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VENTANAS AL CONOCIMIENTO

Dimensions of Digital Transformation

in Higher Education Institutions for Continuing Education.

Cyberspace and Emerging Research:

A Transepistemic and Transdialogic Vision from Transcomplexity.

Other Subjects

The Research Competencies of University Professors and the Scientific Production of Students.

Emotional Education as a Tool to Improve the Educational Process in Colombia: A Literature Review.

Educational Games:

Unlocking the Potential of Playful Learning

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Transforming Education: Innovations and Challenges in the Academic World

In the rapid advancement of the digital age, education is in a constant state of transformation. This issue of our scientific journal presents a collection of articles and essays that highlight how pedagogical innovations and new methodologies are redefining teaching and learning across various disciplines. From higher education to the teaching of natural sciences and the inclusion of students with special educational needs, our authors address the challenges and opportunities facing the current educational system. These works not only highlight the importance of innovation and transformation but also underscore the challenges we face in the academic world.

The first article explores digital transformation in higher education, emphasizing the importance of adapting to a digitalized society. The authors analyze how institutions must evolve to meet the needs of digitalization, especially in the context of continuing education. The COVID-19 pandemic has accelerated these processes, making the need for structural change evident. This study delves into the dimensions and levels of digital transformation, identifying key actors and proposing patterns to facilitate this change. The findings suggest that higher education must integrate more effectively with technology to improve the quality and accessibility of continuing education, a crucial change to prepare students for the challenges of the 21st century.

In the field of natural sciences, a second study focuses on educational methodologies based on the knowledge theory of Maturana and Varela. This research addresses the low performance and lack of interest of students in disciplines such as physics, chemistry, and biology. The authors propose a pedagogical approach that connects theory with the reality of students, using participatory action research to implement and evaluate new methodologies. The results show a significant improvement in student performance and motivation, suggesting that this knowledge theory can revitalize the teaching of natural sciences and strengthen student engagement. The application of this approach has the potential to transform science learning, making it more relevant and attractive to students.

Another research article examines the relationship between the investigative competencies of university professors and the scientific production of students. Through a quantitative study with a non-experimental and cross-sectional design, the authors find a strong positive correlation between these variables. The results highlight the importance of a well-trained faculty in research, as this translates into students who are more prolific in generating scientific articles. This finding underscores the need to strengthen research competencies in higher education to foster a culture of research and knowledge generation. In this sense, research and innovation in education are fundamental for the advancement of knowledge and the development of new technologies and methodologies.

In a study on educational policies and their impact on academic performance in Latin America, the authors adopt a quantitative and correlational approach to analyze data from five countries. The results reveal a significant correlation between educational policies and student academic performance. This study suggests that well-designed and implemented educational policies can sig-

nificantly improve academic performance in the region, highlighting the importance of strategic and coherent approaches in policy formulation. Effective implementation of these policies is essential to address educational inequalities and ensure that all students have access to quality education.

Research on socio-formative competencies for non-licensed technology and informatics teachers in Colombia reveals the need for specific training programs for these professionals. Through structured interviews and a phenomenological-interpretative approach, the authors identify various categories that highlight the challenges and motivations of these teachers. The findings suggest that continuous and specialized training is crucial to improving pedagogical practice in technological areas and to prepare teachers to face the challenges of the 21st century. Teacher training in new technologies is vital to ensure that students are prepared for an increasingly digital and connected world.

The emotional component and its relationship with academic performance is another topic addressed in this issue. A study conducted in Medellín, Antioquia, shows a significant positive correlation between students' emotions and their academic performance. The results underscore the importance of considering the emotional component in teaching, as positive emotions can improve academic performance. This finding highlights the need for pedagogical strategies that address students' emotions to create a more effective and welcoming learning environment. Integrating emotional education into the curriculum is crucial for the holistic development of students, promoting not only academic success but also personal well-being.

The inclusion of students with intellectual disabilities in Colombia is examined in another article, which compares the theoretical and practical aspects of educational inclusion. The results reveal significant discrepancies between theory and practice, suggesting that while there is a solid theoretical framework, its practical implementation is inconsistent. This study highlights the need to improve inclusion policies and practices to ensure that all students receive a quality and equitable education. Effective inclusion is essential to ensure that all students, regardless of their abilities, have the opportunity to reach their full potential.

In the context of virtual education in Nicaragua, an article examines the challenges faced by university teachers to enhance student knowledge through digital platforms. The research underscores the need for teacher training and adaptation to create a dynamic and effective learning environment. The results indicate that virtual education can be effective if teachers are adequately prepared and have the necessary tools to manage information and communication technologies. Adopting virtual education is crucial to expanding access to education and adapting to changes in the global educational landscape.

Emotional education is highlighted as a key tool to improve the educational process in Colombia. Through a literature review, the positive impacts of emotional education on academic performance, school coexistence, and students' emotional well-being are analyzed. The theoretical findings suggest that emotional education promotes essential skills such as self-awareness, self-regulation, and empathy, contributing to holistic personal and academic development. Implementing emotional education programs can transform the educational experience, creating a more positive environment and supporting students' overall growth.

In an essay on epistemology and its role in scientific production, the author reflects on how epistemological reflection is fundamental to the creation and development of scientific research. This essay highlights the importance of epistemology in shaping scientific work standards and its influence on knowledge generation. Epistemological reflection is essential to ensure the quality and integrity of scientific research, promoting a critical and rigorous approach to knowledge development.

Transpersonal management is presented as a new trend in the business world in another study. The authors investigate how transpersonal competencies can improve business efficiency, proposing a managerial model that integrates these skills to foster an organizational environment conducive to learning and innovation. This approach highlights the need for holistic management that promotes continuous business development. Transpersonal management has the potential to transform business management, promoting a more human and collaborative approach.

Discovery learning is proposed as an innovative methodology to revolutionize the teaching of biology in Colombia. Through an exhaustive review of research and theories, the authors show how this methodology can foster critical thinking, creativity, and student motivation. The findings suggest that discovery learning can significantly improve understanding and appreciation of biology, promoting more active and participatory education. Implementing this methodology can transform science teaching, making it more engaging and effective for students.

Environmental education linked to the philosophy of the Presocratics is analyzed in a study that highlights the importance of integrating environmental education with a philosophical and complex approach. The authors argue that environmental education can benefit from a perspective that combines rationality and ethics, inspired by the thoughts of the Presocratics. This approach can transform environmental education, promoting a deeper and more ethical understanding of the environment and our relationship with it.

Cyberspace as an emerging research scenario is explored from transcomplexity. This article analyzes how cyberspace challenges traditional research frameworks and offers new opportunities for scientific exploration. The authors propose that cyberspace allows for freer and more conscious research, integrating various ontological, epistemic, and methodological dimensions. Research in cyberspace has the potential to transform science, opening new avenues for exploration and discovery.

Educational gaming is presented as a powerful tool to unlock the potential of playful learning. The authors investigate how gaming can improve students' cognitive and social skills, fostering a more engaging and effective learning environment. This educational approach highlights the benefits of playful learning and its ability to motivate students. Integrating gaming into education can transform learning, making it more enjoyable and effective.

Eduethics in the use of artificial intelligence through prompt engineering is the subject of an essay that highlights the importance of ethics in education about the use of artificial intelligence. The author argues that eduethics is essential to ensure responsible and beneficial use of AI,

promoting critical reflection on its applications and consequences. Ethical education about AI is crucial to ensuring that this technology is used responsibly and beneficially, promoting sustainable and equitable technological development.

Finally, an essay on pedagogical didactics for students with special educational needs examines how specific strategies can be implemented to improve the development of skills and competencies in these students. The authors highlight the importance of a globalized didactics that ensures comprehensive and effective attention. Implementing inclusive pedagogical strategies is essential to ensuring that all students have the opportunity to reach their full potential, promoting equitable and quality education.

In summary, this issue of our scientific journal presents a compendium of research and essays that reflect the dynamism and innovation in the educational field. We invite our readers to immerse themselves in these studies and reflect on the multiple ways we can transform and improve education at all levels. Each of these works emphasizes the importance of innovation and transformation in education, as well as the challenges we must face to ensure a brighter and more equitable educational future for all.

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Editorial

Transformando la Educación: Innovaciones y Retos en el Mundo Académico

En el vertiginoso avance de la era digital, la educación se encuentra en un constante proceso de transformación. Este número de nuestra revista científica presenta una colección de artículos y ensayos que destacan cómo las innovaciones pedagógicas y las nuevas metodologías están redefiniendo la enseñanza y el aprendizaje en diversas disciplinas. Desde la educación superior hasta la enseñanza de las ciencias naturales y la inclusión de estudiantes con necesidades educativas especiales, nuestros autores abordan los desafíos y las oportunidades que enfrenta el sistema educativo actual. Estos trabajos no solo destacan la importancia de la innovación y la transformación, sino que también subrayan los retos a los que nos enfrentamos en el mundo académico.

El primer artículo explora la transformación digital en la educación superior, resaltando la importancia de adaptarse a una sociedad digitalizada. Los autores analizan cómo las instituciones deben evolucionar para satisfacer las necesidades de digitalización, especialmente en el contexto de la formación continua. La pandemia de COVID-19 ha acelerado estos procesos, haciendo evidente la necesidad de un cambio estructural. Este estudio profundiza en las dimensiones y niveles de la transformación digital, identificando los actores clave y proponiendo patrones para facilitar este cambio. Los hallazgos sugieren que la educación superior debe integrarse de manera más efectiva con la tecnología para mejorar la calidad y accesibilidad de la educación continua, un cambio crucial para preparar a los estudiantes para los desafíos del siglo XXI.

En el ámbito de las ciencias naturales, un segundo estudio se centra en las metodologías educativas basadas en la teoría del conocimiento de Maturana y Varela. Esta investigación responde al bajo rendimiento y falta de interés de los estudiantes en disciplinas como física, química y biología. Los autores proponen un enfoque pedagógico que conecta la teoría con la realidad de los estudiantes, utilizando la investigación acción participativa para implementar y evaluar nuevas metodologías. Los resultados muestran una mejora significativa en el rendimiento y motivación de los estudiantes, sugiriendo que esta teoría del conocimiento puede revitalizar la enseñanza de las ciencias naturales y fortalecer el compromiso estudiantil. La aplicación de este enfoque tiene el potencial de transformar el aprendizaje de las ciencias, haciéndolo más relevante y atractivo para los estudiantes.

Otro artículo de investigación examina la relación entre las competencias investigativas de los docentes universitarios y la producción científica de los estudiantes. A través de un estudio cuantitativo con un diseño no experimental y transversal, los autores encuentran una fuerte correlación positiva entre estas variables. Los resultados destacan la importancia de un cuerpo docente bien capacitado en investigación, ya que esto se traduce en estudiantes más prolíficos en la generación de artículos científicos. Este hallazgo subraya la necesidad de fortalecer las competencias investigativas en la educación universitaria para fomentar una cultura de investigación y generación de conocimiento. En este sentido, la investigación y la innovación en la educación son fundamentales para el avance del conocimiento y el desarrollo de nuevas tecnologías y metodologías.

En un estudio sobre políticas educativas y su impacto en el desempeño académico en América Latina, los autores adoptan un enfoque cuantitativo y correlacional para analizar datos de cinco países. Los resultados revelan una correlación significativa entre las políticas educativas y el rendimiento académico de los estudiantes. Este trabajo sugiere que políticas educativas bien diseñadas y aplicadas pueden mejorar significativamente el desempeño académico en la región, destacando la importancia de enfoques estratégicos y coherentes en la formulación de políticas educativas. La implementación efectiva de estas políticas es esencial para abordar las desigualdades en la educación y asegurar que todos los estudiantes tengan acceso a una educación de calidad.

La investigación sobre competencias socio-formativas para docentes no licenciados en tecnología e informática en Colombia revela la necesidad de programas de formación específicos para estos profesionales. A través de entrevistas estructuradas y un enfoque fenomenológico-interpretativo, los autores identifican diversas categorías que resaltan los desafíos y motivaciones de estos docentes. Los hallazgos sugieren que la formación continua y especializada es crucial para mejorar la práctica pedagógica en áreas tecnológicas y para preparar a los docentes para enfrentar los desafíos del siglo XXI. La capacitación de los docentes en nuevas tecnologías es vital para asegurar que los estudiantes estén preparados para un mundo cada vez más digital y conectado.

El componente emocional y su relación con el rendimiento académico es otro tema abordado en este número. Un estudio realizado en Medellín, Antioquia, muestra una correlación positiva significativa entre las emociones de los estudiantes y su desempeño académico. Los resultados subrayan la importancia de considerar el componente emocional en la enseñanza, ya que las emociones positivas pueden mejorar el rendimiento académico. Este hallazgo destaca la necesidad de estrategias pedagógicas que aborden las emociones de los estudiantes para crear un entorno de aprendizaje más efectivo y acogedor. La integración de la educación emocional en el currículo es crucial para el desarrollo integral de los estudiantes, promoviendo no solo el éxito académico, sino también el bienestar personal.

La inclusión de estudiantes con discapacidad intelectual en Colombia es examinada en otro artículo, que compara los aspectos teóricos y prácticos de la inclusión educativa. Los resultados revelan discrepancias significativas entre la teoría y la práctica, sugiriendo que, aunque existe un marco teórico sólido, su implementación práctica es inconsistente. Este estudio destaca la necesidad de mejorar las políticas y prácticas de inclusión para garantizar que todos los estudiantes reciban una educación de calidad y equitativa. La inclusión efectiva es esencial para asegurar que todos los estudiantes, independientemente de sus habilidades, tengan la oportunidad de alcanzar su máximo potencial.

En el contexto de la educación virtual en Nicaragua, un artículo examina los desafíos que enfrentan los docentes universitarios para potenciar el conocimiento estudiantil a través de plataformas digitales. La investigación subraya la necesidad de capacitación y adaptación por parte de los docentes para crear un entorno de aprendizaje dinámico y efectivo. Los resultados indican que la educación virtual puede ser efectiva si los docentes están adecuadamente preparados y cuentan con las herramientas necesarias para manejar las tecnologías de la información y la comunicación. La adopción de la educación virtual es crucial para expandir el acceso a la educación y adaptarse a los cambios en el entorno educativo global.

La educación emocional es destacada como una herramienta clave para mejorar el proceso educativo en Colombia. A través de una revisión documental, se analizan los impactos positivos de la educación emocional en el rendimiento académico, la convivencia escolar y el bienestar emocional de los estudiantes. Los hallazgos teóricos sugieren que la educación emocional promueve habilidades esenciales como la autoconciencia, la autorregulación y la empatía, lo que contribuye a un desarrollo personal y académico integral. La implementación de programas de educación emocional puede transformar la experiencia educativa, creando un entorno más positivo y apoyando el crecimiento integral de los estudiantes.

En un ensayo sobre la epistemología y su papel en la producción científica, el autor reflexiona sobre cómo la reflexión epistemológica es fundamental para la creación y desarrollo de investigaciones científicas. Este ensayo destaca la importancia de la epistemología en la configuración de estándares de trabajo científico y su influencia en la generación de conocimiento. La reflexión epistemológica es esencial para asegurar la calidad y la integridad de la investigación científica, promoviendo un enfoque crítico y riguroso en el desarrollo del conocimiento.

La administración transpersonal es presentada como una nueva tendencia en el mundo empresarial en otro estudio. Los autores investigan cómo las competencias transpersonales pueden mejorar la eficiencia empresarial, proponiendo un modelo gerencial que integra estas habilidades para fomentar un entorno organizacional propicio para el aprendizaje y la innovación. Este enfoque destaca la necesidad de una gestión holística que promueva el desarrollo continuo de la empresa. La administración transpersonal tiene el potencial de transformar la gestión empresarial, promoviendo un enfoque más humano y colaborativo.

El aprendizaje por descubrimiento es propuesto como una metodología innovadora para revolucionar la enseñanza de la biología en Colombia. A través de una revisión exhaustiva de investigaciones y teorías, los autores muestran cómo esta metodología puede fomentar el pensamiento crítico, la creatividad y la motivación de los estudiantes. Los hallazgos sugieren que el aprendizaje por descubrimiento puede mejorar significativamente la comprensión y apreciación de la biología, promoviendo una educación más activa y participativa. La implementación de esta metodología puede transformar la enseñanza de las ciencias, haciéndola más atractiva y efectiva para los estudiantes.

La educación ambiental vinculada a la filosofía de los presocráticos es analizada en un estudio que destaca la importancia de integrar la educación ambiental con un enfoque filosófico y complejo. Los autores argumentan que la educación ambiental puede beneficiarse de una perspectiva que combine la racionalidad y la ética, inspirada en los pensamientos de los presocráticos. Este enfoque puede transformar la educación ambiental, promoviendo una comprensión más profunda y étia del medio ambiente y nuestra relación con él.

El ciberespacio como un escenario de investigación emergente es explorado desde la transcomplejidad. Este artículo analiza cómo el ciberespacio desafía los esquemas tradicionales de investigación y ofrece nuevas oportunidades para la exploración científica. Los autores proponen que el ciberespacio permite una investigación más libre y consciente, integrando diversas dimensiones ontológicas, epistémicas y metodológicas. La investigación en el ciberespacio tiene

el potencial de transformar la ciencia, abriendo nuevas vías para la exploración y el descubrimiento.

El juego educativo es presentado como una herramienta poderosa para desbloquear el potencial del aprendizaje lúdico. Los autores investigan cómo el juego puede mejorar las habilidades cognitivas y sociales de los estudiantes, fomentando un entorno de aprendizaje más atractivo y efectivo. Este enfoque educativo destaca los beneficios del aprendizaje lúdico y su capacidad para motivar a los estudiantes. La integración del juego en la educación puede transformar el aprendizaje, haciéndolo más divertido y efectivo.

La eduética en el uso de la inteligencia artificial a través de la ingeniería de prompts es el tema de un ensayo que resalta la importancia de la ética en la educación sobre el uso de la inteligencia artificial. El autor argumenta que la eduética es esencial para garantizar un uso responsable y beneficioso de la IA, promoviendo una reflexión crítica sobre sus aplicaciones y consecuencias. La educación ética sobre la IA es crucial para asegurar que esta tecnología se utilice de manera responsable y beneficiosa, promoviendo un desarrollo tecnológico sostenible y equitativo.

Finalmente, un ensayo sobre la didáctica pedagógica para estudiantes con necesidades educativas especiales examina cómo se pueden implementar estrategias específicas para mejorar el desarrollo de habilidades y competencias en estos estudiantes. Los autores destacan la importancia de una didáctica globalizadora que garantice una atención integral y efectiva. La implementación de estrategias pedagógicas inclusivas es esencial para asegurar que todos los estudiantes tengan la oportunidad de alcanzar su máximo potencial, promoviendo una educación equitativa y de calidad.

En resumen, este número de nuestra revista científica presenta un compendio de investigaciones y ensayos que reflejan el dinamismo y la innovación en el campo educativo. Invitamos a nuestros lectores a sumergirse en estos estudios y reflexionar sobre las múltiples formas en que podemos transformar y mejorar la educación en todos sus niveles. Cada uno de estos trabajos subraya la importancia de la innovación y la transformación en la educación, así como los retos que debemos enfrentar para asegurar un futuro educativo más brillante y equitativo para todos.

