projects allows students to understand the world through educational processes adapted to their context. Technology drives innovation, motivating students and improving the quality of the education. Social innovation delves into the necessities of vulnerable people and promotes initiatives that aim for the protection of the environment.

Innovating involves the interaction of processes that consider the exchange of information with the exterior. Schooling plays a paramount role in the transformation of the environment, and it also promotes dialogs among the context, the technology and the environmental education. The generated ideas and the efficient practices replicate and adapt in diverse contexts, enriching the innovation process.

The intervention process not only contributes to the learning experiences of the students regarding the environment and the technological projects, but it also generates accompaniment and reflection spaces for the entire community, promoting at the same time collective learning, as well as wider environmental conscience.

IV. DISCUSSION

During the course of the Pedagogical Support project for children from the "San Sebastián-Manizales Community Football and Dance Schools" and the Foundation, we carried out the fifth phase, which focused on promoting environmental awareness and preserving the natural environment through technological projects. The results of this research have revealed a series of highly relevant findings.

Firstly, it was observed that the participating students demonstrated greater appropriation and recognition of the positive influence of technology in their educational process. They better understood how technological tools can enhance their learning and contribute to the development of society in general. The increase in technological awareness can be translate into better use of digital resources in future stages of their education.

Authors such as Alzate et al., (2018); Parra-Bernal & Agudelo-Marín (2022); Largo-Taborda et al., (2022) and Hurtado (2020), state that the use of technology in schooling processes allows students to increase their interest and motivation (Ruiz-Ortega & Rodas, 2023), when addressing new concepts that were not initially attractive.

In addition, an improvement was seen in the areas in which pedagogical support was provided. Students who received this assistance experienced an increase in their levels of socialization and greater respect for the norms established in the program activities. This strengthening in social coexistence is essential for their personal development and future success in society.

In this context, the use of technological tools not only improved aspects related to the learning of some concepts of natural sciences, but it also promoted the

care of the environment from the perspective of the conservation of materials that can have other uses or that can be recycled, thus generating spaces for reflection around the recognition of environmental problems (Largo-Taborda & Rosero-Moreano, 2016; Largo-Taborda, 2022).

Finally, it is relevant to highlight that the project not only promoted academic training, but also emphasized academic qualification of students. Integration and development activities were carried out during the scheduled days. In addition, the participation of the students' families was promoted, fostering spaces for reflection and dialogue. Parents showed significant commitment to "Obras Sociales de Betania" foundation as well as "Universidad Católica de Manizales", which further strengthens the positive impact of the project on the community and contributes to a more comprehensive and holistic education.

In short, the fifth phase of this project proved to be highly beneficial in terms of technological awareness, social development and academic qualification. The positive results obtained highlight the importance of addressing not only academic aspects, but also values and social interaction in the education of young people in the community of "San Sebastián-Manizales". These findings can serve as a basis for future educational programs and projects that seek a positive and lasting impact on society..

V. CONCLUSIONS

After working in the community through the project called Pedagogical Support for the children of the soccer and dance schools of the community of "San Sebastián - Manizales", which was developed with "Obras Sociales de Betania" foundation, and was implemented with a focus on strengthening environmental awareness, it can be concluded that students show greater disposition and recognition of the value of protecting the environment. Besides, it allowed to highlight the contribution of technology in the training process throughout the fifth stage of the technological project and care for the environment, especially into social impact.

At the same time, there was also improvement in teaching support, which in turn showed that students who participated in Stage 5 experienced an increase in their level of socialization and respect for the rules established in the activities designed to promote social coexistence. Most importantly, this stage also helped to strengthen the culture of conservation and care of the environment.

Finally, it is important to recognize that through the pedagogical processes aimed at building environmental awareness in the community, students and their families have strengthened this aspect, since by developing support through the use of ICT, it was possible to involve parents in the construction and development of activities, fostering collaborative and joint work that extended from the home of each student.

Through the project "Pedagogical Support for Children belonging to the Soccer and Dance Schools of the Community of "San Sebastián" in Manizales, "Obras Sociales de Betania" foundation, we have implemented phase 5 of the project, which focuses on strengthening environmental awareness and care for the environment through technological projects. The results indicate a greater level of appropriation and recognition by students of the contributions of technology in their learning process and in the development of society in general.

Likewise, we have observed significant improvements in the areas where pedagogical support has been provided. In particular, the students who participated in phase five showed an improvement in their socialization skills and greater respect for the rules established in the activities, which has contributed to a more harmonious coexistence.

In addition, the project has enriched the process of human qualification, not only through the areas of intervention, but also through integration and development activities during the established days. Collaboration has been encouraged within the family as a means of consolidating spaces for reflection and dialogue between the children participating in the program and their parents. The latter have demonstrated an outstanding commitment to "Obras Sociales de Betania" and "Universidad Catolica de Manizales" University of Manizales in the continuation and progress of the project.

ACKNOWLEDGEMENTS

Acknowledgement to "Universidad Católica de Manizales" and the Foundation "Obras Sociales de Betania"s for supporting the researchers of this project.

Researchers' names and institutions.

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Wilson, Alejandro Largo Taborda – – "Universidad Católica de Manizales, *Natural Sciences and Mathematics programs.*

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STATE OF THE ART ON THE ANCESTRAL PLANTING OF THE "JUNCO" (GYNERIUM SAGITTATUM) AND THE WEAVING OF BASKETS ORIENTED TOWARDS ENVIRONMENTAL EDUCATION IN THE CARE OF MOTHER EARTH.

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Reception Date: July 01, 2023
Acceptance Date: November 09, 2023

Abstract

This article is the result of a research work that is in process of development and makes special emphasis on the state of the art and the theories that support it, taking into account the philosophy of Andean thought of indigenous peoples. Its objective is to determine how the ancestral planting of the reed (Gynerium Sagittatum) and the weaving of baskets, contributes to environmental education in the children of the indigenous community Quillasinga de Jenoy and from there to contribute to the care of mother earth, especially the care of water. For this purpose, techniques such as direct observation, conversation and minga of thought supported by oral tradition, whose characteristics are part of the community's customs, are used.

In this way, it is expected that the results of this work will make it possible to contribute to environmental education taking into account the cultural identity of the community, starting from early ages as in the case of the children of the Genoy cabildo and in this sense to rescue the knowledge possessed by the elders as well as their experiences throughout life, so that the relationship of man with mother earth and everything that lives around him is mediated by harmonization under the principles of reciprocity and complementarity as expressed by some theoreticians.

Keywords: Andean thought, reed (Gynerium Sagittatum), basket weaving, environmental education. Mother earth, water, cultural identity, principles of reciprocity and complementarity.

Resumen

El presente artículo es el resultado de un trabajo de investigación que se encuentra en proceso de desarrollo y hace especial énfasis en el estado del arte y las teorías que la sustentan, teniendo en cuenta la filosofía del pensamiento andino de los pueblos indígenas. Cuyo objetivo es de determinar cómo la siembra ancestral del junco *(Gynerium Sagittatum)* y el tejido de canastos, contribuyen a la educación ambiental en los niños de la comunidad indígena Quillasinga de Jenoy y desde ahí poder aportar al cuidado de la madre tierra, en especial al cuidado del agua. Para ello, se emplean técnicas como la observación directa, el conversatorio y la minga de pensamiento apoyada en la tradición oral, cuyas características hacen parte de las costumbres de la comunidad

De este modo, se espera que los resultados de este trabajo posibiliten aportar a la educación ambiental

ESTADO DEL ARTE SOBRE LA SIEMBRA ANCESTRAL DEL "JUNCO" (GYNERIUM SAGITTATUM) Y EL TEJIDO DE CANASTOS ORIENTADOS HACIA LA EDUCACIÓN AMBIENTAL EN EL CUIDADO DE LA MADRE TIERRA.

teniendo en cuenta la identidad cultural de la comunidad, iniciando desde edades tempranas como es el caso de los niños del cabildo de Genoy y en este sentido rescatar los saberes que poseen los mayores al igual que sus experiencias a lo largo de la vida, para que la relación del hombre con la madre tierra y todo lo que habita a su alrededor esté mediada por la armonización bajo los principios de reciprocidad y complementariedad como lo expresan algunos teóricos.

Palabras Clave: Pensamiento andino, junco (Gynerium Sagittatum), tejido de canastos, educación ambiental. Madre tierra, agua, identidad cultural, principios de reciprocidad y complementariedad.

I. INTRODUCTION

Within the Andean cosmogony, the components of the world (material and immaterial) have life, and therefore are subject to complying with the natural cycle. This is why, mountains, flowers, animals, the moon, stars, among others, are considered alive. In this way, nature is identified as the mother or Pachamama, the source and final resting place of life and, like every mother, she takes care of her children and they take care back of her through a harmonious relationship that, in turn, allows for a balance between its inhabitants (García, 2003).

Therefore, the community of Cabildo Quillasinga de Jenoy has an indigenous worldview closely linked to Mother Earth, which is why the present study stems from the need to strengthen its cultural identity and roots in its ancestral territory, under an environmental vision, which seeks to recover the spiritual connection of man with nature, addressing its weaving and relating it to environmental education. Here the reed, in addition to constituting a protector of water, is the raw material for working basketry and, around it, to be able to address issues related to the protection of water, the culture of the chagra, the cultivation of reed, the making of baskets,

and, in general, the care of Mother Earth, from ancestral wisdom and the Quillasinga indigenous worldview.

In accordance with the previous view, this article gathers and synthesizes information from studies around the ancestral planting of the reed *(Gynerium sagittatum)* and the weaving of baskets oriented towards environmental education in the care of Mother Earth, with the purpose of developing a training process that allows the community to identify environmental situations and problems that affect their environment, become aware of them and act as agents of change by proposing possible solutions articulated to the knowledge and know-how proper of their culture.

II. PROBLEM STATEMENT

Taking into account the development of the cultural processes carried out within the Quillasinga indigenous community of the Jenoy council, it is important to rescue spaces where children are the protagonists in the execution and the duty of the elders is to transmit ancestral knowledge to future generations so that, from an early age, there is recognition and appropriation of their cultural identity, supported by traditions, knowledge, beliefs, uses and customs that allow empowerment within their ancestral territory.

Consequently, it is important to address the environmental aspect within the geographical territory. It is located within a natural area with different thermal floors, whose favorable ecological and environmental factors could be summarized in the existence, still, of multiple species of secondary forest combined with the permanence of some species of terrestrial fauna and exploitation of stone mines. In this regard, this soil can guarantee the survival of an ecosystem in adequate conditions. Then, the characteristics of this soil make the development of agricultural activities possible such as the cultivation, especially of corn as wel as bananas and coffee. (Agreda, 2009, p.76)

In this way, there are species of flora such as chilco trees, maduro, huesillo, matial, tacaso, pilche, quillotocto, matial with white flowers, moquillo, higuerón, cascarillo, campanillo and balso, among others. Some of them are used for firewood, as well as being used in ancestral medicine and food for both humans and birds. Regarding fauna species, there are mammals such as: rabbits, putuchil, pintadillas, mountain dogs, armadillos, hedgehogs, reptiles, amphibians, birds, chiguacos, vultures, hawks, owls, doves, parrots, cuscungos, curillos and doves, among others.(Agreda, 2009, p.78)

However, it has been observed that activities such as livestock farming are displacing agricultural activities, leading to the loss of animals and plants native to the region, a situation that may be a consequence of deforestation. (Agreda, 2009, p.80)

This is the case of the reed *(Gynerium sagittatum)*, whose popular name is "cañoto", "caña brava" or "caña flecha" in Colombia, belonging to the family of the Gramineae, which in addition to serving to protect the sources of water, the banks of the rivers, ravines and lakes, is constituted as raw material for the weaving of baskets as a craft, an activity that long ago was characteristic of the culture of this district; which is cultivated within its orchards on a small scale. Thus, and with respect to the cultural dimension of this community, the craft has diminished, since people have dedicated themselves to carrying out other types of activities, which generate economic income with greater profitability. However, the claim is not only economic but cultural and, therefore, environmental. Thus, weaving becomes a fundamental activity within the culture.

At the same time, another problem that is evident in Jenoy, as in all the towns in the world, is the use of plastic containers, which have been displacing natural elements such as the reed baskets that have disappeared from the cultural and economic environment of Jenoy. Therefore, it is necessary and convenient to encourage the use of these utensils, which allow to reduce the impact of plastic on water sources, biodiversity and natural ecosystems.

In this regard, Montezuma (2012) refers to this craft as one of the activities that are part of the traditions of the inhabitants of this district. In his studies, he relates that indigenous people and farmers used baskets to collect the products they obtained from their gardens or their fields. For this reason, it is considered that basketry arises from agricultural needs. (p. 35)

Thus, those people dedicated to this trade have the opportunity to share their knowledge and know-how within the family and once the products are obtained, the dedication, commitment and wisdom that is part of their identity as a member of an ancestral territory are reflected in their work. It should be added that the artisan relies on the raw material that nature offers him, however, this does not mean acting against it. On the contrary, under the principles that characterize the Andean peoples, there is a close relationship with nature that drives him to work avoiding generating negative impacts on mother earth.

Due to this, the present investigation aims to determine how the ancestral sowing of the reed, in the weaving of baskets, contributes to environmental education in the children of the Quillasinga indigenous community of Jenoy, in order to contribute to the care of mother earth, especially water, where the children will be the protagonists, who supported, from ancestral wisdom, will be able to transmit the word, build thought and in turn keep alive the memory of the ancestors under an. environmental approach.

III. METHODOLOGY

This study is developed under the qualitative paradigm following a Classroom Action Research design with a critical social approach oriented under the hermeneutic and ethnographic method. This design conceives its conceptual bases in: Guardian (2007), Restrepo (2009), Pascual (2011), Torrecilla (2011) and Colmenares, et al. (2008) Fundamental authors for the development of this study, who allow to promote social changes, transform reality so that the subject is an agent of change around the environmental and therefore cultural aspect. In this way, the work unit will be made up of the older authorities, the wise grandparents and the children of the Genoy council, with whom a methodological route is proposed. It consists of three moments, "Spinning knowledge about the ancestral sowing of the reed, for the weaving of the baskets and its practice in the conservation of water", "The children build the fabric of ancestral wisdom" and "Leaving a mark on our territory"; in each of them, meetings will be addressed intending to apply research techniques and instruments such as participant observation, the conversation and the minga supported by oral tradition, whose extracted information will be recorded in the field diary in order to respond to the objectives initially stated.

IV. BACKGROUND

Next, a presentation is made on the international, national and regional background regarding the categories addressed in the study, which support the work in order to be taken into account for the analysis of the results obtained.

At an international level, different investigations have been found that reveal the physical and biological characteristics of the *Gynerium Sagittatum* species, as well as the way to use this plant in daily practices. Among the most relevant studies are those carried out by Cárdenas (2011) who reveals the characteristics regarding the use and exploitation of the species in question, which is used in housing construction activities, where the stem is used to cover roofs and walls, as well as to make and design crafts, for example, corrals, crowns, among others. (p.42).

On the other hand, Raymudio (2015) through his study related to ethnobotany, reveals that the Poaceae family is one of the most representative species in the area, since it is used in the pre-Hispanic architecture of Peru, where the stem or cane is used to make mats, baskets, etc. (p. 55)

Gutiérrez (2010) points out that Amazonian peoples dedicated to artisanal activities carry out inadequate environmental practices, which generate deforestation and therefore loss of biodiversity as well as the ecosystem imbalance. However, it is a practice that is part of their daily life, since their economic stability depends on it. Thus, we see how these activities generate negative impacts on the environment. Therefore, the application of techniques that contribute to the adequate management of sustainable extractive activities is required, especially of the Gynerium Sagittatum or wild cane species.

In this regard, Baltazar (2011) points out that non-timber forest products need to be integrated into sustainable forest management techniques and biodiversity conservation strategies; thus, from these products it is possible to generate better economic profitability for local communities and species such as wild cane are part of the resources that provide the highest income due to their usefulness (p.1).

On the other hand, Martínez, Fujigaki and Bongiglioli (2020) in their study clarify that the baskets woven by the women of the Rarámuri community are dedicated to weaving baskets, which were used to store or transport corn and beans. These were part of the kitchen utensils, to store food, as well as to store tools, fabrics or others, which had entered the market a few years ago.

The techniques for basketry among Seri and Rarámuri women are different, although their usefulness is what they have in common (p. 57).

At the national level, very relevant studies were found highlighting the importance of basket weaving by strengthening the uses and customs that characterize each region is highlighted. Martínez, Landim and Ferreira (2018), through their study, recognize the importance of implementing the ancestral wisdom that indigenous

communities possess in the processes of environmental sustainability with the species Gynerium sagittatum and to observe the dynamics of the peoples and their ways of meeting in order to achieve a purpose, taking into account their needs and the problems that arise in their territory.

On the other hand, the Center for Research and Documentation for Crafts (2002) shows how different ancestral techniques of the Zenú people can be used in sustainable processes to make more elaborate and competitive products in the market, in order to preserve the wisdom of the people and rescue these cultural practices.

Abella (2021) allows to observe how the pindo becomes one of the most important crafts in the region, since behind its elaboration there is the history of a people, the ancestral knowledge of its community and the roots for its territory by containing the cultural identity of its inhabitants, who have managed to turn it into cultural heritage, thanks to its articulation in the customs and traditions of this region.

In this sense, and more specifically at the regional level, Montezuma (2012) allows to identify the cultural and ethnic wealth that the department has, pointing out that indigenous peoples left their mark within the territory, where planting, artisanal practices, and rituals have been part of a tradition, which must be practiced by members of the community in order to achieve empowerment and appropriation of their cultural identity.

García and García (2019) argue that, in the development of the teaching-learning process, it is important to take advantage of materials that exist in the context, which are good learning tools that enable the student to remember what they have learned in class to the extent that they have manipulated the basket, becoming an ethnopedagogical strategy that arises from indigenous knowledge and allows children to learn and experience facts from different spaces within the context in which they develop.

Finally, in the study by Tascón (2019) entitled "Weaving the memory of the basket in the Marcelino Tascón Reservation, Valparaíso", the need to share, know, record and understand even more the weaving of baskets to strengthen cultural identity is exposed, since it entails returning to the territory, knowing the origin of the people through the spiritual connection with nature and the path through the territory.

On the other hand, the epistemological and theoretical bases that support the present study are also presented. In this way, the work is based on sociocultural constructivism, which, according to Vygotsky, is based on the concept of culture, where he refers to it as:

It is important that the individual can relate to the social and cultural environment, since from there, he is able to share and exchange ideas with other subjects, leading to an integral development that at the same time can strengthen his knowledge. (Carrera and Mazzarella, 2001, p. 43)

For this reason, constructivism is considered a very important model within the educational context, since it takes into account the subject, who in this case is the student, and the context that surrounds him under social and cultural aspects. In this way, the student will be able to develop and strengthen his values, skills and attitudes that will be the fundamental tools in participation as an agent that contributes to the change of society within his community. (Guerra, 2020).

In this sense, and regarding what the sociocultural theory proposes, it is appropriate to address the Andean cosmogony, where the components of the world (material and immaterial) have life, and therefore are subject to complying with the natural cycle. In this way, nature is identified as the mother or Pachamama, the source and final resting place of life and, like every mother, she takes care of her children and they take care back of her through a harmonious relationship that in turn allows a balance to be achieved between its inhabitants. (García, 2003, p. 2)

Likewise, Toledo and Barrera (as cited in Liverani, 2018) under the biocultural approach point out that there is a strong relationship between the biological and cultural diversity of indigenous territories, oriented towards the conservation of the environment with interdisciplinary approaches, which allows for symbiotic conservation under the principle of reciprocity.

Indeed, indigenous peoples have shown that they cultivate their roots within the territory, the place where life develops, thoughts are shared, words are transmitted, the memory of their ancestors is kept and the legacy is left to the new generations, who through cultural practices continue to rescue the uses and customs that characterize their cultural identity in addition to living in a harmonious environment with nature.

Manuel Castro of ECUARANI, expresses that Good Living is represented in a set of sociocultural values where

communities must maintain coexistence and harmony in the territory, in which care for Mother Earth prevails from their ancestral wisdom and their worldview, highlighting the legacy left by their elders on the knowledge of the different cultural practices that characterize indigenous peoples. (Houtart, 2011).

For this reason, traditional wisdom should be taken and revalued in order to protect and conserve Mother Earth, since we currently live in a consumerist development model, where the well-being of man is measured through his purchasing power, which is why new development processes must be implemented that allow us to understand the importance of the environment not as a resource, but as the set of relationships where man is part of nature and it is his duty to try to live and coexist in a healthy and ecologically balanced environment.

Therefore, it is pertinent to talk about the role of humanity in the development of a harmonious society, where one must begin by changing the egocentric self in which one thinks that nature belongs to it, for the practice of the common welfare in which all species are included, creating and strengthening the bonds of affection that the ancestors had with the loving Pachamama. Durán (as cited in 2010, p. 59)

It is appropriate to refer to the meaning of the word Pacha, which, according to Ayala (2018) is related to the cosmos. In fact, and under the principles of Andean rationality, it is said that everything is related to everything.

Each of the principles is presented as follows: According to the principle of rationality, it is the way in which reality can be conceived, in which everything is related. Hence, under the principle of relationality, all beings, things and elements of nature are related. Likewise, there is a strong spiritual connection in which the principle of reciprocity intervenes.

In this regard, this principle is characterized by the justice that inhabits the cosmos, where all actions carried out by an agent towards another in charge of receiving such an action must be rewarded by the latter in the same way. Therefore, if everything is to flow in the best way without interruptions, this principle must be carried out.

In this sense, anothe principle is that of correspondence, in which there is a link mediated by a harmonious relationship between what exists.

Finally, there is the principle of complementarity in which everything has a complement, for example, a night has a day, a man has a woman, light has darkness, etc.

On the other hand, reference is made to the concept of water from the Andean worldview. For this, Restrepo (s.f) asserts that it is important to understand that from Andean thought, water takes on a meaning that goes beyond being considered as a resource of nature from which human beings can benefit. Therefore, this element, considered a living being, is also part of the territory and, therefore, is related to the principles mentioned above. (p.78).

V. CONCLUSIONS

The Quillasinga indigenous community of Jenoy carries out several processes in which it seeks to rescue its uses and customs. Despite this, it is observed that the children do not have much knowledge about their culture, which is worrying in the sense of strengthening the cultural identity of the new generations, being the fundamental base for their ancestral knowledge to continue surviving throughout history.

The indigenous communities carry out their cultural practices oriented to live in harmony with mother earth, for which it is considered essential to rescue the work of weaving reeds as a strategy to achieve training in environmental values that promote the development of good practices in favor of the environment.

In relation to this article, it can be observed that the Gynerium sagitattum species is used for similar tasks in the different regions of study, highlighting basketry as its main use; however, each community has its own knowledge, which makes each craft be made differently, according to the worldview of each indigenous people.

The Gynerium sagitattum species is used to make various crafts and products that communities use in their daily lives; however, its planting and production is gradually decreasing, since it offers little profitability to its inhabitants and they choose for other tasks that generate greater income.

From the crafts, proper of each region, the economy of a community can be promoted, strengthened and enhanced, using as base products that, at some point

in their history, managed to create profitable income for the community, which is why it is considered necessary to rescue this ancestral knowledge that still preserves harmony with Mother Earth.

ACKNOWLEDGEMENTS

To the senior authorities, grandparents and children of the indigenous council of Genoy who trusted on us and have shared their knowledge, wisdom and experiences about their customs and traditions that characterize the identity of their culture, and who have been a source of fundamental information in the construction and development of this study.

To our advisor, Dr. Esperanza Agreda, for providing with her knowledge, experiences and guidance during this process of professional training.

To our beloved alma mater, the University of Nariño, especially the Faculty of Education, for providing us with all the spaces, tools and knowledge to train us as professionals in the educational field.

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DIDACTICS IN THE TEACHING AND LEARNING OF HISTORY IN THE FIFTH GRADE.

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Reception Date: August 26, 2023
Acceptance Date: February 20, 2024

Abstract

There is no connection between History as a Social Science and its teaching process. This separation of practice and research has prompted attention to developing a project focused on History teaching. The main goal of this article is to examine the results of the educational and teaching diagnosis, which enable the teaching and learning of History for fifth-grade students at San Luis Gonzaga and Técnico Girardot high schools in Tùquerres, Nariño. This dismantling of practice and research has generated interest in developing a project focus on History teaching. The main of this article is to know the results about the educational and teaching in diagnosis stage, which make it possible to enhace the teaching – learning process for fifth grade students at San Luis Gonzaga and Técnico Girardot high school in Tùquerres – Nariño.

T his dismantling of practice and research has generated interest in developing a project focused on History teaching. The main aim of this article is to present the results of the educational and teaching diagnosis, which make it possible to enhance the teaching-learning process of history for fifth-grade students at San Luis Gonzaga and Técnico Girardot high schools in Tùquerres, Nariño. First, it was realized a documentary analysis which look over the institutional curriculum, semi-structured interviews were created and applied to students and teachers.. These actions allow comparing the current situation of history teaching – learning in both institutions with the theorical contributions and curricular guidelines of Social Science of National Ministry of Education. During the diagnosis, it was found that there are some pedagogical and curricular difficulties in the teaching- learning process. These issues led to the development of didactic proposal solution.

Key words: History, teaching, learning, didactics.

Resumen

En el campo educativo no existe conexión entre la historia como ciencia social y su enseñanza. Esa desarticulación entre la investigación y la práctica en las aulas ha generado el interés por desarrollar un proyecto enfocado en la didáctica de la historia. Este artículo tiene como objetivo dar a conocer los resultados de la etapa diagnostica sobre los procesos pedagógicos, didácticos y curriculares que hacen posible la enseñanza y aprendizaje de la historia en el grado quinto en las instituciones educativas Técnico Girardot y San Luis Gonzaga del municipio de Túquerres, departamento de Nariño. En un primer momento, se lleva a cabo un proceso de análisis documental direccionado a la revisión del currículo institucional y a la elaboración y aplicación de entrevistas semiestructuradas a docentes y estudiantes, estas acciones permiten confrontar la situación actual de la enseñanza aprendizaje de la historia en las dos instituciones con los aportes teóricos y los lineamientos curriculares de Ciencias Sociales del Ministerio de Educación Nacional. En el transcurso del diagnóstico se reconocieron algunas dificultades a nivel pedagógico, curricular y didáctico dentro del proceso de enseñanza-aprendizaje de la historia; estas llevaron a plantear una propuesta didáctica, como respuesta a dichas problemáticas.

Palabras Clave: Historia, enseñanza, aprendizaje, didáctica.

LA DIDÁCTICA EN LA ENSEÑANZA Y EL APRENDIZAJE DE LA HISTORIA EN EL GRADO QUINTO.

I. INTRODUCTION

The process of teaching and learning history has generated numerous discussions in the academic field, above all, after the political situation generated from signing the agreement of peace between the Colombian state and the guerrilla group called FARC. This agreement demanded to rethink the way of teaching History in Colombia in the basic education and vocational high school.

The law 1874 of 2017 emerges in the frame of the agreements of La Habana and reestablishes the compulsory of teaching the history of Colombia in elementary school to be deepened in high school. Under a critical approach oriented to strengthening the identity and the recognition of differences, this law contributes to the clarification of the truth and to the reparation of the victims of the armed conflict. On the other hand, the commission of truth and the center of memory were in charge of collecting testimonies of thousands of victims. This information permitted to make some didactic material, available in all the educational institutions in the country with the purpose to strengthen not only the curriculum contents but also the didactic strategies used in the classrooms. (Senate of the Republic of Colombia, 2017). As teaching History, stated since the nineties, is anchored in the curricular structure in the social science area; therefore, it is not considered as a subject or knowledge area in the elementary and high

school education. However, the new government politics demand to include the history of Colombia as a basic axle in the curricular structure of social sciences, where the competences of the own area must be articulated along with citizen competences, (Ministry of Education of the Republic of Colombia, 2023).

History, when it becomes an integral part of the social sciences must be developed under three competences: social thinking, perspective analysis and the reflexive, and systemic thinking (Colombian Institute for fostering and evaluation of superior education, 2015, page 51). These, in turn, are tackled by means of transversality of four competences (cognitive, procedural, valuation and socializing) each one with its own evidence of learning and performance indicator. Competences seen in the basic standards as competences (EBC – for its acronym), basic rights of learning (DBA) and curricular guidelines, whose implementation must be transversal in all levels of formation.

In that sense, it is necessary that the curricular organization for the teaching of History stated by the Ministry of education finds its support in the theorical contributions of the pedagogical currents so the teacher acts assertively in their educational practice and be able to have constant feedback their knowledge and the didactic strategies to use.

At present, there is not any articulation between the formation objectives that the teaching of History states and the development of the critic thinking in the students. Therefore," the scholar history should serve them to develop the ability to think historically the social reality in which their daily life develops so as the time goes by, they can develop the ability to analyze any social and cultural process" (Vega, 1998). The objective must be to teach History within Social Sciences from a critical perspective, so the generations recognize and understand their past beginning from a social approach, where the actors be related into a historical process and questioning problems arise that reflect the causality of an event. The teaching of History requires bringing up structural changes in thinking and in the acting of people, which is equivalent to form autonomous and critical human beings before reality.

According to Pantoja, "the teaching of History requires facing the complexity of the historical knowledge, by using explicative, comprehensive and propositive models to characterize the scholar History" (Pantoja Suarez, 2017). That is to say, it requires an articulation of the historical disciplinary knowledge and knowledge of the pedagogical and didactics of History, to generate processes of didactic transposition in charge of structure knowledge assimilable to the students, specifically of the fifth grade; those processes require the compromise of teachers to approach to the theorical disciplinary knowledge and to generate didactic strategies adjusted to the teaching of History from there.