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Dimensions of digital transformation in higher education institutions for continuing education

Dimensiones de la transformación digital en instituciones de educación superior para la formación continua

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Abstract

To comprehend the need for digital transformation in the field of continuing education, we must first be aware of the existence of a digitized society facilitated by technological changes and the phenomenon of globalization. These changes are reshaping our understanding of the world and how we live in it. It is in this context of digital transformation that society expects higher continuing education to respond to the demands of digitization. With the aim of defining patterns that facilitate transformation processes in our higher education institutions for the development of continuous training programs, this article analyzes, through 26 articles (between 2017 and 2022), selected using the PRISMA methodology, the main dimensions, levels, and actors involved in digital transformation processes. The results lead us to conclude that it is an emerging field of interest, especially after the COVID-19 pandemic, which has accelerated digitization processes.

Keywords: Continuing education, digital transformation, lifelong learning, digitization, higher.

Resumen

Para entender la necesidad de transformación digital en el campo de la educación continua primero deberemos ser conscientes de la existencia de una sociedad digitalizada facilitada por los cambios tecnológicos y el fenómeno de la globalización. Estos cambios están transformando nuestra forma de entender el mundo y vivir en él. Es en este contexto de transformación digital donde la sociedad espera que la educación continua superior responda a las necesidades de digitalización. Con el objetivo de definir patrones que faciliten los procesos de transformación en nuestras instituciones de educación superior en el desarrollo de programas de formación continua, el presente artículo analiza, a través de 26 artículos (entre 2017 y 2022), seleccionados usando la metodología PRISMA, las principales dimensiones, niveles y actores implicados en los procesos de transformación digital. Los resultados obtenidos nos llevan a concluir que se trata de un campo de interés emergente, especialmente después de la pandemia del COVID-19 la cual ha acelerado los procesos de digitalización.

Palabras claves: Educación continua, transformación digital, aprendizaje a lo largo de la vida, digitalización, educación superior.

Introduction

In our "digitalized society" (González *et al.*, 2018), digital technology is evolving rapidly, especially during the last decade of the 21st century with the emergence of certain technologies such as Artificial Intelligence (AI), 3D printing, robotics, the Internet of Things (IoT), and quantum computing (QC), among others. This period is known as the 4th Industrial Revolution (Penprase, 2018), in which technology has become one of the main external drivers of digital transformation (Hanelt *et al.*, 2021; Verhoef *et al.*, 2021).

According to the Organisation for Economic Co-operation and Development (OECD, 2017), digital transformation is the result of the digitalization of economies and societies. Other authors consider digital transformation as the best approach to address emerging trends generated by digital technologies (Aditya *et al.*, 2021). In any case, together with the phenomenon of globalization (Branch *et al.*, 2020), digital technologies have forced organizations to initiate digital transformation processes whose purposes, among others, are: a) efficiency and cost reduction, b) value creation, and c) cultural change through the use of digital technologies (Castro *et al.*, 2020; Hanelt *et al.*, 2021; Tekic & Koroteev, 2019). This situation has been increased and accelerated by the 2020 pandemic (COVID-19), affecting all productive and service sectors.

Given this context, higher education institutions are not exempt from transformation, and there are different reasons that lead us to make this statement. First, if we consider Gobble's (2018) words about the social purpose of transformation, higher education institutions, by having social commitment as their third mission (Carrión, 2018; Rojas *et al.*, 2018), play an important role in this context of change towards a digital society. Second, it refers to the need to integrate these technologies into the processes and services (both operational and academic) by automating and digitizing them (OECD, 2000). Thirdly, in a post-digital education context (Fawns, 2018; Lamb *et al.*, 2022), we can agree that students are more connected than ever before (González *et al.*, 2018). These students are digital natives and have higher expectations about the possibilities of digital learning (Henderson *et al.*, 2017). Therefore, the necessary integration of technology cannot be simplified to the context of its use. It requires a transformation process within the institution itself, involving changes in the traditional business model, organizational processes and structures, products and services, and organizational culture (Giang *et al.*, 2021; Teslia *et al.*, 2020; Verhoef *et al., 2021*). In other words, digital transformation is not defined as a simple process of incorporating technology at the level of teaching or a few processes (Fernández et al., 2019), or "digital transformation in higher education institutions refers to the development of new, more advanced and effective methods and practices in pursuit of the mission of higher education" (Alenezi, 2021, p. 2).

However, the process of digital transformation in higher education institutions poses significant challenges since "the last 100 years show that education has not been transformed or altered by successive waves of technological innovation" (Selwyn, 2016, p. 439).

With the aim of addressing this complex issue, the present study aims to provide an overview of the state of digital transformation in higher education institutions, in the context of continuing education, through a literature review process based on the PRISMA methodology for the last 5 years (2017-2022), in the SCOPUS and Web of Science (WoS) databases. The results of this work are presented in this article, which is organized into the following sections. The present section, where we have presented the framework by which the constructs of digital transformation and higher education institutions for continuing education are related. The "Concepts" section, where definitions of the search concepts are shared and decisions made for the concretion of the search algorithm are described. A section called "Methodology" that describes the protocol followed, the process of data selection, and the results of the analysis process. A

"Conclusions" section that presents the main inferences obtained from the study. A "References" section with the referenced bibliography. And finally, in the "Annex" section, the analyzed articles are listed.

Concepts

For our study, the main terms considered in the literature search refer to digital transformation and continuous education in the context of higher education institutions.

Regarding the first of the terms, "digital transformation" it should be noted that it lacks a single definition (Hanelt *et al.*, 2021), and it was not until 2003 that it was distinguished from the term "digitization" (Pihir *et al.*, 2019). For our study, the term is defined as "a series of profound and coordinated changes in culture, workforce, and technology usage that facilitate new educational and operational models, transforming the operations, strategic directions, and value proposition of the institution" (Grajek & Reinitz, 2019).

Regarding the term "Continuing training" it is understood as education "after initial education and training, [...] intended to help individuals: improve or update their knowledge and/or skills; acquire new skills for a career change or new training; continue their personal or professional development" (CEDEFOP, 2014, p. 51). It should be noted that continuing education is also associated with other terms such as "professional training", "professional development," or "adult education" (Bade-Becker *et al.*, 2009). For our analysis, we understand that the term "professional training" "is attributed to a specific study cycle corresponding to Vocational Education and Training (VET) (CEDEFOP, 2014, p. 292), which is not part of the present analysis. However, we will consider the concept of "professional development" as it is part of the definition of the term "continuing education".

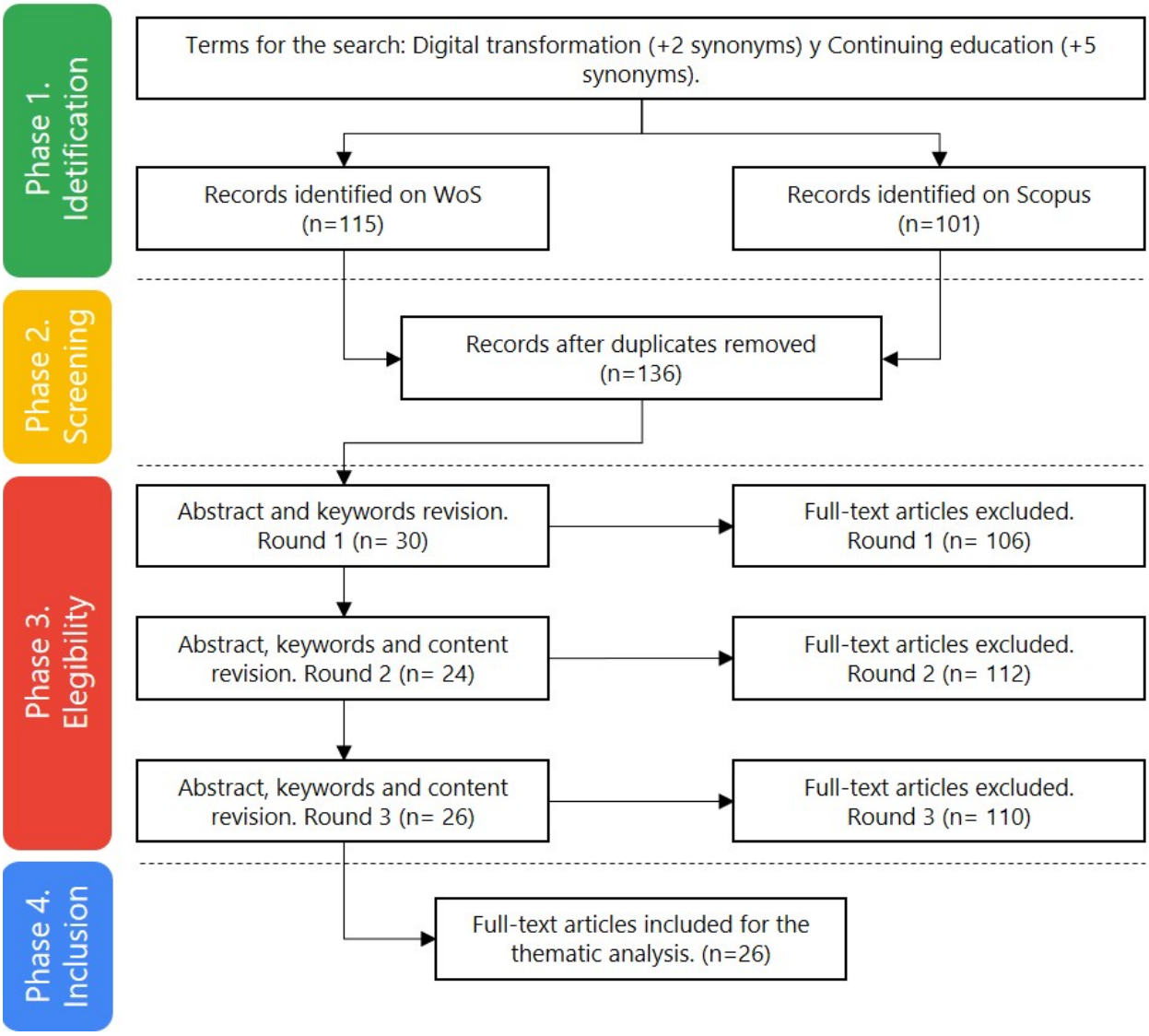
- "Making a European Area of Lifelong Learning a reality" (European Commission, 2001).
- "Recommendations on key competences for lifelong learning" (European Council, 2006).
- "Education and Training 2020" (Council of Europe, 2009).

For this reason, the following terms have been considered synonymous with the concept of "Continuing education": "lifelong learning" "permanent education/training," "adult education."

Methodology

In order to conduct a literature review on the state of digital transformation in continuing education carried out by higher education institutions, with a search date of March 13, 2022, and limited to the last 5 years, the following process based on the PRISMA model (Page, McKenzie *et al.*, 2021; Page, Moher *et al.*, 2021) has been followed, as illustrated in Figure 1.

Figure 1
Workflow process (PRISMA methodology)



Note: Original source.

Identification Phase

For the identification phase, the following combinations of terms (in two languages: Spanish and English) were used in the following thematic databases: Web of Science (WoS) and Scopus, limiting the searches to the title, abstract, or keywords defined by the author..

Table 1
Search Algorithms

Since indexing in different databases is not the same, initially, the analysis has been conducted separately for each database.

ES: Title, abstract or author-specified keywords = ("Transformacion Digital" OR "Digitalizacion") AND ("Educacion continua" OR "formacion continua" OR "lifelong learning" OR "formacion permanente" OR "educacion permanente" OR "educacion de adultos" OR "desarrollo profesional") | Year: 2017-2022.

EN: Title, abstract or author-specified keywords = ("Digital transformation" OR "Digitalisation" OR "Digitalization") AND ("Continuing education" OR "Continuing training" OR "lifelong learning" OR "adult education" OR "continuing professional development) | Year: 2017-2022.

Table 2
Search Results in WoS and Scopus.

Results	WoS		Scopus	
	Global	=2017	Global	X>=2017
Spanish	0	1	2	2
English	130	117	117	104
Open Access	48	46	36	35
lid X>=2017	105		101	

Note: Original source.

For the specification of the temporal criterion, 2017-2022, the following parameters have been considered:

1) The nature of the topic itself leads us to the need to narrow down the search to more recent periods to conduct reviews of scientific literature that allow us to access the most updated knowledge on our topic of interest.
2) 89% of the search results are concentrated in the period from 2017 to 2022.

Having established the temporality criterion, the obtained records were reviewed to refine the information with the purpose of obtaining unique records.

Discard criteria:

1) Publications not written in English or Spanish.
2) Those that did not contain information about authors, title, or abstract were categorized as null.

3) Records were considered duplicates if they contained the same abstract, authors, and publication year.

The following table shows the results obtained, taking into account the previous filtering processes (temporal criterion and unique record):

Table 3
Results of the identification phase

Results	WoS	Scopus
	X>=2017	X>=2017
English/ Spanish	93	90
Duplicates / Nulls	-1	-2
Total valid	92	88
Unique records	136	
	48	44 44

Note: Original source.

As can be observed, in this phase, 80 records that did not meet the selection criteria have been excluded (37% out of 216), leaving a total sample of 136 publications: 48 from WoS, 44 from Scopus, and 44 common.

Eligibility phase

With the aim of delimiting the results to our object of study and determining its distinctive characteristics: dimensions, actors, and levels of implementation; we have proceeded to evaluate the different publications to answer the following questions:

1) Does it describe any digital transformation process in the higher continuing education sector?
2) What dimension(s) and categories do they describe?
3) To what organizational level do they refer?
4) Who are the actors involved?

1. Higher Continuing Education Sector

To analyze if an article addresses the first of the described questions, 3 rounds of reading have been conducted. In these rounds, the abstract and the keywords defined by the author (1st, 2nd, and 3rd round), as well as the content of the publication (in the 2nd and 3rd round), have been evaluated according to the following evaluation table:

Table 4
Eligibility evaluation criteria.

Valeur	Description	Action
Yes	Contains clear references with explicit information.	Include in the following phase as eligible.
Partial	It is inferred, although the information is not explicit.	
Null	With the existing information, the sector cannot be inferred.	Review full article and reevaluate.
Nou	Contains clear references to another sector.	Exclude from the following phase.

Note: Original source.

In each of the rounds, different elements were analyzed according to the following description:

1) Round 1: Reading of the abstract and keywords.
2) Round 2: Reading of the abstract and keywords in all, and content of publications in the "Null" category.
3) Round 3: Reading of the abstract and keywords in all; and content of publications in the "Null" and "Partial" categories.

As a result of the filtering carried out over the three rounds, 26 publications (**Annex 1**) have finally been identified as eligible for the subsequent analysis phases, as shown in the following summary table:

Table 5
Results of the 3 rounds of eligibility.

Values	Round 1	Round 2	Round 3
Yes	30	24	26[1]
Partial	21	27	29[2]
Null	39	14	8
No	46	71	83

Note: [1] They could not be analyzed in further detail as the full article was not available. [2] They couldn't be analyzed because the article wasn't available. Own work.

2. Dimensions and Categories

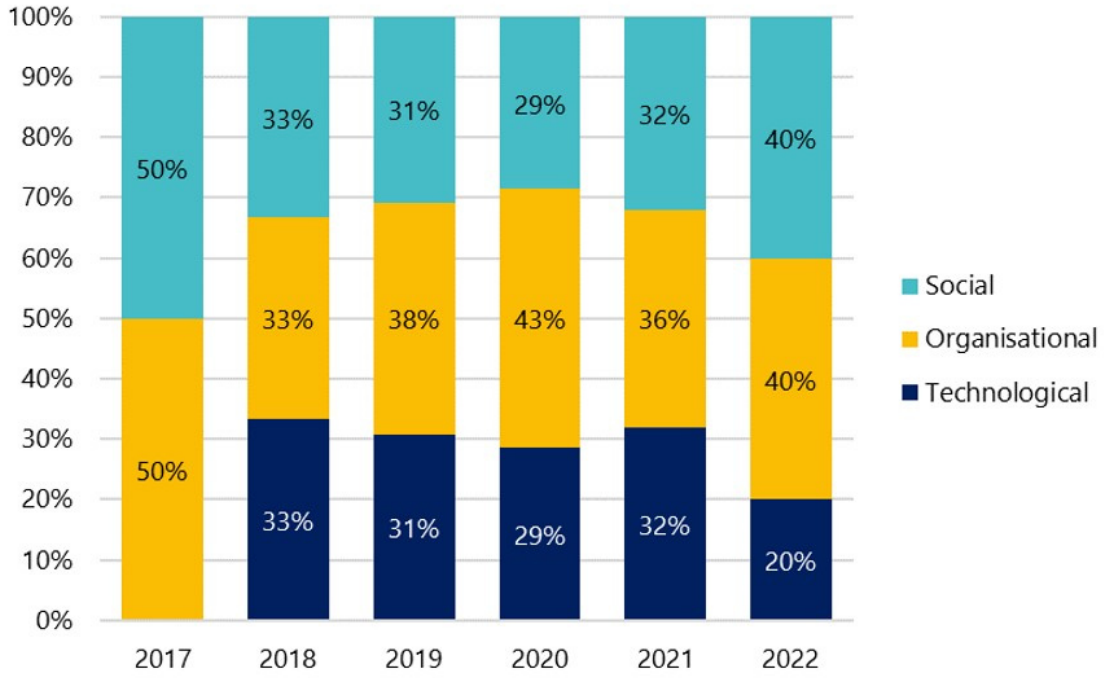
Taking a multidimensional view of the digital transformation process or digitization (Aditya *et al.*, 2021; Hanelt *et al.*, 2021; Rodrigues., 2017), which affects any organization in multiple aspects (Giang *et al.*, 2021; Teslia *et al.*, 2020; Verhoef *et al.*, 2021), we have opted to establish different levels of analysis.

At a first level, we will focus on the complexity of the definition of digital transformation itself. As such, according to authors such as Reis *et al.* (2018) or Castro *et al.* (2020), it encompasses three main dimensions:

1) The "technological" dimension, focused on the use of digital technologies.
2) The "organizational" dimension, requiring a change in organizational processes or the creation of new business models (Henriette *et al.*, 2015).
3) The "social" dimension, which affects many aspects of our lives to the extent, for example, of becoming a catalyst for social innovation (Kaputa *et al.*, 2022).

Taking into consideration the three aforementioned dimensions, the following distribution is shown in our sample of eligible publications:

Figure 2
Distribution of dimensions by publication year.



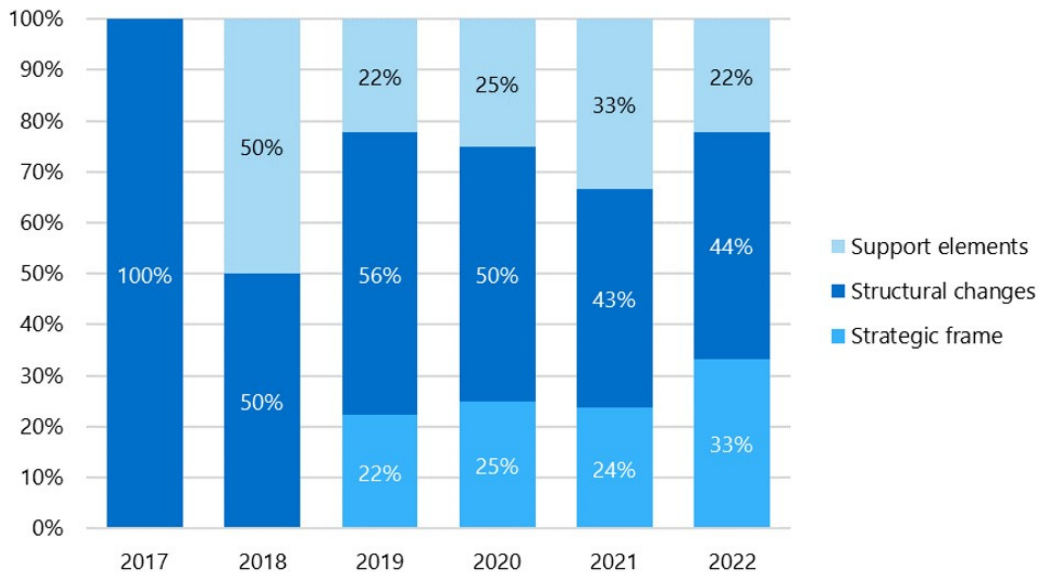
Note: Original source.

As can be observed, the three dimensions participate in similar percentages, reinforcing the idea of the multidimensionality of transformation processes. Similarly, since 2018, a certain increase in interest has been detected in the organizational and social dimensions (Castro *et al.*, 2020). This responds to the fact that the technological dimension is limited to the need to incorporate technology, while there is increased interest in organizational changes (for example, recommending the development of teacher training centers or the need for a legal framework) or in the social dimension (as an asset for improving society and/or the regional context).

As a second level of analysis, publications were analyzed according to groupings established by different authors such as Graham *et al.* (2013), Khalid *et al.* (2018), and Rampelt *et al.* (2019):

- **Strategic Framework [G1]:** institutional policies, strategies, vision, governance, among others.
- **Structural Changes [G2]:** technological, legal, pedagogical, and administrative environment, among others.
- **Support Elements [G3]:** incentives, professional support services, student support, among others.

Figure 3
Distribution of groupings by publication year.



Note: Original source.

Unlike the pattern identified in the earlier dimensions analyzed (Figure 2), the distribution regarding the 3 aforementioned groupings (Figure 3) shows a certain predominance of structural changes, while the conception or development of support elements is the least present group; this trend persists over the years. Additionally, there is an increase in interest in strategic issues (from 0% to 33% in the year 2022).

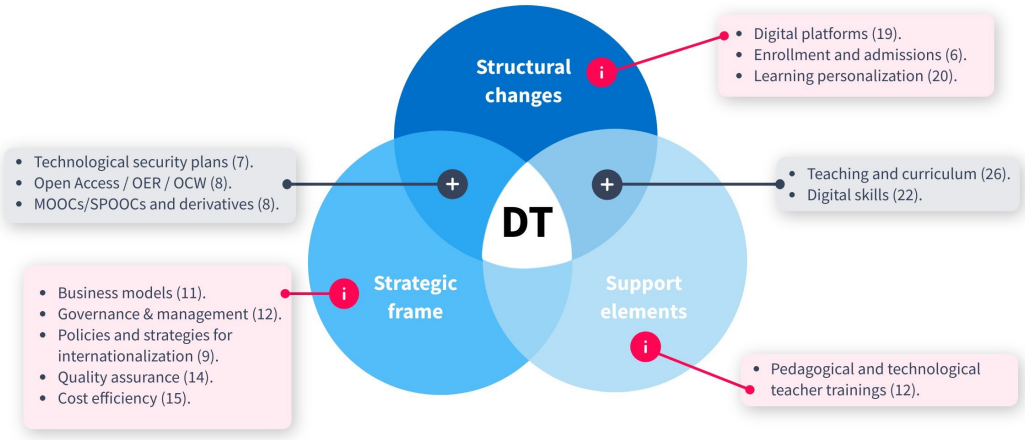
The following infographic (Figure 4) shows how the previous dimensions and groupings would be combined according to levels of importance identified in the analyzed articles.

Figure 4
Digital transformation: dimensions and groupings.

Note: Original source.

In each of the aforementioned groupings [G1/G2/G3], we have also identified different thematic categories. The following table shows the distribution of some of the most recurrent themes in the 26 analyzed articles. The following image shows the intersections between the groups and the themes, indicating the number of related articles in each category:

Figure 5
Categories for digital transformation and number of articles.



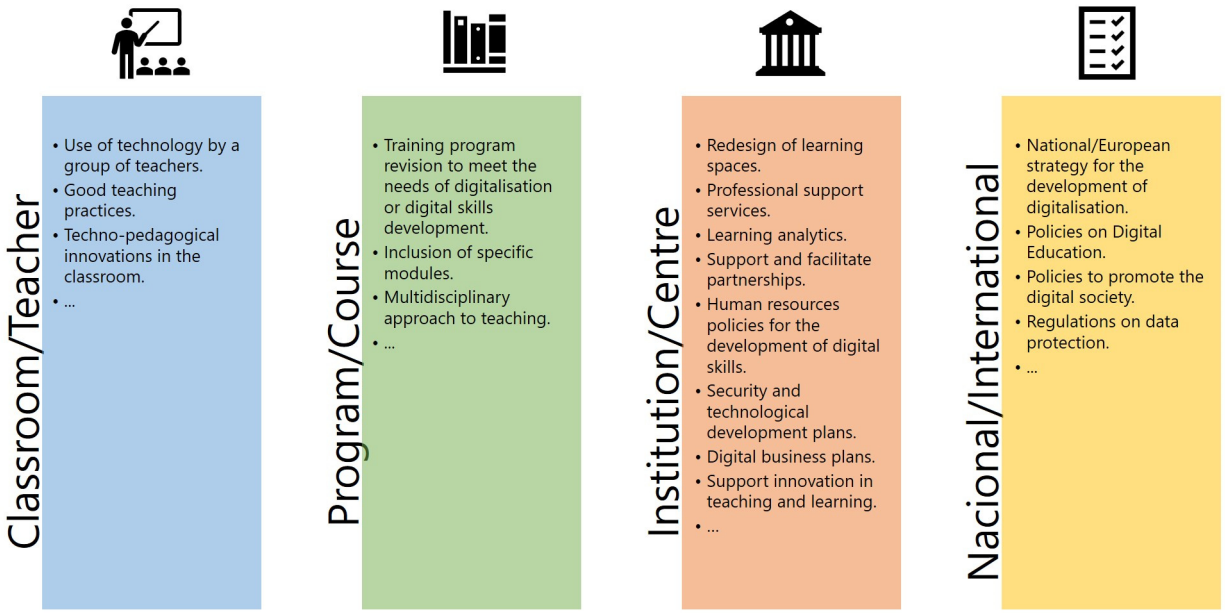
Note: Original source.

3. Level of implementation of digital transformation

As would happen in any organization, and higher education institutions are no exception, a process of digital transformation may involve different levels of implementation, from a macro to a more micro level (Arnold & Sangrà., 2018; Hanelt *et al.*, 2021; Johnston *et al.*, 2018). Other frameworks refer to these same levels of implementation using different terms: individual, institutional, and social (Loebbecke & Picot., 2015).

Our proposed analysis suggests a first categorization of the 26 publications based on the level of impact of the expressed digitization process, ranging from the micro level (Classroom/Teacher, Program/Course) to the macro level (National/International), passing through the meso level (Institution/Center):

Figure 6
Levels of implementation of digital transformation

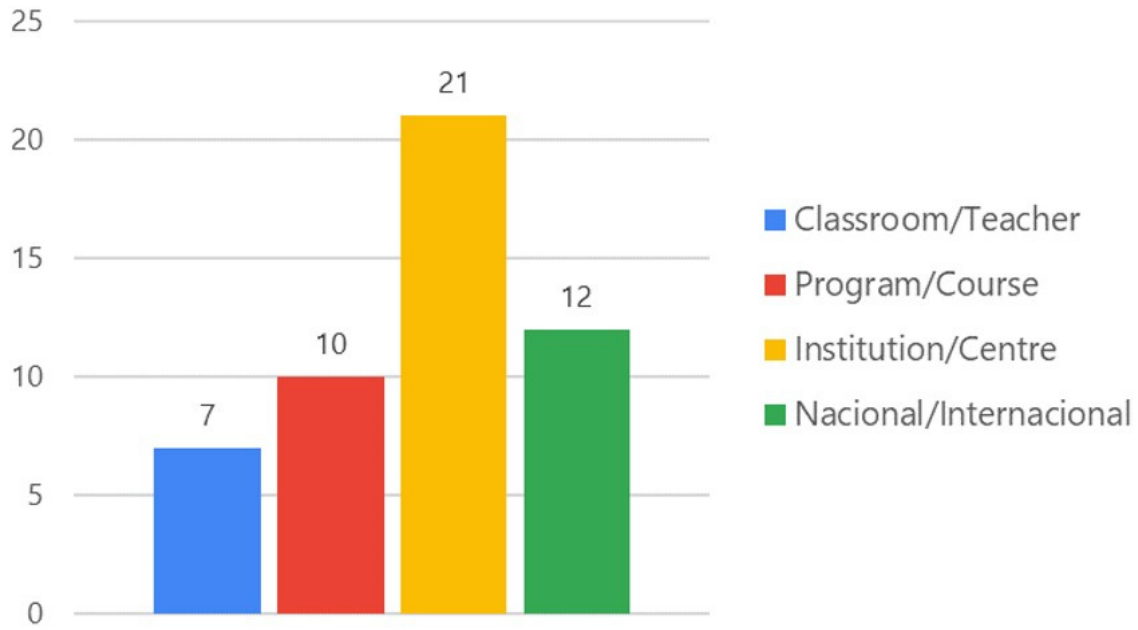


Note: Original source.

The first three represented levels (Classroom/Teacher, Program/Course, and Institution/Center) correspond to the different levels of technology adoption defined by Graham *et al.* (2013). They describe a gradation from a more exploratory and introductory level, limited in risks and without institutional support; evolving towards a more mature implementation with full institutional support.

If we analyze the 26 articles according to these levels (considering that the same article may involve more than one reference level), the results obtained are shown in the following graph (Figure 7):

Figure 7
Levels of implementation identified in the articles



Note: Original source.

Below, each of the levels and the relationships found are described in more detail:

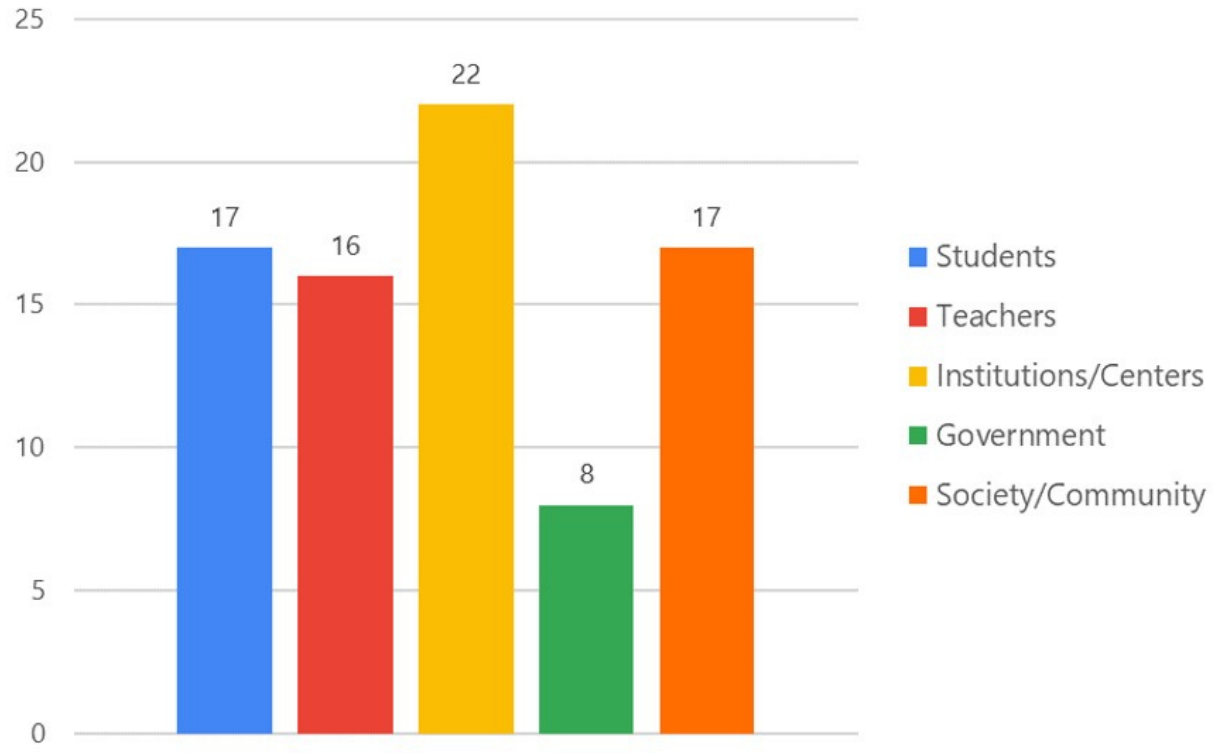
- **Classroom/Teacher:** In these cases, institutional support is limited, and teachers, individually or in small groups, explore ways in which they can digitize teaching and learning processes. Under this definition, we have identified 7 references (27%). Only 1 of them focuses on proposals at the Classroom/Teacher level, with the Institution/Center being the most referenced (71%).
- **Program/Course:** It includes value proposals related to the review and creation of programs or courses adapted to the needs of our digital society. In this category, 10 references (38%) have been identified, 8 of them projected at the Institution/Center level, 3 at the National/International level, and 3 at the Classroom/Teacher level.
- **Institution/Center:** This third level is characterized by the adoption of digital transformation actions at the institutional level and experimentation with policies and practices to support the development and growth of digitization. The number of references assigned to this level is the highest of all, with 21 (81%). Like in the previous levels, the number of articles solely assigned to this level is reduced to 4. The rest of the references combine recommendations and implementation proposals at other levels, mainly at the Program/Course (38.10%) and National/International (47.62%) levels.
- National/International: This last level is characterized by the definition or specification of policies and recommendations for the promotion and development of digitization in the

higher continuing education sector. In this category, we find 12 references (46%), with 2 solely assigned to this level, while 10 are combined with the Institution/Center level.

4. Actors

Every digital transformation process in the educational context, besides considering the use of technology, involves taking into account different actors, promoters, and/or recipients of the transformation process itself. In our analysis context, the following actors have been identified:

Figure 8
Actors involved in digital transformation processes.



Note: Original source.

As shown in the preceding graph (Figure 8), the main actors are "Institutions/Centers," followed by the group of "Students," "Society/Community," and "Teachers." In the last position would be the "Government."

These data reinforce the results obtained previously, with 85% of the articles again focused at the Institutional/Center level. In all articles in this block, the need for institutional-level changes is defined to:

a) Promote teaching and curriculum improvement by applying innovative methods (100%).

b) Ensure the development of digital skills (86.36%).
c) Offer training proposals based on personalized or individualized learning (77.27%).
d) Implement digital platforms (72.72%) that enable self-directed learning (68.18%).
e) Reduce costs in existing traditional models and be more efficient by improving management (59.09%).
f) Ensure the quality of digitized services (54.54%).
g) Institutionalize support services and training for teachers and students (40.91%).

To a lesser extent, institutional approaches are also found regarding the need for policies and strategies related to internationalization, the use of Open Access resources, or the implementation of the Sustainable Development Goals 2030 (SDGs).

When examining the involvement of students (65.38%), it primarily relates to the challenge that continuing education institutions face in training them in competencies (100%) to meet the needs of a digitized society. To achieve this, the use of various digital platforms is proposed (76.47%), employing innovative methods and tools (100%) that allow for personalized experiences (88.24%) and the promotion of self-directed learning (58.82%), without compromising on the quality provided (47.06%).

The same applies to teachers (61.54%), as they are responsible for promoting adequate training in digital competencies and innovating both in curriculum and methodology (100%), while also maintaining the quality of education (56.25%); performing their duties in digital environments (81.25%). This requires them to develop the necessary methodological and digital competencies through their own training/updating (68.75%).

At the level of society/community as actors (65.38%), the need to review teaching methodologies and existing curricula, adapting them to societal expectations by leveraging the benefits offered by digitization (100%) emerges again as relevant. We particularly highlight the need for digitally competent citizenship (82.35%). At the level of higher continuing education, there is also a demonstrated need to maintain close alliances between higher education institutions and companies or productive agents in society (29.41%), given their relationship with the curriculum (as providers of information on training needs or as facilitators of the necessary environments for their development, whether platforms or practices).

Finally, we only found 8 articles (30.77%) where the direct influence of governments is explicitly indicated as promoters, promoting policies that foster lifelong learning (100%) or the necessary technological infrastructure (75%). These policies may also extend to aspects related to MOOCs - Massive Open Online Courses (37.5%) or intellectual property protection (25%).

Conclusions

The analysis conducted has shown that digital transformation is a complex and multidimensional process, which encompasses dimensions (technological, organizational, and social), multiple

categories (business models, governance and management; support elements; technological environment and platforms, open educational resources, digital competencies, curriculum, teaching and learning processes, or enrollment, among others), and levels of development, ranging from the micro level (Classroom/Teacher, Program/Course) to the macro level (National/International), passing through the meso level (Institution/Center).

In this complexity, the Institution/Center level emerges as the one that garners the most interest with the highest number of referenced articles (Figures 5 and 6). With 81% of the 26 analyzed articles, there is a greater interest in surpassing the Classroom/Teacher and Program/Course levels and establishing a more mature and institutional implementation of digitization processes through the definition of policies and strategic plans that affect different elements within an institution.

As we have been discussing, transformation poses an organizational and cultural change that even affects the business model linked to lifelong learning (Castro *et al.*, 2020; Hanelt *et al.*, 2021; Rodrigues, 2017; Tekic & Koroteev,, 2019). These new business models must be capable of generating value in a digitized society, thereby keeping the third mission of higher education institutions relevant: social commitment (*Carrión, 2018*; Rojas *et al.*, 2018). Some authors even argue that higher education institutions should be leading this change, which they define as cultural (Branch *et al.*, 2020).

As observed in the analyzed articles, for the majority, the concept of adding value is conceived as the need to ensure the development of digital competencies, personalized learning, and the institutionalization of support and training services for both students and teachers. Under this vision, it is logical to consider the revision of educational programs and include the use of technology and the development of competencies in isolation. However, this approach proves to be ineffective and unsustainable. From our perspective, we believe that this process of generating value in a highly digitized society involves elements beyond the program or digital competencies (Branch *et al.*, 2020; Castro *et al.*, 2020).

Similarly to any organization undergoing digital transformation, for a higher education institution, this process also entails structural, technological, and cultural changes; changes in strategy and policies; processes, operations, and services (Gill *et al.*, 2016; Ifenthaler & Egloffstein, 2020; Newman, 2017; Reis *et al.* 2018; Venkatraman, 2017). However, considering its differential value as a continuing education institution, we believe that to achieve this, it should (a) implement innovative teaching practices, (b) offer flexible and customizable training proposals, focusing on the student (c) through digital technologies that enable (d) self-directed learning models; while aiming to (e) improve efficiency in management through agility and cost reduction, always assessing (f) user experience and the quality of services once digitized. All these listed elements have been identified in other studies on digital transformation in higher education institutions (Branch *et al.*, 2020; Castro *et al.*, 2020; Kane *et al.*, 2015; Matt *et al.*, 2015; Mohamed *et al.* 2021; Rodrigues, 2017; Shaughnessy, 2018).