In this sense, the didactic knowledge rises from the practice of teaching; however, but one thing is the teaching-learning process and another is teacher training to intervene in this process. As Pantoja mentions, didactics is the channel of communication between teaching History and learning History, which aims to train according to the requirements of the culture and at the same time to influence the development of the people and the communities in the present. (Pantoja Suarez, 2017) For this reason, didactics is necessary to strengthen knowledge and motivate the learning process of History beginning from the analysis and understanding of the reality of the contexts.

To organize the information, it was necessary to state three analysis categories: History, teaching and learning of History and didactics. The concept of History allows to understand the conceptions of teachers' and students' in contrast with theory, its purpose it to rethink the History that is taught in fifth grade and generate a broader vision which includes diverse social actors and which is concerned with unveiling the causality of historical processes. The teaching and learning category provides the necessary theorical orientations under the light of the main contributions and innovations developed in this field of knowledge. On the other hand, didactics allows to know the strategies and activities used by teachers for the teaching of History.

One of the objectives of this study is precisely to identify the relationship between macro curriculum and micro curriculum to comprehend to understand the level of appropriation that educational institutions have of the curricular structure of the area of social sciences and History and how this is reflected in the classroom.

II. METHODOLOGY

The methodology used in the project was the educational investigation, which generated an approach to the scholar reality and let identify the current difficulties in the educational surroundings with the purpose to propose strategies that help to improve the problems

found. The aim of the research is to find out and explain the state of the teaching-learning of history in the fifth grade at the I.E. San Luis Gonzaga and "Tècnico Girardot" High Schools, through a diagnosis based on the analysis of institutional documents and interviews with both teachers and students.

In addition, qualitative research was carried out, in which primary and secondary documentary sources were analyzed. The information made it possible to compare the data obtained during the data collection stage, both from the institutional documents of the two schools and from the interviews with teachers and students. This information was organized into categories: historical representation, teaching-learning of history, history didactics and evaluation. Each category of analysis was based on the information obtained from the institutional documents, which were compared with the teachers' interviews and corroborated by the interviews with the students, as well as a bibliographical review of some authors to support different theories.

In the primary sources is the analysis of the different government establishments as DBA (basic rights to learning), EBC (basic standards for competences), curriculum guidelines of Social science , PEI (Institutional Educational Project) and guides of self-management of each institution; in the secondary sources were used interviews to teachers and students . The objective was to describe and interpret how teachers of Social science are teaching History, under what parameters and contents they are following the process. This information was facilitated by the teachers in charge of this area, by means of evidences such as study plans, classroom plans and their same experience, etc.

In the next stage, interviews were conducted with students, where it was possible to contrast the information obtained from the teachers in the process of teaching and learning of History and didactics. This stage provided first-hand knowledge of the student's experience in the classes of History, which strategies attract their attention and which strategies, on the contrary, generate disinterest. Similarly, it was possible to learn about the curricular organization stipulated within the educational institutions, including the changes brought about as a result of the pandemic and how they were articulated in the social sciences and specifically in History.

Data collection techniques

Semi-structured in-depth interview: interviews are another key element in the research, as they bring the researchers closer to the participating actors. According to Bisquerra, the objective of the semi-structured in-depth interview is to 'obtain information orally and in a personalized way, about events experienced and subjective aspects of the person such as beliefs, attitudes, opinions, values, in relation to the situation being studied' (Bisquerra, Alcaraz, Gómez, Beltrán, & Martínez, 2009). The aim is to understand how the teaching-learning of history is developed, taking into account the experience of the teachers and the opinion of the students. This involves recognizing their opinions and thoughts about history and its didactics. This information was recorded in a systematization matrix, where the questions and answers of the participants (teachers and students) were organized; an analysis matrix was also constructed based on the three research categories (History teaching, historical representation and History didactics).

Documentary analysis: this information gathering tool complements the work carried out with the interviews, as it allows contrasting and consolidating information through the review of different documents already written, according to the documents can be personal or official (Bisquerra, Alcaraz, Gómez, Beltrán, & Martínez, 2009), within which there is a great variety, in the case of the present research will be analyzed official documents, among which are: institutional educational projects (PEI), curriculums, contents, and daily lesson planners; this type of information generates an overall picture of how History is taught in these institutions.

This information also allowed for the analysis and interpretation of each category, based on the syntheses of the different actors interviewed. In some cases, the information collected was organized in a matrix, where the most relevant information for the research was filtered. The tables were designed for this research, both for IEPs, learning materials and lesson plans.

Through the triangulation of information, the data obtained during the data collection stage were compared, the institutional documents of the two schools were analyzed, and interviews were conducted with teachers and students. This made it possible to confront the approaches of the institutional documents with the educational reality, as well as to make a parallel with the two institutions under study. This information was organized into the following categories: representation of history, teaching and learning, and didactics of history. In addition, the bibliographical review of some authors was used to provide theoretical support for the analysis of the information.

A. Unit of Analysis

This research was carried out in the fifth grade of elementary school of San Luis Gonzaga and Técnico Girardot High Schools, located in the municipality of Túquerres.

Currently, in the fifth grade of the San Luis Gonzaga High School, there are five grades: 5-1 with 34 students, 5-2 with 36, 5-3 with 33, 5-4 with 33, and 5-5 with 32 students to totalize 198; their ages range from 9 to 11 years old. The children come mostly from the urban area, and from small towns and villages nearby. Starting from the third scholar year up to the fifth grades the school program is divided into groups of subjects. Therefore, in the fifth grade the students have three different teachers since 2020, like this: Social science, English, Informatics and Language subjects are taught by a teacher graduated in Social Science; Math, Artistic, Religion subjects are taught by a teacher graduated in Basic Elementary Education and Natural Science and Reading are taught by a teacher graduated in Basic Elementary Education specialized in Natural Science.

As it was mentioned above, the research will be carried out in the fifth grade of the Fatima School, which has a teaching staff of five multi- disciplinary teachers who work in grades from first to the fifth and a teacher for pre-school. The school offers educational service to 130 students; within the campus there is only one class per for grade. The fifth grade is made up by 22 students, 12 are female and 10 are male. Their ages range from10 to 11 years old. The population that attends Fatima school is from nearby neighborhoods, (Fatima, Voladero, Ipain, el Faro, La Inmaculada and the village of la Guayaquila).

III. RESULTS

The preliminary results of the research will be presented according to the three research categories, in that order, beginning with a brief theorical synthesis, followed by the description and analysis of the findings in each educational institution and finally, it is analyzed the teachers and students' vision in relationship to History and Didactics.

A. Teaching-learning of History.

The teaching of history in Colombia is linked to the curricular guidelines for the Social sciences, created 20 years ago within the frame of the educational reforms that originated in the country after the creation of Law 115 of education in 1994. These guidelines cover the teaching guidelines for all the disciplines that make up the social sciences, including history. The curriculum is organized in such a way that all the thematic contents must be developed in an interdisciplinary and transversal manner in each grade, which means that historical knowledge must be related to political, economic, social, and cultural knowledge; the basic standards for competencies (EBC) and the basic learning rights (DBA) have organized the contents and competencies for each grade of schooling, which implies the existence of specific competencies focused on strengthening historical knowledge in both elementary and high school education.

According to the Ministry of Education, the teaching of history should be linked to the teaching objectives of the Social Sciences, aimed at the reflection of social phenomena beyond the level of interpretation and understanding of the facts. It is then the systematic research the means that promotes knowledge about the social for the pursuit of the welfare of humanity and the peaceful coexistence of the different members (Ministry of National Education, 2006). Similarly, the Basic Standards for Social Sciences competencies establish "that students can access the knowledge and understanding of the basic concepts required to approach the dynamic, plural and complex nature of human societies" (Ministry of National Education, 2006). To this extent, the purpose of teaching history is to learn about the past of individuals, through the assimilation of basic concepts of the social and historical sphere that allow individuals to find themselves in the difference and act in favor of peaceful coexistence.

Having understood some general aspects of the curricular guidelines for the Social sciences, it is evident that both institutions have different ways of articulating the macro curriculum required by the ministry of education, with the PEI (Institutional educational project), the area plans and homework guides. On the one hand, the IE Técnico Girardot shows better curricular organization, the institutional documents are periodically restructured and show relationship between the formation objectives, competences and the institutional profile, this in turn is reflected in the curriculum, where the programmatic contents are contained in agreement with the EBC and DBA.

In San Luis Gonzaga School, on the other hand, there is less curricular articulation, there is not coherence between PEI and the area plan yet. In fact, the PEI is being constructed and the social science area project is being reduced to the curriculum frameworks, i.e., there aren`t any objectives or methodological or conceptual frame

that support the teaching and learning processes of the area. In addition, the curriculum frameworks maintain a traditional organization composed of achievements, indicators, knowledge and evaluation; the competency-based model, despite being mentioned in the PEI, is not developed within the frameworks.

The historical contents suggested for fifth grade within the area of social science are focused on the history of Colombia during 15th, 19th, and 20th centuries, where topics related to the colony, independence, the republic making, technological advances in the (20th) century and politic and social formations in the first half of the 20th century are addressed. Likewise, each institution organizes the suggested contents according to their own criteria. In the case of I.E. San Luis Gonzaga, greater relevance is given to local and regional history since the first grade, with topics related to places, characters, important events in Túquerres, history of Nariño, original peoples of the municipality; however, there is a scarce articulation between national and regional events. On the other hand, in the I.E. Técnico Girardot, although the curriculum is organized in the order stipulated by the DBA, regional themes are not prioritized, which generates large gaps in local historical knowledge.

To deepen into the difficulties of the teaching-learning process of history, the teachers mention "History is taken as a narration of events in an isolated way, without being compared to the present, so it is difficult to get a critical and analytical spirit of the present time. The history of our small homeland is left aside and much importance is given to universal history, especially in high school, leaving many gaps to be understood" (Guerrero, 2021). The thesis supported by the teacher exposes the scarce training in history didactics and expresses concern about how to address such issue when different factors are involved teaching qualification, professional profile, time intensity, scarce training, among others. Therefore, the teacher cannot be held solely responsible for the teaching process.

Another of the teachers interviewed states the following: one of the issues that I can observe from my experience is that the historical formation is mostly given in the fifth grade, but in the lower grades the focus is on Geography, therefore, there is not a common thread in the processes of teaching history. In addition, the topics are addressed sporadically with no real contextualization of the contents, that's why the students are unaware of the regional history" (Cifuentes, 2021). The students of the IE Técnico Girardot, who express having elaborated maps, studied borders, countries, departments, location of the earth, time zones, (Guerrero A, 2021), corroborated this information. This is due to a certain extent to the provisions of the Ministry of education regarding the social science curriculum, within which spatial geographic knowledge is developed in the first, second and third grades; while the teaching of history is intensified from the fourth grade onwards. In addition, history topics are not related to the context, and this results in poor reflection of the historical topics.

When students are enquired about the knowledge they have acquired about Social sciences and History, most of them mention historical events such as the discovery, slavery, independence, and the commoners' revolution and remember some characters in the local and national context such as Simon Bolivar, Christopher Columbus and Manuela Cumbal. The students remember these events in a very general way, but they don`t relate them with the causes and consequences, which generates a lack of knowledge of the historical processes, the students memorize the date, the event and the character, they don`t go beyond that. For this reason, it is understood that they do not see History as a process, but as set of isolated events, without any relationship or link, even less, they manage to relate the facts with the reality of their contexts since national history has been taught from the institutional narratives. In relation to Social sciences, students remember some traditions of Tuquerres such as the carnivals, typical dishes of the region and indigenous communities existing in their territory. With respect to these topics, greater retentiveness can be evidenced, since they are the stories of their town or community

B. Representation of history.

The Ministry of National Education requires within the competences in social science to analyze historical dimensions of events, issues and social phenomena. Students must locate in time and space the historical events and social practices. (Ministry of National Education, 2023). This implies that the teaching process is supported by the epistemology of history and that the teacher can share it with the students; in short, the teaching of history does not lie only in the transmission of information, but in forming historical knowledge from realities and social practices.

Understanding History from a social dimension makes it possible to understand the dialogical relationship between teaching and history, the teacher is who constructs knowledge under a theorical speech in the classrooms, because he/she can`t teach something they do not know. The teacher teaches based on knowledge

constructed in academies and society; therefore, History is not reduced to a theorical concept, but it is seen as a process that develops inside a social reality. To make this relationship visible it is necessary to analyze it beginning from the concept of historical representation. The historical representation allows researchers to understand the vision of history of both teachers and students; it is necessary to understand how teachers have constructed their knowledge and how they teach history it in the classroom. In the same way, it is essential to understand the way students have appropriated this historical knowledge and how they represent it.

Charter's statements are key to understanding the process of internalization of concepts and realities; therefore, the recreated representations of History have an energy of their own that can persuade and convince others of a certain "truth". Representations have created discourses around a particular event such discourses may vindicate and, at the same time, point out, condemn or make invisible a social group, it all depends on the perspective from which such events are analyzed. (Chartier, 2007)

Political or economic interests that have generated particular representations of itself have clearly permeated history, which explains the birth of the national history and its particular perspective of narrating the past, always based on the exaltation of heroes and outstanding characters. This kind of history is the one that has been internalized and represented in the classroom; the textbooks themselves have collaborated with legitimacy of a speech that tells only a part of the national past.

According to the answers given by the teachers, it could be inferred that traditionalist views regarding history are kept: some consider it a helpful science of the Social sciences, which is in charge of narrating all the events, facts, and happenings that humankind has experienced from its origins to the present. Other teacher expresses that it is "a story, a narration of events that happened and left traces and the past of our own life" (Goyes, 2021). This teacher's point of view on history limits the conception to a narration of facts that occurred in the past and a way of preserving the cultural and historical heritage.

The answers of the teachers make evident the limited theoretical handling they have about history, not yet considered as a way of discussion and reflection before the reality of the context, the student is not allowed to understand how a historical process is generated, which implies that the kind of society and the characteristics of the epoch where the events take place are not analyzed in depth.

Historical representation also allows to understand how have constructed their own concept of history. A great number of students relate the past with the experiences they have lived from the daily life of their families and surroundings; some of their answers validate this statement: "they are actions we have been doing for a long time". (Benavides, 2021).

(Benavides, 2021) "When we remember good and bad moments about what has happened" (Meneses, 2021). The relationship that students establish with the past is connected with both their own and others' experiences of their daily lives; for them, the past is yesterday, it is a fact or an experience already lived. The concept of the past contributes to clarifying the concept of history, since children are still in a developmental stage where they should be helped to construct the complex thinking, understanding the past is the first step to understand the true purpose of History.

Other students relate the past with the history of their ancestors or that of their people, as stated by the student: the past is "what our ancestors did, remembering what happened before" (Meneses, 2021). For children, the ancestors are those people who lived in their town before, everyone has a history and that is part of a unique legacy that forges identity and culture. Although students are not fully aware of the complexity of the term past, they assume it as a quality of each human being; they understand the importance of the past in their formation as a person.

Finally, it became evident that teachers do not handle a deep concept of History, they limit themselves to seeing history as the narration of facts of the past, but not as a means for understanding and reflecting on the present, the lack of training in history and social sciences is notable. Because of this, students relate the past to everyday events, and with their personal experiences, they also relate history to an important event in the past in a certain place; there is a close connection between history, dates, and characters

c. Didactics of History.

In order to know the perspective of the two educational institutions regarding the didactics of history is necessary to understand that there is a very close relation between teaching and learning of history, this communication can be achieved through didactics, since it provides indispensable tools to make learning possible. In fact, it is a fundamental instrument for the teacher: it is the promoter of knowledge by establishing learning patterns

in the student, and achieves a direct relationship between knowledge and learning through motivation and assertiveness processes in teaching practices. Didactics awakens the student's interest when knowledge is adapted both to the problems of the context where it is taught and to the children's cognitive development levels. Therefore, didactics is dynamic, it is changeable and depends entirely on the teacher's reading of his or her educational environment. Didactics is responsible for the unifying process of historical content and its teaching-learning. It is transcendental the teacher's reflection on the methodology used to improve teaching and change his practice in favor of the learning subjects.

To know the relation between theory and practice, it was important to approach the educational reality of the teachers in the classroom, to weigh their knowledge regarding didactics and its application. It is worth mentioning that teachers are not professionals in the area of social sciences, therefore, the didactic knowledge they handle is generalized, as evidenced by their opinions "Didactics is a way to know how to reach and give accurate knowledge to the student, it is the means we have as teachers to convert the theoretical knowledge of a subject into assimilable and understandable knowledge for the student" (Ortega, 2021). There is certain clarity about the concept of didactics, the teachers are aware of the importance of that discipline in the development of the teaching and learning processes. However, the problems stem from the planning and application of suitable strategies to the context, since there aren`t theoretical feedback exercises nor sceneries of discussion before didactics, the teachers have felt satisfied with the knowledge during their time of formation, but they have not deepened or updated the topic.

According to didactics, it is necessary to propose a strategy and learning sequences; on this point, teachers and their answers are inquired both in IE Técnico Girardot and I.E. San Luis Gonzaga agree when they mention activities such as video presentations, songs, readings, presentations, workshops, panel discussions, and essays which are useful resources for both teachers and students. Furthermore, there were found other responses in relation with the learning sequences.

"Consult family histories, write them up and tell them, stories told in role plays or with puppetry, write up events they have experienced, ask the students to take an important personal object and give reasons about its importance. Highlight important dates in history and take advantage of them to go deeper into them. Make comparisons with the attitudes that arose at the time of the events and how students value them today. Narrate important events in the form of stories..." (Guerrero B, 2021).

These activities, unlike the previous ones, present an order and resort to innovative activities such as family stories, which directly involve the students, thus attracting their attention and facilitating learning. For similar reasons, the exercise called "the personal object" is also very valuable. For its part, the use of puppets provides the staging of certain events that are difficult to narrate in an expository class.

Since there are several elements to analyze in the answers of the students, it begins with knowing how the teacher develops a class of history. According to fifth graders, the Social science teacher always greets the students at the beginning of the class explains the dynamics of the day's activities, and then proceeds to explain the contents. The vast majority of students from both institutions recall that the history class usually begins with an explanation of the topic, and then proceeds to dictations, which are common: "First she gave us an explanation and then she made us work in the notebook" (Benavides, 2021). Another of the students shares this statement: "Now the classes are short, first he made us write, we did dictation, at the end of the topic he left us exams, he gave us space to study in class" (Guerrero A, 2021). From this, we can conclude that the strategy used by the teachers corresponds to a traditional expository class, where the central resources are the board (to explain the subject) and the notebook (where the information is recorded).

Nevertheless, there are other elements that make part of the strategies used by the teachers, such as interviewing older people, used to learn about customs, way of life or regional history: "We have consulted topics on regional history, interviews were conducted with older people" (Martinez, 2021). The strategies focus mainly on recording the customs and traditions of the region, the typical food in the area, religious and cultural celebrations. However, according to the students of the two institutions, their likes and personal interests are not well taken into account, since the activities, while reflect an interest to involve close topics. It is still necessary to generate a better connection between the gotten knowledge and the daily life, that is, children need to understand that they are generators of memory and that all those regional features and customs are the result of historical processes in which they are immersed.

With respect to the activities that have been developed within social sciences to promote the learning of history,

in most cases there are exhibitions, use of concept maps, geographic maps, billboards, songs, stories, models. These activities are of greater relevance for children, because they allow them to develop various skills that involve their bodies, and for this reason they remember them more easily. In spite of this, they assure that most of the dynamics of the class is centered in the magisterial illustrations, written summaries, dictations, work with books (in the case of I.E.1), consultations, etc. This shows that there is no implementation of the necessary strategies to get the learning of history.

In summary, the main objective of knowing the problems faced by history didactics is to recognize the strengths and possible solutions, in order to contribute to the construction of an innovative strategy that enhances the teaching-learning process, without neglecting the richness of the context; for the same reason, students are asked about the way they would like to learn History. The students at San Luis Gonzaga High School would like to visit historical places, visit museums, learn about the most important people of the region, the history of their town, the customs of their region, learn about the history of Colombia, and have dramatizations. On the other hand, the students at the I. E. El Técnico Girardot are interested in learning about topics related to their region such as: the history of the indigenous people, the topic of the commoners and the wars, the history of Colombia and its culture. The above is taken into account for the elaboration of the strategy.

IV. CONCLUSIONS

The diagnosis provided a general overview of the teaching-learning of history in the institutions under study, and thus to identify difficulties and potentialities regarding the didactics of the discipline. Therefore, it is necessary to take advantage of the results of the process to contribute to the construction of a pertinent didactic strategy.

In the analysis of the institutional documents there was a disagreement between what was established by the Ministry and PEI, plans of area and learning guidelines. Furthermore, in the curricular guidelines of the Social sciences are established the specific guidelines according to the scholar level, the ones which The diagnosis made it possible to obtain a general overview of the teaching-learning of history in the institutions under study, and thus to identify difficulties and potentialities regarding the didactics of the discipline. Therefore, it is necessary to take advantage of the results of the process to contribute to the construction of a pertinent didactic strategy.

In relationship to the interviews made to the teachers in both institutions, there are still gaps that separate the conception of the teachers and the concept of history as such, which prevents achieving the true teaching-learning process of history, starting with the lack of teacher training and qualification concerning the area. Consequently, the student's conception of history remains in a relationship with the past, without greater significance in the present. Consequently, most of the activities developed in class are aimed at memorization and repetition, manifested in dictations, master classes, oral lessons and the recognition of heroes of national history, all without generating processes of reflection or questioning of the facts. For children, history represents the past that should be narrated but not questioned.

Furthermore, a scarce theoretical development was found in terms of didactics we found a scarce theoretical development in terms of didactics, since the didactic strategies and sequences are not explicitly stated in the classroom plans by the teachers; In this sense, when students are asked about the knowledge acquired about social sciences and history, in most cases they remember events in a very general way, since students learn the date, the event and the character, but they do not relate them to a cause or to the implications that triggered it, this generates a lack of knowledge of the historical processes and weakens the formation of critical thinking.

In the same way, the learning guidelines are clear evidence of the scarce use of didactic strategies, since they are limited to exposing a theoretical basis and then applying a reinforcement workshop, where there are no activities guided by specific objectives, but rather questions to corroborate the reading of the guide. In addition, the activities described by both teachers and students do not obey a didactic strategy as such, since this goes beyond activities. The strategy implies an order and an intention for each activity, .e.g. the teacher must know how, where and when to apply the strategy, must take into account the steps to follow and provide the relevant instructions to achieve the proposed learning goals.

Finally, the diagnostic allowed us to know the students' expectations regarding history teaching strategies, they propose other novel activities such as dramatization,

exhibitions, interviews with adults, visits to historical places, which generate spaces of expression and participation where the communicative and citizen skills be strengthened. These spaces allow students to play roles, take the initiative, lead processes, and lead, in summary actively participate in the construction of knowledge, while exploring other forms of learning. In addition, the linearity in teaching strategies that place traditionally the teacher as the center of the teaching and learning process is avoided because the teacher is in charge of speaking, of imparting knowledge, while students listen and take notes. Therefore, this research allowed to open horizons towards a suitable methodology for teaching as well as innovating curricular contents, in order to achieve a significant learning of History.

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TRANSFORMING EDUCATION IN COLOMBIA: DIDACTIC STRATEGIES, STEM, AND 21ST CENTURY SKILLS.

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Reception Date: September 18, 2023

Acceptance Date: September 16, 2024

Abstract

In the current educational context, it is imperative to evolve beyond mere information transmission and adapt to the demands of the 21st century. In this regard, the STEM (Science, Technology, Engineering, and Mathematics) educational approach has proven to be fundamental in equipping students with essential life skills.

This article presents a qualitative analysis of the didactic strategies implemented by teachers in the RUTA STEM program in educational institutions in Colombia, highlighting the educational transformation they are undergoing.

Furthermore, the need to tailor learning environments to the characteristics and demands of students is explored, emphasizing the relevance of a student-centered approach. Likewise, the article examines how the effective integration of educational technologies, supported by educational projects within the knowledge transmission strategy outlined by the RUTA STEM (STEM Tournament), can enhance STEM education and, consequently, the development of individuals competent in critical skills to face an increasingly complex world.

Key words: Didactic strategies, STEM, Information and Communication Technologies (ICT), 21st century skills, ATLAS.ti.

Resumen

En el contexto educativo actual, es imperativo evolucionar más allá de la mera transmisión de información y adaptarse a las demandas del siglo XXI. En este sentido, el enfoque educativo STEM (Ciencia, Tecnología, Ingeniería y Matemáticas) ha demostrado ser fundamental para equipar a los estudiantes con habilidades esenciales para la vida.
Este artículo presenta un análisis cualitativo de las estrategias didácticas implementadas por los docentes en el programa RUTA STEM en Instituciones Educativas de Colombia, poniendo de manifiesto la transformación educativa que están experimentando.

Además, se explora la necesidad de adecuar los ambientes de aprendizaje a las características y demandas de los estudiantes, subrayando así la relevancia de un enfoque centrado en el estudiante. De igual manera, se examina cómo la integración efectiva de tecnologías educativas, respaldada por proyectos educativos presentados en la estrategia de transmisión del conocimiento dispuesta por la RUTA STEM (Torneo STEM), puede potenciar la

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educación STEM y, por ende, la formación de individuos competentes en habilidades críticas para enfrentar un mundo cada vez más complejo.

Palabras Clave : Estrategias didácticas, STEM, Tecnologías de la información y comunicación (TIC), Habilidades del siglo XXI, ATLAS.ti.

I. INTRODUCTION

Contemporary education is not only focused in transferring knowledge, but in cultivating skills that prepare students to face the changing challenges of the 21st century (Ministry of National Education, OEA, et al., 2022). The STEM approach, integrating Science, Technology, Engineering and Mathematics, has become a fundamental pillar in the educational transformation in Colombia (Descamps Daw, 2019).

This article seeks to explore how the combination of didactic strategies with STEM can enhance the development of crucial 21st century skills. In this sense, the units of analysis that were part of the research project entitled '21st CENTURY SKILLS AND STEM EDUCATION: QUALITATIVE ANALYSIS OF THE DIDACTIC STRATEGIES OF THE ROAD STEM PROGRAMME IN COLOMBIAN EDUCATIONAL INSTITUTIONS WITH THE SUPPORT OF ATLAS.ti', are taken into account, as described below, based on different studies.

From the international sphere, the connection of new technologies with various human processes, especially in the field of education, is an important factor in the transformation of society. Research such as 'Technological skills of university students: a Latin American perspective' (Yañez-Figueroa et al., 2015) highlights the need for permanent qualification and continuous access to digital services to dissipate the technological gap. At the global level, 'Revolution 4.0, Competences, Education and Orientation' (Echeverría Samanes & Martínez Clares, 2018) highlights the importance of competences in order to face the future in the Fourth Industrial Revolution. Furthermore, 'STEM Education in Spanish-speaking

South America' (Tovar Rodríguez, 2019) underlines the relevance of the STEM approach in Latin America and its impact on students' acquisition of practical and transferable skills.

Likewise, in Colombia, research on didactics strategies, education, STEM and 21st century skills have earned relevance, especially in the post-pandemic context. Initiatives such as the 'ICT competencies model for teachers' (Hernández et al., 2016) seek to stimulate the creation of innovative educational environments in higher education. Similarly, 'Developing skills for the fourth industrial revolution through problem- and project-based learning methodologies' (Duque et al., 2018) highlights the importance of addressing current problems through training. ICT-related educational policies in Colombia are also analyzed in 'Educational policies of ICT in Colombia' (Rueda Ortiz & Franco Avellaneda, 2018), acknowledging the need to transform educational practices.

At the regional sphere, studies such as 'Educational robotics, Lego Mindstorms and Innobot, in the department of Nariño' (Canacuan Rosero, 2021) have shown that STEM methodology is effective in developing STEM skills in students. These studies emphasize the importance of implementing this methodology effectively in classrooms so that students can develop their learning capabilities and skills acquisition.

The linking of teacher training processes in relation to the STEM educational approach is crucial to improve education in different contexts and according to their needs. The inclusion of significant experiences at the national level allows us to identify participants who have contributed from their work as teachers to give continuity to this research. Projects such as the 'STEM Route' in Colombia, promoted by government entities and organizations', seek to stimulate the interest of children, adolescents, young people and teachers in the STEM field. These projects are designed to provide spaces that enable the approach and activation of emerging technologies to strengthen the skills necessary to face the fourth industrial revolution. Competitions and contests such as the 'STEM Tournament' are an integral part of this strategy, providing participants with the opportunity to present STEM projects and foster 21st century competences (Colombia learns, n.d.; Ministry of National Education, Fundaction Tecnalia Colombia, et al., 2022). In this framework, it is recognized the leading role of the teacher in the educational process and highlights the need to train teachers to effectively implement the STEM approach and use the necessary technological tools to carry it out.

A detailed analysis of the participation and development of STEM proposals in different regions of Colombia reveals a diversified and evolving panorama. The adoption and implementation of STEM programs and strategies vary significantly according to the region, showing challenges and advances in each one.

Colombian education policies and laws recognize the importance of STEM education for the country's development. Law 115, which regulates public education, emphasizes the need to develop critical and analytical skills to foster scientific and technological innovation, improve the quality of life and contribute to social and economic progress (Congress of the Republic of Colombia, 1994). Law 1753 of 2015 establishes the National Science, Technology and Innovation Policy, seeking to integrate advances in science and technology into productive processes and the solution of social and economic problems (Congress of the Republic of Colombia, 2015). The Ten-Year Education Plan 2016-2026 defines education policy and sets goals to improve the quality of education, including the promotion of STEM education as a key tool for social and economic development (Ministry of National Education, 2016).

In addition,Law 1874 of 2017 creates the National Network of STEM Territories with the objective of promoting STEM education in Colombia and training citizens with scientific, technological, engineering and mathematical skills (Congress of the Republic of Colombia, 2017). The National Science, Technology and Innovation Policy 2022-2031 seeks to strengthen the country's scientific and technological capacity, promoting innovation and economic and social development, highlighting the importance of the STEM approach (Consejo Nacional de Política Económica y Social CONPES (4069) Republic of Colombia & National Department of planning, 2021). In line with this, the Ministry of National Education (MEN) is leading an educational vision that includes standards, curricular guidelines and guides, promoting educational innovation and the use of digital technologies to improve 21st century skills (Colombia Learns, 2022). These measures underline Colombia's commitment towards the promotion of STEM education, highlighting its importance in fostering sustainable development and a major competitiveness in a world each time more driven by scientific and technological advances.