On the other hand, we cannot forget that 46% of the analyzed articles referred to the need to

incorporate the National/International perspective. In this context, we encounter different approaches such as: a) the need for regulations on elements like data handling, b) the promotion of a digital culture and/or society in a globalized context, or c) promoting national and international cooperation among different actors (educational institutions, productive sectors of society, governments, among others).

Based on all the aforementioned points, and as a final conclusion, it is evident that digital transformation processes cannot be attributed to a single dimension, category, or level of implementation. In the context of continuing education developed by higher education institutions, this process must continue to be implemented and researched from a more institutional approach, with the existence of necessary policies and strategies, both at the national and international levels, and the activation of plans that allow the generation of new business models focused on improving the student experience, teacher training, and the development of a true digital culture.

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Conflicts of Interest

The authors wish to inform that there are no conflicts of interest associated with the current study, nor does the research involve human participants requiring informed consent.

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Educational methodologies based on Maturana and Varela's theory of knowledge for teaching natural sciences

Metodologías educativas desde la teoría del conocimiento de Maturana y Varela para enseñanza de las ciencias naturales

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Abstract

The study arises in response to the low performance and lack of interest of students in physics, chemistry and biology. Observing that natural science teachers focus on rigid and traditional methodologies, disconnected from the reality of the students. The objective was to analyze the possibilities offered by Maturana and Varela's theory of knowledge for the development of educational methodologies in the teaching of natural sciences. The socio-critical paradigm and participatory action research were used, with diagnosis, planning, implementation and evaluation phases, carried out with 5th year students in the three subjects, collecting data from 12 teachers and students. The study concludes that the methodology based on the theory of knowledge positively impacts the performance and motivation of students. The information obtained guides transformations in educational practices, revitalizing the teaching of natural sciences and strengthening student commitment in these disciplines.

Palabras claves: Tools, Moodle Platform, Teacher Challenges and technologies.

Resumen

El estudio surge como respuesta al bajo rendimiento y falta de interés de los estudiantes en física, química y biología. Observándose que los docentes de ciencias naturales se centran en metodologías rígidas y tradicionales, desvinculadas de la realidad de los estudiantes. El objetivo fue analizar las posibilidades que ofrece la teoría del conocimiento de Maturana y Varela para el desarrollo de metodologías educativas en la enseñanza de las ciencias naturales. Se empleó el paradigma socio-crítico y la investigación acción participativa, con fases de diagnóstico, planificación, implementación y evaluación, ejecutándose con estudiantes de 5to año en las tres asignaturas, recopilando datos de 12 docentes y estudiantes. El estudio concluye que la metodología basada en la teoría del conocimiento impacta positivamente el rendimiento y la motivación de los estudiantes. La información obtenida orienta transformaciones en prácticas educativas, revitalizando la enseñanza de ciencias naturales y fortaleciendo el compromiso estudiantil en estas disciplinas.

Palabras clave: metodologías educativas, teoría del conocimiento, ciencias naturales.

Introduction

Throughout history, mankind has persisted in a constant quest for knowledge, and ancient literature, such as the Bible, offers a fascinating perspective on humanity's early attempts to understand the world around them. The Reina Valera (1960) version of the book of Genesis 3 provides an illustrative example of this ancient inquiry.

> 4 And the serpent said to the woman, "You will not surely die. 5 For God knows that in the day you eat of it your eyes will be opened, and you will be like God, knowing good and evil." 6 So when the woman saw that the tree was good for food, that it was pleasant to the eyes, and a tree desirable to make one wise, she took of its fruit and ate. She also gave to her husband with her, and he ate.

Synthesizing the previous ideas, it can be observed that, in the verses of Genesis, it explores how the first human beings faced the temptation to acquire knowledge, symbolized by the act of eating from the tree of the knowledge of good and evil. This narrative not only sheds light on the origins of human knowledge-seeking but also raises fundamental questions about the relationship between the pursuit of knowledge and ethics.

Thus, by examining the roots of this concern in ancient literature, a window is opened to understanding the human motivations behind the quest for knowledge throughout time. From an educational perspective, the Genesis narrative highlights the importance of seeking a balanced knowledge that is intimately linked to ethics. The serpent's promise that, by eating from the tree of knowledge, humanity would attain wisdom and be "like God, knowing good and evil," suggests the intrinsic connection between knowledge and the ability to discern between right and wrong.

From the standpoint of the author of this work in the educational field, this story can be interpreted as a reminder of the need for a balanced approach in the acquisition of knowledge. It is not simply about seeking knowledge for its own sake but understanding how that knowledge relates to ethics and morality. The emphasis is on cultivating an ethical awareness alongside the pursuit of knowledge.

While from a philosophical perspective, it suggests that effective education is not just about accumulating information but also about fostering the ability to discern and apply that knowledge ethically. Educators have a responsibility to guide students toward a comprehensive understanding that enriches not only their minds but also develops their ethical discernment.

In this line of thought and trying to contextualize the central theme of this study, a summary is made from the perspective of the researcher to the book "The Tree of Knowledge: The Biological Roots of Human Understanding" by Humberto Maturana and Francisco Varela. It is inferred that this text stands out as a fundamental work in the biology of knowledge. The authors propose an innovative theory that challenges the traditional notion that knowledge is a direct copy of reality. Instead, they argue that knowledge is an emergent construction of the continuous interaction between an organism and its environment, where cognitive structures are generated through biological processes (Maturana & Varela, 1990).

Likewise, Jové (2022) considers that this approach has significantly impacted the understanding of knowledge and has permeated various fields of knowledge. Particularly in understanding the notion of this work "the tree of knowledge," it can influence education by altering the perspective on learning, as Maturana and Varela's proposed theory suggests that learning is not simply the accumulation of information but an active process of knowledge construction.

Therefore, Parada (2023) considers that this paradigm shift has stimulated new educational methodologies, emphasizing active student participation, collaborative knowledge construction, and reflection on educational practice. Furthermore, this text allows the author of this study to deduce that this book represents a contribution to improving the quality of education by inspiring educational policies that seek to raise standards. Hence, the researcher considers that this book can

contribute to the understanding of learning as knowledge construction and drive changes in how educational policies are approached, promoting more dynamic and participatory

According to Ortiz (2015), in the educational context, this implies recognizing and fostering students' ability to generate their own understandings, rather than simply receiving information passively. According to Obando & Galviz (2023), these methodologies should aim to create environments where students can identify themselves and others, thus promoting a deeper understanding of themselves and the world around them.

In the view of Rodríguez & Torres (2003), educational processes in the classroom should be directed towards the collaborative construction of knowledge, fostering interaction and dialogue among students. The emphasis on reflection on educational practice suggests that educators should be facilitators who guide and support the learning process, rather than mere transmitters of information.

Considering the ideas of the aforementioned authors, the researcher believes that an approach of innovative educational methodologies from the theory of knowledge of Maturana and Varela drives a profound change in how we conceive teaching and learning. It is about empowering students as active constructors of their knowledge, promoting recognition, collaboration, and reflection in a dynamic and participatory educational environment.

In this line of thought, Ruiz & Abad (2019) consider that innovative educational methodologies play a fundamental role in improving and adapting the educational process. Their importance lies in their ability to respond to the individual needs of students, offering a personalized approach that recognizes diversity in learning styles.

According to De La Aldea (2019), by stimulating critical thinking, these methodologies go beyond memorization, promoting deep understanding and active application of knowledge. Furthermore, they cultivate creativity by challenging students to approach problems from various perspectives, fostering original solutions and preparing them to face real-world challenges.

For Arnold *et al.* (2011), an important aspect of these methodologies is their emphasis on collaborative learning, reflecting the importance of teamwork and communication skills in social and work environments, as integrating practical and contextualized approaches prepares students to apply their knowledge effectively. Likewise, motivation and engagement are increased through dynamic and engaging approaches, using educational technology and promoting active participation.

Finally, Correa-Díaz *et al.* (2019) point out that the constant updating of these methodologies contributes to keeping education relevant and equips students with relevant skills in an ever-evolving environment. Together, innovative educational methodologies are essential for providing comprehensive education and preparing students for success in contemporary society.

Therefore, di Pasquo *et al.* (2020) highlight that the application of educational methodologies from the perspective of Maturana and Varela's theory of knowledge for teaching natural sciences

represents an innovative and transformative approach in the educational field since this theory, known as the biology of knowledge, contends that knowledge is not a direct copy of reality but an active construction that arises from the interaction between the organism and its environment.

According to Méndez (2018) and Mendoza & Godoy (2016), based on this foundation, educational methodologies focus on promoting students' active participation in constructing their own knowledge. Significant learning is promoted, where students not only absorb information but also engage in practical experiences that allow them to build their understanding of natural sciences. Additionally, Toro & Vega (2021) argue that applying this theory in teaching natural sciences involves designing activities and resources that stimulate curiosity, exploration, and questioning. The aim is to create an educational environment that reflects the complexity and interconnectedness of natural phenomena, enabling students to develop a deep and contextualized understanding.

In the view of Jové (2022), it is important that educational processes in biology align with the principles of Maturana and Varela's theory of knowledge, as these authors propose adaptability and flexibility in the application of these methodologies, thus allowing for a dynamic response to the specific needs and characteristics of students, promoting active and meaningful learning in the fascinating world of natural sciences.

Considering the aforementioned approaches, this study focused on analyzing the possibilities offered by Maturana and Varela's theory of knowledge for the development of educational methodologies in teaching natural sciences.

Metodology

The study aims to improve the processes of teaching natural sciences, so it was proposed to analyze the possibilities offered by Maturana and Varela's theory of knowledge for the development of educational methodologies in the teaching of natural sciences. It should be noted that the study initially targeted 12 teachers from the natural sciences area as they are responsible for the teaching processes. They were presented with the action plan to implement it in their physics, chemistry, and biology classes, selecting a section of 36 students from three sections A, B, and C of the José Antonio Almarza Educational Unit in the Zulia state, Mara municipality. In this regard, the initial step was the teaching action aimed at consolidating the understanding of texts according to the interests and needs of the learner.

In reference to this, an action plan was designed that started from a diagnosis, which was carried out to obtain information about the real needs in the teaching of natural sciences. Therefore, it was necessary to gather information in its real context. In this sense, it worked through the feasible project modality, so an operational model was developed to provide a solution to the problem studied (Hurtado, 2015).

Hence, the procedures of the Participatory Action Research (PAR) method were adopted, which is defined by Rojas (2002) as a methodological approach that combines social research with social action. It is an iterative process in which researchers and participants work together to identify and

solve social problems. Similarly, for Flores (2021), it is a methodological approach that integrates research and action with active participation of those involved in the process. According to Ansoleaga (2019), it focuses on addressing specific problems in practical contexts through collaboration between researchers and community members.

According to Scribano (2007), this research method (PAR) is linked to field design, which was developed systematically and orderly, through several phases that contributed to achieving the proposed objectives. In this regard, in the context of analyzing the potential applications of Maturana and Varela's theory of knowledge in the design of educational methodologies for teaching natural sciences, Participatory Action Research (PAR) is deployed according to Ansoleaga's (2019) criterion as follows:

In the diagnosis stage, researchers and participants collaborated to identify difficulties in learning natural sciences through observation methods and interviews. This phase included reflection, that is, jointly analyzing the results of the diagnosis. Through the planning stage, they worked together to develop an action plan aimed at addressing the identified problems. This plan incorporated new educational strategies aligned with Maturana and Varela's theory of knowledge.

Likewise, the execution of the plan was considered, which was carried out in stages, where researchers and participants would collaborate in the design and implementation of specific educational activities. Finally, the evaluation phase, which involved reviewing and analyzing the results of the action plan, using observation methods and interviews. This allowed analyzing changes in student learning through discussion groups or workshops, thus closing the PAR cycle. Therefore, it is important to note that the effectiveness in teaching natural sciences will be evaluated through the performance of the students, so the diagnosis starts from their reality.

Table 1
Initial teacher diagnosis of the situation in light of the thematic concern

Diagnosis of the teaching-learning process in natural sciences among fifth-year students at José Antonio Almarza High School.	
Objective	Identifying the possible causes of the lack of effectiveness in the teaching strategies of natural science teachers.
Methods	Gathering information on the following aspects: • Learning objectives. • Teaching strategies. • Student participation. • Student attitudes.
Guiding Questions	• What are the learning objectives that natural science teachers are trying to achieve? • Are these objectives clear and measurable? • What teaching strategies are natural science teachers using? • Are these strategies suitable for the learning objectives? • How are students participating in the classes? • Are students engaged in learning activities? • What are the attitudes of students towards natural sciences? • Are students motivated to learn natural sciences?

Results	• Learning objectives may be too vague or difficult to achieve. • Teaching strategies are not suitable for the learning objectives. • Learning activities are not engaging or challenging for the students. • The teachers are unable to motivate students or create a positive learning environment.
Conclusions	It is necessary to examine the learning goals to ensure their clarity and measurability. Appropriate pedagogical tactics should be chosen in line with these objectives. Likewise, educational activities that are engaging and challenging for students need to be conceived. Additionally, it is imperative to cultivate motivation skills and foster the creation of a positive learning environment.

Note: Own elaboration (2024).

Natural science educators exhibited deficiencies that impacted the effectiveness of their teaching methods. Among the fundamental causes, the lack of precision in learning objectives stands out. The clarity and measurability of these objectives are essential for planning suitable teaching strategies. If the objectives are ambiguous or difficult to achieve, it is likely that the strategies will be ineffective.

Likewise, another determining factor that was evidenced was the use of inadequate teaching strategies. These strategies must be properly aligned with the learning objectives to ensure the effectiveness of the process. The inadequacy of the strategies leads to a deficiency in the acquisition of concepts or skills by students.

Additionally, the design of unattractive or unchallenging learning activities also emerges as a prominent cause. These activities must captivate and challenge students to maintain their motivation and commitment to learning. If the activities lack these elements, students are likely not to actively participate in the educational process.

Furthermore, the lack of skills in motivation and creating a positive learning environment by teachers is revealed as a crucial element. Educators must be able to inspire students and foster a positive environment to stimulate the desire to learn. The absence of these skills can result in a lack of motivation on the part of students. It is imperative that natural science teachers recognize these causes and strive to refine their teaching strategies.

Table 2
Diagnosing the students

Diagnosis of the teaching-learning process in natural sciences among fifth-year students at José Antonio Almarza High School.	
Objective	Identifying the difficulties that 5th-year students at José Antonio Almarza High School have in learning natural sciences.
Methods	• Observation: The researchers observed the natural science classes of 5th-year students at José Antonio Almarza High School for one week. • Interviews: The researchers interviewed 10 5th-year students at José Antonio Almarza High School.

Guiding Questions	What are the knowledge and skills that students should acquire in natural science classes? What are the teaching and learning strategies used in natural science classes? What are the attitudes of students towards natural sciences?
Results	• The diagnostic results indicate that 5th-year students at José Antonio Almarza High School struggle to learn natural sciences. These difficulties can be classified into three main categories: • Lack of prior knowledge: Students have difficulties understanding complex scientific concepts because they lack the necessary basic knowledge and skills. For example, students struggle to grasp the concept of evolution because they lack basic knowledge of genetics. • Inadequate teaching strategies: The teaching strategies used in natural science classes are not suitable for the students' needs. For instance, teachers often employ teacher-centered teaching strategies, which limit students' active participation. • Negative attitudes towards natural sciences: Students hold negative attitudes towards natural sciences, which may hinder their learning. For example, students perceive natural sciences as boring or challenging.
Conclusions	• The diagnostic results indicate the need to implement changes in the teaching of natural sciences at José Antonio Almarza High School to address the difficulties students face in learning this content. These changes should focus on the following aspects: • Strengthening students' prior knowledge: Teachers should provide students with the necessary basic knowledge and skills to understand complex scientific concepts. • Using student-centered teaching strategies: Teachers should employ teaching strategies that encourage active student participation. • Fostering positive attitudes towards natural sciences: Teachers should create a positive and stimulating learning environment that motivates students to engage with natural sciences.

Note: Own elaboration (2024).

The results obtained from the diagnosis (which was completed with both a written and oral examination, by subject area) indicate that fifth-year students at José Antonio Almarza High School face significant challenges in learning natural sciences, categorizing these difficulties into three primary categories. Firstly, the lack of prior knowledge is highlighted, revealing that students struggle to comprehend complex scientific concepts due to a lack of fundamental knowledge and skills. An illustrative example is the difficulty in understanding the concept of evolution, attributed to a lack of basic knowledge in genetics. Another relevant aspect is the inadequacy of teaching strategies employed in natural science classes, which fail to meet the specific needs of students. A notable example is the preference for teacher-centered strategies, which limit active student participation in the learning process.

Additionally, the existence of unfavorable attitudes towards natural sciences among students is identified, which may constitute a barrier to their learning process. For instance, the perception that natural sciences are boring or difficult contributes to creating a negative predisposition towards the subject. These findings underscore the need to comprehensively address these issues to improve the quality of learning at José Antonio Almarza High School.

Activity Planning

The results of the diagnosis provided insights into the weaknesses in teaching natural sciences. Based on this information, two action plans were developed: a general one and a specific one.

These plans were designed to be implemented over the course of one school term (3 months), in collaboration with natural science teachers.

Table 3
General Action Plan

Concept	Activity	Objective	Example
Direct observation of autopoietic systems, such as cells or ecosystemss	Understanding how autopoietic systems produce their own conditions of existence.	Autopoiesis In a biology class, students can observe an aquatic ecosystem, such as a pond or a lake. They can record their observations, such as the different types of plants and animals living in the ecosystem, and then analyze their observations to identify the relationships between these organisms.	Understanding the complexity of ecosystems. Developing observation and analysis skills. Promoting environmental awareness.
Analysis of how humans identify themselves and others.	Understanding how recognition influences the construction of knowledge.	Recognition In a history class, students can analyze how scientists from different cultures have developed various theories about the universe. They can discuss how these theories have been influenced by the beliefs and values of different cultures.	Understanding the importance of cultural context in the construction of scientific knowledge. Developing critical analysis skills. Fostering respect for cultural diversity.
Exploration of how humans construct cognitive structures to interpret and understand the world.	Understanding how cognitive structures influence the construction of knowledge..	Cognitive structures In a physics class, students can discuss how scientific theories evolve as new information emerges. They can analyze how new theories build upon existing ones but also introduce new concepts and ways of thinking.	Understanding the dynamic nature of scientific knowledge. Developing critical thinking skills. Fostering scientific curiosity.
Analysis of how knowledge is constructed from experience.	Understanding how knowledge is always contextual and relative.	Knowledge In a social sciences class, students can analyze how different cultures have developed diverse knowledge about nature. They can discuss how this knowledge has been based on the experiences of different cultures with the natural world.	Understanding the dynamic nature of scientific knowledge. Developing critical thinking skills. Fostering scientific curiosity.

Note: Own elaboration (2024).

These activities were tailored to the educational level of fifth-year high school students and various topics in the natural sciences. Their aim was to promote active student participation in the learning process, collaborative knowledge construction, and reflection on educational practice.

In this regard, in the physics class, students were invited to observe a pendulum in motion. They recorded data on the pendulum's movement and then analyzed it to identify the laws governing its motion. This activity also promoted active student participation in the learning process, as students collected their own data and analyzed it. At the same time, they compared observations and conclusions with their peers.