Education plays a fundamental role in the progress of society, and throughout its historical development, it has increasingly incorporated vital disciplines that today are recognized as STEM areas. These disciplines, once considered independent, have become an essential fusion that drives knowledge and innovation in society. In the Colombian context, the adoption of the STEM Education Approach has been fundamental in meeting the educational needs of the population, thus contributing to the country's development.

Integration of STEM in Education

To understand the STEM Education Approach in Colombia, it is crucial to examine its historical evolution (Echeverría Samanes & Martínez Clares, 2018; Gutiérrez Torres, 2020; Marín-Ríos et al., 2023; Ministry of National Education, OAS, et al., 2022; Ramos-Lizcano et al., 2022; Soo Boom NG, 2019; Yepes Miranda, 2020). Over time, education has undergone significant transformations to adapt to the demands and challenges of society. The conception of education as a driver of knowledge and innovation have led to the integration of subjects. This approach has been shaped by the need to train individuals capable of addressing the challenges of our time and promoting the advancement of society through solid STEM skills.

STEM education promotes active and meaningful learning by performing students' active participation in their learning process (NextGen STEM, 2021). The incorporation of technology and digital tools in the STEM approach is fundamental to enhance learning and foster creativity and innovation (García-Villaraco et al., 2021). The digital era in which we live demands that students acquire technological skills from an early age, and STEM education provides the space for this to happen in an integrated and meaningful way.

It is fundamental that educators, educational institutions and policymakers work together to promote STEM education and ensure that it is accessible to all students (García-Villaraco et al., 2021). This involves providing adequate resources, training and support, as well as creating environments conducive to active learning, creativity and innovation.

Didactics strategies for STEM teaching

Didactics strategies in the STEM educational approach are not simply techniques, but are intrinsically influenced by the teacher's educational philosophy, his or her vision of education, the pedagogical model employed and the curricular theories that underpin his practice. These strategies are manifested in the teacher's interaction with students, the organization of content, the choice of methods and resources, and the assessment of learning (Londoño et al., 2010). It is fundamental to understand that these strategies cannot be applied mechanically, but they must be adapted to the particularities of the students, the educational environment and the beliefs of the teacher (Londoño et al., 2010).

In the context of the STEM approach, it is essential that teachers strategically choose the most appropriate methodologies for their students and the specific educational context. Among the recommended strategies in this context are Problem-Based Learning (PBL), Challenge-Based Learning (CBL), Project-Based Learning (PBL), Inquiry-Based Learning (IBL), Cooperative Learning, Gamification, Design Thinking, and Engineering Design (Echeverría Samanes & Martínez Clares, 2018; Jauregui et al, 2018; Johnson et al., 1999; Ministry of Education, Culture and Sport Spain, 2015; Vinicio et al., 2020).

Problem-based learning (PBL) involves students collaborating to tackle real-life or simulated problems, applying their acquired knowledge and skills. This method fosters reflective and critical learning, with an integral view of knowledge, involving the community in decision-making on various issues (Vinicio et al., 2020).

On the other hand, Challenge-Based Learning (CBL) seeks to connect knowledge with real-life experiences, allowing students to integrate theory and practice by solving authentic challenges (Echeverría Samanes & Martínez Clares, 2018).

Similarly, Project-Based Learning (PBL) promotes the practical application of knowledge and skills through the resolution of real or simulated problems, strengthening the understanding of academic concepts and critical thinking (Ministry of Education, Culture and Sport Spain, 2015).

The Inquiry-Based Learning (IBL) approach places students in a central role, encouraging them to explore a topic autonomously, asking questions, collecting data and information, and analyzing them to reach their own conclusions (Echeverría Samanes & Martínez Clares, 2018). On the other hand, Cooperative Learning fosters students to work together in small groups to achieve common goals, supporting each other and sharing knowledge (Johnson et al., 1999).

Gamification, or the use of game elements in non-game contexts, and Design Thinking are strategies that enhance creativity and problem solving through iterative and user-centered approaches (Rodríguez-Martínez & et al., 2017). Likewise, Engineering Design aims to teach students to apply engineering principles and techniques to solve real-world problems (Ministry of National Education, OEA, et al., 2022).

Finally, the Flipped Classroom (FL) moves part of the learning process outside the classroom, allowing more time in class for direct interaction with the teacher and collaborative knowledge construction (Kanobel et al., 2019). This approach combines direct instruction with constructivist approaches, promoting students' motivation and engagement in their own learning process (Kanobel et al., 2019).

Each of these strategies offers unique approaches and benefits to foster meaningful and active learning in the STEM context, and it is crucial to adapt them according to the specific needs and goals of each educational setting.

21st century skills for the advancement of society

In a globalized and technological world, 21st-century skills have become essential to face the challenges of today's society. These skills include essential abilities such as critical analysis, problem-solving, originality, teamwork, effective communication and the responsible and effective use of technology. Within the educational sphere in Colombia, the promotion of these competencies has become a fundamental element of the STEM Education Approach, with the aim of preparing students to contribute to the social, economic and environmental progress of the country as engaged citizens. The Ministry of National Education et al. (2022) endorses the importance of STEM skills for success in the 21st century and emphasizes their strengthening as a key objective in current and future education. The 21st-century skills are grouped into ways of thinking, ways of experiencing the world, ways of working and tools for working. Among the ways of thinking, creativity, innovation, critical thinking, problem solving, and autonomous learning are highlighted as skills that reflect how people tackle challenges and make informed decisions (Alvaro et al., 2021).

The ways of experiencing the world refer to interaction with the environment and the use of technology, including the appropriation of digital technologies and computer competence (Álvaro et al., 2021). The authors also highlight that, in terms of work approaches, life and professional trajectory, personal and social responsibility, and citizenship participation such as local and global are considered. These aspects indicate how people interact with others and fulfil their roles in society. Finally, the skills necessary to work effectively with others are referred to as tools for working, encompassing communication and collaboration, which are essential skills for labor and personal success (Álvaro et al., 2021).

II. METHODOLOGY

This study is based on a qualitative approach, using the ethnographic method (Hernández Sampieri et al., 2014) to analyses in depth the didactic strategies implemented by teachers in the ROUTE STEM program. The use of the ATLAS.ti to realize analysis of the content of the information collected, allowing for a deeper understanding of the data and emerging patterns *(Analyses Your Qualitative Data With ATLAS.ti Web - ATLAS.ti, n.d.).*

Later, it is presented an overview of the research phases, according to Atıcı (2016), these phases can be integrated into:

Preparatory phase of the design

This phase is crucial to establish the basis of the research. The choice of qualitative methodology, especially in the context of ethnography, seems to be appropriate to understand in depth the educational practices and experiences of teachers in the STEM approach. Documentary review and literature analysis are essential to get an accurate understanding of the current state of knowledge in a given field.

Field work phase

Access to the research setting and careful selection of participants became critical steps. The active participation of teachers and STEM experts provided invaluable insights into the implementation of STEM education strategies and the development of 21st century skills, thus enriching the research process.

Information phase

The use of ATLAS.ti for qualitative analysis represents an excellent choice. The application of techniques such as inductive coding and categorization allows a deep and meaningful analysis of the data collected. Furthermore, the organization of data using bibliographic managers such as Mendeley

is complemented as a good practice to assure the integrity and accessibility of references.

III. RESULTS

The analysis of content realized with ATLAS.ti revealed that the combination of STEM strategies not only boost STEM-based learning, but also plays a fundamental role in cultivating competencies such as analytical skills, the ability to solve problems effectively, promoting collaboration and stimulating creativity in students.

STEM training routes provide teachers with a crucial opportunity to keep up-to-date and expand their knowledge in science, technology, engineering and mathematics. In a world in constant technological evolution, being aware of the latest trends and advances in these areas becomes an essential element in providing quality and relevant education to students (Ministry of ICT et al., 2021).

This specialized training prepared teachers to carry out STEM projects in their classrooms, equipping them with innovative and creative teaching methods that involve actively the students. These approaches not only enrich students' learning experience, but also prepare them more effectively for future careers in STEM fields (Ministry of National Education, Fundación Tecnalia Colombia, et al., 2022; Ministry of ICT et al., 2021).

In addition, the inclusion of teachers in these training programmers, which were required in advance of participating in the STEM tournament, ensured that all contestants had a robust foundation of knowledge and skills in the STEM field (Ministry of ICT et al., 2021). This ensured that the tournament remained a fair competition, and that the projects presented reflected a high standard in terms of quality and creativity.

The STEM Route established various scenarios of participation, from the range municipal to the national, playing a crucial role in the promotion and evaluation of projects related to this educational approach (Ministry of ICT et al., 2021).

During the STEM 2022 Tournament, an observation guide was used to collect detailed information about the projects submitted by teachers and students participating in the national training program Ruta STEM. This guide allowed for an enriching qualitative analysis of the projects, providing detailed insight into the contextual and qualitative aspects of each project (Ministry of ICT et al., 2021).

The projects that arose because of the implementation of the STEM Pathway evidenced a beneficial effect on both the advancement of STEM skills and knowledge and on the community. These projects also stimulated greater environmental awareness and promoted an entrepreneurial mindset, thus strengthening the connection between the educational institution and the surrounding community.

This evidence supports the notion that the implementation of STEM education strategies can generate social benefits, economic and environmental substances. It is crucial to highlight that the STEM Pathway incorporates a gender equity perspective by promoting equal participation of men and women in STEM disciplines. Furthermore, the incorporation of gamification as an educational tactic helps to increase students' motivation and engagement, which can have a significant impact on their learning experience. Finally, a focus on project or challenge work allows students to tackle practical challenges and apply knowledge in real-life contexts, thus fostering integral development.

By observing the example provided by the teachers participating in the STEM 2022 Tournament and consider their research processes and the results obtained, it can establish significant relationships between the didactic strategies implemented and the current motivations at different educational levels. This analysis supports the importance of adapting educational strategies to respond to the changing needs and demands of students in the STEM field, thus assuring effective and relevant education in this era technologically constantly evolving.

IV. DISCUSSION

The effective integration of STEM strategies in education is essential to prepare students for the modern Laboral world. These strategies not only foster the development of 21st century skills, but also foster an interdisciplinary approach to problem solving, which is essential to tackle the complex challenges of today's society.

The STEM+ approach emerges as a response to the need to tackle in an integral and contextualized way the training of students in different areas of knowledge and skills relevant to life and the labor world today and in the future. By integrating elements of science, technology, engineering, mathematics and other disciplines such as the arts and humanities, it

seeks to develop individuals with a broad and flexible vision that enables them to tackle complex problems and develop innovative and sustainable solutions.

This multidisciplinary integration also reflects the interconnected reality in which we live, where the problems and challenges we face are not limited to a single area of knowledge. For example, solving environmental problems requires not only scientific knowledge, but also design skills, understanding of complex systems and sensitivity to cultural and social aspects related to the environment.

STEM+ education fosters active and meaningful learning by encouraging students' active participation in their own learning process. Through methodologies that involve teamwork, problem solving and practical application of knowledge, students have the opportunity to develop critical skills such as critical thinking, creativity, effective communication and adaptability.

The incorporation of technology and digital tools in the STEM approach is fundamental to enhance learning and foster creativity and innovation. The digital era in which we live demands that students acquire technological skills from an early age, and STEM+ education provides the space for this to happen in an integrated and meaningful way.

In secondary education, the adolescents in full intellectual and emotional development find in strategies such as engineering design a route to explore their creativity and apply STEM concepts in innovative projects. Challenge-based learning resonates with their challenging spirit, prompting them to proactively overcome obstacles. Teachers when they use these approaches not only facilitate knowledge acquisition, but also guide students towards essential skills for their academic and professional future, providing support and motivation.

In secondary education, students are at a stage of consolidating their identity and interests. Cooperative learning provides them with opportunities to work in a team and value the diversity of skills in a project, while problem-based learning challenges them to seek real solutions, stimulating their critical thinking and decision-making. Teachers at this level must be facilitators of learning, helping to connect theoretical concepts with practical applications, integrating elements of gamification to increase motivation and, consequently, active students' participation.

In Primary Education, students are curious, with an open mind to explore the world around them. Strategies such as design thinking and project-based learning teach them to approach challenges with creativity and empathy, stimulating their imagination and problem-solving skills in an environment of play and discovery. Teachers at this level must be enthusiastic guides who encourage children's natural curiosity, incorporating elements of gamification to make lessons fun and engaging, making education an exciting and memorable experience for children.

The effective integration of STEM-related educational resources at different levels not only strengthens the understanding of scientific concepts, technological, engineering and mathematics, but also fosters essential skills as it is quoted above. It is fundamental that teachers are trained and willing to adopt innovative pedagogical approaches that integrate STEM of a transversal way in the curriculum having access to up-to-date and technologically advanced educational resources.

Ultimately, promoting STEM education goes beyond teaching prompt concepts; it involves nurturing a STEM mindset that stimulates curiosity and enthusiasm for lifelong learning. This approach prepares students to successfully face the challenges and benefit from the opportunities that the future holds. The visual approach from ATLAS.ti facilitated understanding of the interconnectedness between various key concepts and provided a clear graphical representation of how these relate in the context of the project, identifying meaningful patterns and trends for a deeper understanding of the data.

V. CONCLUSIONS

This research highlights the importance of strategically integrating didactic strategies around STEM into education to cultivate 21st-century skills. The Adaption of educational environments according to students' needs, in line with national educational projects, is essential to ensure effective and relevant educational development. The results have significant implications for the continuous improvement of education in Colombia and in other similar educational contexts, advocating for the conscious adoption of STEM technology and strategies as fundamental pillars in the formation of the 21st-century citizen.

The STEM education approach in Colombia represents

a significant evolution in education, embracing the historical integration of science, technology, engineering, and mathematics in teaching.

Continuing to explore and strengthen this integration in the education system is essential to prepare future generations for the challenges and opportunities of contemporary society.

The use of ATLAS.ti in the content analysis provided an enriching and detailed view of the data collected, thus supporting the results and conclusions presented.

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DEGREE OF ADAPTATION OF PROCESS INNOVATION IN 39 SUSTAINABLE PRODUCTION UNITS IN THE MUNICIPALITY OF PASTO, COLOMBIA.

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Reception Date: October 4, 2023
Acceptance Date: August 12, 2024

Abstract

As we know, productive and entrepreneurial systems of any kind have been facing the great challenge of innovating to increase their competitiveness, quality and globalization. This interaction allows for the holistic development of productive systems, applying the support of institutional and community networks, with the aim of strengthening the social fabric and integral development in the territories. The present research work reflects the analysis of the processes of characterization of innovation, acquired in the framework of the project called "Transformation, territorial, resilience and sustainability 2020-2022" in its first phase, executed by FAO in conjunction with the Municipal Mayor's Office of Pasto-Nariño. Thirty-nine sustainable productive nodes were implemented, which only produced potatoes and milk as primary activities; the project was subjected to a comparative statistical analysis of means through the INFOSTAT 2020 statistical package, to characterize the degree of adoption of innovation in the beneficiary communities of the project. The results showed that in phase one, the average number of technologies used by the farming community was 23.8%, corresponding to 14 practices on average, and in the second phase the increase in technologies implemented was 22.48%, corresponding to 13 new practices, respectively.

It was also observed that the most used technologies were: adaptation of silvopastoral systems, soil conservation practices, soil cover, use of organic fertilizers and management of biopreparations. It is concluded that the course of this research, the communities have generated a significant impact, doubling the number of new practices used in the sustainable production nodes. Likewise, it can be seen that the standard of living perceived by the community does not present significant changes, but the trend of the standard of living in the communities increases due to the process of technology transfer and development in the territories.

Key words: Innovation, productive nodes, sustainability, silvopastoral.

CARACTERIZACIÓN DE LA INNOVACIÓN DE PROCESOS EN 39 NODOS PRODUCTIVOS SOSTENIBLES EN EL MUNICIPIO DE PASTO, COLOMBIA.

Resumen

Los sistemas productivos y empresariales, se han enfrentado al gran reto de innovar para incrementar su competitividad, calidad y globalización. Esta interacción permite el desarrollo holístico de los sistemas productivos, aplicando el apoyo en redes institucionales y comunitarias, con el ánimo de fortalecer el tejido social y desarrollo integral territorial. El presente trabajo de investigación plasma el análisis de los procesos de caracterización de la innovación, adquiridos en el marco del proyecto denominado "Transformación, territorial, resiliencia y sostenibilidad 2020-2022" en su primera fase, ejecutado por FAO en conjunto con la Alcaldía municipal de Pasto-Nariño. Se implementaron 39 nodos productivos sostenibles, los cuales solo producían papa y leche como actividad primaria; el proyecto se sometió a un análisis estadístico comparativo de medias a través del paquete estadístico INFOSTAT 2020, para caracterizar el grado de adopción de la innovación en las comunidades beneficiarias del proyecto. Los resultados mostraron que en la fase uno, el promedio de tecnologías usadas por la comunidad campesina era del 23,8% correspondiente a 14 prácticas en promedio y en la segunda fase el incremento de tecnologías implementadas fue del 22,48% que corresponde a 13 nuevas prácticas respectivamente; igualmente, se pudo observar que las tecnologías más empleadas fueron: adecuación de sistemas silvopastoriles, prácticas de conservación de suelos, coberturas de suelos, uso de abonos orgánicos y manejo de biopreparados. Se concluye que el trasegar de esta investigación, las comunidades han generado un impacto significativo, duplicando el número de nuevas prácticas usadas en los nodos productivos sostenibles. Igualmente, se puede apreciar que el nivel de vida percibido por la comunidad no presenta cambios significativos, pero la tendencia del nivel de vida en las comunidades aumenta debido al proceso de transferencia de tecnología y desarrollo en los

territorios.

Palabras Clave **-** Innovación, Nodos productivos, Sostenibilidad, silvopastoril.

I. INTRODUCTION

Innovation measurement is essential in knowledge management, playing a fundamental role in the integral development of communities by generating significant benefits. Several analytical models, such as the Oslo Manual (MO) in 2018, recognize the types of innovation and serve as a reference for surveys as tools for innovation measurement (Gault, F. 2023). In Latin America, the Ibero-American Network on Science and Technology Indicators (RICYT) introduced the Bogota Manual (MB), standardizing indicators of technological innovation (Hidalgo Delgado, A. Y. 2019).

In Colombia, Technological Development and Innovation Surveys (EDIT) were conducted in manufacturing and services, supported by entities such as COLCIENCIAS, DNP and DANE (Aguilar Gallegos, N., & Altamirano Cárdenas, J. R. 2020). The Agricultural Innovation Survey ENIAGRO in 2013 marked the measurement of innovation in the Colombian agricultural sector (Omar, C. et al. 2013). In addition, technology transfer in the agricultural sector was strengthened with the creation of the National Agricultural Innovation System (SNIA) in 2017 (Contreras Pedraza & Uribe Galvis, 2021).

In this context, the motivation to investigate innovation arises from the need to observe the erratic behavior of the agricultural sector, focusing on modern agriculture beyond agri-food, including market competition, quality and its positive impact on rural communities (Parra Real, J. L. 2023). Additionally, FAO aims to transform agri-food systems to ensure food security and sustainable development. The Secretariat of Agriculture of Pasto joins this proposal with the project "Territorial transformation, Resilience and Sustainability", implementing "sustainable productive nodes (NPS)" in San Juan de Pasto.

These nodes are systems that interact in the rural community to protect food security and strengthen various aspects. Sustainable production based on agroecology is fundamental. For this reason, the study of technological dynamics in production systems provides guidelines for innovation strategies and holistic development in global communities, impacting technological, business, social and environmental aspects (Melgoza Arteaga, M. 2022).
This study focuses on characterizing innovation in 39 sustainable productive nodes in San Juan de Pasto, under the project "Resilience, productivity and sustainability" in collaboration with FAO and the Municipality of Pasto.

II. METODOLOGY

The innovation exploration was carried out in 6 villages of Santa Barbara, municipality of Pasto, department of Nariño, Colombia. The area is characterized by a steep slope with an average altitude of 2800 meters above sea level

Image 1. NPS Women Entrepreneurs of Peace. Source: Own.

Fuente: Esta Investigación

The study area corresponds to 39 units called "sustainable production nodes (SPN)" of ¼ Ha, distributed in the study area. An indicator is identified, which describes a set of observable practices in each NPS.

Each NPS was provided with seeds and tillage tools, as well as a comprehensive training package provided by FAO in conjunction with the Pasto municipal government.

As for the collection of information, primary sources obtained through the technical assistance process in the area with the producers were used; we also relied on secondary sources such as a characterization study of the area, to capture the perception of the technologies used at the beginning of the project and the impact generated by it in a sample of 39 Nodes, at the beginning and end of the implementation of the NPS in its first phase.

Table 1 shows the NPS under study and their main characteristics before project implementation.

Vereda	NPS	Producción base	Hombres	Mujeres
Los Àngeles	10	Papa y leche	32	43
Jurado	6	Papa y leche	13	35
Cerotal	6	Papa y leche	4	28
Las Encinas	6	Papa y leche	12	35
La Esperanza	6	Papa y leche	10	29
Las Iglesias	5	Papa y leche	15	32

Fuente: Propia

The selected innovation indicator can be identified in Table 2, mainly characterizing sustainability and agro ecological reconversion processes.

Table 2. INDICATOR SELECTED IN THE PROCESS OF INNOVATION IN AGROECOLOGY.

Indicador	Medición
Procesos nuevos o mejorados	Número o porcentaje de labores incorporadas

Fuente: Propia

The analysis considered the selection of indicators that were easy to understand and measure, whose information was feasible to obtain, with the greatest possible reliability, and took into account previous studies by Funes-Monzote et al. (2009), Vera-Pérez (2011) and (Blanco-Lobaina et al., 2013).

Work incorporated.

It was possible to observe 60 practices in the NPS under study based on the information shown in Table 3.

3. These practices were grouped by themes, such as: P1, Establishment of agroforestry systems; P2, Polyculture and spatial and temporal diversification; P3, Biological control; P4, Productive diversification; P5, Crop rotation; P6, Production and use of organic fertilizers; P7, Soil conservation and protection; P8, Other practices. (Contino-Esquijerosa et al., 2018).

Table 3. Sustainable agroecological practices

Practirce	Group membership considerations
P1 Establishment of agro-forestry systems	Planting of: posts and/or live fences, forest and/or fruit plantations, tree protein banks, scattered trees in pastures, hydro-regulating strips, trees intercropped with agricultural crops, trees intercropped with pasture and/or forage, biological corridors and trees in non-productive/cultivable soils.
P2 Polycultures. Spatial and temporal diversification	Intercropping of: annual crops, perennial crops or mosaics, annual crops intercropped with perennial crops, trees of different species, agricultural crops with forage crops, grasses associated with herbaceous legumes, agricultural and/or forage crops with flowers.
P3 Biological control of pests	Use of: bio pesticides or biological means, traps (colored, scented, among others). Planting of pest repellent and/or medicinal plants and natural preparations (repellent or medicinal).
P4 Diversification of production	Existence in the production system: agriculture, livestock, fruit trees, beekeeping, aquaculture, rabbits, poultry, swine, sheep and/or goats, timber, flowers and ornamental plants.
P5 Crop rotation	Crop rotation: annuals, perennials, annuals, with perennials. Rotation of agricultural areas with livestock and recovery of idle or invaded areas of thorny bushes..
P6 Production and use of organic fertilizers	Production of: animal manure (and its treatment), compost, worm humus, efficient microorganisms and bio fertilizers. Use of biodigester effluents. Soil application of: animal manure, compost, worm humus, efficient microorganisms, organic fertilizers, bio fertilizers and/or bio nutrients, chicken manure, cachaza, crop residues, bio digester effluents and organic fertilizers.

P7 Preservation and protection of the soil	Soil cover with: Mulch (dead cover) and crop residues, use of: legumes/ green manures, rehabilitation and/or renovation of pastures and barriers (dead or live) against soil erosion, terracing against soil slope. Use of: minimum tillage and animal traction.
P8 Other practices	Use of: Crop residues and by-products for animal feed and alternative energy sources.

Fuente: Contino-Esquijerosa et al., (2018).

When implementing the NPS, they quantified the work incorporated, analyzing the new practices in a time range of 4 months. Subsequently, an analysis of the processes incorporated in the 39 NPS was obtained.

Regarding the statistical analysis, a comparison of proportions was carried out with the INFOSTAT®

III. RESULTS AND RESEARCH DISCUSSION

The process of observation and information processing is shown in Table 4, detailing a process of adoption of new practices in the 39 NPS.

It can be inferred that the practices with significant differences are those that have a higher degree of adoption, because they are those that are easier to perform in the field, such as pest control work as a biological alternative using different types of preparations, chromatic traps, repellents, efficient microorganisms, etc. Many of these practices are recommended by Nicholls et al (2015).

Tabla 4. PRUEBA DE MEDIANAS
PARA DOS MUESTRAS FASE X VARIABLE.

Variables	Total de Practicas	Desviación		Mediana		P(2 colas) estándar
		Fase		Fase		
		1	2	1	2	
P1	9	0,51	1,23	2	1	0,0873
P2	5	0,59	1,07	1	1	0,8173
P3	6	0,41	1,53	1	2	<0,0001
P4	11	1,02	1,44	2	1	0,0083
P5	5	0,55	1,47	1	2	0,0036
P6	9	1,27	1,86	2	4	<0,0001
P7	4	0	0,99	1	2	<0,0001
P8	10	1,12	1,3	3	2	<0,0001
Total	60			13	15	

Fuente: Propia

On the other hand, in some neighboring areas, as they are cattle-raising areas, they have agroforestry systems, and for this reason, some units have previously worked with arrangements concerning protein banks, live fences, etc.

Likewise, there is a wide variety of untapped forage sources that were identified in the adoption processes for their use.

Regarding soil resource management P6, in Table 5 we can appreciate a degree of apprehension of knowledge and application of new practices in a percentage of 44.74% for the efficient management of waste for soil improvement, allowing an improvement in the overall quality of the soil as named by (Olivares-Perez et al, 2018).

Similarly, regarding crop rotation and polyculture, the trends indicate that the community has an average adoption rate of 9.33% and 33.16% respectively in terms of maintaining these systems as part of a biodiverse approach.

Similarly, regarding crop rotation and polyculture, the trends indicate that the community has an average adoption rate of 9.33% and 33.16%, respectively, for maintaining these systems as part of a biodiverse approach.

In Table 5, we can see that the practices implemented in phase one were 23.8% corresponding to 13 practices on average and in the second phase the increase of technologies used was 22.48% corresponding to 15 new practices respectively.

It was observed that the most commonly used technologies were: adaptation of silvopastoral systems, soil conservation practices, soil cover, and use of organic fertilizers and management of biopreparations.

Tabla 5. Evolución de labores en el proceso
fase 1 2020, fase 2, septiembre 2022.

Variables	Total de Practicas	Numero de Practicas		Practicas promedias %		Total, de labores aplicadas %
		Fase		Fase		
		1	2	1	2	
P1	9	2,28	1,03	25,36	11,40	36,76
P2	5	1,41	1,05	28,21	21,05	49,26
P3	6	1,13	1,68	18,80	28,07	46,87
P4	11	2,44	1,03	22,14	9,33	31,47
P5	5	1,44	1,66	28,72	33,16	61,88
P6	9	2,10	4,03	23,36	44,74	68,10
P7	4	1,00	1,37	25,00	34,21	59,21
P8	10	2,49	1,50	24,87	15,00	39,87
Total	60					

Fuente: Propia

This ultimately generates welfare in the agroecosystem, such as greater biological, productive, economic, energetic and environmental efficiency (Funes-Monzote, 2009), all of which translates into higher income in a sustainable and environmentally friendly way.

In this regard, Velásquez Alcántara, H. D. (2023). Refers that these applied processes are effective methodological elements to establish a dialogue between experts and farmers, and that they also facilitate the collective construction of knowledge and guarantee the inclusion of agroecological principles in the technological activity of reconversion.

Likewise, Solis, C. R. R., Ramírez, E. E. G., & Angulo, J. P.C. (2017). They pointed out that the training and renewal of thinking, to the improvement of the management of managers, is vital for the integral development of the territories.

Thus, we can infer that agricultural extension is key in the processes of knowledge acquisition and acceptance of new technologies through change management.

For this reason, an analysis of the adoption of new technologies provides guidelines to strengthen the development links in the different communities, generating input for the reconversion of technologies.

We can also affirm that the diversity of agroecological practices and ancestral knowledge, as a factor of innovation and development in the communities, is key to economic, productive, social, and environmental sustainability and viability in the study area.

As for diversification as a source of social development, it gives us the perspective of an agroecological system, encouraging the community to opt for the use of these new technologies.

In general terms, we can observe in Table 4, that the average of total practices fluctuates between 31.47%, 68.10% and represents 49.8% of average labor applied, which corresponds to a medium to low technological level.

IV. CONCLUSIONS

It is concluded that the support networks for innovation, headed by the agricultural extension service, induce process innovation and adoptability, technology transfer, innovation and development in the territories. Similarly, the level of innovation tends to increase over time due to the need to produce food efficiently, breaking paradigms. In addition, they are an important pillar in the territorial development process, establishing new challenges to strengthen food security.

We can also infer from the data obtained, that it is necessary to carry out a deep analysis of the technologies and their respective instruments because the practices in the field must ensure their versatility and adaptation to the reality of the field in each territory. Thinking about the efficiency of the processes, to ensure a more efficient generational replacement and that our future generations do not abandon the field due to the lack of tools, strategies, and opportunities for a decent and satisfactory income generation.

AKNOWLEDMENTS

The author expresses sincere gratitude firstly to the Eternal YHWH, family and loved ones. I also thank the Mayor's Office of San Juan de Pasto and the FAO project team for "Resilience, productivity and sustainability".

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RESEARCH AS A PEDAGOGICAL STRATEGY (IEP) IN WATER RESOURCE CONSERVATION.

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Reception Date: October 18, 2023
Acceptance Date: April 12, 2024

Abstract

This thesis studies the impact of Research as a Pedagogical Strategy (IEP) on attitude changes related to the conservation of water resources, in high school students of the IEM El Encano. It begins by recognizing the importance for students of conserving water resources. Subsequently, they develop an investigation to characterize the quality of a natural water body. Finally, the changes in attitude towards the conservation of water resources achieved through their research are evaluated. This work is located within the qualitative research paradigm, with an interpretive approach and a phenomenological type. In the first part, the semi-structured interview is used as a tool to collect data; in the research with the students, a didactic sequence based on the IEP is designed and the Guttman scale is used to evaluate the changes in attitude. At the beginning, the students think that water is polluted with solid waste. They find that there is an incipient culture of care for the environment due to ignorance of the dynamics of its operation, which is reflected in the satisfaction of economic needs with the ecological services of the environment as a priority, instead of preserving them. After applying the IEP, they conclude that anthropogenic actions are the cause of the negative impact on water. Individual and collective actions in wastewater treatment stand out, as a way to protect the environment, recognizing the link between water quality, ecosystem, and human health. However, they show a medium personal willingness to participate in the environmental awareness of the community.

Keywords: Conservation, Water resources, IEP

Resumen

Esta tesis estudia el impacto de la Investigación como Estrategia Pedagógica (IEP) en los cambios de actitud relacionados con la conservación del recurso hídrico, en estudiantes bachilleres de la IEM El Encano. Se inicia reconociendo la importancia que tiene para los estudiantes la conservación del recurso hídrico. Posteriormente, ellos desarrollan una investigación para caracterizar la calidad de un cuerpo natural de agua. Finalmente, se evalúan los cambios de actitud hacia la conservación del recurso hídrico logrados con su investigación. Este trabajo se ubica dentro del paradigma cualitativo de investigación, con enfoque interpretativo y tipo fenomenológico. Como herramientas, para colectar información, en la primera parte, se emplea la entrevista semiestructurada; en la investigación con los educandos, se diseña una secuencia didáctica basada en la IEP y para evaluar los cambios de actitud, se aplica la escala Guttman. Al comienzo, los estudiantes conciben que el agua se contamina con los residuos sólidos. Manifiestan que existe una cultura incipiente por el cuidado del ambiente debido al desconocimiento de las dinámicas de su funcionamiento, reflejada en satisfacer necesidades económicas con los servicios ecológicos del entorno, como prioridad, en lugar de conservarlos. Luego de aplicar la IEP, concluyen que las acciones antropogénicas son causa de afectación negativa del agua. Destacan las acciones individuales y colectivas en el tratamiento de aguas residuales, como una forma de protección del entorno, reconociendo la interconexión entre calidad del agua, ecosistema y salud humana. No obstante, evidencian una mediana disposición personal por participar en la sensibilización ambiental de la comunidad.

Palabras Clave: Educación ambiental, conciencia ambiental, recurso hídrico, conservación, IEP.

LA INVESTIGACIÓN COMO ESTRATEGIA PEDAGÓGICA (IEP) EN LA CONSERVACIÓN DEL RECURSO HÍDRICO.

I. INTRODUCTION

This research focuses on the observation of changes in the attitudes of the students from the Municipal Educational Institution El Encano regarding the conservation of water resources. Due to its vital importance in ecosystems, this resource continues to be negatively affected by human actions. This underscores the need to strengthen the awareness of new generations concerning its care and conservation through education in schools.

Environmental education offers a wide space for the application of different strategies, among which are those based on learning based on research developed by students and teachers, such as those studies focused on topics such as didactics and pedagogy oriented to environmental conservation. (Hernández et al., 2020; Gutiérrez, 2014; Sánchez-Barbudo et al., 1995; Fajardo, 2017; Tibaduiza, 2020), environmental awareness (Bastidas y Sandoval, 2018; Boelens y Parra 2009; López y Acosta 2002; Angarita et al., 2018; Vásquez-Thorné y Núñez-Sarmiento, 2018; Cabana-Manjarrez et al. 2018),

strengthening pro-environmental attitudes (Correa y Martín, 2014; Ruíz et al., 2018; Pérez, 2011;) and recognition of environmental problems and autonomous execution of proposals (Gordillo et al., 2015; Caamaño–Guerra et al., 2018; Gaviria-Paredes et al., 2018)

The negative interaction between environment and society in the context of El Encano village, requires the intervention of environmental education to recognize the natural dynamics of the environment and, in this way, strengthen the sensitivity of the new generations in such a way that behavioral changes can be induced in favor of the protection of the factors that integrate the natural environment, especially those related to water. In this way, we seek to mitigate the negative impact of human activities as they are carried out today, in order to achieve a harmonious convergence between social progress and the inevitable interaction of human beings with their natural environment.

According to these criteria, the need arises for the use of educational tools that promote conceptual and attitudinal changes in the human-environment relationship. For the development of this study, Research as a Pedagogical Strategy (IEP) is used, which is applied in the recognition of the quality of one of the most important natural water bodies in El Encano village, hoping to show changes in the students' attitude towards the conservation of the water factor once the process is concluded.

This research is developed within the qualitative paradigm, using an interpretive and phenomenological approach. It begins by identifying the interpretations and positions presented by the students in relation to the environment and especially the water factor, using the semi-structured interview as a tool for data collection. Subsequently, a methodological sequence is designed based on IEP guidelines to characterize the water quality on a stream in the area, identifying the variables that may be the cause of the negative impact on the water. Finally, a recognition of the change in students' attitudes towards the conservation of water resources is carried out, using the Guttman scale as a data collection instrument.

The methodology used is outlined below, followed by a summary of the findings and finally the conclusions and recommendations.

II. METHODOLOGY

This research adopts the qualitative paradigm, since it is oriented towards understanding the behavior, relationships, interactions and organizational dynamics of people with their environment, without focusing primarily on quantification. The study focuses on obtaining ideographic knowledge about the phenomenon of the water factor, exploring questions that represent reality in a meaningful way, as outlined by Paz (2003) when she states that in qualitative research, in order to understand the daily events and phenomena that outline human experience, it is necessary to relate them directly to the context in which they occur.

The approach is interpretative because, being environmental research, it allows us to enter into the world constructed by the subjects and to understand the vision of its functioning based on their shared perceptions. By participating in the search for meanings and representations about the surroundings, we move towards a more inclusive and participatory environmental education. As Capocasale (2015) expresses it, on this approach when it is stated:

The goal is to penetrate the world that subjects construct and share, and to understand how they function on the basis of their intersubjective agreements. At present, it focuses primarily on the search for the meanings that subjects give to their own practices in the situations in which they act. (p.43)

This type of research is phenomenological because it seeks to go beyond the superficial facts to identify the characteristics of the environmental event under study by exploring the subjective experiences of the participants and identifying significant connections between them, in order to describe and understand the scaffolding that underlies the environmental phenomenon and its influence on their attitudes and behaviors toward nature. When relating the phenomenological type to qualitative research, Aguirre and Jaramillo (2012) argue that a description of the participants' experience of the phenomenon should be made until the essence is reached; then, the structures that make it possible (transcendental phenomenological description) should be described until the essence of the phenomena is reached based on the previous descriptions.

The population of this research corresponds to the high school students from El Encano village, who study their

secondary education in this institution; belonging to the different villages of the 18 which integrate El Encano village from the municipality of Pasto. The sample is represented by 30 volunteer students, young ladies and young people of the Municipal Educational Institution from El Encano village, belonging to the Environmental Committee of each course in the high school section, who were between 11 and 17 years old.

For the theoretical framework, a critical review and documentary analysis of theories related to the German and Latin American educational paradigms was made, where the critical-transformative and popular educational currents were found, outlining the constructivist and investigative approaches to focus the line of Research as Pedagogical Strategy (IEP). Likewise, the conceptual framework focuses the concepts and studies related to environmental awareness and education, environmental maintenance and conservation, and the water factor as relevant topics of this thesis, which represent the basis to focus its practical execution and interpretation of results.

In addition, information was obtained regarding projects that could be similar to the objectives of our study, related to the application of research as a pedagogical strategy in relation to environmental education processes in elementary school students. Such collected information facilitated the drawing up of a bibliographic information map, which led to the recognition of situations not yet studied in the field in question, in which it was possible to locate the development of this thesis. Vickery (1970) adds that one of the informative needs of the recovery methods, including documentary analysis, is to know what other scientific peers have done or are doing in a particular field.

Since this research focuses on the study of the interaction between society and the natural environment in the region of El Encano, it was decided to use the semi-structured interview as a tool to collect information because it facilitates a familiar and authentic approach with the students allowing the identification of the attitudes they have developed throughout their upbringing and the social context in which they have developed in relation to the natural environment, especially with the water factor. In this regard, Alonso (1999, as cited in De Toscano, 2009) states that in "the semi-structured interview is intended through the collection of a set of private understandings, the construction of the individual's social sense or reference group behavior of the participants.

Another tool used was the field diary, which is used during the development of a didactic sequence by participants in the sample under the guidance of the teacher, in accordance with the guidelines of investigation as a pedagogical strategy (IEP). According to Van Maanen (2011), the field diary consists of a written and systematic record of observations, reflections and relevant events that occur during the development of an activity or project. In the context of this research, the observable human-induced factors that negatively affect the water quality of a stream in the area were are recorded in a diary. This diary also contains a detailed record of the taxonomic classification of the bioindicators collected in the stream bed after the fieldwork had been carried out, which allows the assessment of the degree of potability or pollution in the different areas of the water body under study.

After collecting data from one of the streams in the village of El Encano, the Guttman scale was used as a tool to collect information to identify changes in attitudes, through questions divided into categories resulting from the identification of aspects related to attitudes towards the water factor in the semi-structured interview. Referring to this tool, Aigneren (2008) says:

The purpose of this scale is to measure attitudinal one-dimensionality - it measures only one dimension in accordance with the assumption that the whole attitude is contained in a single dimension, the options are presented in a special arrangement so that the alternatives or questions measure the intensity of appreciation or opinion. (pg.50).

III. RESULTS

A.Semi-structured interview results

The first systematic process consisted of identifying the previous perceptions and attitudes that the participants from El Encano High School have towards the conservation of environmental resources, especially water resources. This step was developed based on the thematic analysis proposed by Schütz (1973), where the semi-structured interview technique is used, which, following Boyatzis' (1998) perspective, should provide "basic elements of raw information that can be considered as significant in relation to the topic under study".

Once the questionnaire had been validated by the academic authorities, the interviews were carried out. The responses allowed the researchers to identify these four categories: pollution and environmental degradation, flora, environmental awareness and environmental culture, which are defined as follows.

Pollution and environmental degradation. Since these two aspects are directly linked and supported by sufficient arguments for the purposes of this research, we accept the criterion of Reyna (1999) who, when referring to environmental pollution, indicates that in the production, use and final disposal of any good and service, materials and energy capable of irreversibly damaging the mechanisms of nature to regenerate the biosystem and sustain life are emitted into the environment. From another perspective, environmental deterioration is often perceived as the result of human error, negligence, or irresponsibility. It is also seen as an unintended consequence of poor economic and public policy.

Based on the aforementioned general visions that support the category, several elements emerged from the responses obtained, which are represented in the following subcategories: solid waste, water resources, extinction of animal species, soil deterioration due to agrochemicals, and air pollution.

Solid Waste (C1RS): The individuals interviewed stated that they are aware of the ultimate destination of solid waste by depositing it in the sanitary landfill. They also expressed the belief that the environment is polluted by throwing this waste on the ground or burning it, which produces air pollution. The respondents feel that waste on the ground is indicative of a lack of awareness among the population about the environmental consequences of waste. They state that they retain waste from manufactured food in the pockets of their clothes or backpacks and dispose of it in containers when they find them. They also identified that the presence of tourists in La Cocha lagoon increased the volume of waste produced in El Encano village.

Water Factor (C1FH): The water factor is a unique physical entity that can be viewed as an abiotic component of the biosphere. However, its definition is more expansive when considering the intertwined environmental components that constitute an interdependent network. The dynamics of this network are intrinsically linked to the physical state and quality of water, which in turn define the characteristics of biomes and ecosystems (Andrade and Navarrete, 2004).

The students identify the contamination of the environment as a result of the disposal of waste into water sources. This has led to the deterioration of water quality, making it unsuitable for direct consumption from natural sources. The only sanitary option for consumption is boiling the water.

Animal Species Extinction (C1EEA): The sample of students concede that environmental degradation impacts the survival of animal species and that logging is a contributing factor. When forests are destroyed, animal habitats are also destroyed.

Agrochemical Soil Deterioration (C1DSPA):

A minority of those interviewed were aware that the use of agrochemicals, due to their toxicity, has a detrimental impact on the quality of arable soil, they end with pollinators and animal species, contamination of water sources, and adverse effects on food produced on the land and human health.

Air Pollution (C1CA): In this regard, the respondents indicated that the air quality is contaminated by several factors, which include: smoke from vehicles used by tourists who visit frequently, smoke generated by coal production, and smoke produced by burning solid waste in areas without access to collection vehicles. Additionally, they perceive the use of pesticides affects the health of the air.

2) Flora. This is defined as the set of species present in a given place or area. The study of vegetation focuses on vegetation communities, their structure, and flower composition (Hernández et al., 2000). For the purposes of this study, the authors divided the flora into the following subcategories: deforestation, coal production, and actions to conserve the flora.

Producción de Carbón (C2PC): En sus respuestas los entrevistados expresan que el carbón vegetal es un excelente combustible, económico que reemplaza al gas y que el uso que le dan beneficia a restaurantes y asaderos de los de cuyes, sin embargo, les es claro que la producción de este material acaba con la flora del lugar, deteriora el suelo y con ello afecta negativamente al ambiente en general.

Deforestation (C2D): Deforestation is the "cutting down" of trees and other vegetation in a wooded area. This term was more familiar to the students interviewed, who believed that cutting down the forest for coal production contributes to environmental pollution. Some tourists who visit the area engage in activities such as starting bonfires, cutting down trees, or removing plants from the place. Individuals also cut down trees and forests for the purpose of installing commercial posts, rather than conservation of the area's flora.

Coal Production (C2PC): In their responses, participants expressed their belief that vegetable coal is an excellent and economical fuel that replaces gas. They also noted that its use benefits restaurants and guinea pig barbecues. However, they acknowledged that the production of this material has adverse environmental impacts, including the destruction of local flora and deterioration of soil.

Actions to Conserve Flora (C2APCF): The participants believed that cutting down trees and bushes in El Encano should be avoided, as they purify the air and store water. They had observed that in some areas, individuals who cut down trees replant seedlings of the pruned species, while in other locations, they participate in communal labor to maintain the agriculturally productive sectors and the forest that is still preserved. As a result of the training they received at school, they have learned to plant trees, to avoid cutting down forests, and to respect the integrity of forests.

3) Environmental Awareness. This is a concept that has evolved in recent years and it is also important to cite Rachel Carson, who published the paradigmatic book "The Silent Spring", which is considered the forerunner of environmental awareness in America. Rivas-Escobar and Luna-Cabrera (2016).

Febles (2004) defines environmental awareness as the system of life experiences, knowledge, and experiences that an individual actively uses in their relationship with the environment. This description involves complex psychological processes that intertwine in a systemic way, expressing and controlling the interactions between the person and their environment. These processes include knowledge, attitudes, behavior, awareness, and human perceptions.

This category has been divided into two subcategories: awareness of the ecological services of the environment and economic development versus environmental conservation.

Awareness of the Ecological Services of the Environment (C3CSEA): Vargas (2012) asserts that the evident issues that have led to the current ecological crisis are indications of a disruption in the structure of environmental values and, consequently, in behavior towards the environment. The young people interviewed believed that a lack of knowledge about ecological processes was the main reason for low awareness of environmental care. They believed that this lack of knowledge was reflected in a lack of concern for natural resources and a lack of interest in reducing the cutting of forests and the discharge of sewage, pesticides, detergents, and solid waste into streams, as well as to neglect or ignoring the actions by private companies to prevent its contamination.

Economic Development vs. Environmental Conservation (C3DEFCA): This subcategory is summarized by the concept of 'sustainability' which, referring to the interaction between environment and society, according to Colom (2000, cited by Marcote and Suárez, 2005), implies a balance between ecological, social and economic aspects, as opposed to policies that seek only growth and development. For the students it was clear that people give more importance to economic sustenance than to the care for and conservation of the environment by maintaining the illegal production of charcoal destined for sale in the sector of El Encano and other sectors of the Pasto municipality by increasing food stalls, restaurants and hotels for the service of tourists without considering the environmental impact that these actions have by default.

4) Environmental Culture. Environmental culture should be recognized as a constant construct that reflects people's use of natural resources and their level of responsibility towards the environment (Motta, 1994; Zaragoza, 1998, cited in Mata, 2004). For this study, environmental culture was approached from the following subcategories: positive actions towards the environment and practices to reduce water pollution.

Positive Environmental Actions. (C4APFA): The interviewees attested to the value of recycling food packaging or sorting at the source many of the manufactured food wrappers, some farmers collect pesticide containers as a precautionary measure to give them to plastic recycling companies; the students commented that the education they received at school led them to act spontaneously in the correct use of water, the recycling of expired batteries, making handicrafts from solid plastic waste, and the reuse of plastic containers and the production of fertilizer from organic household waste.

Practices To Reduce Water Pollution. (C4PPDCA): The participants were aware that one of the uses of water is to dispose of household waste and its negative impact on rivers and La Cocha lagoon; some farmers use rainwater to irrigate their crops without having to divert water flows; to avoid pollution of rivers by discharging, a minority of commercial centers and households use bio-digesters; some dairy farmers use waste whey from cheese production to feed pigs; some trout farmers bury trout entrails, viscera rather than dumping them in rivers..

Conclusions of the semi-structured interviews.

For the students interviewed, the presence and poor management of solid waste was relevant as a significant factor that generated contamination in the environment of El Encano.

In the surveyed points of view, the notion that the waters of the streams of the township that feed La Cocha lagoon showed signs of pollution by anthropic action, preventing them from being consumed directly, was identified.

It was recognized that the inhabitants of the area placed a priority in satisfying their economic needs, rather than in managing or preserving the natural environment in El Encano.

There was knowledge and awareness among respondents that water resources such as flora and soil were deteriorating and that the benefits of their ecological services were diminishing.

The students believed that most of the people who live in El Encano acted unconsciously towards the environment because they were not aware of its dynamic nature, which prevented them from recognizing the effects of excessive actions that, in the long run, were harmful to the ecological services it provides.

In general, actions in favor of the conservation of natural resources have been identified by a minority of the local residents and owners of food stalls in the township, aimed at conserving the flora and water in El Encano. The fact that it is a minority suggests that the population in general had an incipient culture of environmental care that needed to be strengthened to favor its conservation.

B. Design and Development of the Pedagogical Strategy (IEP)

In terms of the methodological path of research as a pedagogical strategy, Manjarrés et al. (2016) propose the following phases:

Phase I: Creation of the research group. The workshop of the question, the formulation of the research problem.
Phase II: Methodological design. Design and application of research tools.
Phase III: Analysis of results. Conclusions, sharing of results.

Each of the above phases is broken down as described below:

1) Phase I: Creation of the research group. It is broken down into three stages as follows:
Forming the Research Student Group: it was previously conducted with young men and women of the environmental committee of every course taken at the High School Section and corresponded to the thirty students who participated in the semi-structured interviews to develop the first objective of this study.

Sharing of common-sense questions: The questions are related to the water factor in the natural environment of the village of El Encano. The students posed questions that were transformed into research questions through cultural negotiation, and at the same time they facilitated situated learning, which corresponds to the acquisition of meanings that arise from activities carried out in interaction with others, resulting in a shared meaning that is achieved through the negotiation of meanings and interpretations through active communication (Bruner, 1991).

Research problem construction: it was obtained from the questions, which made the problem-oriented learning real.

For the construction of the research problem in this type of learning, the following steps were developed: the problematic situation, the problem and the research question (Díaz, 2006), as described below:

The problematic situation: Where the knowledge and understanding of the student, upon realizing the impossibility of directly resolving a conflict, led to a synthesis of questions regarding the negative impact on the water quality of the rivers and streams that feed into La Cocha lagoon, in El Encano village.

The problem: In this regard, the group of young researchers concluded that they did not know the true cause of the negative impact on the quality of water in the natural bodies of the sector. Among the possible causes, it was assumed that there could be inadequate or unconscious actions of a domestic, agricultural, livestock or commercial nature in relation to the environment of the daily life of the inhabitants from El Encano.

Research question. In accordance with the above, the group of students summarized a research question which solution that sought to verify whether the possible causes raised for the problem were correct. The synthesized question was:

In which area of a river in El Encano is it possible to drink directly from its waters?

2) Phase II. Methodological Design. It is broken down into two stages:

Design of the inquiry trajectory: In response to the research question, students collaboratively organized proposals aimed at verifying the possible causes affecting the quality of water in natural bodies in the environmental sector of El Encano. Among the proposals, one emerged that was significant and viable: to identify how the quality of water, depending on the area of the river or stream (high, medium, or low in relief) before reaching Laguna de La Cocha, affects the existence of the forms of life that inhabit the rivers and streams.

Using this idea, students and research teachers examined options to carry out this identification. Among others, they decided to characterize the water quality of the Quillinzayaku stream in Santa Rosa, El ENCANO village, based on the presence of bioindicators and using the BMWP index, which stands for Biological Monitoring Working Party (Roldán, 2016), and the ASPT index, which means Average Score Per Taxon in English (Álvarez, 2005). After getting information about this water quality identification mechanism, the entire group outlined the steps to be developed, as it is described in the following stage.

Journey of the inquiry trajectory: This consisted of a field practice where the methods and tools defined in the previous stage were applied, serving as a synthesis of learning achievements: collaborative, problematizing, and situated. The trajectory consisted of two general processes as follows:

Collection of bioindicators of water quality. This was carried out in the high and low areas of the Quillinzayaku stream in the Santa Rosa district of the El Encano corregimiento. For this, the group of student researchers, along with accompanying teachers, collected samples of macroinvertebrates that grow on the bottom of the streambed. The sensitivity of these bioindicators to the conditions of the aquatic habitat where they are found provides an indication of the water quality in the area being sampled (Roldán, 2016). For the practice, each student used a field diary, Surber and kick nets (Roldán, 1988), as well as magnifying glasses, disposable plates, brushes, a solution of 70% ethanol, and labeled jars for the macroinvertebrate samples. Sampling in the mid-zone was planned from the beginning, but the dense vegetation surrounding the streambed in this area prevented access, making it impossible to carry out.

Taxonomic classification of the collected samples. This step was performed by the student researchers in the laboratory of the El Encano Municipal Educational Institution, with the support of the research teachers, using optical instruments such as stereoscopes and copies of the guide for studying aquatic macroinvertebrates in the Department of Antioquia (Roldán, 1988).

They were identified using the BMWP and ASPT indices to determine the water quality of the sampled locations in the aforementioned stream. These indices take into account the number of families and sensitivity scores or degrees of tolerance to eutrophication of the macroinvertebrates captured in each area (Roldán, 2016).

To calculate the BMWP index, the ecological scores of the families were simply summed according to their degree of tolerance to eutrophication. Meanwhile, the ASPT is calculated by dividing the BMWP by the number of families, see Ec. 1 (Arango et al., 2008).

$$ASPT = \frac{BMWP}{N^{o}deFamilias} \times 100$$

The classification and meaning referenced in the results of these indices are indicated in Table I.

The results obtained indicated that the water in the upper zone of the Quillinzayaku stream had a Class I quality, rated as "Good," which indicated that it was very clean water, uncontaminated, and of unaltered quality. The final values obtained are shown in Table II.

Tabla I. CLASIFICACIÓN DE RESULTADOS

Clase	Calidad	Valor del BMWP	Valor del ASPT	Significado	Color
I	Buena	> 150	> 9-10	Aguas muy limpias	
		101-120	> 8-9	Aguas no contaminadas	
II	Aceptable	61-100	> 6,5-8	Ligeramente contaminadas: se evidencian efectos de contaminación	
III	Dudosa	36-60	> 4,5-6,5	Aguas moderadamente contaminadas	
IV	Crítica	16-35	> 3- 4,5	Aguas muy contaminadas	
V	Muy Crítica	< 15	1-3	Aguas fuertemente contaminadas, situación crítica	

Fuente: elaboración propia, 2023.

Tabla II. RESULTADOS SENSIBILIDAD ZONA ALTA

Orden	Número de Familias	Número de individuos colectados	Sensibilidad de familias (BMWP)	ASPT
TOTAL	15	64	127	8,5
Calidad			Clase I >120 Aguas muy limpias No contaminadas Calidad buena	Clase I ≥6 Aguas No contaminadas Calidad no alterada

Fuente: elaboración propia, 2023.

Tabla III. RESULTADOS SENSIBILIDAD ZONA BAJA

Orden	Número de Familias	Número de individuos colectados	Sensibilidad de familias (BMWP)	ASPT
TOTAL	13	32	94	7,2
Calidad			Clase II 61-100 Aguas Ligeramente contaminadas: Se evidencian efectos de contaminación. Calidad Aceptable	Clase II > 6,5-8 Ligeramente contaminada Calidad Aceptable

Reflection: This involved reconstructing the methodological process. Experiences shared by each young researcher during the field practice and taxonomic classification were discussed, highlighting individual perceptions and viewpoints. This led to a broader understanding of the problem, thanks to collective production and the exchange of knowledge and experiences. It allowed the problem to be characterized at a level broader than initially known by all, generating the construction of knowledge regarding the researched issue.

Conclusions of the work with IEP in the Quillinzayaku Stream. They are summarized in two points, as follows:

In the upper part of the Quillinzayaku stream, there were many plants called frailejones. It is a special place, without houses or crops, where there was no pollution from waste or pesticides. Additionally, there were no animals that could contaminate the water with their waste. For all these reasons, the BMWP and ASPT indices showed that the water in this area was very clean and of good quality, Class I.

When we went to the lower part of the stream, we saw that there are more houses, and some forested areas have been cut down to make space for crops. There are also places where animals, like cows and pigs, are kept. It does not seem that the houses have a system to treat the water before it goes into the river. All of this makes the water somewhat dirty, but it is still not too bad. The BMWP and ASPT indices indicate that the water is acceptable, although there are signs that it might be slightly contaminated, hence its quality is Class II.

Therefore, the answer to the research question is expressed in the following arguments:

In the Quillinzayaku stream, located in Santa Rosa, El Encano Village, there is a site where the water is very pure and safe to drink. This is in the upper zone of the stream, where there are no people engaging in activities that could pollute the water. Thus, we can drink water directly from the river without worrying about its quality. In the lower part of the Quillinzayaku stream, we cannot drink water directly from the river because it is contaminated with animal waste, chemical fertilizers, garbage, and wastewater from human activities of people living near this river.

Socialization of results: This is carried out with the community of participants at the Municipal Educational Institution.

El Encano, by the group of participant researchers, who experienced the project from its inception.

For its execution, first, the group of young researchers is divided into subgroups, and the stages of the research process are distributed among them. Then, each subgroup creates a script and draft graphic presentations to later develop a slideshow presentation. Finally, the steps taken in the research and the results obtained are shared with the participant community, using the slideshow created by all the subgroups as support. Each participant, for the socialization, presents the part of the process they are responsible for, within a time frame of 1 to 3 minutes.

C. Analysis of Results Using the Guttman Scale

After applying the IEP to assess the water quality in the Quillinzayaku stream, the changes in attitudes generated among the sample group of participants regarding water resource conservation are evaluated. To this end, the Guttman scale, validated by academic authorities, is used. This scale consists of a questionnaire of thirty-two (32) questions, organized into eight (8) categories, arranged in stepped groups of four (4) questions each.

Category 1. Solid Waste Management. According to the Guttman scale, the reproducibility coefficient is obtained, considering that four (4) questions were answered by 30 participants. In this category, 16 errors were identified at random, according to the formula for the reproducibility coefficient (see Ec. 2).

$$CR = 1 - \frac{nº\ de\ errores}{nº\ items * nº de\ sujetos}$$

For this category, the results are as follows:

$$CR = 1 - \frac{16}{4 * 30} = 0{,}87$$

Where 0.87 falls below the acceptable reliability parameter of 0.9 for a strict Guttman scale; this result may be due to the questions in the scaling questionnaire needing to be more specific when inquiring about behavior regarding solid waste and its impact on water resources. The responses reveal an awareness of daily actions concerning these wastes in the urban environment, but do not demonstrate the negative effects of these on the natural water sources of the corregimiento. This suggests, seemingly, a limited awareness of the importance of conserving this environmental factor. However, according to Ansón (1964), who refers to the reproducibility coefficient of this scale with results below 0.9, states that "sometimes weak scales are used, with a reproducibility coefficient ranging from 90 to 80 percent, with errors always distributed at random." Therefore, in the context of this category, although it is "weak," it is a scale which analysis has the potential to provide information about the attitude changes that the sample has undergone

participants are experiencing regarding the environment. We then rely on the result to make the following interpretations:

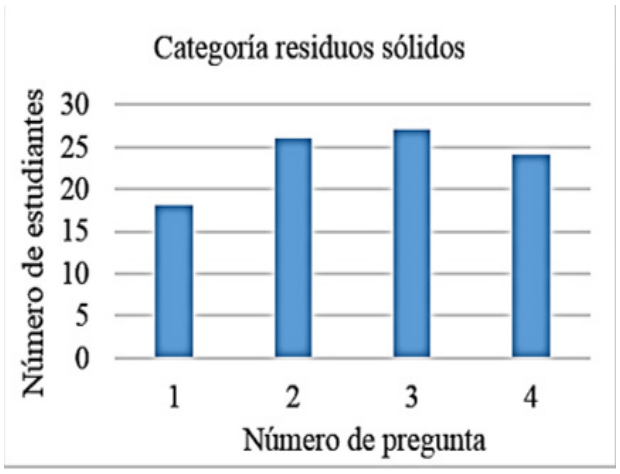

Fig.1 Categoría Residuos sólidos

In this category, out of a total of 30 participants, 11 answered affirmatively to all four (4) questions, 14 answered affirmatively to three (3) of them, four (4) young people agreed to answer "Yes" to two (2) questions, and one (1) agreed to mark affirmatively on only one (1) of the questions. These results are organized in Table IV.