Meanwhile, in the biology class, students were invited to work in groups to conduct research on a coral reef ecosystem. They collected information on the different components of the ecosystem and then analyzed it to identify the relationships between these components. This activity promotes active student participation in the learning process, as students must research and analyze information. Additionally, it fosters collaborative knowledge construction, as students must work together to collect and analyze information.

Similarly, in the chemistry class, students were invited to conduct an experiment to investigate the behavior of a chemical substance. They recorded data from the experiment and then analyzed it to identify the properties of the chemical substance. This activity promotes active student participation in the learning process, as students must design and conduct the experiment. Additionally, it fosters collaborative knowledge construction, as students can share their observations and conclusions with their peers.

Based on the above, a series of activities were proposed as part of the action plan to be implemented with fifth-year students.

Table 3
General Action Plan

Area	Activities	Objective	Materials	Procedures
Biology	Research on a biological phenomenon.	Linking Learning to Students' Experiences.	Paper and Pencil for the Students. A Biological Phenomenon to Investigater.	The teacher presents the biological phenomenon to the students. The students present the results of their investigation in class. The students divide into groups to investigate the phenomenon. The students conduct the investigation in the classroom or in the field.
	Design of a Biological Experiment.	Linking Learning to Students' Experiences.	Paper and Pencil for the Students. A Biological Phenomenon to Investigater.	The teacher presents the biological phenomenon to the students. The students present the results of their investigation in class. The students divide into groups to investigate the phenomenon. The students conduct the investigation in the classroom or in the field.

Area	Activities	Objective	Materials	Procedures
Biology	Creation of a Biological Model	Fostering Understanding of Scientific Concepts.	Materials for Creating the Model	The teacher presents a scientific concept to the students. The students divide into groups to create a model of the scientific concept. The students present their models to the rest of the class.
Physics	Reconstruction of a Physical Experiment	Promoting the Understanding of Scientific Concepts.	Materials for Conducting the Experiment	The teacher presents a scientific problem to the students. The students work in groups to design a project to solve the problem. The students carry out the project. The students present the results of their project to the class.
	Design of a Scientific Project	Promote Active Student Participation in the Learning Process	Materials for Conducting the Project	The students work in groups to develop a scientific project. The students present their projects at a science fair.
	Participation in a Science Fair	Linking Learning to Students' Experiences	Materials for the Project	The teacher presents the chemical reaction to the students. The students divide into groups to investigate the reaction. The students conduct the investigation in the classroom or in the laboratory. The students present the results of their investigation to the class.
Chemical	Investigation of a Chemical Reaction	Linking Learning to Students' Experiences	Paper and pencil for the students. A chemical reaction to investigate.	The teacher presents the chemical reaction to the students. The students divide into groups to investigate the reaction. The students conduct the investigation in the classroom or in the laboratory The students present the results of their investigation to the class.
	Design of a Chemical Experiment	Promoting Active Student Participation in the Learning Process.	Materials for Creating the Model.	The teacher presents a scientific problem to the students. The students divide into groups to design an experiment to solve the problem. The students conduct the experiment. The students analyze the results of the experiment.
	Creation of a Chemical Model	Promoting the Understanding	Materials for Creating the Model.	The teacher presents a scientific concept to the students. The students divide into groups to create a model of the scientific concept. The students present their models to the rest of the class.

Note: Own elaboration (2024).

Implementation Phase

This phase was linked to the execution and observation of participant attitudes when initiating, developing, and concluding strategies for teaching natural sciences. In other words, the proposed phases before, during, and after were taken into account. Therefore, understanding how autopoietic systems produce their own conditions of existence involved exploring the mechanisms that allow them to generate and maintain their own internal structures and processes. The main objective of this activity was to expand participants' understanding of the self-organization and self-perpetuation of complex systems, exploring the dynamics that underpin their autonomous existence.

Likewise, recognition was addressed as a fundamental component in knowledge construction, seeking to understand how the act of recognition, both individually and collectively, significantly influences the formation and evolution of knowledge. This activity aimed to explore the connections between perception, recognition, and active construction of understanding in various contexts. Meanwhile, understanding how cognitive structures influence knowledge construction was a relevant focus, as it explored the patterns and cognitive processes underlying the assimilation, interpretation, and application of information, highlighting the importance of cognitive structures in how knowledge is constructed and organized.

Similarly, the notion that knowledge is always contextual and relative was addressed, exploring the elements that contribute to the contextualization of knowledge and recognizing its dynamic nature and its dependence on situational factors. This activity sought to promote awareness of the relativity of knowledge and its intrinsic connection to the environment and particular circumstances. Together, these activities contributed in the past to a deep exploration of cognitive processes, recognition, and self-generation of systems, fostering a more holistic and contextualized understanding of knowledge.

In this regard, concerning the application of strategies in the biology area, specifically with research on a biological phenomenon, the goal was to deepen the understanding of a specific aspect of life, whether at the molecular, cellular, or through more complex biological systems. This activity aimed to discover new knowledge, answer scientific questions, and contribute to the advancement of understanding in the field of biology. Likewise, the design of a biological experiment aimed to apply the scientific method to test hypotheses and validate theories. Through careful planning of variables and controlled conditions, significant data supporting or refuting the hypothesis was intended to be obtained. This process not only contributed to scientific research but also developed skills in experimental design and critical analysis.

Therefore, the creation of activities in the biology subject involved the conceptual or physical representation of a specific biological system. It was used to simulate biological processes, understand relationships between different components, or predict behavior under specific conditions. Through the activities, the aim was to provide a tool that facilitated the understanding and study of biological phenomena in a more accessible and visual way. These activities were implemented over the course of a month.

Regarding activities in the physics area, researching the reconstruction of a physics experiment aimed to deepen understanding of specific physical phenomena by recreating and analyzing previous experiments. This activity's main objective was to obtain a more detailed understanding of the physical principles involved, as well as to improve the research and analysis skills of the participants. The design of a scientific project involved formulating and executing a structured plan to investigate and address specific scientific questions. This activity aimed to foster creativity and the practical application of scientific knowledge, promoting the development of skills in experimental design, data analysis, and clear and coherent presentation of results. It's worth noting that these activities were worked on consecutively over the course of a month.

Additionally, participation in a science fair represented an opportunity to communicate and share the results of research and scientific projects with a wider audience. This event not only aimed to highlight individual achievements but also to encourage interaction and exchange of ideas among participants and the scientific community at large, promoting interest and appreciation for science. Together, these activities sought to cultivate scientific thinking, independent research, and the ability to effectively communicate scientific findings.

In relation to the chemistry area, the activities were implemented over the course of one month. Regarding the topic of chemical reactions, the aim was to deepen understanding of specific chemical processes through analysis and detailed exploration of these reactions. This activity's main objective was to expand participants' knowledge about the principles and mechanisms governing chemical reactions, thus promoting a deeper understanding of the world of chemistry. Likewise, in the design of a chemical experiment, in the past, a structured plan was formulated and executed to investigate and explore specific scientific questions related to chemical reactions. This activity aimed to foster creativity and the practical application of chemical knowledge, developing skills in experimental design, data analysis, and precise and coherent presentation of results.

Finally, the creation of a chemical model in the past involved the conceptual or physical representation of a specific chemical system. This model was used to simulate chemical processes, understand relationships between different components, and predict behavior under specific conditions. The activity aimed to provide a tool that facilitated the understanding and study of chemical phenomena in a more accessible and visual way. Together, these activities contributed to cultivating scientific thinking, independent research, and the ability to apply and effectively communicate the knowledge acquired in the chemical field.

Evaluation Phase

This phase allowed the researcher to interpret, explain, and draw conclusions from the activities carried out. This evaluation was conducted to analyze the possibilities offered by Maturana and Varela's theory of knowledge for the development of educational methodologies in natural science teaching. After applying each phase and especially fulfilling the planning of activities in the areas of biology, physics, and chemistry, new teaching criteria based on student progress

were established. Therefore, after implementing the action plan, teachers were evaluated through interviews, while students underwent a written and oral exam, which was analyzed to extract areas for improvement.

Results

The following are the emerging categories from the interviews conducted with teachers, which were interpreted in a general manner by the researcher.

Figure 1
Possibilities offered by the theory of knowledge of Maturana and Varela

Note: Semantic network Atlas Ti. Own elaboration (2024)

In Figure 1, the categories that emerged from the discourse of the interviewed teachers are shown, demonstrating that, according to them, the methodology based on Maturana and Varela's theory of knowledge benefited the educational process in various ways. Primarily, because *it places the student at the center of the learning process*. According to the natural science teachers who participated in the implementation of the action plan, placing the student at the epicenter of the educational process, in accordance with Maturana and Varela's Theory of Knowledge, implies a transformative pedagogical approach. It was observed during the activities that the students participated in the construction of their own knowledge, moving away from traditional teacher-centered approaches.

They also expressed that these activities allowed them to appreciate the innate ability of students to learn and adapt to their environment. This is because the teaching process was presented to them as a dynamic and bidirectional experience, where the student not only absorbed information but also interacted, questioned, and constructed meanings from their experiences. At the same time, the activities worked with the self-regulation and autonomy of fifth-year students,

which was decisive, as this allowed them to explore, experiment, and reflect on scientific concepts actively.

Additionally, through the activities carried out, contextualized learning was evident, where the content was linked to the students' reality and experiences. This connection with their immediate environment and daily experiences facilitated a deeper and more meaningful understanding of the topics addressed. Furthermore, interdisciplinary learning was promoted, allowing students to explore natural sciences from various perspectives and disciplines, enriching their overall understanding.

On the other hand, the teachers stated that students had a different perception of natural sciences since, by contrasting the traditional view of learning, where the teacher was seen as the provider of knowledge and the students as passive recipients of said knowledge, students themselves guided the topics of study through their participation.

All this was because, through the execution of the planned activities, students *were seen as active participants in the construction of their knowledge*. This indicates that the methodology based on Maturana and Varela's theory of knowledge emphasizes the importance of experience, *as each student participated by interacting with the world around* them, namely, with their own reality, highlighting the importance of students having opportunities to experience the world firsthand. This was done through practical activities, i.e., through experiments, projects, and field visits.

Furthermore, according to natural science teachers, *the experience gained fundamental importance* in the context of teaching biology, chemistry, and physics from Maturana and Varela's Theory of Knowledge. They began this statement by highlighting that the activities allowed for a deep understanding that learning is not an isolated process from reality but an active construction nourished by the experiences lived by the student. Additionally, they emphasized that the experience provided the meaningful context necessary for scientific concepts to gain relevance and meaning. By integrating theory with practice, students not only memorized information but also understood it through its application in real situations. This contributed to the formation of a more ingrained and applicable knowledge in everyday life.

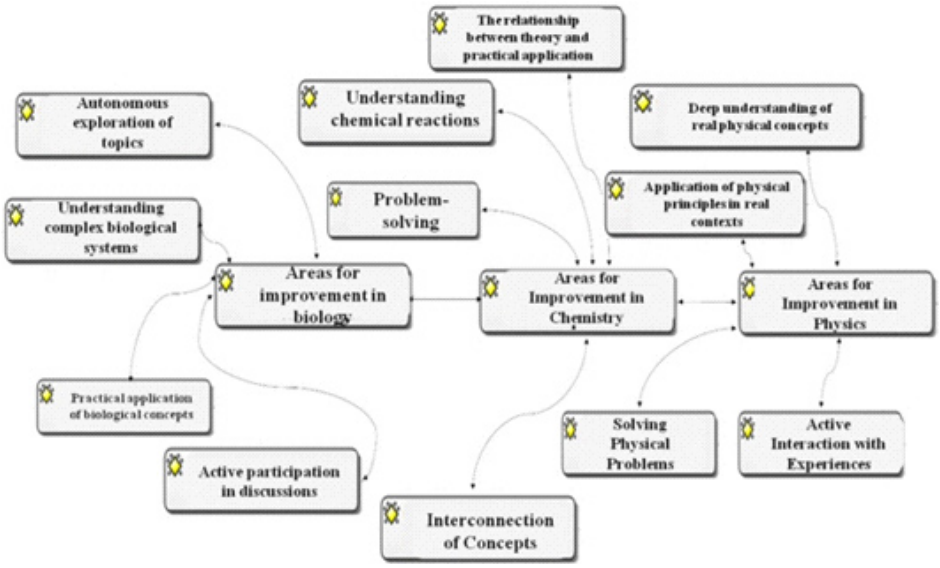
Moreover, the teachers expressed that the methodology based on Maturana and Varela's theory of knowledge promotes collaboration, *as students learn to work together.* It was observed that teamwork to solve problems and share ideas helped them provide solutions. Collaboration helped them develop critical thinking skills, problem-solving, and teamwork skills. Hence, the importance of *promoting collaboration* so that the experiences and ideas of some benefit others.

Within this framework, they also stated that methodologies based on Maturana and Varela's Theory of Knowledge foster curiosity and promote the integration of positive emotional experiences, thus activating more effective cognitive processes. Additionally, they stimulated collaborative learning, in line with the social perspective of the theory, enriching the exchange of

ideas and perspectives, contributing to a more holistic and enduring understanding of natural sciences. This methodology allowed observing that students need time to *reflect on their learning* and how it relates to their own experience. Reflection helps them better understand the knowledge they are constructing.

Now, when evaluating students in each subject (biology, chemistry, and physics), several categories related to the study objectives were extracted, which were disaggregated into the parts of each written and oral assessment:

Figure 2
Areas of improvement in the subjects of physics, chemistry, and biology



Note: Semantic network Atlas Ti. Own elaboration (2024)

Figure 2 shows the results of evaluations applied to 5th-year students during the implementation of biology activities. In this regard, students demonstrated *outstanding commitment to active participation in discussions*, as observed through oral exams, where they made efforts to be dynamic elements in the exchange of ideas. They notably showed a disposition to ask reflective questions, provide critical analysis, and foster enriching dialogue that benefited the entire group.

Regarding the *practical application of biological concepts*, this category stands out because students immersed themselves in activities and experiments that tested their theoretical knowledge. This experience allowed them not only to understand the concepts superficially but also to integrate them into concrete situations, thereby strengthening their understanding and practical skills in the biological field.

In terms of *understanding complex biological systems*, the activities led students to unravel the intricate connections between the various elements that make up these systems. It was observed

that they dedicated time to studying these interrelationships in detail and analyzing how they affect overall functioning. This meticulous approach allowed them to acquire a deeper and more holistic perspective of complex biological systems.

Another underlying category in the field of biology was the exploration of *understanding complex biological systems*, where students demonstrated a proactive attitude towards continuous learning. Their efforts to constantly seek new sources, participate in related extracurricular activities, and willingness to tackle advanced topics evidenced their commitment to expanding their knowledge in the field of biology, as well as their readiness to explore the complexities this field presents when linked to their daily lives.

When analyzing the evaluations in the area of chemistry, the following categories emerged: *problem-solving*, where students were observed to put significant efforts into developing their analytical and problem-solving skills. They also actively participated in practical exercises, showing that each activity represented a challenge for them to address complex problems and effectively apply the chemical principles learned to find precise and logical solutions.

Regarding the *understanding of chemical reactions*, which was another category extracted, it was observed that students made efforts to go beyond superficial memorization. They worked on understanding the intrinsic dynamics of reactions, identifying the factors that influence them, and applying this knowledge to predict results and explain phenomena observed in the laboratory.

Additionally, the *category of theory-application relationship emerged*, where it was evident that students sought to coherently integrate theoretical concepts with practical experiences in the laboratory. This demonstrated that their objective was not only to understand the theories behind chemical processes but also to effectively apply them in practical settings, thus strengthening their comprehensive understanding of the subject matter or topics covered.

Another category extracted was *the interconnection of concepts*, where it was observed that students worked to visualize how different chemical ideas and theories intertwine. At the same time, it was evident that they explored the relationships between various concepts, recognizing the importance of understanding how a chemical principle can influence others and how these connections contribute to a deeper and more global understanding of the discipline (chemistry).

When analyzing the physics subject, progress was evident regarding problem-solving in physics, with students showing greater effort and desire to develop their skills in addressing complex situations and deriving solutions using physical principles. As a demonstration of this, they actively participated in solving practical problems, feeling challenged by exercises requiring an analytical approach and the precise application of physical formulas and theories.

In this regard, *the application of physical principles in real contexts was presented*, where they sought opportunities to bring theoretical concepts into the tangible world. To achieve this, they engaged in each proposed activity and practical situations requiring the direct application of

physical principles in solving real-world problems, thereby strengthening their ability to link theory with concrete applications.

Regarding the *deep understanding of real physical concepts*, it was observed that they dedicated time to explore beyond the surface of basic theories. They expressed a focus on understanding fundamental and often complex physical theories at a deeper level, recognizing the broader implications and connections these theories have in the overall landscape of physics.

Finally, through *active interaction with experiments*, they sought to directly engage in the practical application of physical concepts by carrying out each proposed activity in this area (physics). Thus, it was observed that their active participation in experimental activities not only demonstrated their effort in theoretical understanding but also improved their ability to relate experimental results to the underlying physical principles, enriching their experience in the field of physics.

Discussion

When contrasting the study results with various theories, including those of Rodríguez & Torres (2003), it becomes evident that placing the student at the center of the learning process is crucial. This perspective reflects a paradigm shift towards more meaningful and autonomous learning, where students not only absorb data but also actively participate in exploring and understanding concepts.

Additionally, according to Ball *et al.* (2014) and Hernández (2009), the active participation of students in constructing their knowledge underscores the importance of involving them directly in the educational process. By assuming active roles, students not only memorize information but also develop critical skills in analyzing and applying knowledge, thereby enhancing their ability to understand and recall concepts more effectively.

In this regard, Ruiz (2008) highlights that the direct interaction of each student with the surrounding world in the learning process is fundamental for contextualizing information and giving it relevance. Maturana & Maturana (2003) indicate that this approach allows students to apply theories and concepts in practical situations, creating tangible connections between theory and reality. Practical experience enriches learning by providing a deeper and more meaningful understanding of concepts, emphasizing the importance of learning through action.

According to Maturana & Dávila (2006), collaboration and teamwork among students are fundamentally important as they reflect the reality of the work and social environment. Learning to work as a team not only develops social and communication skills but also broadens individual perspectives by integrating diverse experiences and approaches. This collaboration is valuable not only in the academic sphere but also prepares students for future interactions in the real world, as stated by Gorostiza (2021).

Bedoya (2023) emphasizes that activating more effective cognitive processes highlights the im-

portance of stimulating students' critical and analytical thinking. By promoting problem-solving, logical reasoning, and the practical application of knowledge, deeper and more lasting learning is promoted. This cognitive activation not only improves information retention but also strengthens students' ability to tackle complex challenges.

Thus, Jové (2022) argues that reflection on learning is fundamental to the teaching of natural sciences, as it fosters metacognition and individual awareness of the learning process. According to Maturana (2004), by encouraging students to reflect on how they approach and understand concepts, a deeper understanding is promoted, along with the ability to apply more effective learning strategies. Therefore, reflection also facilitates the identification of areas for improvement and the development of self-regulation skills, thus contributing to more autonomous and meaningful learning.