Tabla IV. RESPUESTAS MANEJO DE RESIDUOS SÓLIDOS

Nº de individuos que responden afirmativamente	Cantidad de preguntas
11	4
14	3
4	2
1	1

Fuente: elaboración propia, 2023.

Due to the high tendency to answer affirmatively to 3 or 4 questions in this category, it can be generally observed that there is concern among participants regarding solid waste management in their immediate surroundings. However, there is limited willingness among the group of young researchers to actively engage in its management. This is reflected in the fact that those who responded positively to the act of seeking a container to dispose of the solid waste they produced were represented by a small number.

When comparing this result with those interpreted from the semi-structured interview, there is coherence in their positions, as the majority of young participants argued that "waste on the ground indicates widespread ignorance among residents about the negative consequences of waste on the environment." Similarly, a small number of interviewees stated that they tend to "keep solid waste from manufactured food products in their clothing pockets or bags and then discard it when they find a container along their way" (C1RS).

Category 2. Polluting Effects of Wastewater. According to the Guttman scale, the reproducibility coefficient for this category is:
Reproducibility Coefficient

$$CR = 1 - \frac{12}{4 * 30} = 0{,}9$$

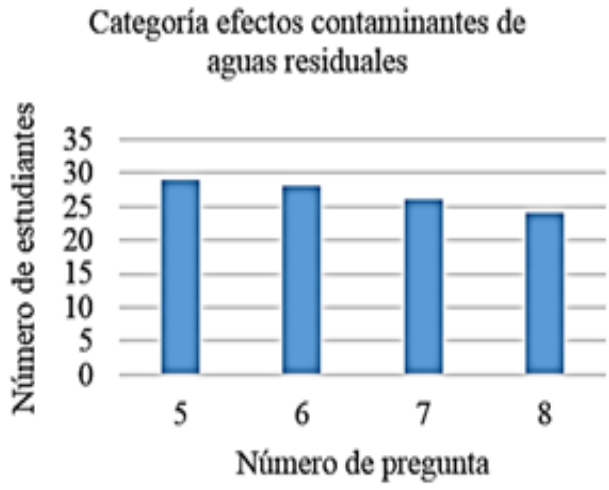

Fig.2 Categoría Efectos contaminantes de aguas residuales

The parameter of the reproducibility coefficient in this category is 0.9, which indicates that it falls within the acceptable reliability limit determined by the Guttman scale. This allows for the interpretation that participants recognize the negative impact on the water quality of the natural bodies that feed the Laguna de La Cocha due to wastewater drainage from homes and animal farms. This, in turn, also affects the wildlife (flora and fauna) of the lagoon ecosystem and, by extension, the health of the residents of El Encano Village. The responses also indicate an awareness that treatment of wastewater drainage could improve the overall health of the residents. The number of affirmative responses provided by them is shown in Table V.

Tabla V. RESPUESTAS EFECTOS CONTAMINANTES AGUAS RESIDUALES

Nº de individuos que responden afirmativamente	Cantidad de preguntas
18	4
11	3
1	2
0	1

Fuente: elaboración propia, 2023.

This result is significant in relation to the general objective of this research, as it highlights how, after developing the IEP focused on recognizing water quality, changes were revealed in the participants' conceptions regarding the water factor in their region. In the semi-structured interview, the majority of them expressed only that "polluting the environment is when garbage is thrown into the streams, causing the water to no longer be pure and making it impossible to drink directly from natural sources, which is why it has to be boiled before consumption" (C1FH). However, they did not mention the idea of wastewater drainage as a primary form of pollution affecting these natural bodies.

1) Category 3. Knowledge of Agrochemical Effects. For this category, the reproducibility coefficient resulted in:

$$CR = 1 - \frac{18}{4 * 30} = 0{,}85 \qquad (5)$$

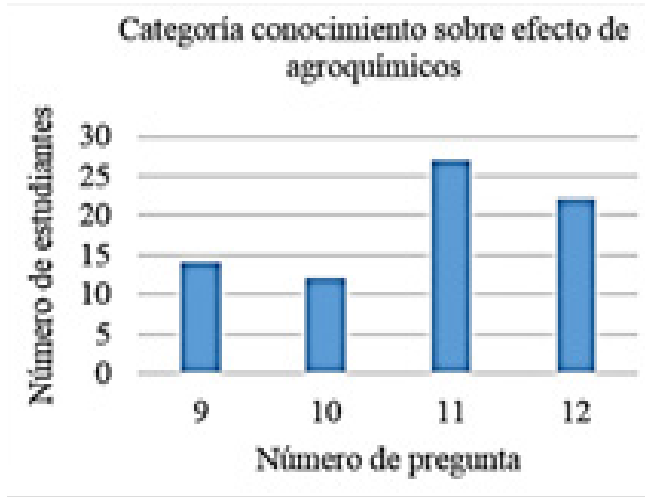

Fig.3 Categoría conocimiento sobre efectos de agroquímicos

Similar to the first category, since it is below the acceptable level of 0.9, it is defined as a scale of weak reliability. However, the score based on the number of affirmative responses given by the student researchers is shown in Table VI.

Tabla VI. RESPUESTAS CONOCIMIENTO EFECTO AGROQUÍMICOS

Nº de individuos que responden afirmativamente	Cantidad de preguntas
5	4
10	3
10	2
5	1

Fuente: elaboración propia, 2023.

It can be inferred that the weak scaling value in this category is due to the limited knowledge that the members of the research group have regarding the negative effects that agrochemicals can cause on water and the environment in general. However, by informing themselves through the questions of the scale about the damage that fertilizers and artificial inputs cause to life in nature and to people in the village, the participant researchers demonstrate concern and adopt a supportive stance toward promoting agricultural practices, such as the use of organic fertilizers and natural pest control methods, to replace the usual use of agrochemicals.

Although the reproducibility coefficient indicates a weak reliability scale, the analysis results in this category show a notable positive change in the attitude of the research group regarding their perception of agrochemical use. When comparing the number of individuals who responded affirmatively on the Guttman scale with the data collected from the semi-structured interview, it is evident that only a minority of interviewees clearly

understood that agrochemicals, due to their toxicity, degrade the quality of arable soil by sterilizing it, negatively affecting pollinators and animal species. Furthermore, they recognized that these products contaminate water, harm the quality of food produced on land, and have impacts on human health (C1DSPA).

Category 4. Wastewater Management. For this category, the reproducibility coefficient resulted in:

$$CR = 1 - \frac{17}{4 * 30} = 0{,}86 \qquad (6)$$

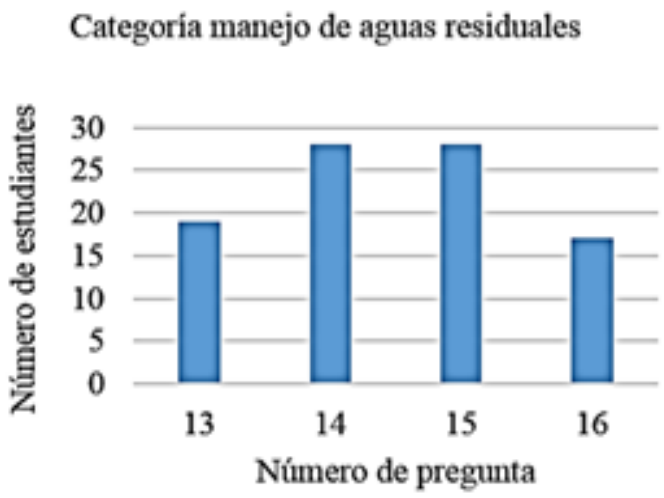

Fig.4 Categoría manejo de aguas residuales

Similar to the first and third categories, this falls below the acceptable level of 0.9, indicating a weak reliability scale. However, the interpretation is made based on the score corresponding to the number of affirmative responses given by the participant researchers, as shown in Table VII.

Tabla VII. RESPUESTAS MANEJO DE AGUAS RESIDUALES

Nº de individuos que responden afirmativamente	Cantidad de preguntas
8	4
16	3
6	2
0	1

Fuente: elaboración propia, 2023.

The weak scaling in this category indicates that, for some participants, it is common for wastewater generated by the normal activities of the community to be discharged untreated into the streams of the district. This demonstrates that this minority group still does not recognize the need to carry out this process as a relevant means to prevent negative impacts on the environment in general.

However, according to the trend in affirmative responses, a majority of the research group is concerned about the fact that the wastewater drained from their homes and district ends up flowing into Laguna de La Cocha, along with the lack of proper management of it. They express their willingness to learn and implement sustainable practices in their homes to treat and recycle wastewater, seeking to reduce the negative impact on the environment. They also recognize that it is the responsibility of each family in the area where they reside to find ways to control the release of wastewater into the rivers and Laguna de La Cocha.

The result of working with the scale reflects a moderately positive change in the students' attitudes toward the environment. Initially, they positioned themselves as distant observers of the phenomenon, attributing the lack of awareness about environmental care to ignorance of ecological processes in the community. They cited, among other factors, indifference toward preventing the discharge of wastewater, pesticides, detergents, and solid waste into the streams. They also mentioned the lack of attention or ignorance regarding the treatment that private companies in the productive sector carry out to prevent contamination of this resource.

However, the number of affirmative responses in this category indicates that among those who participated in the research, there is an individual conviction that reflects committed stances to address situations that negatively impact the natural bodies of water in the village.

2. Category 5. Conservation Attitudes. For this category, the reproducibility coefficient resulted in:

$$CR = 1 - \frac{18}{4 * 30} = 0{,}85 \qquad (7)$$

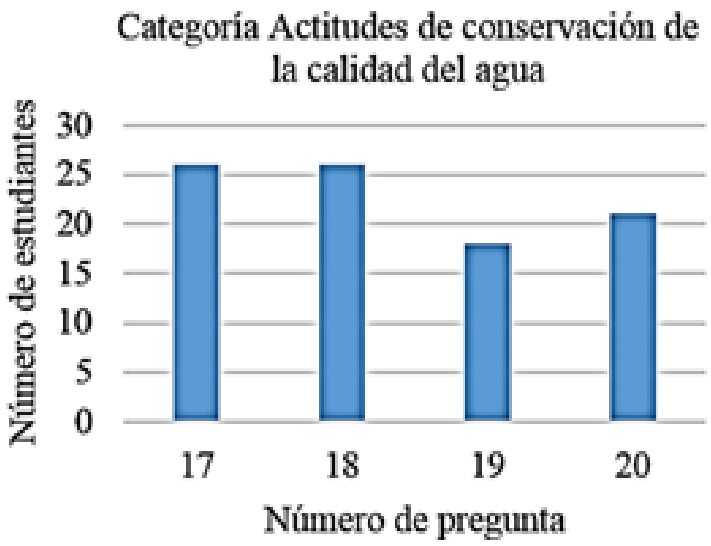

Fig.5 Categoría actitudes de conservación de la calidad del agua

Despite having a weak reliability scaling, the analysis is conducted based on the values of affirmative responses provided by the participants in the research group, as expressed in table VIII.

Tabla VIII. RESPUESTAS ACTITUDES DE CONSERVACIÓN

N° de individuos que responden afirmativamente	Cantidad de preguntas
13	4
9	3
4	2
4	1

Fuente: elaboración propia, 2023.

The scores below the acceptable level may not necessarily be due to weak environmental awareness, but rather to the limited leadership willingness among some members of the research group to share their insights gained during the investigation into water resource conservation in the area. The trend of affirmative responses indicates that participants, individually, feel motivated to engage in actions aimed at caring for and conserving water, expressing their readiness to adopt personal measures to reduce water pollution in their region. They reinforce this idea by considering that each individual has the responsibility to preserve and protect water for the benefit of their community and the environment through their daily actions.

However, in response to the proposal to gain more knowledge about water conservation and to share that information with their peers and people in their neighborhood through awareness campaigns or community activities, just over half of the group showed interest.

They express their willingness. This stance remains consistent when compared to the results of the semi-structured interview, where, in response to questions related to the environmental culture exhibited by the people of El Encano, there was no argument that referenced community work focused on protecting the environment.

However, even though the willingness to engage in community environmental awareness work is present in just over half of the group of young participants, this can be interpreted as a positive start towards greater environmental awareness and collaboration within the community.

Category 6. Attitudes in Favor of Water Conservation. The reproducibility coefficient in this category was

$$CR = 1 - \frac{24}{4 * 30} = 0{,}8 \qquad (8)$$

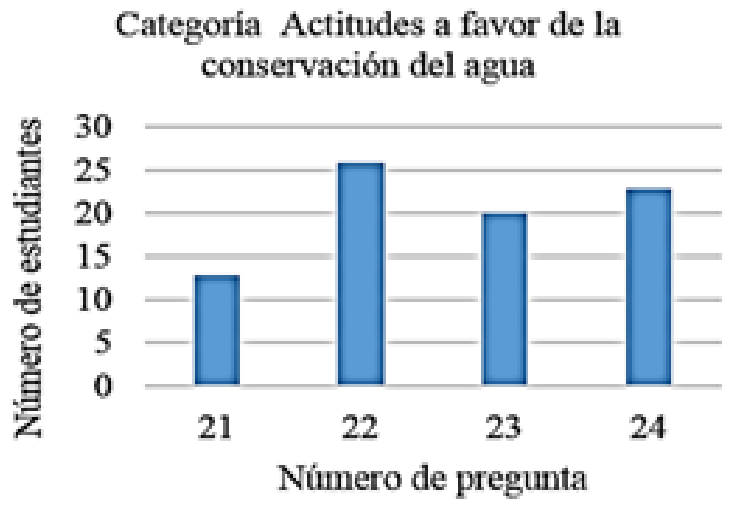

Fig.6 Categoría actitudes a favor de la conservación del agua

The value of the reproducibility coefficient is the lowest among those obtained in the work with the Guttman scale across the eight categories; however, the reliability falls within the range of a weak scale and, according to the criteria used for the analysis, offers valid results.

In this case, one reason may be that there is a scaling error and the content of the first question should have been focused as an argument encompassing the validation of the other three, placing it in fourth position in the group. This is because, according to the trend of affirmative responses in this category (Table IX), when community labors are held in their neighborhoods to carry out reforestation and cleaning tasks for paths and streams, just under half of the participants claim to actively participate.

Tabla IX. RESPUESTAS ACTITUDES A FAVOR DE LA CONSERVACIÓN DEL AGUA

N° de individuos que responden afirmativamente	Cantidad de preguntas
6	4
13	3
8	2
3	1

Fuente: elaboración propia, 2023.

An explanation for this result can be found in the responses obtained during the semi-structured interview. In these responses, it was mentioned that "in some areas, people who cut trees replant seedlings of the pruned species, while in other areas, they occasionally hold community labors for the maintenance of productive agricultural sectors" (C2APCF), suggesting that initiatives by the residents of the district to engage in these collective participation practices in favor of the environment are not common occurrences. This may explain why, for the most part, they claim not to participate in such activities, as they appear to be infrequent in the El Encano district.

However, the majority of the group of young researchers considers it necessary to conduct prior motivation among the neighbors of the neighborhoods before carrying out community labors and conservation activities for the rivers and streams to ensure their active participation. Additionally, a significant majority of them express their willingness to motivate and encourage neighbors to get involved in community labors, thus working together for the well-being of the rivers and streams in the area. Similarly, the group of young individuals is clear that one way to positively change the neighbors' attitude towards environmental conservation, especially regarding water, is through community labors that promote the preservation of the natural environment and sustainable development in their village.

2) Category 7. Commitment to Water Conservation. For this category, the reproducibility coefficient was:

$$CR = 1 - \frac{16}{4 * 30} = 0{,}87 \qquad (9)$$

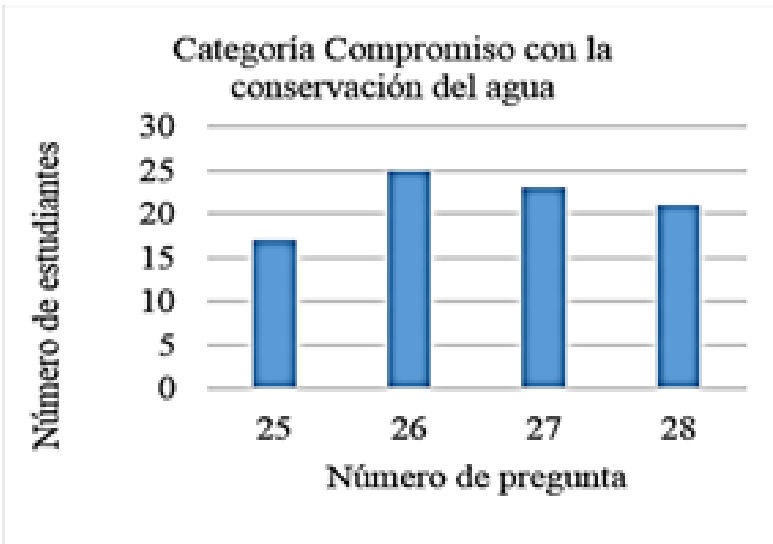

Fig.7 Categoría compromiso con la conservación del agua

The marking of affirmative responses is shown in Table X

Tabla X. RESPUESTAS COMPROMISO CON LA CONSERVACIÓN DEL AGUA

Nº de individuos que responden afirmativamente	Cantidad de preguntas
12	4
9	3
4	2
3	1

Fuente: elaboración propia, 2023.

In this category, the majority of participants state that they are willing to provide voluntary assistance if asked to participate in a campaign for the cleaning and maintenance of the rivers and streams in El Encano. A similar number of participants express their willingness to invest part of their free time in learning more about the consequences of water pollution and contributing to the protection of the rivers in the district. A majority, although slightly less than the previous groups, indicate that they would participate in educational activities such as garbage collection at La Cocha lagoon and cleaning the beds of trout breeding sites, in order to avoid possible sanctions from the Ministry of Environment for residents of their neighborhoods.

However, the value of the coefficient within a weak scaling in this category could again be attributed to the limited leadership willingness to motivate others to participate in a collective effort in favor of the environment, especially concerning water resources. Here, just over half of the researchers responded affirmatively to the question: "Would you be willing to dedicate part of your free time to inform others, such as family and friends, about the importance of protecting and conserving the rivers and streams in El Encano?"

This result aligns with the conclusions obtained from the semi-structured interview, where it is mentioned that residents and business owners are concerned about conserving the flora and water of El Encano; it is argued that the fact that this attitude is shared by a minority suggests that the population, in general, has an emerging culture regarding environmental care, which needs to be strengthened to promote conservation.

3) Category 8. Participation in the PRAE. In this category, the reproducibility coefficient falls within the acceptable reliability range of the Guttman scale:

$$CR = 1 - \frac{6}{4 * 30} = 0{,}95 \qquad (10)$$

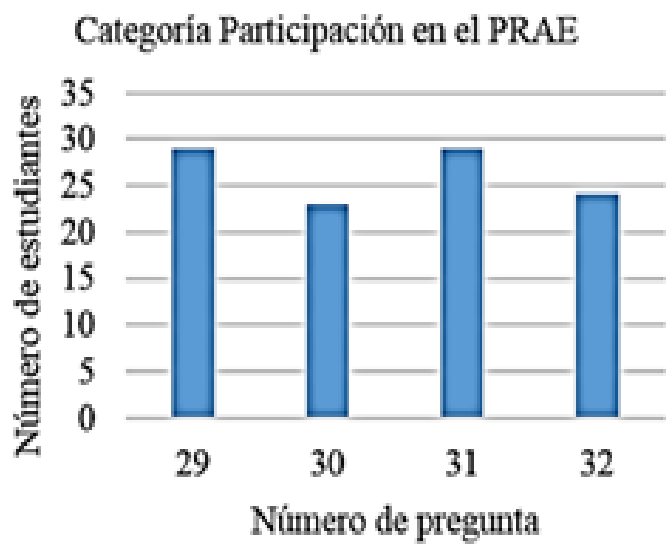

Fig.8 Categoría participación en el PRAE

It can be associated with the affirmative responses of the group of questions in this category, as shown in Table XI.

Tabla XI. RESPUESTAS PARTICIPACIÓN EN EL PRAE

Nº de individuos que responden afirmativamente	Cantidad de preguntas
20	4
6	3
3	2
1	1

Fuente: elaboración propia, 2023.

It is noticed that the result approaches the ideal level of reliability; therefore, a high assertiveness can be recognized in the meaning of the responses related to their participation in the Environmental School Project (PRAE) of IEM El Encano.

Through their experience in the research work on water, the majority of participants recognize the purpose or objective of the institutional PRAE, which aims to strengthen participants' awareness of conservation and care for the environment, especially regarding water resources. Similarly, they believe that valuable life lessons can be learned by participating in school activities aimed at protecting the ecosystem of "La Cocha lagoon", particularly the water.

In a smaller percentage, yet still a majority, the group of participants expresses feeling motivated to continue participating in events or actions promoted by the PRAE of the institution. Additionally, they express their willingness to actively participate from school in implementing initiatives in favor of the natural environment (vegetation, wildlife, water, soil) in El Encano village.

The results in this category indicate a strengthening of the stance that participants displayed initially, when, in general, their responses to the semi-structured interview argued that "the education received in school leads them to act spontaneously in the appropriate use of water, recycling used batteries, making crafts with plastic solid waste, giving a second use to plastic containers, and producing compost with homemade organic waste" (C4APFA).

IV. CONCLUSIONS

After developing the IEP, noticeable changes are evident in the perceptions of the participant researchers at IEM El Encano regarding the water resource in their region, leading them from a basic understanding they had at the beginning about water pollution to recognizing the common anthropogenic actions that significantly negatively affect it.

The transformation in the perceptions achieved by the participant researchers through the adaptation of the IEP to address the importance of the water resource and environmental awareness suggests a positive effect on attitude change. This is reflected in their demonstrated potential to strengthen personal knowledge and attitudes related to water conservation and their contribution to environmental sustainability.

By highlighting the importance of implementing effective measures at both the individual and community levels for the treatment of wastewater as a means of protecting both the surrounding environment and the health of the population in El Encano village, a deeper commitment to the protection of water and the natural environment is evident. This change also reveals a strengthening of environmental awareness, as it recognizes the complex interconnection between water quality, the ecosystem, and human health in their perceptions.

The willingness to engage in community environmental awareness work regarding water resources was evident in just over half of the group of young students; however, this can be considered an encouraging starting point towards a stronger environmental awareness and broader collaboration within the community. Nevertheless, it raises significant concerns to identify and understand the re-

asons behind the limited leadership willingness of some students to address obstacles and find effective ways to communicate the importance of water conservation and the vital role each individual can play in this effort. Thus, it becomes a challenge to identify and understand the reasons for this personal disposition, which could trigger new research motives.

However, the methodological approach of the IEP shows weaknesses in terms of the intended global reach. It was expected that, by implicitly addressing the water aspect—which is intertwined with environmental dynamics—the changes in participant attitudes resulting from this methodological strategy would extend to other environmental factors in general, such as flora, fauna, and soil. However, only observable changes were noted in the water factor, which is the subject of this study, with minimal changes in participant attitudes towards other variables impacting various components of the natural environment, such as solid waste management to prevent pollution of natural water bodies, among others.

The participant researchers tend to maintain inadequate attitudes towards solid waste management, due to entrenched habits formed in their homes and social contexts. Although proper solid waste management at IEM El Encano has been carried out in the presence of teachers—who represent an authority figure and somewhat condition this behavior—genuine changes towards positive behavior are scarce. This includes properly disposing of a piece of discarded paper and avoiding contamination of the environment. Such a situation is similar to the perceptions that participants expressed from the beginning, indicating that there has been no positive attitude change regarding the environment in this aspect.

With the development of the IEP, in relation to the Environmental School Project (PRAE), it is evident that several of the learnings achieved at school within this project are spontaneously applied in their daily lives, being only one perspective of the research group, not of the entire participant community. However, it is revealed that the concept participants have about the reach of the PRAE includes motivation for environmentally benign actions such as recycling, reusing non-biodegradable waste materials, or disposing of solid waste in appropriate containers while at school; such practices are validated.

As attitudes that represent a firm environmental consciousness, there are no active positions involved in the sustainable management of natural resources or commitments to questioning and denouncing negative environmental impacts such as deforestation and water pollution.

Although encouraging results were achieved with the application of the IEP, it is important to recognize that environmental education is an interdisciplinary process that involves the participation of all areas of knowledge, along with the engagement of the educational community as a whole within the school environment. Furthermore, this process requires consistency, and its success depends on various interrelated factors such as family, culture, socioeconomic conditions, and the media. These are influential factors that, in the pursuit of authentic positive attitude changes that demonstrate sustainable strengthening of environmental consciousness over time, must operate in coordination toward shared collective objectives, setting aside individual and egocentric approaches.

V. RECOMMENDATIONS

Research in environmental education generates knowledge and strengthens awareness for the sustainable conservation of the environment among participants. However, its impact can be even broader in society if the strategy is conceived as a continuous process capable of influencing decision-making and the adoption of more responsible practices concerning water and the environment.

Future research within the framework of environmental education could focus on exploring the authenticity and long-term sustainability of the attitudes and knowledge acquired during the development of this thesis by the participant researchers, and how these can translate into concrete actions in their daily lives.

As a cross-cutting project, the influence of the PRAE could be more significant if adopted in its literal sense. Following this idea, the areas of knowledge, families, the educational community, and social, civic, and community organizations involved in the institutional environment should collaborate towards a shared environmental goal. Until this occurs, the actions promoted by the Environmental School Project in favor of the environment will be marginal or dismissed due to the influence of particular interests, whether economic, cultural, territorial, or political.

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THE ENVIRONMENTAL DIMENSION IN THE AQUACULTURE PRODUCTION ENGINEERING PROGRAM AT THE UNIVERSITY OF NARIÑO.

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Reception Date: September 19, 2023
Acceptance Date: August 16, 2024

Abstract

The role of the university is to generate spaces for ongoing discussion and understanding. Therefore, it is necessary to propose changes in the approaches, contents, and practices linked to each of the academic programs offered by the different Higher Education Institutions from their own territory; likewise, teachers acquire a commitment to students and society, since it is they who, through their pedagogical actions, are responsible for giving life to the curriculum, which must be designed according to the needs of their context. The purpose of this document is to identify the Environmental Dimension (ED) in the curricular approach of the Aquaculture Production Engineering (APE) program at the University of Nariño; to this end, a documentary analysis, interviews, and a knowledge test were conducted with teachers and students of the APE program. This research was developed as a case study, under a qualitative paradigm, with an interpretive approach. The findings show that the program's documents direct both its vision and mission towards aspects related to sustainable development, however, this is not reflected in its competencies or micro-curricula; on the other hand, teachers and students express their conception of the environment as surroundings, everything that surrounds us, and as biotic and abiotic aspects. It is concluded that there is a disarticulation and incoherence between the educational proposal and its development with respect to the ED; likewise, both teachers and students frame their knowledge from a naturalistic vision of the environment.

Keywords: Higher education, curriculum, environment, context.

Resumen

El papel de la universidad es generar espacios de discusión y entendimiento permanente. Por ello, es preciso plantear cambios en los enfoques, contenidos y prácticas vinculadas a cada uno de los programas académicos ofertados por las diferentes Instituciones de Educación Superior desde su propio territorio; así mismo, los docentes adquieren un compromiso con los estudiantes y la sociedad, por cuanto, son ellos a través de sus actos pedagógicos los encargados de dar vida al currículo, que ha de ser diseñado según las necesidades de su contexto. La finalidad de este documento, se enmarca en identificar la Dimensión Ambiental (DA) en el enfoque curricular del programa de Ingeniería en Producción Acuícola (IPA) de la universidad de Nariño; para ello, se realizó análisis documental, entrevistas y

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prueba de conocimiento a docentes y estudiantes del programa IPA. La presente investigación se desarrolló como un estudio de caso, bajo el paradigma cualitativo, con un enfoque interpretativo. Los hallazgos encontrados muestran que los documentos del programa encaminan tanto en su visión y misión aspectos relacionados al desarrollo sostenible, sin embargo, no se ve reflejado en sus competencias ni micro currículos; por otra parte, los docentes y estudiantes manifiestan su concepción de ambiente como entorno, todo lo que nos rodea y como aspectos bióticos y abióticos. Se concluye que existe una desarticulación e incoherencia entre la propuesta educativa y su desarrollo con respecto a la DA; así mismo, tanto docentes como estudiantes enmarcan sus conocimientos desde una visión naturalista del ambiente.

Palabras Clave: Educación superior, currículo, ambiente, contexto.

I. INTRODUCTION

The environmental problems evident today stem from the adoption of Western development models, leading to a fragmented view of the environment and one focused solely on meeting human needs (Iguarán et al., 2021; Sauvé, 2006).

In this sense, education plays a fundamental role in the accumulation and dissemination of these types of preconceived thoughts and models; therefore, from academia, the role of the teacher must be transformed, linking their training to critical pedagogy, understanding the different components that make up the environment applied to contexts and that allow them to strengthen their competencies and those of their students (Avendaño y Guacaneme, 2016).

Likewise, the environmental training of teachers is directly related to culture, in the way humans interact with nature and their territory within the teaching-learning

process (Quintana, 2017). In this sense, the diversity of environmental, social, and cultural contexts must be taken into account, with the aim of fostering in individuals a change in attitude with critical thinking, assuming their own responsibility in solving socio-environmental problems (Márquez et al., 2021).

On the other hand, authors such as Almarza et al. (2019) and Rodríguez (2020) state that, worldwide, there are different higher education institutions that are incorporating the environmental dimension transversally into the curricula of different academic programs; in such a way that they lead to the training of professionals who, from a holistic perspective, contribute to the solution of environmental problems, in accordance with Colombian regulations; however, its application has not transcended this component, as there is a disconnect between the different sectors of education (Vélez y Londoño, 2016).

In this sense, the curriculum in Educational Institutions - IEs, aims to train people by using different contextualized strategies and resources, providing the possibility of spaces for continuous reflection along with the development of knowledge being, and doing (Velásquez, 2009). Therefore, the importance of addressing environmental issues within the curriculum is emphasized, as it represents an opportunity for its integration across different educational levels and areas of knowledge (Miranda et al., 2019).

Therefore, this article aimed to identify the environmental dimension in the curricular approach of the Aquaculture Production Engineering program at the University of Nariño.

II. METHODOLOGY

This study is framed as a case study, which consists of a detailed description and analysis of unique social units or educational entities, identifying the interactive processes that shape them (Arnal et al., 1992; Bisquerra et al., 2009; Ortiz, 2015). The research is situated within the qualitative paradigm; therefore, to achieve the objectives, it aims to understand reality, which is dynamic, multifaceted, and holistic, as well as to interpret educational and social phenomena, transform practices, make decisions, and develop knowledge; finally, a triangulation of the results was carried out, considering the degree of integration among them (Bisquerra et al., 2009; Sampieri et al., 2020). An interpretive approach was adopted as it develops the understanding, analysis, and interpretation of content; furthermore, it is grounded in the construction and reconstruction of sociocultural identities as present in educational settings (Arnal et al., 1992; Ortiz, 2015).

A. Unit of Analysis and Work.

The study population consisted of 57 individuals: 46 students enrolled in the Aquaculture Production Engineering (APE) program at the University of Nariño in the A-2023 semester, and 11 faculty members with full-time, part-time, and administrative appointments in the same program, totaling 57 individuals.

To determine the unit of analysis, a stratified random sampling with proportional allocation (SRS) was conducted, using the formula for calculating finite populations (López-Roldán and Fachelli, 2015; Segoviano and Tamez, 2014).

$$n = \frac{N*Z^2*p*q}{(N-1)*e^2+Z^2*p*q} \quad \textbf{(1)}$$

Where,
n: Sample size
N: Population size
Z: Confidence level of 90% (1.96)
e: Margin of error of 10% (0.10)
p: Probability of success (0.5)
q: Probability of failure (0.5)

For the distribution of the total sample (1), proportional allocation of the sample was used based on the population size of each stratum (López-Roldán and Fachelli, 2015).

$$n_h = \frac{N_h}{N} * n \quad \textbf{(2)}$$

Where,
N: Population size
Ni: Size of each population stratum
ni: Sample size in each stratum
n: Total sample size in (1)

The strata were composed of faculty members affiliated with the APE program, regardless of their employment status (contractual, hourly, full-time), and students enrolled in the fourth, sixth, and eighth semesters. These students were required to be currently enrolled in at least one course within the APE curriculum. Second-semester students were excluded as they had not yet undertaken courses in the field of sustainable development. Similarly, tenth-semester students were excluded because their academic formation was based on a curriculum different from the one being analyzed in this study. The sample size

for each stratum is presented in Tables I and II

Table I. *Proportional Sample of Professors and Students APE-2023*

Stratum	N_h	Proportional Weight	Proportional Allocation
Professors	11	18%	6
Students	46	82%	25
N	57	n	31

Table II. Stratified proportional sample of students APE-2023

Estrato	N_h	Proportional Weight	Proportional Allocation
Semester IV	19	41,3%	10
Semester VI	17	36.9%	9
Semester VIII	10	21,8%	6
N	46	n	25

The values presented in Tables I and II were used to develop interviews and administer a knowledge test

B. Data Collection Instrument.

To analyze the curricular approach of the APE program towards Sustainable Development (SD), matrices were used for a documentary review of the Program Educational Plan (PEP) and micro-curricula in the field of sustainable production, based on Narváez et al. (2022). A structured interview was conducted with program faculty and students to determine their conceptions of the environmental dimension and its incorporation into the curriculum. The interview was validated by experts who considered aspects such as: appropriate language for the informant's level, inducement to respond, clarity of writing, internal coherence, and whether the question aimed at a defined objective. For the application of the interview, it was necessary to obtain the participants' approval through the signing of an informed consent form.

To describe the conceptions of the environment, a test was administered to faculty and students in the fourth, sixth, and eighth semesters of the program. Finally, a cross-analysis of these was conducted, obtaining the key or most influential categories for their articulation from the PEP.

C. Systematization and Data Analysis.

For the documentary analysis, the information contained in the PEP and the micro-curricula of the APE program was extracted using the following formats: completed instrument for the documentary review of the Program Educational Project – PEP and instrument for the documentary review of the field of sustainable production. For the categorization of information, the guidelines established by Strauss and Corbin (2002) were followed, using a color code according to the different conceptions of the environment. Likewise, a participation code was assigned according to the role represented (faculty or student). The foregoing allowed for an analysis of the program's curricular approach and its relationship to the SD it presents, establishing the recurrences for each of the established categories, which were tabulated and graphed for interpretation.

III. RESULTS

A. Documentary Review of the Program Educational Project.

The PEP for Engineering in Aquaculture presents, both in its definition of the career and in its vision and mission, a conception of the environment based on sustainable development and the sustainability of resource use; however, a theoretical definition of its stance is not evident among these.

Regarding the development of the teaching-learning process, the PEP presents a "Curricular Model: Project-Based Learning (PBL)" (p. 74); which is carried out from the fourth to the ninth semester, where the subjects have a direct link to the elaboration and development of this project; its purpose is to contribute to acquiring the competencies to identify and solve problems autonomously, according to the context in which they act, based on the dimensions of knowing, doing, and being.

On the other hand, the program, among its specific competencies, alludes to SD by mentioning in the Knowing aspects related to the studies of the repercussions of aquaculture systems on the environment, establishing a recursive and anthropocentric vision; likewise, in the Doing, it focuses on the management of production supported by the physical, biological, and economic components for obtaining quality products and in the Being, it involves the vision of sustainable development of aquaculture from ethical behavior.

B. Documentary Review of Subject Micro-Curricula

In the field of training in sustainable production, the micro-curricula or Subject Educational Project - SEPs as they are called in the PEP, show recurrences regarding the pedagogical approach of the subjects; thus, most of the documents (74%) do not refer to how the subject is developed and when it is done. The carrying out of theoretical classes with the help of slides under a concept of transmissibility of knowledge is mentioned, probably this is due to the scarce teacher training in pedagogy and didactic strategies to address emerging issues, SD. Regarding the analysis of the general competencies of the units, as well as the topics included in these documents, different approaches to SD are evident as shown in Figure 1.

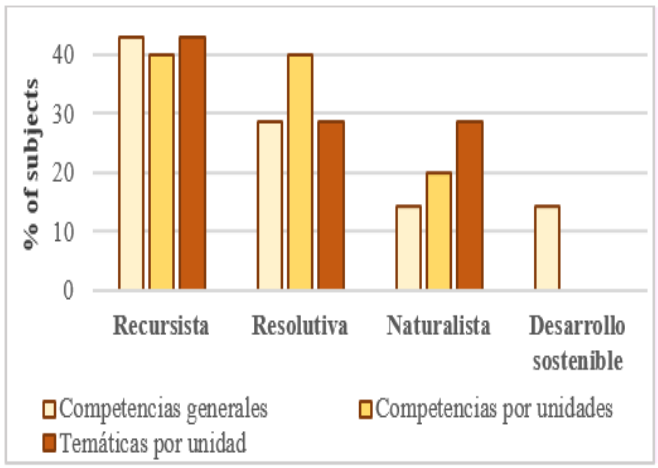

Fig. 1. *Enfoque ambiental de las asignaturas del campo de formación en producción sostenible.*

As evidenced in Figure 1, the SEPs exhibit diverse approaches to the environment, primarily characterized by a recursive perspective in both their competencies and thematic content. This recursive perspective involves the utilization of environmental elements for economic development, with a particular focus on production systems and the methodological and functional processes of aquaculture. Consequently, the concept of environmental sustainable development—proposed as a means to integrate SD into the program's career definition, vision, and mission—occupies the lowest position in the development of subjects within this field of study. It is only established in the general competency of the subject, rather than in the competencies of the units or their specific themes.

C. Interview with Faculty and Students of the APE Program.

Figure 2 presents the perceptions of faculty and students regarding the curricular approach developed in the APE program.

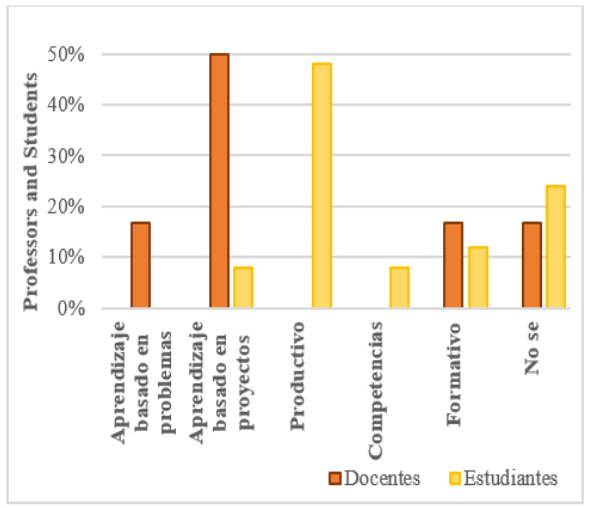

Fig. 2. *Percepción del enfoque curricular de docentes y estudiantes del programa de APE - 2023.*

As observed in Figure 2, faculty members do not mention competency-based learning at all, indicating a complete disconnect. Most faculty members recognize PBL as the program's curricular approach, which aligns with the model proposed in the PEP. However, when asked how they integrate the curricular approach into the development of their courses, faculty members mentioned responses such as, "reusing materials that would normally be discarded" (DOC1-9), "through case studies and simple experiments" (DOC4-9), and "acquiring the competencies that students need to perform" (DOC6-9). This indicates an inconsistency when it comes to implementing the educational proposal established in the PEP, and there is no evidence that these approaches are oriented towards a specific context or problem-based learning, a situation that has been previously highlighted when faculty members fail to reflect the PEP's proposals in their course plans.

As can be observed in Figure 4, the general trend among APE program faculty regarding the concept of the environment allows for the identification of four conceptions, with a naturalist orientation being the most prevalent at 70%. This perspective is characterized by statements such as: "The environment is the set of biotic and abiotic elements that share a space" (Doc1-1); "The environment is the setting in which life manifests itself, including all living things on Earth and the biosphere" (Doc3-1); "The physical space that brings the biosphere into action" (Doc5-1); "The environmental conditions, physical, chemical, and biological characteristics of the environment where the production system is located" (Doc1-3).

Similarly, the general conception of students tends to identify the environment from a naturalist perspective.

They are able to identify the biotic and abiotic elements of their surroundings and the ecosystems that are the subject of work in aquaculture production, with statements such as: "The environment is the environment in which we live, which includes all living things" (Sem8-Est4-1); "It consists of animals, plants, bacteria, and more that make life develop" (Sem4-Est3-1); "It is the set of ecosystems that surround us" (Sem6-Est1-1); "Everything biotic and abiotic" (Sem4-Est6-2).

IV. DISCUSSION

Documentary Review of the Program Educational Project According to Sudar and Peralta (2020), despite the inclusion of SD in the curricular structure of the programs they studied, its presence is low in their components. Similarly, Pérez (2015) argues that academic programs, although mentioning environmental aspects in the program project, do not develop them, and most establish the environment from its basic components from a recursive or naturalist perspective. Likewise, Aparicio and Rodríguez (2019) and Bravo (2021) highlight the inadequate handling of environmental concepts that university professors may have.

On the other hand, Jiménez (2021), Tapia et al. (2019), and Villamandos et al. (2019) report that among the various problems when incorporating SD into university curricula is the training and knowledge of teachers on environmental issues, as well as their implementation from the curricular proposal. In this sense, authors such as García et al. (2019), Tapia et al. (2019), and Valero-Avendaño and Cordero-Briceño (2019) mention that educators must understand the foundations and trends in environmental matters, especially considering the diversity of existing positions and perspectives. Thus, these debates must lead to significant proposals, even more so if one wants to develop these elements in pedagogical models and have them reflected and developed in both institutional documents and educational practice itself, in order to integrate what to teach, how to teach it, and how to evaluate it, and facilitate the change of mentality and behavior of future professionals and in their field of action (García et al., 2019).

Thus, it is necessary for teachers and students to engage in a discussion that allows them to understand the concept they seek to instill in future professionals and to clearly reflect the theoretical foundation of the concept of the environment in the document, criteria that will serve as a basis for the development of the curriculum.

On the other hand, PBL is a coherent strategy that has been implemented in various undergraduate and graduate programs in aquaculture, considering that the student plans and manages their project, develop critical thinking, and thus obtains an observable product, in addition to developing the competencies acquired in the classroom through the resolution of real problems such as those found in aquaculture production; for its part, the teacher is committed to modifying their role to achieve the purpose of PBL, leaving aside the conventional and transmissive way of knowledge to that of a guide (Creada-Garrido et al., 2019; García-Planas and Taberna, 2019; Martínez-Llorens et al., 2020; Peñaranda et al., 2021).

Likewise, the curricular construction focused on competency-based training is coherent and obeys the normative requirement reflected in decrees and laws for Colombia, following the trend that exists worldwide (Guerrero, 2010). However, the proposal of sustainable development becomes incoherent, since it is not clearly evidenced in the specific competencies of the program. In this sense, Tobón (2005) mentions that one of the fundamental activities of the curricular design process requires that this knowledge be managed integrally; moreover, it must be taken into account that from the complex concept of competencies, these are an "unfinished and constantly constructing-deconstructing-reconstructing approach-continuously requiring critical analysis and self-reflection to understand and use it" (p. 66).

Thus, the APE Program shows a series of challenging aspects in relation to the incorporation of SD into its curricular approach, although the program intends to promote sustainable development, there is no coherence in the definition and application of sustainability, which in turn reflects a low solidity in the theoretical definitions that are handled in the different documents of the program, which can generate confusion among teachers and students, and in turn make it difficult to integrate SD into the aforementioned curriculum effectively; on the other hand, the PBL strategy implemented in the program can be an effective way to address SD by connecting learning with real problems of aquaculture production. However, it is essential that teachers have a solid understanding of environmental fundamentals to adequately guide students in solving these problems.

A. Documentary Review of Subject Micro-Curricula.

Luna and López (2011) mention that subjects taught through mechanics, transmissibility, and content repetition, where theory dictates practice, fall under

the theoretical framework proposed by authors such as Joseph Schwab, Franklin Bobbit, and Ralph Tyler, among others. This highlights the inconsistency between what is proposed in the curricular model and what is developed in the subjects. Similarly, Alcántara-Rubio et al. (2022) mention that, to date, transmissive and instrumental pedagogies are still used in higher education, emphasizing the need for teacher training on environmental issues through critical thinking and reflection.

Regarding the environmental approach presented in the APE program, these findings correlate with those found by Tapia et al. (2019), who mention that there is a low presence of the competency with an emphasis on sustainable development, representing only 20% of the total curriculum of different programs at the Autonomous University of Guerrero. Likewise, despite the fact that SD is planned at the curricular level in some academic programs at the National University of the Northeast, a strong naturalism-based conceptual predominance still exists (Sudar and Peralta, 2020). Pérez (2015) indicates that, within the subjects analyzed in the biology program at the University of Tolima, the concept of the environment is not taken from a complex and integrated conception of its different components. Moreover, he mentions that what is proposed in the training plan is disconnected from the micro-curricula of this program. In this sense, it is evident that one of the possible problems is the fragmentation of knowledge and disciplines, a situation that is contrary to the integrative and structuring approach necessary for understanding the environment (Bravo, 2021; Sudar and Peralta, 2020). Thus, the sustainable development proposed in the APE PEP is lagging behind, evidencing a low coherence and articulation with the PEAs of this field of training; possibly due to the limited dissemination of the PEP, few spaces for reflection by the educational community to reach consensus on the concept of the environment that is intended to be developed in the program. In this way, the role of the curriculum in the training of professionals and the relevance and importance of addressing environmental issues in the face of the socio-environmental problems that have been faced for some time on our planet becomes meaningful.

In this regard, Alcántara-Rubio et al. (2022), Bravo (2021), Jiménez (2021), Ramírez and González (2014), and Villamandos et al. (2019) mention that the educational community is an integral part as a socializing agent and generator of changes in the face of socio-environmental problems. They also mention that the curriculum, through its study plan, is positioned as one of the main points or axes for carrying out the incorporation of SD in education, leaving it to all its students, who will make their contribution within their own context through the academic and human competencies acquired; on the other hand, teachers are key agents for achieving the incorporation of SD. However, a great commitment is required to the traditional pedagogical changes that have been applied in the development of their courses, as well as the acquisition of competencies in the environmental component; therefore, the absence of environmental content in educational projects leads to the non-development of competencies by future professionals (Piza et al., 2018).

B. Interviews with Faculty and Students of the APE Program.

Curricular Approach: Given the lack of clarity among faculty regarding the methodological proposal outlined in the PEP, they have failed to fully immerse students in Project-Based Learning. This approach involves contributing to learning through the construction of knowledge and self-education, providing solutions to real-world problems, and fostering curiosity among students. In this way, content responds to students' interests, as their curiosity initiates inquiry. Therefore, the project must address a real problem that is relevant to the student's context (Regalado, 2019).

In this regard, Kilpatrick (1918), as cited by Fernández (2017), emphasizes the importance of guiding students in choosing the problem and ensuring their active engagement in the teaching-learning process. Furthermore, he argues that when students have the opportunity to propose a project spontaneously, it will benefit them as they will feel involved in its development. According to García-Planas and Taberna (2019) and Perazzo (2009), PBL aims to foster advanced cognitive skills so that students can adopt and strengthen their own methodology in effectively solving problems related to their social environment. Therefore, this educational approach promotes active learning, where the process of research on a topic proposed by the students, the teacher, or in a participatory manner, generates solutions that foster the creation of new knowledge.

Considering that one of the functions of the teacher is to train future professionals by applying what is stipulated in both the PEP and the PEAs, it is necessary to bear in mind that these documents must be coherent with each other and allow for participatory construction with the support of the academic community. Moreover, socio-environmental problems must be addressed from

different components; in this sense, the incorporation of SD requires that teachers have comprehensive training in both pedagogical and environmental aspects, and in this way be able to generate a change in attitude towards the solution of problems, providing students with knowledge aimed at modifying their habits and behaviors not only related to their profession but also to the environment (Almarza, et al., 2019; Bravo, 2013; Cárdenas, 2013; Covas, 2004; Mora, 2012; Ramos and Sánchez, 2019).

This situation becomes more evident when analyzing the results obtained from students in different semesters, where they opt predominantly for a productive approach. As Molina (2016) points out, productive training is a teaching strategy aimed at developing specific skills and competencies required for a particular task or job. Instead of providing broad and general training, it focuses on providing students with the practical skills necessary to carry out a specific function in the workplace efficiently and effectively. The foundation of this educational approach, as mentioned by Guillermo et al. (2018), lies in the concept of direct utility, meaning that the knowledge acquired by students during the training process is immediately and practically applicable in the workplace. This again evidences a total disconnect between what is stated in the PEP, what is interpreted and taught by teachers, and finally, what is understood by students in their subjects. The disparity in results is clear and may be due to the increasing pressure to achieve measurable and tangible results in terms of grades and academic performance. Students, unlike teachers, perceive teaching as an opportunity to excel and gain recognition through their achievements, leading them to view teaching as an opportunity for productivity in their professional roles (Guillermo et al., 2018).

Environmental Dimension: The predominant findings of both teachers and students related to SD within the curricular approach of the APE program are inscribed under the considerations presented by Sauvé (2005), who mentions that the conservationist/naturalist current focuses on the conservation and proper management of resources. On the other hand, Sudar and Peralta (2020) conclude that careers that have been incorporating environmental issues into their PEPs, and especially within micro-curricula, have an evident predominance of a naturalist perspective on SD.

Thus, these results can be considered because education in the country has been geared since the 1970s towards the management and conservation of natural resources, in compliance with the current regulations of the time, whose objective focused on environmental preservation and the conservationist perspective through courses and the incorporation of these concepts in formal education (Eschenhagen, 2009; National Environmental Education Policy, 2002). About this, a naturalist reductionist conception leads to a teaching model, along with its thematic content, towards ecology and the conservation and protection of nature, thus leaving aside the sociocultural, political, and economic aspects that need to be addressed to achieve cognitive and behavioral changes in students regarding the concept of the environment (Morales, 2016; Quintero and Solarte, 2019).

In this sense, it is important to consider the training of teachers in understanding this dimension, as it is they who construct and execute the curricula and micro-curricula of the different subjects. Moreover, they are responsible for conveying this knowledge to students; therefore, teacher training becomes relevant in the reflective construction of the academic work of universities in the integral training of students as future decision-makers. Thus, a proposal lacking a methodological orientation does not ensure its adequate implementation (Almarza et al., 2019; Ezquerra et al, 2015; Holguín, 2017; Pérez, 2015; Tapia et al., 2019).

C. Knowledge Test of APE Faculty and Students.

One reason why both faculty and students in the APE program tend to have a naturalist perception of the environmental dimension may be due to the fact that the SEPs, linked to the field of sustainable production, have unit-specific themes that refer only to naturalist topics. In these, the relationship between this conception and contextual problems or the link to the sustainable development proposed in the PEP cannot be evidenced. On the contrary, a review of the topics reveals that they are aimed at using nature as a means of teaching and at perceiving the environment as an ecosystem and understanding the ecological phenomena that occur within it (Sauvé, 2006).

In this sense, it can also be argued that the relationship between teacher and student is fundamental in the educational process. Teachers not only impart knowledge but also have the ability to influence the adoption of conceptions and criteria among students. Bandura (1977) mentions that students tend to imitate the behavior of the models they are exposed to, and teachers are one of the most influential models in the educational context. Students replicate concepts from teachers because they see them as authorities and experts in the subject.

Thus, teacher training in environmental issues is

important because it allows them to recognize the elements that comprise it and the permanent interaction that exists between them, avoiding the fragmentation of this concept in the exercise of teaching, giving the possibility of developing it outside of conventional areas such as natural sciences (Ezquerra et al., 2015).

The results obtained show a direct relationship with those obtained in the micro-curricula of the different subjects in the field of sustainable production, which indicates a clear inconsistency between what is proposed in the APE program's base document, such as the PEP. Although the mission, vision, and competencies propose a concept of the environment related to sustainable development, it is evident that the topics taught do not relate to this dimension. Moreover, when identifying the elements that compose it, it is observed that they are not taken into account for the elaboration of production processes, and the environmental theme has simply been addressed superficially, which has not allowed students to develop a critical and reflective attitude towards regional problems.

V. CONCLUSIONS

There is a disconnect and incoherence between the educational proposal of the Aquaculture Production Engineering program and SD, as it is proposed from a sustainable perspective but is developed under a naturalist-recursive vision of the environment. One of the possible causes is the fragmentation of knowledge and disciplines, a situation that is contrary to the integrative and structuring approach necessary for understanding the environment.

The Subject Educational Projects (SEPs) contemplate different approaches to the environment, where a recursive vision, oriented towards economic growth, prevails in both their competencies and their thematic content. This vision links aspects such as production systems, methodological and functional processes of aquaculture activity, which are mostly disconnected from their context, considering that political, social, and cultural aspects are left aside as constitutive elements of SD.

It was determined that there is a divergence between the curricular approach of the Aquaculture Production Engineering program proposed in the PEP and that recognized by students and teachers, considering that recurrences are proposed in project-based or problem-based learning and the formative approach by teachers; but in students, it is reiterated in the productive approach, demonstrating limited dissemination and appropriation of the productive project.

It was evident that there are different conceptions of the environment among teachers and students, where, for both groups, the naturalist trend is the most prevalent. In this sense, the conceptions of the environment held by teachers are related to the natural environment and, consequently, they are methodologically used to educate, which are assimilated by their students. The lack of knowledge of the sociocultural relations of the environment can be considered aggravating factors of the environmental problem; however, with respect to the way in which the environmental dimension is addressed in the program's approach, there is a tendency towards the conservationist and conservationist-naturalist perspective, which is due to the pedagogical strategies implemented as alternatives to provide immediate solutions to the problems of the sector, leaving aside other constitutive elements of the environment such as the political, cultural, and social.

ACKNOWLEDGMENTS

The authors express their gratitude to the Aquaculture Production Engineering program at the University of Nariño for the support provided in conducting this research.

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BIODIVERSITY CONSERVATION VERSUS THE REALITY OF WILDLIFE MANAGEMENT UNITS IN ECUADOR.

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Reception Date: October 28, 2023
Acceptance Date: August 23, 2024

Resumen

Zoos number over 10,000 worldwide and are visited by millions of people each year. Their primary focus remains on exhibition and recreation, with limited knowledge about their specific roles in wildlife management and the crucial role of environmental education in biodiversity conservation. This research aimed to assess the current state of Environmental Education in wildlife management units in Ecuador. It was conducted from 2017 to 2020 using a qualitative-quantitative, non-experimental, cross-sectional, descriptive, bibliographic, and documentary approach. Information interviews and surveys were used, with the sample size determined from the records provided by the Ministry of the Environment (MATE). Participants included owners, administrators, and supervisors of 49 out of the 75 registered centers in that year. Cross-tabulated tables and complex data graphs were created. The findings revealed that zoos are positioned as centers for wildlife protection, conservation, education, and research, with a focus on recreation. Other units have limited involvement in environmental education, indicating the need for more work to establish secure habitats for species, respect their rights, and raise awareness among visitors about the importance of preserving habitats, territories, and wild species' living areas without human intervention through educational activities and programs.

Keywords: Environmental Education, Research, Recreation, Exhibition.

Abstract

Los zoos superan los 10000 centros en el mundo y son visitados por millones de personas al año, todavía sus propósitos se centran en la exhibición y la recreación, y poco se conoce sobre las funciones específicas en el manejo de la fauna silvestre y en especial, el papel que desempeña la educación ambiental como aporte en la conservación de la biodiversidad, sobre todo en estos momentos que se ha radicalizado la crítica sobre la permanencia de estos en el mundo. Esta investigación tuvo como propósito determinar el estado actual de la Educación Ambiental en las unidades de manejo de la fauna silvestre del Ecuador, se realizó desde el 2017 hasta el 2020, con el enfoque cuali-cuantitativo no experimental, de corte transversal descriptivo, bibliográfico y documental, utilizando la entrevista de información y la encuesta, cuyo tamaño muestral se estimó a partir del registro proporcionado por la Secretaría de Ambiente del MATE, aplicada a los propietarios, administradores y /o encargados de 49 de los 75 centros registrados durante ese año. Se crearon tablas y gráficas cruzadas

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con data compleja, cuyos hallazgos determinan que los zoológicos se posicionan como los centros de protección y conservación de la fauna, la educación y la investigación, sin dejar de lado la recreación; el resto de unidades tiene escasa participación en la educación ambiental y todavía se debe trabajar mucho en disponer de hábitats seguros para que las especies vivan, se respeten sus derechos y se trabaje en concienciar a los visitantes sobre la importancia de mantener los hábitats, territorios y zonas de vida de las especies silvestres sin intervención humana a través de actividades y programas educativos.

Palabras Claves: educación ambiental, investigación, recreación y exhibición.

I. INTRODUCTION

When talking about animals in captivity we often think of zoos (WASA, World Association of Zoos and Aquariums, 2015), whose purposes are focused on exhibition and recreation with a limited understanding of the specific functions, they fulfill in wildlife management according to (SINC, 2011) Zoos house 15% of endangered species of this 25% corresponds to threatened mammals, 9% to endangered birds, and 3% to amphibians, for Conde et al. They constitute "a bank that ensures the survival of endangered species" and zoos may be "the only practical option for the conservation of species whose habitats are disappearing". With one in seven endangered species found in a zoo, zoos are playing an increasingly active role in biodiversity conservation.

Concurrent with the changes in the priorities of the functions, there is an important aspect that determines its evolution for the WAZA. It is no longer intended to show individual animals (XIX century), nor the animal in its habitat (XX century) but to show the complete ecosystems. This redefinition raises a new concept called "zoo-immersion", where visitors feel transported to the world of animals, understand their ecological relationships, and are educated through thematic techniques to reconstruct as best as possible, natural elements from where they come from.

There are countless criticisms about the permanence of these captivity centers associated with feeding, behavior and adaptation in an artificial environment can be detrimental to the physical and psychological health of the animals; Furthermore, it is questioned whether it really contributes to the conservation of endangered species with a focus on the protection of natural habitats and the prevention of biodiversity loss, considering the educational value as a fundamental part of the care of species and a driving force for conservation, epicenter of feedback, The educational value as a fundamental part of species care and a driving force for conservation, an epicenter of feedback, motivation and generation of ideas that contribute to the pedagogical expectations to promote a sense of belonging to the care of nature in children and adolescents, who are currently more immersed in the inherent rights that animals have, debating whether keeping them in captivity for our enjoyment and entertainment is ethical or not.

Zoos are positioned as centers for the protection and conservation of fauna, with the hard work of education and research, without neglecting recreation (Collados, 1997), as long as they comply with the objectives as stated by the Association of Zoos and Aquariums (2006):
a) Collaborate with ex situ conservation programs through technical support, visitor education and research.
b) To work in conjunction with other organizations in conservation programs.

c) Support discussions with public and private institutions on the conservation of flora and fauna species.

d) Increase their income through conservation projects and programs.