Conclusions

The study concludes that, from the perspective of Maturana and Varela's Theory of Knowledge, educational methodologies show fundamental improvements in teaching, which involves promoting active experimentation. Educators can design activities that engage students in conducting experiments and practical projects, allowing them to interact directly with concepts. This approach not only enhances theoretical understanding but also empowers students by enabling them to discover and explore physical phenomena themselves, thus fostering their autonomy in the learning process.

Furthermore, in the field of chemistry, significant improvements can be achieved by focusing on the practical application of chemical principles. That is, integrating methodologies that highlight the application of chemical theories in solving real-world problems is relevant because, by encouraging projects that require the practical application of these principles, the connection between theory and application is strengthened, promoting a deeper and more meaningful understanding of chemistry. This approach aligns teaching with Maturana and Varela's idea that knowledge is actively constructed through action and experience.

Similarly, in the context of biology, there are significant improvements, as students can focus on the interconnection of biological concepts. Educators can design activities that highlight the interrelationships between various biological concepts and complex systems. Therefore, methodologies aligned with Maturana and Varela's vision of active knowledge construction promote a holistic and contextualized understanding of the natural sciences. This is because they encourage the exploration of the complex relationships between different biological, physical, and chemical aspects, enabling students to develop a deeper and more interconnected understanding of each discipline.

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The research competencies of university teachers and the scientific production of students

Las competencias investigativas de los docentes universitarios y la producción científica de los estudiantes

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Abstract

The objective was to determine the relationship between the research competencies of university teachers and the scientific production of students. The methodology was typified as basic, adopting a quantitative approach, with a descriptive correlational level, non-experimental and cross-sectional design. A survey was used as a technique and a structured questionnaire with 48 items was used as an instrument, applied to 32 teachers and 98 undergraduate and graduate students. The results reveal a Spearman correlation coefficient of 0.814, indicating a very strong positive correlation between the research competencies of the teachers and the scientific production of the students. This finding highlights that teachers with more developed research competencies tend to have more prolific students in the generation of scientific articles. In conclusion, the positive correlation observed supports the idea that a faculty trained in research contributes directly to the formation of more committed and successful students in the generation of scientific knowledge.

Keywords: articles, competencies, research competencies, university education, scientific production, research competencies, scientific production.

Resumen

El objetivo consistió en determinar la relación entre las competencias investigativas de los docentes universitarios y la producción científica de los estudiantes. La metodología se tipificó como básica, adoptando un enfoque cuantitativo, con nivel descriptivo correlacional, diseño no experimental y transversal. Se empleó como técnica la encuesta y como instrumento un cuestionario estructurado con 48 ítems, aplicado a 32 docentes y 98 estudiantes de pregrado y postgrado. Los resultados revelan un coeficiente de correlación de Spearman de 0,814, indicando una correlación positiva muy fuerte entre las competencias investigativas de los docentes y la producción científica de los estudiantes. Este hallazgo destaca que los docentes con competencias investigativas más desarrolladas tienden a tener estudiantes más prolíficos en la generación de artículos científicos. En conclusión, la correlación positiva observada respalda la idea de que un cuerpo docente capacitado en investigación contribuye directamente a la formación de estudiantes más comprometidos y exitosos en la generación de conocimiento científico.

Palabras claves: artículos, competencias, competencias investigativas, educación universitaria, producción científica.

Introduction

The intrinsic relationship between the research competencies of university professors and the scientific production of students has acquired a significant role in the contemporary academic environment. In this context, González *et al.* (2022) indicate that educators' ability to develop research competencies becomes the driving force behind the growth and intellectual development of university students. Similarly, Chávez *et al.* (2022) point out that research not only es-

tablishes itself as a fundamental component of the teaching-learning process but also as a bridge that connects theory with practice, equipping students with the necessary skills to explore, understand, and contribute to scientific knowledge.

In this scenario, Yangali *et al.* (2020) emphasize the need for educators committed to scientific advancements, guiding their knowledge and practices to promote scientific production and the generation of theories that contribute to the scientific community. Furthermore, Reiban (2018) expresses the relevance of deepening the vital connection between university professors' research competencies and students' scientific production. In this regard, Nolazco *et al.* (2022) highlight the importance, in the context of modernity, of developing teachers' capacity to lead research and cultivate an environment conducive to critical thinking, as this directly influences the development of research skills in students, stimulating their participation in generating new knowledge.

Following this line of thought, Reiban (2018) underscores that the research competencies of university professors worldwide encompass various aspects, necessitating a solid cognitive foundation that includes mastery of scientific fundamentals, from theories and concepts to research methods. Castellanos *et al.* (2022) assert that teachers must understand research processes, from formulating questions to interpreting results, and adhere to the ethical standards governing scientific research.

According to Perdomo (2021), it is essential for teachers to develop metacognitive competencies that allow them to reflect on their research practice, identify areas for improvement, and adjust their approaches. Moreover, it is crucial for them to possess the ability to effectively communicate research findings, another vital competency, whether through publications, conference presentations, or broader dissemination. Collaboration with other researchers is also highlighted as a key competency, as science advances through teamwork and the synergy of knowledge.

On the other hand, Salazar *et al.* (2018) consider research ethics a fundamental pillar, emphasizing that teachers must respect ethical standards, apply scientific methods, and transparently report results. Continuous training is essential to develop these competencies, encompassing courses, workshops, and practices in scientific research. Participation in academic activities, collaborations, publications, and conference presentations also contributes to strengthening these competencies.

Following this line of thought, Díaz and Cardoza (2021) highlight that in the Latin American region, student scientific production has experienced a significant increase in recent years. The authors also add that, according to a study conducted by the Red de Indicadores de Ciencia y Tecnología Iberoamericana e Interamericana in 2021, students in the region published a total of 22,612 scientific articles in Scopus-indexed journals, marking a significant 30% increase compared to 2020.

According to the Scimago Index 2022, the leading countries in student scientific production in

Latin America are Brazil, Mexico, Argentina, Chile, and Colombia; meanwhile, Venezuela ranks eighth out of a total of 50 countries in the region. Regarding research fields, medicine ranks first, followed by natural sciences, social sciences, engineering, mathematics, and computer science.

However, Hernández *et al.* (2022) point out that, despite this growth, student scientific production in Latin America still lags behind other regions of the world such as Europe, Asia, and the United States. Nevertheless, these advances indicate progress in developing a scientific culture among university students in the region. This increase is attributed to various factors, including increased investment in higher education, improved education quality, the growing internationalization of research, and the development of programs supporting student research. These elements have contributed to strengthening participation in generating scientific knowledge in the region.

For Acosta (2023), the influence of Venezuelan university professors on the limited scientific production of students is influenced by several factors. Many lack the necessary research training, either because they did not have the opportunity to participate in projects during their studies or because student research is not a priority in Venezuelan universities. Additionally, the lack of incentives for research in Venezuela contributes to this unfavorable scenario. The absence of resources, recognition, and opportunities for publication in high-impact journals discourages university professors from prioritizing research in their work. This lack of research impetus translates into a lack of support for student participation in research projects.

According to Blanco (2021), another crucial challenge is the time limitation faced by Venezuelan university professors due to their overwhelming workloads. Between teaching, research, and administrative tasks, they have little time to dedicate to student research. This temporal restriction prevents professors from providing the guidance and support necessary for students to carry out high-quality research.

Finally, Canquiz *et al.* (2023) argue that the negative perception of research in Venezuela as an elitist and impractical activity also influences students' limited interest. The idea that research lacks practical utility can discourage student participation in research activities, thereby contributing to limited scientific production. It is essential to address these challenges to foster a conducive environment for the development of student research in the Venezuelan university context.

Therefore, the underlying causes of this issue may lie in teachers correcting papers without providing meaningful feedback to the student. Additionally, they do not explain in detail how research processes should be approached. In many cases, there are also differences of opinion among teachers about how these processes should be carried out. Furthermore, the delay in providing corrections exacerbates the problem, given the limited time available to students to conduct research, as deadlines are aligned with the academic calendar. Therefore, the objective of this study was to determine the relationship between the research competencies of university

professors and the scientific production of students.Methodology

The study adopted a quantitative approach, which, according to Acosta (2023), focuses on obtaining numerical data and their statistical analysis. Likewise, the research type was basic, pure, or fundamental, which, according to Arias (2016), focuses on creating new theories or improving existing ones. Similarly, the level was descriptive, which involves the characterization of a fact, phenomenon, individual, or group, and correlational in scope, which, according to Hernández and Mendoza (2018), seeks to determine relationships between variables without manipulating them, simply by measuring and analyzing their link. In the case of the study, it allowed for the analysis of the relationship between the variables of research skills of teachers and the scientific production of students. The design was non-experimental, characterized by data collection in natural environments without planned intervention, and cross-sectional, as information was collected at a single point in time.

The study population consisted of 32 teachers and 98 undergraduate and graduate students from the following universities: University of Zulia - LUZ, Dr. Rafael Belloso Chacín University - URBE, José Gregorio Hernández University, and Rafael Urdaneta University - URU. It is noteworthy that the information was not classified by university, as it is not necessary to know the behavior of the phenomenon by educational institution, but rather seeks a general perspective of what happens regarding the problem posed, so there was no classification between teachers and students either. The sample selection was random, with criteria for inclusion being diverse disciplines and academic levels (undergraduate and graduate) and active involvement in research.

The participation of universities with recognized academic programs, trajectory, and varied approaches to research was prioritized to ensure diversity in students' scientific production. The research experience of teachers was also considered, including those with a history of directing research projects and making significant contributions to the development of research skills among students. The inclusion of university students was based on their active participation in research projects, scientific publications, or conference presentations.

To collect information, the survey technique was employed. Questions were formulated to a group of subjects with the purpose of obtaining specific data. A Likert-type structured questionnaire composed of 48 items (24 for each variable) presenting five response alternatives was used. The questionnaire was transcribed into the digital format of Google Forms and sent to respondents via WhatsApp and email for completion.

It is worth noting that the instrument underwent evaluation by specialists before its implementation. Additionally, its validity was determined using Cronbach's Alpha reliability coefficient, obtaining values of 0.875 for the "research skills" variable and 0.915 for the "scientific production of students" variable. Finally, the results were analyzed using the statistical software SPSS, version 27. Frequency tables were generated for descriptive statistics, and a correlation table resulted from the inferential statistical process.

Results

Below are the tables detailing the research results on the research skills of teachers and the scientific production of students.

Table 1
Research Skills of Teachers

Levels	Methodological Processes Mastery		Teaching Skills		Management Skills		Communication Skills	
	f	%	f	%	f	%	f	%
Low	83	69,1	21	17,5	19	15,8	12	10,5
Medium	10	8,23	87	72,5	73	60,8	88	73,3
High	27	22,5	12	10,5	28	23,3	20	16,6
Total	120	100	120	100	120	100	120	100

Source: Authors' elaboration (2024).

The results presented in Table 1 provide a detailed assessment of the research skills of teachers. Regarding the "mastery of methodological processes," the low level is predominant, covering 69.1%, indicating a need for strengthening in this domain. This is followed by the high level at 22.5%, suggesting a significant presence of skills, while the medium level is more limited, representing 8.33% of the total.

Regarding "teaching skills," participants' perception shows that 72.5% rate these skills at a medium level, reflecting a solid but not exceptional foundation. In contrast, 17.5% perceive them at a low level, suggesting areas for improvement, and only 10.5% evaluate them at a high level, indicating a smaller presence of exceptional skills in this aspect.

Regarding "management skills," 60.8% of respondents position them at a medium level, denoting a balance in these competencies. On the other hand, 23.3% recognize them at a high level, indicating a prominent presence of management skills, while only 15.8% categorize them at a low level, indicating areas for improvement.

Finally, when analyzing "communication skills," it is highlighted that 73.3% place them at a medium level, indicating widespread communicative competence. On the other hand, 16.6% rate them at a high level, highlighting the presence of exceptional communication skills, and only 10.5% position them at a low level, indicating specific areas for improvement in this aspect.

From the results, it is concluded that there are areas where teachers need to improve to strengthen research skills. The low level observed in the "mastery of methodological processes" suggests a need for improvement in this aspect. Although "teaching skills," "management skills," and "communication skills" are perceived at a medium level by most respondents, this indicates that they could still be improved to promote the development of research skills in students.

Table 2
Causes of low scientific production among students

Levels	Guidance		Timely feedback		Time management		Methodológical direction accuracy	
	f	%	f	%	f	%	f	%
Deficiente	89	74,1	93	77,5	87	72,5	84	70
Moderate	20	16,6	17	14,1	23	19,1	20	16,6
Efifcient	11	,1	10	8,33	10	8,33	16	13,3
Total	120	100	120	100	120	100	120	100

Source: Authors' own elaboration (2024).

The results in Table 2 provide a detailed insight into the causes attributed to the low scientific production among students, focusing on the "guidance" provided by teachers. According to the respondents, 74.1% receive little guidance from teachers, hence perceiving it as deficient. A moderate rating is assigned by 16.6%, indicating some balance, while only 9.1% consider it efficient, pointing out areas where more effective guidance is evident.

Regarding "timely feedback," 77.5% of participants rate it as deficient, indicating a lack of prompt response from teachers. A moderate rating is perceived by 14.1%, and only 8.33% classify it as efficient, suggesting the presence of more effective practices in this dimension.

Concerning "time management," 72.5% of respondents express it as deficient, indicating challenges in effective time management by teachers. A moderate rating is given by 19.1%, denoting some balance, and only 8.33% evaluate it as efficient, highlighting areas where time management stands out.

Finally, regarding "methodological direction accuracy," 70% respond that it is deficient, indicating difficulties in the precise application of methodologies. A moderate rating is perceived by 16.6%, suggesting a balance, and 13.3% classify it as efficient, indicating areas where more precise methodological direction is evident.

Based on the results obtained, we can conclude that the low scientific production among students can largely be attributed to the lack of guidance provided by teachers. Most respondents expressed experiencing limited guidance, insufficient feedback, poor time management, and imprecise methodological direction. These factors significantly contribute to a general perception of deficiency in the quality of teacher guidance.

The results suggest an urgent need to improve teacher guidance to foster greater scientific production among students. It would be beneficial to address specific areas identified, such as the lack of adequate guidance, timely feedback, efficient time management, and precise methodological direction. This improvement could be achieved through the implementation of training programs for teachers, the creation of additional educational resources, and the establishment

of effective practices that promote an environment conducive to research and academic production. Furthermore, constant feedback from students could be valuable for adjusting guidance strategies and ensuring that their specific needs are met. Ultimately, these improvements could have a positive impact on the quality and quantity of students' scientific production.

Table 3
Correlation Coefficients of Variables

	Coeficients	Variables	Scientific skill of teachers	Scientific Production of Students
Spearman's Rho	Research skills of teachers	Correlation Coefficient	1,000	,814
		Significance (bilateral)		,000
		N	120	120
	Scientific Production of Students	Correlation Coefficient	,814	1,000
		Significance (bilateral)	0.000	
		N	120	120

Source: Authors' own elaboration (2024).

Table 3 shows that the Spearman's correlation coefficient between the research skills of teachers and the scientific production of students is 0.814. This value is very close to 1, indicating a very strong positive correlation between the two variables. In other words, the analysis results show that there is a very close relationship between the research skills of teachers and the scientific production of students. This indicates that teachers with higher research skills tend to have students who produce more scientific articles.

The results demonstrated that the research skills of teachers can have a significant influence on the scientific production of students. The effectiveness of teachers as researchers seems to be crucial for guiding students in the development of their research skills, which in turn, can result in higher scientific production. It would be beneficial for teachers to share their experiences and research methods with students, thus fostering the development of skills that contribute to a more robust scientific production.

Discussion

When contrasting the obtained results with the theoretical postulates of this study, weaknesses are observed in the vast majority of indicators regarding the "mastery of methodological processes in teachers". Barros and Turpo (2022) emphasize its importance by stating that this skill is fundamental to provide the necessary foundation in the development of research skills in students. Mastery of methodological processes implies the teacher's ability to guide students in the effective application of research methods and techniques. According to Blanco and Acosta (2023), this skill not only influences the quality of teaching but also plays a crucial role in the

development of critical, analytical, and argumentative skills in students, essential aspects for their active participation in subsequent research processes, as well as in their academic and professional training.

According to Blanco (2021), a teacher with a solid methodological mastery can guide students in the effective application of research methods, promoting a deep understanding of scientific processes. According to Acosta (2023), this facilitates students acquiring the necessary skills to carry out autonomous research, which, in turn, contributes to greater scientific production by boosting students' ability to address scientific questions and issues systematically and rigorously.

Regarding "teaching skills" in teachers, Castellanos *et al.* (2022) suggest that they are of great significance in fostering scientific production among university students since a teacher with effective pedagogical skills can inspire interest and scientific curiosity in students. For Cardoza *et al.* (2023), the ability to transmit knowledge clearly and motivates facilitate the understanding of complex scientific concepts while stimulating critical thinking and creativity.

According to Dávila *et al.* (2022), a pedagogical approach that advocates for active participation and scientific exploration emerges as a key element in developing research skills in students. This type of approach goes beyond mere knowledge transmission and fosters an educational environment in which students are encouraged to engage directly in the process of discovery and analysis. By providing opportunities for inquiry and the practical application of scientific principles, this approach not only strengthens conceptual understanding but also lays the groundwork for the training of future researchers and knowledge generators in the scientific field.

Fostering active participation involves creating opportunities for students to explore and apply scientific methods in problem-solving or the investigation of specific phenomena. This not only enhances their understanding of concepts but also nurtures their ability to formulate questions, design experiments, and critically analyze data. It also promotes independent thinking and intellectual autonomy, fundamental aspects for the development of strong research skills.

When analyzing "management skills" in teachers, Leyva *et al.* (2022) consider them vital for creating an environment conducive to the scientific production of students. This is because efficient management of research projects involves proper planning, resource allocation, and progress monitoring, which directly influences the quality and success of scientific work. Additionally, according to Mejía *et al.* (2020), management skills enable the creation of a collaborative environment where teachers can facilitate student participation in joint research projects, promoting interaction and knowledge exchange, crucial elements for the development of meaningful research.

Continuing with the analysis, regarding "communication skills" in teachers, Molina (2023) states that they are fundamental for the scientific production of students since they facilitate the effective transmission of knowledge and ideas. This indicates the ability to clearly communicate scientific concepts, findings, and methodologies, which is important for guiding students in presenting their research results.

According to Nolazco *et al.* (2022), effective communication skills contribute to creating a collaborative environment where teachers can effectively communicate their expectations and provide constructive feedback, thus improving the quality of scientific projects developed by students. Meanwhile and Reiban (2018) points out that communication skills in teachers are a key facilitating element for the successful dissemination of research and the impact of scientific production on the academic community.

On the other hand, when analyzing the causes of the low scientific production of undergraduate and graduate students, regarding "guidance," Aponte (2022) points out that when there is little guidance from teachers, scientific production of students is significantly affected. In this regard, Beigel *et al.* (2022) consider effective guidance to be fundamental in providing adequate guidance and support during the research process.

According to Cantabrana *et al.* (2020), a deficit in this aspect can result in disoriented students, facing difficulties in structuring and developing research projects. Hence, according to Romero (2023), lack of direction can also lead to the choice of inadequate approaches or lack of clarity in objectives, hindering the development of research skills and limiting students' ability to contribute significantly to scientific knowledge.