WASA has established four parameters to measure the success of conservation programs and projects, as follows:

1. Increasing healthy populations in their natural habitats, through programs that stimulate the conservation of species worldwide.

2. Availability of safer habitats for species to live in by raising awareness among visitors of the importance of maintaining the habitats, territories, and life zones of wild species without human intervention through environmental education.

3. Improved knowledge of the ecology, biology, and conservation of species, through zoo research on specific species.

4. Improved environmental policies and increased conservation programs and projects at the governmental level (World Association of Zoos and Aquarium, 2005).
Progress in wildlife conservation depends largely on social awareness of the relationships between species, the environment, and human actions, according to the World Zoo and Aquarium Strategy (WAZA). Education plays a key role in the long-term success of conservation strategies such as ex-situ population management, reintroduction, and habitat protection.

According to (Ojasti, 2000), unlike zoos, wildlife management units include areas such as municipalities, farms, reserves, and national parks, managed with specific research, conservation, exhibition, and marketing objectives. These areas vary in size and apply intensive and extensive methods to promote the reproduction of native or exotic species, using aviaries, zoos, and rescue centers, and considering biological, social, and cultural aspects of the ecosystems.

Zoos are changing their approach and operation due to concerns about the treatment of animals, (Iannacone & Alvariño, 2017, p. 37), as well as the need to evaluate the fulfillment of their objectives. However, in some cases, the exhibition of animals is considered crucial to finance conservation, education, and research activities in zoos, which poses challenges in their transformation. They must play an important role in the conservation and protection of endangered species, despite the criticism they generate. According to Fernández-López (2012), over time they have evolved to include conservation, research, captive breeding programs, and education, providing people with the opportunity to learn about the animals from multiple perspectives. These modern centers have clear conservation, research, education, and recreation goals, with a direct focus on involving the public, as expressed by Harris (1995).

For (Alvear, 2016), the reasons that justify the existence of zoos derive mainly from the functions they fulfill in society which he classifies into:

1. Entertainment
2. Profit
3. Education
4. Conservation
5. Research

The first two share a scarce development; they are not the main ones, but they allow for sustainability and are the basis for self-financing, while education, conservation, and research are the pillars that justify their permanence, as stated in the 2005 World Zoo and Aquarium Strategy for Conservation, which is "to integrate all aspects of their work with conservation activities".

Education in zoos is fundamental to promote environmental awareness and conservation, but there have also been questions about the deprivation of freedom of animals, although these facilitate research, some critics argue about the study of the behavior of animals in captivity. This research was born precisely from the need to determine the current state of Environmental Education in wildlife management units in Ecuador as an important element that contributes to the conservation of biodiversity through education, whose specific objectives focused on: providing limited information compared to the study in their natural habitat.

This research was born precisely from the need to determine the current state of Environmental Education in wildlife management units in Ecuador as an important element that contributes to the conservation of biodiversity through education, whose specific objectives focused on:

- Determine the number of wildlife management units that meet the minimum parameters to qualify as such in the Ministry of Environment of Ecuador.

- Establish the contribution of wildlife management units in environmental education programs, research, species conservation, and scientific studies that provide updated information on ecological, ethological, reproductive, and adaptive aspects of wild species managed in captivity.

- To value the sustainability of wildlife centers certified by the Ministry of the Environment of Ecuador (current MATE).

The research work began in 2017 and ended in 2020 in the wildlife management units considered by the Ministry of Environment, today known as the Ministry of Environment, Water and Ecological Transition (MATE) for this purpose 49 of the 75 centers recognized by the Ministry of Environment (current MATE) were taken into account.

II. METHODOLOGY

The research was conducted throughout Ecuador from March 2017 to January 2020, 75 centers were included considering that, for the Ministry of Environment of Ecuador, two categories highlight the spaces where animals are in captivity, among them are:

Wildlife holding and management centers: any infrastructure that houses individuals of wild fauna for conservation, education, and production, among others, and that have been legally constituted, among which are: zoos, wildlife rescue centers, commercial production zoos, and medical and pharmaceutical research zoos.

Wildlife rescue center: a place for the reception of trafficked animals and their maintenance in technically approved conditions. Rescue centers must allow for research tending to the development of adequate management techniques, in addition, they become sites for raising awareness about the problem of species trafficking (Registro Oficial, 2016, p. 16).

The approach was qualitative-quantitative, non-experimental, descriptive cross-sectional (Hernández, 2014). In the first stage, bibliographic and documentary information was collected on the study variables: Biodiversity Conservation: and ex situ wildlife management strategies; in the second stage, information on the current situation of the Wildlife Management Units in Ecuador was collected through an information interview and a survey, for which the sample size was estimated based on the registry provided by the Secretariat of Environment, applied to the owners, administrators and/or managers of 49 of the 75 centers according to the calculation of the sample Eq 1.

$$n = \frac{NPQ}{(N-1)\frac{E^2}{K^2} + PQ}$$

The interview was suggested and approved by the MAE (MATE) and collected the information taking into account in its first phase the general data of the centers, location and access, facilities and infrastructure, number of visitors, information, and exhibition, while in the second phase, the survey was used with 35 items divided into blocks whose indicators were related to topics such as strategic aspects, technical aspects, education, and research and actions; The statistical analysis was carried out with SPSS software, crossing the data of the category of the centers with the rest of the indicators of the survey, and anecdotal records were filled out according to the specific situations of each center.

III. RESULTS AND DISCUSSION

A total of 31 zoos, 5 zoo farms, and 13 rescue centers were studied. The findings from the first phase determined that the centers located in the urban periphery correspond to 55% of zoos and 7.7% of rescue centers, while there are no zoos in these areas. However, 25.5% of zoos, 80% of zoo farms, and 77% of rescue centers are located in rural areas; 6.5% of zoos, 20% of zoo farms, and 15.3% of rescue centers are concentrated in intra-urban areas, which are generally the most remote and difficult to access. The remaining centers are reached by dirt roads or trails, and the type of construction they present is generally mixed, using materials typical of the area.

Of the 49 CMFSE (Wildlife Management Centers) in Ecuador, the majority have the MATE operating approval patent; only one in each category is in the process of approval, and most of them record the profiles of the visitors who come to the centers. Regarding the type of visitors, 31% of zoos receive mostly students and 25% foreigners, while zoo farms receive all types of visitors, and rescue centers primarily receive students. In summary, the rest of the visitors are generally concentrated in groups of friends, families, specialists, scientists, and volunteers, among others.

The information that visitors receive, according to the category of the center, is technical-scientific, interpretive, and didactic, and to a lesser extent, curricular, despite the fact that students are the most frequent visitors to the centers. Regarding the inventory of incoming and outgoing species, all rescue centers maintain this record: 28 of the 31 zoos have it, and 4 of the 5 zoo farms have it; therefore, there is effective control over the entry and exit of fauna species.

According to the findings, most zoos have a variety of educational resources, especially guides, brochures, and posters, related to the type of visitor who comes to the center. These resources are moderately present in the zoos, while the rescue centers do not have them. Thus, 19% of the zoos use posters, and the lowest percentage corresponds to the zoos with 1% in the use of books and dioramas as educational resources.

Almost all of the species found in the centers have information tables that include taxonomic data, ecological and morphological information, and associated problems, among others; however, there is little motivational content to conserve and protect the habitat of the fauna exhibited, and in many cases, these information tables are in poor condition.

Most of the centers have rest areas, visitor centers with general information, but few dynamic and recreational activities that promote habitat conservation, and they are underutilized, especially for the sale of souvenirs or other items. Of the 31 zoos, 21 have an interpretation center, all of them in zoos, and 7 of the 13 rescue centers. The few services correspond to public telephones, infirmaries, libraries, and reading spaces. (Compiled Table 1, Information and Exhibit).

TABLA COMPILADA 1
INFORMACIÓN Y EXHIBICIÓN

	ZOO	ZOOCRIADERO	CENTRO DE RESCATE
Información proporcionada al visitante			
Técnica científica	18	2	9
Interpretativa	20	4	4
Didáctica	17	4	4
Curricular	4	2	3
Inventario de especies que ingresan y salen			
SI	28	4	13
NO		1	0
Recursos educativos			
Libros	8	1	8
Folletos	11	4	5
Guías	18	5	8
Carteles	17	4	7
Guiones	10	2	2
Afiches	19	2	2
Trípticos	13	4	4
Lúdicos	11	2	6
Dioramas	11	1	5
Otros	5	2	4
Información en los letreros			
N Científico	14	3	6
N común	14	3	7
Categoría	9	3	7
Orden	19	2	7
Familia	18	3	8
Mapa de distribución	16	2	7
Ecología	17	3	8
Morfología	17	3	6
Reproducción	14	2	7
Ilustración	15	3	6
Problemas asociados	11	2	6
Flora y fauna del centro			
Artificial	0	1	0
Introducida	7	2	0
Mixta	14	1	4
Nativa	11	2	10
Servicios			
Área de descanso	29	5	8
Centro de visitantes	21	5	1
Parqueadero	26	5	8
Área de picnic	19	4	4
Sanitaros	28	5	9
Vigilancia	25	4	5
Teléfonos públicos	14	1	2
Materiales educativos	18	5	8
Biblioteca	13	1	6
Enfermería	10	3	6
Guías naturalistas	18	5	5

Fuente: Entrevista a las UMFSE

In relation to research projects, 63% of the centers have records, while the existence of cubicles for animals in captivity is present in 25 zoos, 4 zoos and 11 rescue centers, with a percentage ranging between 70 and 80%, although with reduced spaces and little recreation of native flora, mostly mixed flora is used except in rescue centers where the predominant flora is native, precisely because the species that are rescued are close to the location of the centers. On the other hand, the same percentage has an inventory of species, quarantine zones and animal breeding stations; only 60% have animal recreation areas (it is not known what these areas are based on, since no information was provided).

Environmental interpretation is managed through informative panels in 25 zoos, 4 zoo farms and 4 rescue centers, personal interpretative means through guides or interpreters in 13 zoos, 4 zoo farms and 4 rescue centers, non-personal interpretative means, especially audiovisuals in 13 zoos, and self-guided trails in most zoos and moderately present in the other centers (Compiled chart 2, Areas of the Wildlife Management Units).

TABLA COMPILADA 2
ÁREAS DE LAS UNIDADES DE MANEJO DE LA FAUNA SILVESTRE

	ZOO	ZOOCRIADERO	CENTRO DE RESCATE
Registro de proyectos de investigación	19	4	8
Cubículos	25	4	11
Vigilancia	26	4	10
Asistencia veterinaria	28	5	13
Identificación de especies	29	5	11
Registro y herramientas de seguimiento	24	4	9
Inventario de colección faunística	25	5	12
Fichas de ingreso y egreso de animales	27	3	13
Zona de cuarentena	25	5	9
Recreación animal	20	5	9
Estación de reproducción animal	17	3	8
Estación de investigación	17	3	8
Señalética de orientación	23	5	7
Paneles informativos e interpretativos	25	4	4
Medios interpretativos personales	22	4	4
Medios interpretativos no personales	13	3	5
Senderos guiados	23	5	8
Senderos autoguiados	23	4	6
Mesas de información de la fauna	18	2	4

Fuente: Entrevista a las UMFSE

In the second phase of research (Compiled chart 3, Strategic Aspects), the results of the survey showed that between 60 and 70 % of the centers are aware of the functions of wildlife management units in Ecuador and inform their visitors about the importance of conserving and protecting ecosystems, generally with posters or brochures. These media do not fulfill conservationist purposes and little is motivated on the subject in benefit of the protection of individuals and animal populations to stop the process of extinction of species; on the other hand, the importance of knowing the specific functions of the centers does not mean that they should stop being promoted as places of exhibition, since for visitors they are the main purpose of the visit, perhaps due to the scarce didactic content presented in them. 75.5% of wildlife management units consider the center an environmental classroom, while 15% consider it sometimes and 14.5% never, especially rescue centers. Regarding strategic aspects to achieve conservation objectives, the majority of centers (93.87%) stated that they always, almost always or sometimes implement them, especially zoos. However, a small number of centers (6.12%) indicated that they never implement these efforts, mainly two zoos and one rescue center.

TABLA COMPILADA 3
ASPECTOS ESTRATÉGICOS

¿Se conoce la función de las UMFS?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Blanco	1	0	0
	Nunca	1	0	1
	Algunas veces	3	1	1
	Casi siempre	2	1	2
	Siempre	24	3	9
¿El centro informa sobre la importancia de conservar y proteger los ecosistemas?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	1	0	2
	Casi nunca	1	0	0
	Algunas veces	1	0	0
	Casi siempre	1	1	1
	Siempre	23	4	7
¿Métodos educativos para preservar los individuos y poblaciones de animales?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Blanco	1	0	0
	Nunca	0	0	1
	Casi nunca	1	0	0
	Algunas veces	2	0	2
	Casi siempre	4	1	1
	Siempre	23	4	9
¿Métodos y técnicas educativas que detienen el proceso de extinción de las especies?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	0	0	2
	Casi nunca	1	0	0
	Algunas veces	1	0	2
	Casi siempre	6	2	0
	Siempre	23	3	9
¿Se considera al centro como aula ambiental?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	0	0	1
	Casi nunca	1	0	1
	Algunas veces	4	0	6
	Casi siempre	2	1	4
	Siempre	24	4	7
¿Existen esfuerzos para lograr objetivos conservacionistas?		ZOO	ZOOCRIADERO	CENTRO DE RESCATE
	Nunca	2	0	1
	Algunas veces	2	1	1
	Casi siempre	7	1	2
	Siempre	20	3	9

Fuente: Encuesta a las UMFSE

During this phase, with the help of anecdotal records, significant problems were discovered in several wildlife management centers in the province of Guayas. Two of them were not located at addresses registered with MATE, and it is noted that they were set up as private exhibits rather than rescue centers. Two others belong to ex-politicians fugitives from justice and did not allow access to the surveyors despite having been created as rescue centers. A surprising case is mentioned of a primate located in a flower plantation at an altitude very different from its natural habitat and in adverse climatic conditions, and that despite requests for relocation by

the site, no response was obtained from MATE for its relocation.

IV. CONCLUSIONS

- The categorization of the 49 centers studied shows a significant geographic distribution: most zoos are located in the urban periphery, while zoos and rescue centers are more concentrated in rural areas, suggesting a relationship between location and the conservation function of these centers.

- The audience visiting the centers is varied, so the zoos are popular among students and foreigners, which could indicate their educational role and tourist attraction. On the other hand, zoos are more accessible to all types of visitors due to their focus on animal breeding and reproduction.

Rescue centers appear to be geared primarily toward students, possibly because of their focus on wildlife rehabilitation.

- Most of the centers have the MATE operating approval patent, which suggests that they are in compliance with regulatory requirements. However, it is important to consider those centers that are in process to avoid potential compliance problems. It is also relevant that these centers record the profile of visitors, to help in planning and adapting their activities and programs.

- Although most of the FMUs are aware of the functions of these units and promote the importance of conserving ecosystems, the media used, such as posters or brochures, do not seem to effectively fulfill these purposes, which indicates the need to develop more effective Environmental Education strategies that are related to the national curriculum.

In addition, there are no specific techniques or strategies that can be adapted to different types of audiences and more effectively promote the protection and conservation of ecosystems and their species. The lack of an educational approach may contribute to the fact that the centers are perceived primarily as places of exhibition and not as educational spaces for the conservation of habitats and their species.

- UMFSEs often collaborate with scientists and researchers who conduct studies on site, suggesting that this may include work that contributes to the ecology, behavior, reproduction and adaptation of species in captivity. The data obtained can contribute to the understanding of these species and help in their conservation.

- UMFSEs play an important role in the conservation of threatened and endangered species through captive breeding programs and the release of individuals bred in them, helping to increase the populations of endangered species.

- It is important to keep in mind that the effectiveness of UMFSEs may vary depending on the institution and its commitment to conservation and environmental education objectives. In addition, policies and regulations related to wildlife may change over time, which could influence the role and activities of these units.

- The creation of wildlife management units must comply with Ecuador's current environmental legislation. This may include laws related to biodiversity conservation, sustainable use of natural resources and protection of critical habitats, for which the following aspects should be taken into account:

- More rigorous processes should be established for obtaining the necessary permits and licenses to operate a wildlife management unit. This should include requirements for the import, export and possession of species, as well as the operation of specific facilities, with a Management Plan for those wishing to establish a wildlife management unit, including how species conservation, captive breeding, reproduction and other key aspects of management will be carried out.

- Clear criteria need to be established to determine which species are managed in these units. This could be based on species rarity, extinction risk, legal market demand and other factors.

- Implement regulations to ensure the welfare of animals in captivity, including minimum enclosure size, adequate food and access to veterinary care, as well as requiring the implementation of a regular monitoring system and the submission of periodic reports on the activities and status of managed wildlife populations.

- It is important to encourage the participation of local communities in the management of these units, since their support and knowledge are fundamental for

long-term success. This requires environmental education and outreach programs to inform the public about the importance of conservation and sustainable use of fauna, something that is currently very weak.

- It is essential that the process of creating the FMUs involves experts in conservation, biology and animal welfare, as well as local communities and other stakeholders, in order to promote the conservation of ecosystems and contribute to the protection of wildlife.

- Significant concerns have been identified in the management of wildlife management units in the province of Guayas and others, raising questions about compliance with regulations and ongoing supervision by the competent authorities to allow their permanence. Likewise, better supervision is suggested in the physical conditions in which the animals are kept in captivity in order to guarantee transparency, ethics and the well-being of the animals involved. The importance of effective enforcement of environmental regulations and adequate oversight by the competent authorities is also highlighted.

ACKNOWLEDGEMENTS

To the Ministry of Environment, Water and Ecological Transition, and Wildlife Centers in Ecuador for their willingness to conduct the research and especially to the undergraduate students of the Central University of Ecuador, Faculty of Philosophy, Letters and Education Sciences of the Natural and Environmental Sciences, Biology and Chemistry Degree from the academic periods between 2017 and 2019, for all their support as interviewers.

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https://www.youtube.com/watch?v=2IU1E1jfTd0 (Pairi Daza ZOO en 3D en Bélgica)
https://www.youtube.com/watch?v=aCDhS-dRciQ (Edu Zoo)
https://www.facebook.com/brendeliciouss/videos/999010833538418 (ZOO en Japón, realidad aumentad)

TEACHING STRATEGIES FOR THE DEVELOPMENT OF VERBAL COMMUNICATION IN ENGLISH IN THIRD GRADERS AT INSTITUTO CHAMPAGNAT IN PASTO.

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Reception Date: November 14, 2023
Acceptance Date: August 23, 2024

Abstract

Being competent in the 21st century demands quality education that prepares children and young people as global citizens capable of responding to challenges of life, in different areas.
Instituto Champagnat in Pasto, aware of the need to learn English, consistent with the directions of the Ministry of National Education, has begun a path towards a bilingual school.

Learning a language is based on oral communication so it is important to recreate communicative situations where students listen and speak in English to foster an authentic and meaningful environment. To maximize class time in conversational activities, the present research oriented by the mixed research paradigm guidelines and the action participatory research carried out with third graders does not only propose the selection and use of efficient teaching strategies that contribute to the development of communication skills, according to their level and age gradually, but also to design and implement educational activities and materials that promote their development according to students' needs and characteristics and subsequently, evaluate their effectiveness. The international Starters exam was used in the diagnosis and videos, recordings, photos and interviews were used for the gathering information process.

What are the teaching strategies that enhance the development of verbal communication skills in English? These are strategies related to dialogues, videos, creation use and presentation of mini-books about different communicative situations, song festival, prayer of the morning and activities to care for the planet like water campaigns, protest messages, training and presentations in the school and in a congress about reducing, reusing, recycling and garbage classification, promoting interdisciplinarity in English teaching, motivating the Project-Based Learning work "EcoMarists, protectors of our common home."

Keywords: verbal communication, teaching strategies, materials and activities, learning.

ESTRATEGIAS DIDACTICAS PARA EL DESARROLLO DE LA COMUNICACIÓN VERBAL EN INGLES EN LOS ESTUDIANTES DE GRADO TERCERO DEL INSTITUTO CHAMPAGNAT DE PASTO.

El Instituto Champagnat de Pasto, consciente de la necesidad del aprendizaje del inglés, en consonancia con las indicaciones del Ministerio de Educación Nacional, ha iniciado un camino hacia un colegio bilingüe.

El aprendizaje de un idioma se basa en la comunicación oral, entonces es importante recrear situaciones comunicativas donde los estudiantes escuchen y hablen en inglés para propiciar un entorno auténtico y significativo. Para maximizar el tiempo de clase en actividades conversacionales, la presente investigación orientada por los lineamientos del paradigma mixto y la investigación acción participativa, realizada con estudiantes de grado tercero, no solamente propone la selección y uso de estrategias de enseñanza eficientes que contribuyan al desarrollo de habilidades comunicativas, según su nivel y edad, de manera gradual, sino también diseñar e implementar actividades y materiales educativos que fomenten su desarrollo según las necesidades y características de los estudiantes y posteriormente, evaluar su efectividad. En el diagnóstico se empleó el examen internacional Starters y para el proceso de recolección de información, se utilizó videos, grabaciones, fotos y entrevistas.

¿Cuáles son las estrategias didácticas que potencian el desarrollo de habilidades de comunicación verbal en inglés? Son estrategias relacionadas con diálogos, videos, elaboración, uso y presentación de minibooks sobre diferentes situaciones comunicativas, festival de la canción, oración de la mañana y actividades para el cuidado del planeta, como campañas del agua, mensajes de protesta, capacitaciones y exposiciones en el colegio y en un congreso sobre reducir, reusar, reciclar y la clasificación de basuras, potenciando la interdisciplinariedad en la enseñanza del inglés, dinamizando el trabajo de aprendizaje basado en proyectos "EcoMaristas, protectores de nuestra casa común".

Palabras Claves: comunicación verbal, estrategias didácticas, materiales y actividades, aprendizaje.

Resumen

Ser competente en el siglo XXI exige una educación de calidad que prepare a niños y jóvenes como ciudadanos globales capaces de responder a los desafíos de la vida en diferentes ámbitos.

I. INTRODUCTION

Being competent in the 21st century demands a quality education that must start from childhood, youth and continue in different areas throughout life. Our country, every day more aware of the usefulness of the English language, through the Ministry of National Education, MEN (2014), has implemented the National English Program 2015-2025 in order to strengthen the communicative skills of speaking, reading, listening, and writing in English so that at the end of eleventh grade, students achieve the pre-intermediate level (B1) as basic users.

Instituto Champagnat in Pasto, one of the outstanding schools in the city, assumed the challenge of the MEN mentioned in the previous paragraph; for this purpose, since 2023 it undertook a path towards bilingualism through the diligent work of school directors, group tutors and specialist teachers. The weekly hour intensity was increased, especially in elementary school; there was a greater teachers' commitment to the subject to improve their English level and the methodology and didactics of teaching this language for communicative purposes. There was a greater teachers' commitment to the area to improve their level of English, the teaching methodology and didactics of this language for communicative purposes.

To deal with this purpose in a playful, meaningful, and functional way, this research attempts that third-grade children develop the communicative competence with a practical English that helps them enhance their verbal communication skills. Therefore, it is necessary to strengthen listening, reading, and writing in order to educate citizens capable of communicating in English. MEN (2020) considers that the English standards are fundamental guides that lead teachers, parents, and school directors on the development of the communicative competence and the achievement of basic and intermediate level of the foreign language, English.

In this order of ideas, it is urgent to select the most appropriate strategies to enhance the ability to speak English in students, providing them with solid foundations that contribute to strengthen their global and intercultural communication, as well as their cognitive, instrumental, individual, and social development based on critical thinking development, problem-solving, creativity, cooperation, negotiation, decision-making, self-management, resilience, respect for diversity, empathy, communication, and participation. United Nations Children's Fund (UNICEF, 2022).

Learning a new language involves developing the four essential communicative skills: reading, speaking, writing, and listening in English, which play a fundamental role to achieve effective communication in any language (Cronquist and Fiszbein, 2017). According to Vergara et al. (2019), this learning must be done in a gradual way, and considering the age of students, children have an innate ability to absorb and acquire new languages.

The development of communicative skills in a foreign language follows a natural sequence similar to that of the mother tongue. Writing develops in parallel with reading since children start to write letters, then words, and subsequently simple sentences, and as they advance, they learn to construct more complex texts and express their ideas in writing (Franco et al., 2016).

According to Chapelton (2017), it is important that children listen and speak in English because language learning is based on oral communication in authentic and meaningful environments where they can use English in real communicative situations, such as dialogues, descriptions, reports, role plays, reading and stories interpretation, debates, conversations, recordings, and other spaces that familiarize the student with the language rhythm, the sounds, and their intonation and develop a deeper listening comprehension, which is essential to achieve effective communication.

From this perspective, it is necessary to implement appropriate didactic strategies for English teaching that help transform the educational process into a more effective and enriching experience. These strategies do not only allow the development of essential communicative skills but also awaken interest and promote children's participation in language learning (Vergara et al., 2019). When classes focus on oral communication and provide frequent opportunities to practice in authentic situations, students gain confidence in themselves in expressing in English (Chapelton, 2017). Moreover, the adaptation of strategies to the students' age and level ensures a gradual and effective progression in language acquisition and creates solid foundations for the long term.

Based on the foregoing, this research formulated the following problem: How to strengthen the verbal communication skills in English of third graders at Instituto Champagnat in Pasto in 2023? The general objective of this study is to strengthen the development

of verbal communication skills in English in third graders at Instituto Champagnat in Pasto in 2023.

To this purpose, three specific objectives were proposed:

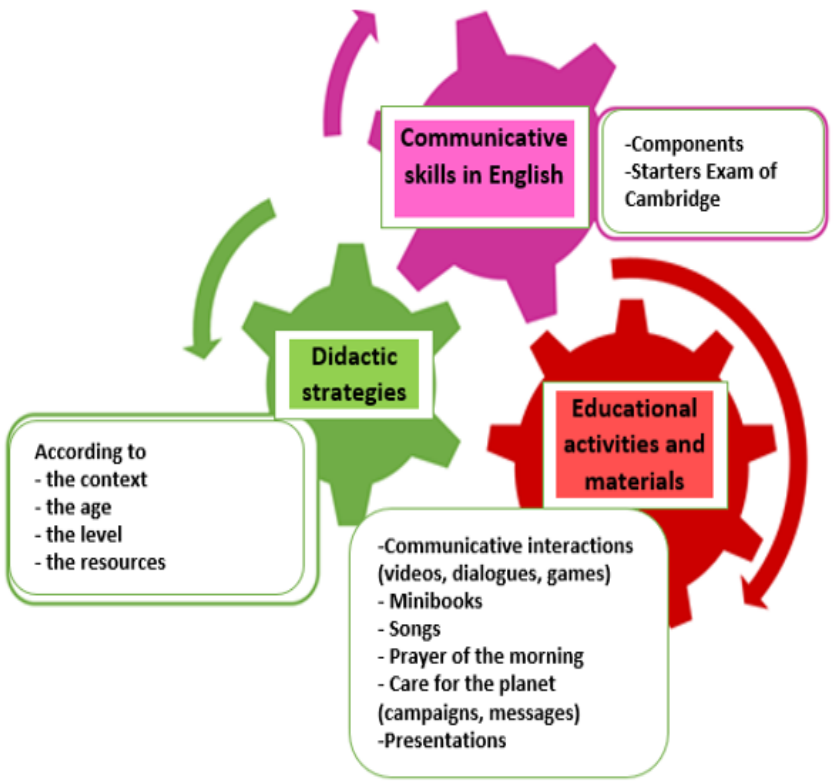
- To diagnose the level of verbal communication skills in English possessed by third graders at Instituto Champagnat in Pasto.

- To implement educational strategies that promote the practice and development of verbal communication skills in English of third graders at Instituto Champagnat in Pasto.

- To evaluate the effectiveness of the didactic strategies implemented for the level improvement of verbal communication skills by comparing the level of verbal communication skills in English of students of group 3.1 of Instituto Champagnat in Pasto through the before and after comparison of the intervention.

The academic exploration and selection of the foundations for the theoretical framework, result from a rigorous and conscious analysis to address the problem in question, focused on two main axes: first, didactic strategies; second, communicative skills in English; and as an interrelated component, educational activities and materials, as shown below.

Figure 1
Axes and components of the Theoretical Framework



Source: This Research

Among the topics that are part of the theoretical framework, it is worth mentioning the communicative approach, the linguistic, pragmatic, and sociolinguistic competences, the Common European Framework, communicative skills, international tests, Cambridge exams, didactic strategies according to the context, age, resources, activities, and educational materials, active methodologies, and the Marist Innova Proposal 3.0 which consists of Happy children Project for preschool (following the Regio Emilia pedagogy), Project-based learning (PBL) in elementary school from first to third grade, and Cooperative learning (CL) from fourth to eleventh grade.

With regard to the context of the classroom, this research was carried out with the four groups of third grade at Instituto Champagnat in Pasto with an intensity in English of six hours a week. The number of students per group ranges between 31 and 32. The classes and activities follow the guidelines of the student's book Kid's Box 3 which can be projected on the board and the work on the Cambridge platform. Several visual and audiovisual resources were used in the classroom, such as videos, songs, audios, slides, photos, images, and flash cards, in the different activities developed each week according to the planning and also contributing from English to the development of the PBL project chosen by third graders: Eco Marists, protectors of our common home.

In addition to the above, this year in third grade there are two students, children of Colombian parents who have lived in Australia (girl in group 3.1) and in the United States (boy in group 3.2) since they were three years old; they will only be in Colombia for one or two years, and then the children, along with their parents and siblings, will go back to these foreign countries. The children collaborated and participated in class, a situation that favored the development of communicative English.