Regarding "timely feedback," Biagioli and Lippman (2020) highlight the idea that this plays a critical role in students' scientific production, and its absence can have significant negative consequences because when teachers do not provide real-time feedback on students' progress, they face difficulties in correcting errors, improving methodologies, and adjusting their approaches. According to León *et al.* (2022), the lack of adequate feedback can demotivate students and affect the quality of their research since they are deprived of the opportunity to learn from their mistakes and progress in their projects effectively.

When analyzing "poor time management" by teachers, González *et al.* (2022) suggest that this directly impacts students' scientific production because research requires careful planning and efficient allocation of temporal resources. In this regard, Ruiz *et al.* (2020) state that when teachers do not manage the time allocated to research projects properly, students may face tight deadlines, stress, and a lack of time to conduct thorough research. This affects the quality and depth of scientific work, limiting students' potential to address research questions comprehensively and contribute significantly to the scientific field.

Finally, the lack of accuracy in methodological direction by teachers, according to Beigel *et al.* (2022), has a substantial impact on students' scientific production, as imprecise direction can result in incorrect application of methodologies, misinterpretation of data, and lack of rigor in research execution.

This compromises the validity and reliability of results, negatively affecting the overall quality of research projects. Likewise, Several Llontop *et al.* (2023) affirm that the lack of direction can also influence students' ability to develop research skills and apply appropriate methodologies, thus

significantly limiting their contribution to scientific knowledge.

Conclusions

The results reveal a significantly high Spearman correlation coefficient, reaching the value of 0.814, indicating a very strong positive correlation between the research competencies of teachers and the scientific production of students. This strong correlation suggests that the quality of research competencies in teachers is directly related to students' scientific performance. In other words, teachers with more developed research skills tend to have students who generate a greater quantity and quality of scientific articles.

This finding also underscores the importance of teachers' research competencies in the training and development of students in the scientific field since, by possessing research skills and knowledge, teachers act as models and facilitators to inspire students to engage in research projects. The observed positive correlation highlights that a faculty with research competencies significantly contributes to cultivating a research culture among students, thus promoting a more prolific and high-quality scientific production.

Therefore, these results support the idea that investing in the development of teachers' research competencies can have a direct positive impact on promoting and improving students' scientific production. This close relationship between both aspects highlights the importance of designing strategies and professional development programs for teachers focused on strengthening their research skills, which will translate into a more enriching and productive educational environment for students.

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Educational policies and academic performance in Latin America*

Políticas educativas y el desempeño académico en América Latina

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Abstract

The study arose from the need to understand the influence of educational policies on the academic performance of high school students in Latin America. Its main objective was to determine the relationship between these policies and academic performance, adopting a quantitative and correlational approach within the positivist paradigm. The methodology included surveying 100 teachers from five countries: Chile, Peru, Ecuador, Colombia, and Venezuela. Validated by 5 experts in the educational field, the reliability was 0.988 (highly reliable) applied virtually. The results revealed a Spearman correlation coefficient of 0.619 between educational policies and academic performance, indicating a moderate correlation. The statistical significance of the p-value, which was 0.000, confirms that this correlation is significant at the 0.05 level, ruling out the possibility that it is a result of chance. The findings suggest that there is a relevant connection between educational policies and students' academic performance in the region.

Keywords: educational policies, academic performance, Latin American context.

Resumen

El estudio surgió de la necesidad de comprender la influencia de las políticas educativas en el rendimiento académico de los estudiantes de bachillerato en América Latina. Su objetivo principal fue determinar la relación entre estas políticas y el desempeño académico, adoptando un enfoque cuantitativo y correlacional dentro del paradigma positivista. La metodología incluyó la aplicación de una encuesta a 100 docentes de cinco países: Chile, Perú, Ecuador, Colombia y Venezuela. Validado por 5 expertos en área educativa, la confiabilidad fue de ,988 (altamente confiable), aplicado de manera virtual. Los resultados revelaron un coeficiente de correlación de Spearman de 0,619 entre las políticas educativas y el desempeño académico, indicando una correlación moderada. La significación estadística del valor de p, que fue de 0,000, confirma que esta correlación es significativa al nivel de 0,05, descartando la posibilidad de que sea resultado del azar. Los hallazgos sugieren que existe una conexión relevante entre las políticas educativas y el rendimiento académico de los estudiantes en la región.

Palabras clave: políticas educativas, desempeño académico, contexto latinoamericano. .

Introduction

Educational policies are directly related to students' academic performance. This is how policies that ensure access to education improve the quality of education and reduce educational inequalities, having the potential to enhance students' academic performance, achieve optimal results, and academic persistence until the end of the school century.

In this regard, Garzón-Baquero (2023) argues that, in any educational system, educational policies are responsible for ensuring equitable access to education, ensuring that all boys and girls have the opportunity to access quality education, regardless of their social, economic, or cultural

background. This aspect is fundamental for both individual and social development. Additionally, they have the potential to improve educational quality. Likewise, this improvement is achieved through investments in education, curriculum reforms, strengthening teacher training, and continuous student assessment. In this way, the aim is to raise educational standards overall.

Thus, Atencia (2023) believes that the importance of these policies lies in their ability to reduce educational inequalities, ensuring that all students have equal opportunities to achieve educational success, regardless of their social background. This indicates that they are relevant for the sustainable development of countries and the realization of the fundamental right to education for all individuals, allowing them to reach their full potential and contribute to the progress of their communities.

In this sense, it is important to highlight specific examples of how these policies can positively impact society, i.e., those that ensure access to education contribute to the reduction of poverty and inequality. For Fuentes-Salazar (2023), those that improve educational quality drive economic growth and social development, while those that reduce educational inequalities promote peace and social cohesion. However, it is essential that educational policies are carefully designed and implemented to achieve effectiveness and avoid negative impacts.

Hence, Mora-Rosales *et al.* (2023) point out that, in various regions of the world, there are countries whose educational policies have left a positive mark on students' academic performance. One of the most notable examples is Finland, which boasts one of the most successful educational systems globally. This achievement is attributed to policies such as free and compulsory education, the outstanding qualification of teachers, and the implementation of continuous assessments for students, which have contributed to achieving high levels of educational equity.

Similarly, according to Byun *et al.* (2023), another emblematic case is that of South Korea, whose rapid economic growth in recent decades has had education as a decisive factor. Through deliberate educational policies, such as significant investment in the education sector, curriculum reform, and improvement of teacher training, the country has managed to raise the quality of education and improve students' academic performance.

According to Gopinathan & Lee (2018), stands out as another example of success in educational policies, as this country has achieved outstanding levels of academic performance through the implementation of policies that include compulsory and free education, demanding academic standards, and standardized assessments. The combination of these elements has contributed to the sustained success of its educational system.

According to De Sousa & Nunes (2023), educational policies in Latin America have had a complex and uneven development in recent decades. Overall, these policies have focused on ensuring access to education, improving the quality of education, and reducing educational inequalities. According to Barria-Herrera & Zurita-Garrido (2023), access to education has improved significantly in recent decades. Currently, most boys and girls in the region have access

to primary and secondary education. However, there are still challenges regarding access to education in rural areas, for students with disabilities, and for boys and girls from minority groups.

According to Gavaldón & Ambrosy (2023), the quality of education in Latin America has been a constant concern. The results of international assessments show that students in Latin America have lower academic performance than students in other developed countries. In recent years, governments in the region have implemented a series of policies to improve the quality of education. These policies include curriculum reform, improving teacher training, and continuous student assessment.

Within this context, Lule-Uriarte *et al.* (2023) point out that educational inequalities in the region are significant, as students from poor families are less likely to access education, complete secondary education, and achieve high academic performance.

Based on all of the above, the present study aimed to determine the relationship between educational policies and the academic performance of high school students in Latin America. It is worth noting that, in this study, no attempt was made to make a comparison or a detailed analysis by country, but rather to consider a sample of five countries in Latin America to establish the relationship between the variables studied and provide a reference for the region.

Methodology

The study was grounded within the procedures inherent to the positivist paradigm, adopting a quantitative approach. Methodologically, this paradigm, according to Hernández *et al.* (2014), is characterized by its orientation towards the collection and analysis of quantifiable data, with the aim of explaining phenomena through the application of statistical methods and the identification of numerical patterns. This approach, as defined by Acosta (2023), is distinguished by its commitment to exploring and understanding phenomena through the measurement and quantification of variables, focusing on obtaining objective and verifiable data.

In this context, the choice of the positivist paradigm implies a rigorous and structured perspective, where research is conducted based on the search for regularities and causal relationships that can be expressed quantitatively. Statistical tools thus become fundamental elements for analyzing and generalizing the results obtained, allowing for a more precise and objective approach to understanding the phenomenon under study.

The grounding in this paradigm reflects the intention to address the research object from an objective and empirical perspective, aiming to identify patterns and regularities through statistical analysis of frequencies. Hence, the quantitative approach of the positivist paradigm provides a methodological framework that allows for a more precise and structured evaluation of phenomena, contributing to the generation of scientific knowledge based on measurable and observable data.

Additionally, it was typified as correlational because it seeks to measure the relationship between educational policies and the academic performance of high school students. As Hernández et al. (2014) point out, it is a type of research design that focuses on the relationship between two or more variables without intervening or manipulating any of them. The main objective is to determine if there is an association or correlation between the variables and, if so, the nature and strength of that relationship.

The sample used in the study consisted of a group of 100 teachers from various countries, including Chile, Peru, Ecuador, Colombia, and Venezuela, evenly distributed with 20 participants from each country. Participant selection was carried out through the LinkedIn social media platform, where teachers were contacted and invited to participate in the study. To collect the necessary information, an online form, also known as a questionnaire, consisting of 36 items designed according to the dimensions and indicators established in the study framework, was used.

The questionnaire addressed various areas relevant to the research objectives, covering specific dimensions considered essential for understanding the topic under study. The included items provided detailed information about the experiences, perceptions, and practices of teachers regarding the variables of interest. In addition to using SPSS software, Version 21, for data processing, a detailed analysis of measures of central tendency and dispersion was conducted to better understand the distribution of the data. This analysis included relative and percentage frequencies, as well as inferential statistics to establish the level of correlation between the variables.

Results

Below are the tables detailing the frequency and correlational results of the educational policy and academic performance variables.

Table 1
Teachers' Perception of Educational Policies in Latin America

Levels	Ensuring access to education		Improving the quality of education		Reducing educational inequalities	
	f	%	f	%	f	%
Poor	4	4,0	86	86,0	85	85,0
Fair	84	84,0	4	4,0	5	5,0
Effective	2	2,0	0	0	0	0
Total	100	100	100	100	100	100

Source: Authors' own elaboration (2024).

The Table 1 provides a detailed overview of teachers' perceptions regarding educational policies in Latin America. In terms of *Ensuring Access to Education*, the results reveal a level of effectiveness that falls within a range considered fair. 84% of the respondents indicate that these policies have had a moderate impact, while 4% believe their effectiveness has been poor, and only 2% consider it to be effective.

When addressing the topic of *Improving the Quality of Education*, the outlook is challenging, as a significant 86% of teachers expressed that the implemented improvements have been poor, highlighting a widespread concern in this aspect. On the other hand, 4% consider these improvements to be fair.

Regarding the task of *Reducing Educational Inequalities*, the results reflect a prevailing perception of deficiency among teachers, as 85% believe that the implemented policies have been poor in effectively addressing this challenge, while only 5% think they have been fair in this regard.

These findings underscore the need for critical analysis and possible reformulation of educational policies in the region. Concern for educational quality and the reduction of inequalities stands out as decisive areas that require immediate attention and effective strategies to achieve substantial improvements in the Latin American educational system.

Table 2
Academic Performance Indicators

Levels	School Attendance		Participation in Activities		Retention Rate	
	f	%	f	%	f	%
Poor	70	70	30	30	90	90
Fair	20	20	60	60	10	10
Effective	10	10	10	10	0	0
Total	100	100	100	100	100	100

Source: Authors' own elaboration (2024).

Table 2 presents in detail the indicators of academic performance, offering an insightful view on school attendance and student participation in activities, as perceived by teachers in Latin American countries. The results highlight notable patterns that deserve analysis and reflection.

Regarding school attendance, it is observed that 70% of the surveyed teachers consider this indicator to be crucial and rate it as poor. Only 20% classify it as fair, and just 10% perceive it as efficient. This trend raises questions about potential underlying factors that may be affecting students' regular attendance, which could have significant implications for their academic performance.

As for student participation in activities, 60% of the teachers rate it as fair, indicating room for improvement in this aspect. Thirty percent of the respondents perceive it as poor, suggesting significant concern regarding students' involvement in activities beyond the core curriculum. Only 10% consider participation to be efficient, highlighting the need for strategies to encourage greater student engagement in these activities.

Finally, concerning the retention rate, 90% of the teachers evaluate it as poor, while only 10% consider it fair. These results raise questions about the educational policies and practices that

may be contributing to low student retention, which could have long-term implications for access to and success in education.

All this indicates that the indicators of academic performance highlight areas of critical attention that could benefit from specific interventions and strategies to improve school attendance, participation in extracurricular activities, and retention rate, aiming to promote a more effective and enriching educational environment.

Table 3
Correlation Coefficient of Variables

			Educational Policies	Academic Performance
Spearman's Rho	Educational Policies	Correlation Coefficient	1,000	,619
		Sig. (bilateral)		,000
		N	100	100
	Academic Performance	Correlation Coefficient	,619	1,000
		Sig. (bilateral)	0.000	
		N	100	100

Source: Author's own elaboration (2024).

Table 3 shows that there is a positive and significant correlation between educational policies and academic performance. This means that countries with stronger educational policies also have students with better academic performance. Hence, the Spearman's correlation coefficient for educational policies and academic performance is 0.619**. This coefficient is considered a moderate correlation.

Furthermore, the statistical significance of the p-value for the correlation between educational policies and academic performance is 0.000. This value indicates that the correlation is significant at the 0.05 level. This suggests that the correlation is not likely to be due to chance. This evidence indicates that there is a positive and significant correlation between educational policies and academic performance. This means that educational policies have a significant impact on students' academic performance.

Discussion

When contrasting the results of the study with some theories on educational policies, Arco et *al.* (2023) point out that when educational policies are designed to ensure access to education, they are often implemented through a set of measures that address various barriers that could hinder individuals' participation in the educational system.

It is thus that Irrazabal-Bohórquez *et al.* (2023) highlight that the adoption of free and com-

pulsory education is established as a fundamental pillar, eliminating economic barriers that could prevent access to education, especially for children and families with low income. This measure aims to ensure that all members of society have the opportunity to access basic education.

Additionally, Pastore (2023) asserts that scholarship programs and financial aid constitute a strategy to reduce economic disparities and facilitate the participation of those students who may face financial challenges to continue their education. These programs seek to alleviate the costs associated with tuition, educational materials, and other related expenses, enabling more individuals to access educational opportunities.

According to Dussel & Williams (2023), accessible school infrastructure also plays a relevant role. The construction and maintenance of schools located in easily accessible areas, as well as the provision of school transportation in remote regions, contribute to ensuring that education is physically accessible to the population. Moreover, adapting facilities for students with disabilities promotes inclusion and equal opportunities.

Therefore, Ornelas (2020) emphasizes that promoting inclusive and diverse policies constitutes another key measure since addressing the needs of specific groups, such as people with disabilities, indigenous communities, or ethnic minorities, involves adapting educational programs to address diverse realities and ensure that education is truly accessible to all.

Finally, according to Bey *et al.* (2023), flexibility in schedules and study modalities emerges as a key strategy to address logistical challenges, as providing flexible options benefits working adults, single mothers, and those with particular responsibilities, allowing greater participation in educational programs. Hence, Escudero (2023) believes that these measures work in harmony to create an inclusive and accessible educational environment, ensuring that education is an achievable right for the entire population.

Continuing with the analysis of the study's indicators, Mansutti *et al.* (2023) state that educational policies aimed at improving the quality of education implement various strategies with the aim of raising academic standards and providing more effective learning experiences. According to Dorado & Benavides (2023), one of the fundamental measures is investing in the training and professional development of teachers since providing continuous training opportunities enables educators to stay updated with the most effective educational methodologies, incorporating new pedagogical strategies and innovative approaches into their practices.

According to Durán *et al.* (2015), the periodic review and updating of school curricula constitute another essential strategy for improving educational quality. Ensuring that the contents are aligned with current needs and demands of the labor market guarantees that students acquire relevant skills and are prepared for the challenges of the 21st century. Additionally, the introduction of educational technologies and digital resources can enrich the learning process, providing students with more interactive and personalized experiences.

According to Gavaldón & Ambrosy (2023), continuous assessment of student performance and constructive feedback are fundamental elements for improving the quality of education. In this regard, Irrazabal-Bohórquez *et al.* (2023) highlight that the implementation of formative assessment systems allows teachers to adapt their teaching methods according to the individual needs of students, identifying areas for improvement, and strengthening acquired skills and knowledge.

Likewise, according to Palencia & Verdugo (2023), fostering the participation of the educational community also contributes significantly to improving educational quality. Involving parents, guardians, and the community at large in the educational process creates a supportive environment that positively impacts students' academic performance. Moreover, establishing effective feedback and communication mechanisms between the school and the community can strengthen collaboration and commitment.

In this line of thought, Reiban & Jiménez (2023) consider that improving the quality of education involves a combination of factors, from teacher training to curriculum updates, the integration of educational technologies, continuous assessment, and community participation. Therefore, these collaborative measures seek to create a dynamic and ever-evolving educational environment, preparing students to face emerging challenges and opportunities in their educational journey and beyond.

According to Rivera (2023), educational policies aimed at reducing educational inequalities adopt a comprehensive approach to ensure that all students, regardless of their socioeconomic background, gender, ethnicity, or geographical location, have equal opportunities and access to quality education. In this regard, Pérez (2023) points out that one of the fundamental strategies is the implementation of inclusion and equity programs that address existing disparities. This implies identifying and eliminating systemic barriers that may disproportionately affect certain groups, ensuring that all students have access to appropriate resources and support.

Taking into account this discursive analysis, Vázquez (2023) argues that the equitable allocation of educational resources is essential to address economic disparities among educational institutions, as this ensures that schools located in disadvantaged areas receive additional funding and resources to counteract inherent inequalities in the educational system. Additionally, the implementation of school feeding and transportation programs can address logistical barriers that may affect students in disadvantaged situations.

According to Edwards *et al.* (2023), attention to cultural and linguistic diversity is key to reducing educational inequalities. Thus, developing inclusive curricula and providing specific support for students whose mother tongue is not the predominant one in the school environment ensures that all students have access to quality education, regardless of their cultural background.

For Barria & Zurita (2023), the implementation of measures to ensure accessibility to education for people with disabilities is also fundamental. Adapting facilities, providing accessible educa-

tional materials, and offering specific support ensure that students with disabilities have equal opportunities to participate and learn effectively.

Meanwhile, Fuentes (2023) considers that promoting gender equity in education is another fundamental component because adopting policies that foster equal opportunities for girls and boys, and implementing strategies to address gender discrimination, contribute to reducing gender-based educational disparities.

Therefore, according to Gopinathan & Lee (2018), reducing educational inequalities involves an integrated approach that addresses various dimensions, from resource allocation to addressing cultural, linguistic, and gender diversity. These policies seek to create an equitable educational environment that ensures that every student, regardless of their context, can reach their full potential and contribute fully to society.