Although the research work was developed equally in the four groups of third grade and in general, the children of this grade participated actively; they are responsible, feel encouraged and enjoy English; for the samples of videos, recordings, photos, observations, and interviews, among others, this research was especially focused on group 3.1, where, besides working with children, it was possible to count on the tutor group's collaboration, the representative parent of the group, and the authorization of all students' parents in this group to be part of this research process. With regard to this grade characterization in particular, it is necessary to note that group 3.1 consists of 31 students: 14 girls and 17 boys.

Figure 2
Context of the classroom and English Festival

Note. Above, it is indicated: 3Rs class (3.1), creation of minibooks (3.1). Below: Water Campaign (3.1), English Festival (third grade).

Source: This research

II. METHODOLOGY

To characterize third graders and evaluate the effectiveness of the implemented didactic strategy, the mixed paradigm and the participatory action research (PAR) were chosen because they allow involving third graders, the main protagonists, in the development and implementation of activities and educational materials in order to ensure that these activities are relevant and meaningful to them. According to Hernández et al. (2014):

- Participatory Action Research (PAR) is a social research approach that seeks to generate changes and improvements in a specific community or context through the active and collaborative participation of the actors involved.

- PRA focuses on problem-solving and the search of practical and sustainable solutions to the challenges facing a community. Rather than being a mere spectator or outside observer, the PRA researcher involves actively in the process, working hand in hand with community members to identify problems, define objectives and develop intervention strategies.

- A PRA structural element is the participant's meaningful participation in all the stages of this research process. This involves listening and giving voice to the people affected by the problem, involving them in the research planning and design and working in team to implement the actions that emerge from the findings.

PRA is also characterized by its reflexive and critical approach. PRA researchers do not only seek to generate practical changes in the community but also seek to understand the social structures and dynamics underlying the problems identified. This critical reflection allows a deeper understanding of the factors that influence on the situation, and the effectiveness of the proposed interventions. This type of research has a flexible and adaptive approach; that is, intervention strategies can be modified and adjusted during the research development.

Martínez (2000) complements the above, stating that this type of research requires taking the world and science with a new outlook and committed to the human being's development and emancipation, since its execution process turns all actors into co-researchers. Finally, it adds that the researcher becomes a discussion organizer, a process facilitator and a problem catalyst.

According to Hernández et al. (2014), the main actions that were executed in this research development were:

Phase 1: Diagnosis. To determine the level of development of verbal communicative skills in English, contextual factors and barriers.

Phase 2: Strategy Design: After identifying student's specific needs, to select and design effective didactic strategies in the development of these skills.

Phase 3: Adaptation and Implementation. To record implementation details.

Phase 4: Relevance Evaluation. In order to analyze the effects of the chosen strategies, comparing the achieved results with the objectives set in the previous phases and to analyze the aspects that influence on the achievement or not of the expected results.

The DIAGNOSIS was performed to each student individually. The guide to procedures was taken into

account to adapt them in 4 moments: "Let's get ready! (¡Alistémonos!) Let's walk! (¡Caminemos!) Let's run! (¡Corramos!) Let's climb! (¡Trepemos!)" In practice, according to the way the students developed the test and once their needs were detected, more questions were asked, examples were presented, and in the same way priority was given to the aspect that required it. At the evaluation time, it was taken into account whether or not there was a need to guide the student in some aspects.

Moment 1: Let's get ready! (¡Alistémonos!) After greeting the child, the child's name was asked: "What's your name?", the scene picture was indicated, and questions about a specific place, people, or objects were asked.

Moment 2: Let's walk! Then, the child was asked to point out what was requested in the image through a question or as an order (command).

Moment 3: Let's run! The object cards were indicated and asked for the objects of 3 or 4 cards: "What is it?" If necessary, it was said: It's a... and, if necessary, it was pronounced the initial sound of the word. Then, the child was asked to place these object cards in the positions: on (sobre, encima de), in (dentro de), under (debajo de), or next to (junto a). For example, put the hat under the table, put the crocodile on the table, and put the t-shirt next to the window, among others.

Moment 4: Let's climb! They were asked about the food in their kitchen, in their house: What do you eat in your kitchen? What do you eat in your house?

III. RESULTS

DIAGNOSIS. As an approach to the diagnosis test, the descriptor scales of the communicative competence mentioned in the Companion Volume to the Common European Framework of Reference for Languages (2020) were taken into account, with which the following results can be determined:

The General Linguistic Range descriptor: can use isolated words/signs and basic expressions in order to give simple information about him/herself: Yes, in the diagnosis test it was possible to appreciate that children answered with words related to the questions that were asked; for example, saying: yes, no, colors, names of objects, family members. In the Starters exam, children are not asked to produce sentences.

The Grammatical Accuracy descriptor: can employ very simple principles of word/sign order in short statements. In the Starters exam, children took into account word order when saying their name because it is a sentence they know. My name is _____. They do not do this grammatically but by usage.

The Propositional Precision descriptor: can communicate very basic information about personal details in a simple way. It could be seen in Part 4 of the test when children talked about the food they eat at home.

The Spoken Fluency descriptor: can manage very short, isolated, rehearsed utterances using gesture and signalled requests for help when necessary. It was not applied in this exam because, by being a diagnosis test, children had not rehearsed or studied for this test.

DIDACTIC STRATEGIES. The application of the PBL strategy from the English class and the interrelation with the different study areas, in addition to promoting children's responsibility in role management and their functions and supporting teamwork, contributed significantly to the development of the project "Eco Marists, protectors of our common home" in relation to the different study areas, awareness and care for nature, animals, the application of the 3 R's (reduce, reuse, recycle), the voice for water and the planet and garbage classification. It allowed to do a practical use of English that do not only contributed to third graders' life but also to their families, preschool and elementary school children and to the participants of the VII International Congress on Education for Children organized by CESMAG University in November 2023, where the results of this research were shared through a presentation and supported by the participation of third-grade Eco Marists children.

Likewise, the participation in the awareness campaign on water care was also highlighted. From the English area, in the four groups of third grade, children made posters and participated with messages in English to announce them to the whole elementary school students. The students of group 3.1 were selected to participate in English with their claim voice for water support.

As verbal communication examples, following Drew (2023), it was also worked on dialogues produced in communicative situations, face-to-face conversations, oral presentations, interviews (Starters oral exam), public presentations as in the PBL Meeting with Parents held in October and in the VII International

Congress in November, as well as stories were told and ideas were shared among team members.

Figure 3
PBL Project: Eco Marists, protectors of our common home

Note: Above, it shows: Water campaign (3.1), Eco Marist logo, 3 Rs speakers (3.1), and Eco Marist prayer (3.3). Below: Presentation at Instituto Champagnat in Pasto (3.1), Garbage Collection Campaign (3.1), and Presentation at CESMAG University (3.1 and 3.3).

Source: this study.

Through this research, effective didactic strategies were applied according to the age of third graders; their tastes, proposals, and interests were taken into account, for example, in the use of songs; In this manner, music motivated the interest in English (Torres, 2019). In this school year, the third-grade children prepared 4 songs to participate in the English Fest program that was developed at Instituto Champagnat Pasto during the institutional festivities of Saint Marcellin that took place in June. Out of the 4 possible songs: "Flowers," "Don't You Worry", "Believer", and "As It Was", the chosen song for the event was "Flowers" by Miley Cyrus. Children from all grades participated; most of the chosen students were from group 3.1.

RESOURCES AND ACTIVITIES.

With regard to the use of materials and activities to improve verbal comprehension, it is relevant to highlight the success of the application of minibooks, since they did not only help in the children's step-by-step development and confidence to speak English, but also they counted on parents' support, who, along with their children, after finishing the development of one minibook, waited anxiously to develop the next one. Through these materials, different topics were worked on: Personal presentation, pets, food (Topic 1), Favorite things (Topic 2), Family, home (Topic 3), and Routines (Topic 4).

With images, letters, or initials of words, children became familiar with the topic and felt good presenting their work. Moreover, their minibooks reflect a creative work, motivation, and love for English. The success of minibooks has also been recognized by English teachers from other grades, who have also used them to tell stories, travels, and past actions, among others.

Figure 4
Minibooks

Source: this research

Figure 5 Example of Minibook – Topic 1

HOJA	DIBUJO / NÚMERO / PALABRA(S) / O FRASE	SE EXPONE
1	Palabra: Ana Belen (nombre del estudiante)	(Hi). My name is Ana Belen.
2	Número: 8 (edad)	I'm eight.
3	Palabra: cat (mascota) y/o dibujo: gato	I've got a cat.
4	Frase: She's_____.	She's Lulu. She's called Lulu.
5	Dibujo: Pizza (fruta o comida favorita)	I like pizza.
6	Palabra: Food	This is my favorite food.

Note. Sheets of paper of Minibook for topic 1 (Personal information, pets, food) and orientations to perform it.

Source: This research

IV. DISCUSSION

It is necessary to enhance the verbal communication skills in English of the youngest students, from preschool and elementary school levels, by adjusting effective didactic strategies to their particularities and preferences, to their learning style and rhythm, to their level of English, to the context and to the communicative purposes. The implementation of pedagogical strategies allows for motivation and effective learning in the classroom. The knowledge and choice of the strategies that best suit the students will allow for a more personalized and effective education (Economic Commission for Latin America and the Caribbean and Organization of Ibero-American States for Education, Science, and Culture, 2020).

Information coming from research on teaching – learning strategies of English language with emphasis on students' oral production, according to Figueroa, R and Intriago, Jose (2022) has shown that meaningful achievements in oral production in this language involve to carry out activities and strategies that promote speaking practice. The foregoing is extremely valuable, fundamental, and at the same time it constitutes an inspiring source to guide the creation and use of minibooks, which in the present study became a motivating tool in the development of presentations on varied topics. This strategy provided security, support, and confidence for students to approach English in a dynamic way and to express themselves effectively. This strategy constitutes an integrating and creative tool that promises to enhance students' verbal communicative competence significantly.

In this research context, the opportunity to work with images and words related to specific topics with elementary school children is highlighted since it allows a playful and effective immersion in the vocabulary associated with different topics, which is essential to achieve a more effective and enriching oral communication (Alcedo and Chacón, 2011).

In the Marist Educational Model: "Marist Innova 3.0", English learning was not only limited to the classroom but it was sought to integrate it in a transversal way in different subjects of the curriculum, thus promoting a communicative and practical approach. This research did not only benefit third graders of Instituto Champagnat in Pasto but also it provided knowledge, findings, and evidence that will contribute to the educational field in general, since, by identifying effective teaching strategies for the development of the oral skill in English, new ideas and approaches that can be applied in other educational contexts will be generated and thereby more students would be benefited.

V. CONCLUSIONS

The main difficulties in third graders' verbal expression of Instituto Champagnat are related to anxiety, restlessness, and fear of making mistakes and speaking in public, as confirmed by Stevick (1980) when he states that more than the materials, techniques, and linguistic analyses that are used in the foreign language teaching, what happens inside the learners and in the classroom determines this process's success or failure.

The English teachers at Instituto Champagnat use updated methodologies as a result of the permanent qualification that the institution provides them; nevertheless, although most of them are emerging from the communicative approach and the vision of this approach focuses on the development of all communicative competences, however due to various situations, teachers are still limited to explicit grammar teaching through the production and understanding of written texts, leaving aside the solution of communicative tasks specific of oral communicative competence.

Among the wide variety offered by foreign language teaching, the didactic alternative that emerged from this research was based on the communicative approach and the tools it offers, such as the task-based approach. For Ellis (2003), these are activities that require students to use language, paying attention not on the form but on the meaning to obtain the communicative objective (p. 10). The project-based approach, teamwork, collaborative learning, dialogues, minibooks, interdisciplinary and transdisciplinary in English allowed a practical use of English and energized work on environmental topics through and from English, according to the goals drawn up in the Eco Marist project. In the end, in addition to the confidence to speak in English, values, feelings, attitudes, self-esteem, social relationships, and teamwork were promoted.

Thanks to the variety of activities adapted to the students' contexts and interests, such as songs, videos, and environmental protection campaigns, presentations on environmental topics, dialogues, minibooks, and constant interaction in English that are part of the strategy, students learned to create meaningful conversations and

messages through verbal communication. The students, parents, and teachers' voices in unison recognized the success of this didactic proposal, which was evident in the familiarity, empathy, increase in vocabulary and conversations that were woven around the production of minibooks and conversations about their content. Likewise, in the confidence and security of children before an international speaking exam. It was a success!

ACKNOWLEDGMENTS

I thank to the Master's degree of Education at the University of Nariño for the training provided, my advisor, Dr. Helda Alicia Hidalgo, and especially third-grade students, teachers, group tutors, parents, and representatives, and especially the work developed by the students of group 3.1 and this group tutor's collaboration, teacher Natalia Serna. Likewise, I express my gratitude to English teachers in the elementary section and school directors of Instituto Champagnat Pasto for their collaboration in this research. In a warm and affectionate way, I express my feeling of gratitude to God, my family, and friends for all their support and company.

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INCIDENCE OF SOCIAL NETWORKS ON CRITICAL THINKING IN UNIVERSITY STUDENTS.

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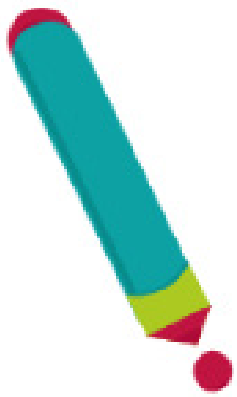

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Reception Date: December 20, 2023
Acceptance Date: August 16, 2024

Abstract

Social networks raise questions about how these platforms affect the way of thinking and acting of millions of people who are part of these digital communities. In the academic spaces of higher education, it is observed that the amount of information, entertainment and new forms of communication are widely used by students, teachers, managers and administrators.

This research article is framed in a documentary review focused on the categories of social networks and critical thinking. Its purpose is to serve as a source of consultation and analysis to determine whether social networks positively or negatively impact the critical and reflective thinking of university students, facilitating their academic and professional development to analyze, evaluate and synthesize information in a reflective and deliberate manner.

The research was based on the search for sources such as books, essays and articles that address critical thinking and social networks in university contexts. Aspects were evident such as: a) limitations in the development of critical thinking in students and the importance of the teacher as a guide; b) essential characteristics of critical thinking such as self-discipline and analysis; c) the initial and ongoing impact of social networks in university environments.

The results highlight the need for teachers to implement specific and effective guidelines for students to critically use information from social networks, thereby improving their critical thinking skills, promoting academic integrity and ethical development. The documentary review concludes that social networks have a significant impact on the critical thinking of higher education students, with both positive and negative effects. Although they facilitate quick access to diverse information and encourage critical reflection, information overload and difficulty discerning reliable sources can limit robust critical thinking.

Key words: critical thinking, social networks, higher education.

Resumen

Las redes sociales plantean interrogantes sobre cómo estas plataformas inciden en la forma de pensar y actuar de millones de personas que forman parte de estas comunidades digitales. En los espacios académicos

INCIDENCIA DE LAS REDES SOCIALES EN EL PENSAMIENTO CRÍTICO EN ESTUDIANTES DE EDUCACIÓN SUPERIOR.

de la educación superior, se observa que la cantidad de información, entretenimiento y las nuevas formas de comunicación son ampliamente utilizadas por estudiantes, profesores, directivos y administrativos.

Este artículo de investigación se enmarca en una revisión documental centrada en las categorías de redes sociales y pensamiento crítico. Su propósito es servir como fuente de consulta y análisis para determinar si las redes sociales impactan positiva o negativamente en el pensamiento crítico y reflexivo de los estudiantes universitarios, facilitando su desarrollo académico y profesional para analizar, evaluar y sintetizar información de manera reflexiva y deliberada.

La investigación se basó en la búsqueda de fuentes como libros, ensayos y artículos que abordan el pensamiento crítico y las redes sociales en contextos universitarios. Se evidenciaron aspectos como: a) las limitaciones en el desarrollo del pensamiento crítico en los estudiantes y la importancia del docente como guía; b) características esenciales del pensamiento crítico como autodisciplina y análisis; c) el impacto inicial y continuo de las redes sociales en entornos universitarios.

Los resultados subrayan la necesidad de que los docentes implementen directrices específicas y efectivas para que los estudiantes utilicen críticamente la información de las redes sociales, mejorando así sus habilidades de pensamiento crítico, promoviendo la integridad académica y el desarrollo ético. La revisión documental concluye que las redes sociales tienen un impacto significativo en el pensamiento crítico de los estudiantes de educación superior, con efectos tanto positivos como negativos. Aunque facilitan el acceso rápido a información diversa y fomentan la reflexión crítica, la sobrecarga informativa y la dificultad para discernir fuentes confiables pueden limitar un pensamiento crítico robusto.

Palabras claves: pensamiento crítico, redes sociales, educación superior.

I. INTRODUCTION

In the digital age, social media has emerged as a pervasive phenomenon that redefines social interaction and the ways we access, share, and process information. This relevant change in communication dynamics raises critical questions about its impact on fundamental cognitive skills, particularly in the academic context. This research aims to understand the influence of social networks on the critical thinking of students in higher education settings.

According to Espíndola & Espíndola (2015), human beings, endowed with intelligence, stand out from other living beings. This ability to understand, interpret, and modify their environment offers countless possibilities and the freedom to choose alternatives, freeing them from mere reliance on animal instincts and routines. However, intelligence, as a powerful tool, carries risks, as it can be used to both build and justify negative situations. Guiding life through intelligence requires a conscious effort that must be learned and should spark the interest of educational institutions to provide tools that develop logical and creative skills in students. Despite the abundance of information available through various media, many students lack the skills to interpret, discriminate, and use it effectively, partly due to a lack of reading habits and an education system that does not promote active student participation. The lack of reading also impacts logical skills, the ability to organize information, and problem-solving capabilities.

Critical thinking is a way of reasoning that can be described in various ways, but it always relates to the concept of evaluation.

The origin of the word "critical" comes from the Greek term κρΐσις (kri), which means to reflect or make a decision. Therefore, when referring to critical thinking, it generally relates to practices of inquiry and evaluation, which ultimately allow for expressing a judgment or adopting a stance based on an event or idea.

Critical thinking is essential for academic and professional development; it involves the ability to analyze, evaluate, and synthesize information in a thoughtful and deliberate manner.

According to Lipman (1991), a prominent educator and thinker, critical thinking goes beyond mere rationalization. When making judgments, clarity of ideas and coherence of arguments must be sought.
For Lipman, critical thinking not only aims to be a "perfect argument," but also involves a continuous process of self-correction. He emphasizes that critical thinking is a comprehensive cognitive skill that coordinates various abilities such as reasoning, concept formation, research, and translation. In his words, when we think critically, we engage in a broad range of cognitive skills grouped into families such as reasoning, concept formation, research, and translation.

In the article "A Look at Critical Thinking in the Educational Teaching Process in Higher Education" by Palacios et al. (2017), it is stated that the ability to reflect, experience, reason, and adhere to the scientific method is fundamental for cultivating critical thinking. This process requires transparency, accuracy, impartiality, and evidence, thereby avoiding subjective opinions. It constitutes an intellectual and disciplined endeavor that skillfully conceptualizes, analyzes, and synthesizes information obtained through observation and reflective reasoning, ultimately leading to belief and action.

II.Limitations of Critical Thinking.

In higher education, the authors of this review note that there are limitations in the development of critical thinking among students. This is attributed to a lack of clarity in the instructions or guidelines provided to students by educators, highlighting the necessity for further investigation and exploration of this issue. Additionally, it is essential to seek and create strategies and methodologies that facilitate the effective implementation of critical thinking.

II. Characteristics of Critical Thinking

The characteristics of critical thinking include being goal-directed, self-disciplined, self-regulated, and self-correcting. This entails the use of concrete examples to illustrate and clarify ideas, as well as establishing relationships between objects and phenomena. It involves identifying and proposing solutions to complications, conducting comparisons, analyzing from various perspectives, and focusing on key ideas.

The role of the teacher is crucial for students to learn to think critically. While this is important, insufficient time and effort are currently dedicated to it in schools. Teachers must ensure that their students develop the art of critical thinking and reflection, making it a regular and organized part of the educational experience.

III. Critical Thinking
The strategies aimed at fostering critical thinking

incorporate pedagogical methods, Meta cognitive skills, and the transmission of competencies. These tactics seek to obtain and utilize essential competencies for critical thinking, such as the ability to analyze, objectively evaluate information, identify valid arguments, solve problems logically, reflect on one's own thinking process, and make informed and well-founded decisions.

The didactics of critical thinking involves participatory and substantive instruction through communication and the exchange of information, which fosters curiosity, the formulation of questions, reflection, and the application of knowledge for decision-making and the presentation of solutions. The educator must create conditions that encourage the free expression of students while providing pedagogical guidance. Key guidelines include the prior selection of content, identification of competencies to be achieved, formulation of analytical questions, activation of participation from all students, and the use of methods that promote active review and reflection.

IV. Social Networks and Critical Thinking

With the advent of the Fourth Industrial Revolution, referred to by Schwab (2016) as "the digital and technological age" (p. 19), many aspects of life have undergone abrupt changes. New ways of relating, interacting, and communicating among individuals have evolved at an incredible pace. The creation of increasingly sophisticated smartphones has led to the invention of new technological platforms such as Facebook, WhatsApp, Instagram, YouTube, X, and TikTok, which are among the most recognized and commonly used by people. This has resulted in the dissemination and propagation of information being just a click away, promoting access to information and influencing the time users spend on these social media platforms.

V. ORIGIN OF SOCIAL MEDIA

Since their emergence in the 1990s, social networks have transformed the ways in which humans communicate and interact. Instant messaging through chat applications provided a means for bidirectional communication among two or more users. In 1995, the first social network, Classmates.com, appeared in the United States. It is considered to be the first platform created by a former university student, intended to maintain contact with classmates, as long-distance communication options at that time were almost nonexistent (Torres, 2020, p. 59). Subsequently, various social platforms began to emerge, with notable early examples including AOL Instant Messenger (AIM) and ICQ ("I Seek You"). This led to a proliferation of platforms starting in 1997, aimed at interconnecting users within online communities. Among these were social sites such as SixDegrees.com in 1997, AsianAvenue.com, BlackPlanet.com, and MiGente.com. From 1998 to 2001, LiveJournal and Cyworld emerged; in 2000, LunarStorm was created in Finland, followed by Ryze.com in 2002, Tribe.net, LinkedIn, Friendster, and Hi5 in 2003, MySpace, Facebook in 2004, Flickr in 2004, YouTube in 2005, and Twitter in 2006 (Pellat, 2009, p. 30). Notably, Facebook, launched in 2004, originated within a purely university community, utilizing email addresses ending in "edu" as a sign of student identity within the Harvard academic environment. Within this context, Pellat (2009) notes that between 2002 and 2006, the rise of Web 2.0 tools facilitated the consolidation of social networks as a major new phenomenon on the Internet. Millions of people have integrated social media into their daily lives, leading to a significant process of cultural adaptation (p. 30).

The integration of social media into everyday life has transformed economic, political, cultural, social, health, and educational sectors for several reasons:

The emergence of Information and Communication Technologies in the 1990s led various social sectors to reevaluate their practices, and the education sector was no exception. This transformation and the dynamics of human relationships particularly foster a flexible, open, and decentralized education, where students become active producers of their own knowledge (Acosta, 2019, p. 216).

While the emergence of these platforms helps to foster connections—whether familial, professional, emotional, or academic—for the benefit of communities, not all practices associated with these networks are beneficial for their members. As Torres (2020) points out, "social networks are not exempt from this reality; through them, crimes such as extortion, threats, trafficking of sexual content, human trafficking, kidnappings, robberies, account theft, etc., are committed" (p. 61).

In addition to these general issues associated with social networks, the educational context reveals further challenges, such as the negative impact on honesty during students' formative processes. Platforms like Facebook and WhatsApp have become, alongside communication and entertainment tools, channels for fraud and information copying. It is increasingly common for students to share answers during assessments in the classroom. This dishonest and unethical practice adversely

affects their performance in educational activities and raises concerns about their critical and reflective learning.

VI. Theoretical Framework

The previously described ideas are grounded in a concept that encompasses both the principles of critical thinking and social networks. Thus, the theoretical foundations of Habermas (1992) with his theory of communicative action are essential for addressing the conception of human criticality through a social-critical approach. His notions of social action and rationalization serve as key references, positing that humans are inherently social beings whose relationships are established through communication across various realms, such as the life world, the system, and communicative action itself. Additionally, Habermas argues that humans exist within a social, cultural, political, and economic environment that governs their interactions, significantly influencing their daily lives.

Within this framework, McLuhan (1964) is also noteworthy, particularly through his book Understanding Media: The Extensions of Man. He emphasizes the paradigm shift between mechanical and electronic media and discusses the invention of new tools for social interaction that alter how people relate to one another and interpret their surroundings. McLuhan's theories suggest that the planet has transformed into a global village, as articulated in his writings.

In relation to this discussion, Han (2014) in In the Swarm examines contemporary modes of existence that govern the world. From a critical perspective, he describes the spectacle and the bubble in which internet societies currently reside, noting how social networks have led to a blurring of public and private spheres. He asserts that "the lack of distance leads to a mixing of the public and the private. Digital communication promotes this pornographic exposure of intimacy and the private sphere" (p. 14).

These theories substantiate the presented ideas and pave the way for understanding the current dynamics between critical thinking and the rise of new forms of communication brought about by the internet, particularly through social media.

II. METHODOLOGY

For the collection of bibliographic documents, various documentary sources were utilized. Firstly, consultations were made with experts in critical thinking and social networks. Additionally, a systematic review was conducted through searches on "Google Scholar." Keywords such as "critical thinking," "social media," and "higher education" were used in these searches.

The criteria applied for the selection of information included: 1) Articles focused on critical thinking and social media, 2) Publications from the years 2018 to 2024, 3) Studies and articles written in Spanish, 4) Publications from Latin American countries and Spain, and 5) Complete, open-access articles with titles related to critical thinking and social media in educational contexts.

Exclusion criteria were as follows: 1) Original articles that do not address critical thinking and social networks, 2) Publications outside the specified date range, 3) Studies in languages other than Spanish, 4) Publications from countries not belonging to Latin America or Spain, and 5) Incomplete articles, restricted-access publications, or duplicates.

III. RESULTS

In the preliminary search, 350 publications were identified using the combined keywords in Spanish: "critical thinking," "social networks," and "higher education." The documentary research revealed that social networks significantly influence the critical thinking of higher education students. This influence stems from the ubiquitous and accessible nature of information on these platforms, which can have both positive and negative effects.

Positive Effects: Social media allows for quick and broad access to diverse sources of information, enriching students' knowledge and perspectives while fostering curiosity and critical reflection.

Negative Effects: However, the overload of information and the lack of skills to discern between reliable and unreliable sources can hinder the development of robust critical thinking.

The reviewed studies highlight several limitations in the development of critical thinking among university students, often attributed to the improper use of social networks, including:

1. Lack of Clarity in Instruction: Many teachers do not provide clear guidelines on how to critically use information obtained from social networks. This underscores the need for more effective and specific pedagogical strategies to promote critical thinking.

2. Academic Dishonesty: Platforms like Facebook and WhatsApp sometimes facilitate dishonest practices, such as sharing answers during assessments, which negatively impacts the development of critical and ethical skills.

It is imperative for teachers to develop clear and effective strategies to foster reflective and analytical skills in their students. Ultimately, the development of critical thinking stands as an essential pillar in the comprehensive education of higher education students, preparing them to face future challenges with acuity and discernment.

Regarding the limitations, it is important to mention that the number of articles analyzed does not encompass the entirety of available scientific literature, as only three databases were considered: critical thinking, social networks, and university students, among many other possible sources. While these factors may introduce certain biases, this systematic review can serve as a valuable reference point for future research and for making more informed decisions on the topic addressed in this article.

IV. DISCUSSION

Research on the impact of social networks on the critical thinking of university students reveals a complex and multifaceted landscape. On one hand, platforms such as Facebook, WhatsApp, and Instagram can enrich access to diverse information and foster intellectual curiosity and critical reflection. This instant and broad access to multiple sources of information has the potential to expand students' perspectives and strengthen their ability to analyze and synthesize information critically.

However, significant challenges also arise. Information overload and the difficulty in distinguishing between reliable and unreliable sources present major barriers to developing robust critical thinking. Moreover, the lack of clear guidelines from teachers on the critical use of information available on social network can hinder the development of critical skills in students. Dishonest practices facilitated by these platforms, such as sharing answers during assessments, further negatively impact their ethical and critical development.

In summary, while social networks offer valuable opportunities for enhancing critical thinking, it also necessitates careful navigation and the implementation of effective educational strategies to mitigate its drawbacks.

V. CONCLUSIONS

1. This research addresses the uncertainty regarding how social networks affect the thinking and behavior of students in higher education. The omnipresence of information, entertainment, and new forms of communication derived from these platforms raises questions about their influence on students' critical and reflective thinking.

2. A limitation in the development of critical thinking in higher education is highlighted, attributed to the lack of clarity from teachers. This underscores the need to investigate and design strategies to enhance its implementation, recognizing the importance of cultivating reflective, analytical, and evaluative skills in students.
3. The role of the teacher emerges as crucial in the development of critical thinking. Emphasis is placed on the importance of dedication and educational practices focused on systematizing reflection throughout the educational process. Strategies such as active learning, dialogue, and self-correction are essential for cultivating effective critical thinking.

4. It is acknowledged that social networks, in the context of the Fourth Industrial Revolution, have transformed communication, interaction, and education. Instant access to information has generated significant cultural change. The research highlights the need to understand how this transformation affects cognitive skills, particularly in the academic realm.

5. The research emphasizes the necessity of critically addressing the impact of social networks on the thinking of university students, recognizing both its benefits and the challenges it poses for the development of critical and reflective skills.
6.This research will facilitate analysis and reflection based on the cited authors and the application of information collection instruments regarding the impact of social networks on critical and reflective development in both professional and personal contexts. Ultimately, fostering critical thinking stands as an essential pillar in the comprehensive education of university students,

preparing them to confront future challenges with acuity and discernment.

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