Within this context, Mora *et al.* (2023) assert that educational policies play an important role in promoting school attendance, as they establish regulations and conditions that directly and indirectly shape students' participation in the educational system, ensuring universal access and free education by eliminating economic barriers, thus ensuring that all children have the opportunity to access education, regardless of their financial resources. Additionally, Rosas (2023) highlights that the implementation of financial support programs, such as scholarships and economic aid, acts as a highly relevant incentive for low-income families, facilitating regular attendance by reducing economic inequalities.

According to Garzón (2023), school infrastructure and accessibility are also crucial areas in educational policies that affect attendance. This is because ensuring that schools are located in accessible areas and providing school transportation in remote regions helps overcome logistical and geographical obstacles that could hinder regular attendance.

Simultaneously, Atencia (2023) points out that awareness campaigns and community engagement supported by specific policies positively influence attendance by fostering a shared understanding of the importance of education and creating an environment that values and supports students' regular attendance.

Taking into account Atencia's ideas (2023), school feeding programs, supported by specific policies, also play a vital role in school attendance by providing nutritious meals that can act as an additional incentive for regular participation, especially in communities where nutrition is a determining factor.

Furthermore, Fuentes (2023) emphasizes the idea that inclusive policies that address the needs of students with disabilities and promote equal opportunities contribute significantly to attendance by ensuring that schools are equipped to meet diverse needs and facilitate the participation of all students in the educational process. All of this indicates that these educational

policies form a comprehensive framework that seeks not only to facilitate access but also to promote continuous and meaningful participation in education.

From Atencia's perspective (2023), participation in activities is closely related to educational policies, being a basic component to enrich students' educational experience. Because educational policies that promote participation in extracurricular activities are often oriented towards ensuring inclusion and equity. That is, these policies aim to ensure that all students, regardless of their socioeconomic background or abilities, have access to a variety of activities that complement their holistic development.

Continuing along this line of thought, De Sousa & Nunes (2023) believe that participation in academic activities aligns with the vision of educational policies that seek to foster students' social and emotional development. This is because interaction in activities such as clubs, sports, or artistic activities is considered fundamental for cultivating social skills, teamwork, and leadership, key aspects of student development that go beyond academic boundaries.

Additionally, Barria-Herrera & Zurita-Garrido (2023) argue that educational policies can be geared towards identifying and supporting specific talents and skills of students. This highlights that participation in academic and extracurricular activities offers opportunities for students to explore and develop their individual interests, whether in sports, cultural, scientific, or artistic areas. Therefore, policies that encourage this diversity of options contribute to strengthening the connection between students and their individual passions.

Similarly, Joiko (2023) posits that participation in school activities is also integrated into the framework of educational policies that promote holistic education because these policies recognize the importance of going beyond basic academic teaching, and extracurricular activities provide opportunities for personal growth, vocational exploration, and the development of multifaceted skills.

Finally, Chen-Quesada *et al.* (2023) suggest that some policies may incorporate incentives for participation in extracurricular activities as part of broader strategies to improve attendance and academic performance. Additionally, Atencia (2023) believes that recognitions, scholarships, or additional academic credits can be offered as incentives, thus encouraging student participation in these activities.

In this vein, Martínez (2023) highlights that participation in extracurricular or academic activities not only benefits from educational policies but also contributes to the fulfillment of the broader objectives of an educational system that seeks to holistically nurture students and prepare them for life's challenges and opportunities.

Chaves *et al.* (2023) assert that educational policies play a fundamental role in influencing student retention rates by establishing guidelines and strategies that address key factors affecting educational continuity. Firstly, some policies incorporate early intervention programs that seek

to identify and address potential academic, emotional, or social challenges that could be precursors to dropout. These strategies aim to prevent obstacles before they become significant barriers to retention.

Similarly, Atencia (2023) points out that policies ensuring equitable access to educational resources and additional support significantly contribute to retention. This may include allocating additional funds for schools in disadvantaged areas, as well as implementing mentoring programs and counseling services that strengthen individualized support for students.

For Lagos (2023), flexibility in educational pathways is another dimension addressed by educational policies, allowing educational programs to be adapted to the individual needs of students. The introduction of flexible education options, distance learning, and credit recovery programs provide students with the opportunity to adjust their educational trajectory, thereby reducing the likelihood of dropout.

Similarly, García (2023) emphasizes the idea that policies promoting inclusion and addressing student diversity also play a significant role in retention. Adapting educational programs to meet the needs of students with disabilities and addressing cultural and linguistic barriers contributes to creating a more inclusive and welcoming educational environment.

Furthermore, for Vázquez (2023), socio-emotional support programs supported by specific policies positively impact retention by prioritizing the well-being of students. Providing psychological support services and promoting a safe and positive school environment are elements that can influence students' decisions to stay in school.

It is thus that Chen *et al.* (2023) consider educational policies to play an integral role in addressing various dimensions affecting student retention, from early detection of challenges to the creation of inclusive educational environments and the provision of necessary supports. Meanwhile & Atencia (2023) believes that these policies ultimately seek to create conducive conditions for students to continue their education effectively and reduce dropout rates.

Conclusions

Based on the results presented, it is concluded that educational policies play an important role in students' academic performance, demonstrating that countries with stronger educational policies also exhibit more prominent academic performance. The Spearman correlation coefficient, which stands at 0.619, indicates a moderate correlation between educational policies and academic performance, suggesting that changes in educational policies are associated with variations in academic performance.

The statistical significance of the p-value, which is recorded as 0.000, confirms that the correlation is statistically significant at the 0.05 level, ruling out the possibility that the observed rela-

tionship is due to chance. These conclusions have far-reaching implications for the formulation of public policies and educational strategies, as they provide governments with a basis for designing policies that positively impact students' academic performance.

All of this indicates that investment in education is required, ensuring equity in access to education, improving the quality of teaching, and conducting regular assessments of academic performance. The implementation of these recommendations could significantly contribute to the creation of a more effective educational system, providing all students with the opportunity to reach their full potential.

Additionally, it is important to note that, although the correlation between educational policies and academic performance is significant, it is not perfect. Additional factors such as socioeconomic backgrounds, family support, and the country's economic conditions may also influence academic performance. Nevertheless, the findings underscore the importance of educational policies as a significant factor that can contribute to the improvement of students' academic performance.

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Socio-formative competencies for non-licensed teachers in technology and informatics: challenges in Colombia*

Competencias socio-formativas para docentes no licenciados en tecnología e informática: desafíos en Colombia

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Abstract

The objective of the study was to analyze the Socio-Formative Competencies for Non-Licensed Teachers in Technology and Informatics. An interpretative-postpositivist methodology was used, with a phenomenological-interpretative approach to understand the experiences of 8 non-licensed teachers but with training in informatics. A structured interview with 22 open-ended questions was used for data collection. Triangulation was applied to ensure the validity and reliability of the results. Findings revealed categories such as sensation of challenge, awareness of limitations, updated perspective, motivation towards technological careers, innovation in the classroom, and connection with the industry. This leads to the conclusion that there is a need for specific training programs for non-licensed teachers in technological areas, in order to improve their pedagogical practice and their ability to effectively teach topics related to technology and informatics.

Keywords: competencies, socio-formative, non-licensed professionals, technology, informatics.

Resumen

El objetivo del estudio fue analizar las competencias Socio-Formativa para Docentes no Licenciados en Tecnología e Informática. Se utilizó una metodología interpretativo-postpositivista, con un enfoque fenomenológico-interpretativo para comprender las experiencias de 8 docentes no licenciados, pero con formación en informática. Se empleó una entrevista estructurada con 22 preguntas abiertas para la recolección de información. Se aplicó triangulación para garantizar la validez y fiabilidad de los resultados. Los hallazgos revelaron categorías como sensación de desafío, conciencia de limitaciones, perspectiva actualizada, motivación hacia carreras tecnológicas, innovación en el aula y conexión con la industria. Lo que permite concluir que existe la necesidad de programas de formación específicos para docentes no licenciados en áreas tecnológicas, con el fin de mejorar su práctica pedagógica y su capacidad para enseñar eficazmente temas relacionados con la tecnología e informática.

Palabras clave: competencias, socio-formativas, profesionales no linceados, tecnología, informática.

Introduction

The occupation of professionals in various fields who hold pedagogical positions at the primary and secondary education levels is an observed reality that has received little attention. Therefore, to provide a statistical approach to this reality, which stems from the researcher's concern and gave rise to this study, some statistics presented by Unesco (2024) are cited, which state:

Coverage rates range between 63% and 76% for teacher qualification and pre-employment training indicators, while coverage rates for relative salaries and in-service training are substantially lower. The global average coverage rate for all SDG 4 indicators is just over 60%. Indicators reflecting teacher qualifications (4.c.3 and 4.c.4) have the highest coverage rates, at just

over 75%, followed by indicators reflecting teacher training (4.c.1 and 4.c.2), which are slightly above the global SDG 4 average. Other teacher indicators tend to have lower coverage rates. The teacher attrition indicator (4.c.6) has a coverage rate just below 50%, while the coverage rate for recent professional development (4.c.7) is below 30%, and that for teacher salaries relative to others (4.c.5) is below 20% (p.6).

Despite the observation made by this organization and including indicators that are not specifically related to teacher training, it represents a starting point for framing the relevance of this study. In this sense, it is estimated that a considerable number of teachers worldwide lack the necessary pedagogical training. According to the Unesco 2017 Global Teacher Survey, about 16% of primary school teachers and 21% of secondary school teachers do not have the required training. This equates to approximately 60 million students receiving education from teachers without adequate pedagogical preparation.

Additionally, according to Unesco (2021), the World Bank's 2021 World Education Report indicates that 69 million new teachers are needed to achieve Sustainable Development Goal 4 of quality education for all by 2030. Of these, 48 million would be needed to replace teachers who retire or leave the profession, and 21 million to meet the needs of new positions created by population growth. It is likely that a significant portion of these new teachers will not have pedagogical training.

In the case of Mexico, a study by the National Institute of Statistics and Geography (INEGI) conducted in 2020 found that 18% of basic education teachers did not have teaching training. This means that around 1.2 million students in Mexico receive education from teachers without adequate pedagogical preparation (González & Crispín, 2022).

In Colombia, a study by the Ministry of National Education conducted in 2018 found that 10% of teachers did not have a professional degree in education, which equates to about 34,000 students receiving education from teachers without pedagogical training (Albadan, 2020). According to the Labor Observatory for Education Report 2022, in Colombia, 40% of teachers do not have training in pedagogy or didactics, meaning that around 136,000 students are taught by teachers without this specific preparation. On the other hand, an analysis by the Colombian Federation of Educators (FECODE) in 2023 estimates that 50% of teachers in Colombia do not have training in pedagogy or didactics, affecting about 170,000 students in the country (Cabeza *et al.*, 2018).

It is important to note that in Colombia, the situation has arisen where many professionals in informatics and other areas take on teaching roles in primary and secondary education institutions due to the growing demand for professionals in the pedagogical field. Meanwhile, graduates in education specialize in specific areas such as mathematics, language, and social sciences, but are not initially trained in the technological field. This has led the Ministry of National Education to hire engineers in technology and informatics to teach. While this approach meets immediate needs, these professionals often lack pedagogical competencies.

In this context, it is important to highlight that when a technology professional assumes the role of a

teacher in primary and secondary levels without having pedagogical competencies, several significant challenges can arise. Communication becomes an issue, as it can be difficult to explain technical concepts clearly and in a way that is adapted to different levels of maturity and understanding (Figueroa, 2024).

Additionally, teachers who lack pedagogical-communicative competence may face several problems in making themselves understood, including difficulties in explaining concepts clearly and comprehensibly to students, as well as in maintaining their attention and interest in the content. Furthermore, the lack of adequate communicative skills can lead to ineffective classroom communication, making it difficult to effectively transmit knowledge and create a positive learning environment (Cabeza *et al.*, 2018).

On the other hand, the lack of strategies to maintain students' attention and interest, as well as the inability to adapt teaching to individual needs, are also common challenges. Regarding classroom management, there may be difficulty in controlling student behavior, maintaining discipline, and creating a positive and motivating learning environment (Figueroa, 2024).

To maintain students' interest, a teacher needs pedagogical skills that allow them to develop appropriate strategies. Without these competencies, it can be difficult to capture and hold students' attention (Durán et al., 2014). The lack of effective strategies to make content relevant and engaging can result in a boring and demotivating learning environment. Additionally, the inability to adapt teaching to individual needs and learning styles can cause some students to disconnect and lose interest in the subject (Albadan, 2020).

It is also considered that the lack of pedagogical competencies can result in planning and evaluation problems, such as difficulty in designing effective didactic sequences, evaluating learning adequately, and conducting formative and continuous assessment. Despite these challenges, the presence of a technology professional in the classroom can also have advantages, such as providing an updated perspective on the technological world, motivating students towards technological careers, and creating innovative learning experiences (Figueroa, 2024).

In this regard, a lack of pedagogical competencies has been observed in non-licensed teachers in educational institutions in Magdalena, Colombia. This translates into communication problems when explaining technical concepts, difficulties in classroom management to maintain discipline and create a positive environment, as well as challenges in teaching planning and evaluation. Meanwhile, students show disinterest in the subject, difficulties in understanding concepts, and potentially low academic results as a result of the teacher's lack of pedagogical competencies in technology. Therefore, the study aimed to analyze Socio-Formative Training for Non-Licensed Teachers in Technology and Informatics.

Methodology

The study methodology adopted the interpretive-postpositivist paradigm, which focuses on understanding and explaining social phenomena from the participants' perspective, recognizing

the subjectivity and complexity of reality. This qualitative approach allowed for an in-depth exploration of the experience of non-licensed teachers in education who teach computer technology (Acosta, 2023).

The method employed was phenomenological-interpretive, which aims to understand the meaning and structure of the experiences lived by the participants. In this case, the goal was to understand how non-licensed teachers in education experience and face the challenges of teaching computer technology in educational institutions (Acosta, 2023).

The sample consisted of 8 non-licensed teachers in education but with training in computer science. The inclusion criteria aimed for them to be IT professionals willing to collaborate by providing information about their experience in teaching this subject. For data collection, a structured interview was used, consisting of an interview guide with 22 open-ended questions designed to address all relevant aspects related to the teaching of computer technology by non-licensed teachers in education.

Regarding ethical considerations, confidentiality of the participants was respected, and their informed consent was obtained before participating in the study. Privacy was ensured, and the identity of the participants was protected in the presentation of the results. Data analysis was conducted using coding-categorization, which helped identify patterns and relationships in the data. Additionally, triangulation was applied, considering empirical, theoretical, and argumentative aspects to ensure the validity and reliability of the results obtained.

Results

The following are the results derived from the triangulation process among the information provided by the informants, the cited theories, and the researcher's argumentation. These results provide a comprehensive and well-founded insight into the socio-formative competencies of non-licensed teachers in technology and informatics. Triangulation enabled the validation and enrichment of the collected data, ensuring the reliability of the findings.

Table 1
Triangulation of the Perception of Technology and Informatics Teachers

Categories	Empirical Moment (direct quotes from key informants)	Theoretical Moment	Argumentative Moment
"Sense of challenge"	"Sometimes it represents a challenge to adapt to the processes involved in planning lessons" (IC1).	According to Echeveste and Martínez (2016), teachers with weaknesses in pedagogical competencies are cognitively affected as they experience stress and feel overwhelmed when planning lessons without the appropriate tools.	Teachers without pedagogical training face both cognitive and emotional challenges when planning lessons and communicating with students. They experience stress, insecurity, and frustration, but some view these challenges as opportunities to improve their skills. This suggests that their experience
	"Personally, it made me feel stressed due to the challenge of teaching without pedagogical training" (IC2).		

Categories	Empirical Moment (direct quotes from key informants)	Theoretical Moment	Argumentative Moment
Awareness of Limitations	"Initially, I felt overwhelmed by the responsibility of educating students without the appropriate tools" (IC3).	According to Figueroa (2024), it is important for teachers to recognize the significance of acquiring pedagogical competencies and to accept the challenge of teaching without specific training. Likewise, it is urgent that they seek support and reflect on their practices to improve, despite facing uncertainty and frustration.	The analysis of teachers' perceptions reveals a complex and challenging reality. On one hand, there is an evident awareness of the need to acquire pedagogical competencies and a willingness to face the challenge of teaching without specific training. However, there is also a sense of stress, overwhelm, insecurity, and frustration in the face of difficulties in effectively communicating and planning lessons. Despite this, teachers strive to improve their skills through daily reflection on their practices and seeking support. Teaching is perceived as an important source of income, reflecting the significance of this work in their lives.
	"This created in me a sense of insecurity about how to approach certain aspects of the educational process" (IC4).		
	"Every day I reflected on my practices and sought ways to improve them" (IC5).		
	"Daily, I faced uncertainty about the appropriate pedagogical strategies" (IC6).		
	"I wanted in-depth courses on how to plan and evaluate" (IC7).		
	"I was frustrated, but it was my source of income" (IC8).		

Note: Own elaboration (2024).

Table 1 presents two main categories, which are derived from the interviews with unlicensed teachers: the sense of challenge and the awareness of limitations. Regarding the sense of challenge, the interviewees expressed that without pedagogical training, they experience stress, insecurity, and frustration when planning lessons and communicating with students. Despite this, some view these challenges as opportunities to improve their skills, suggesting a process of learning and professional growth. In this context, one of the informants stated:

> The sense of challenge in teaching without pedagogical training is very real and constant. At times, adapting to the processes involved in planning lessons can represent a significant challenge. Personally, it has made me feel stressed and overwhelmed, especially in the beginning, when I faced the responsibility of educating students without the appropriate tools. The insecurity about how to approach certain aspects of the educational process and the frustration of facing difficulties in effectively communicating with students have also been part of this experience. However, I try to view these challenges as stimulating and motivating opportunities to improve my skills. It is a complicated and difficult process to manage, but day by day, I strive to learn from my practices and seek ways to improve them. Despite the difficulties, teaching remains an important source of income for me.

In this regard, Gallardo *et al.* (2022) emphasize the importance of training teachers in socio-pedagogical competencies to help them achieve psychological-emotional well-being and gain confidence, which translates into better performance, improved teaching processes, and greater receptivity from students. Similarly, Arteaga *et al.* (2015) believe that pedagogical training pro-

vides teachers with the necessary tools to handle the adaptability required in different educational contexts where they may work.

When interpreting the statements of the teachers and the cited theories, the researcher infers that these professionals (unlicensed) experience a sense of challenge when teaching without pedagogical training. This is important because it highlights the difficulties and pressures that unlicensed teachers face in their educational work. This sense of challenge can serve as a starting point for identifying areas for improvement in the training and support of these teachers, as well as for developing strategies to help them face these challenges more effectively. Additionally, by recognizing and understanding this feeling, it is possible to promote an environment of empathy and support among education professionals, which can contribute to improving the quality of teaching and the well-being of students.

Regarding the awareness of limitations, teachers recognize the importance of acquiring pedagogical competencies and accepting the challenge of teaching without specific training. They seek support and reflect on their practices to improve, despite facing uncertainty and frustration. Teaching is perceived as an important source of income in their lives. In this context, one of the interviewees highlighted that:

As a teacher, awareness of my limitations is fundamental to my professional development. I recognize the importance of acquiring pedagogical competencies and accepting the challenge of teaching without specific training in education. Despite the difficulties and uncertainty I face when communicating with students and planning lessons, I constantly seek to improve my skills. Every day, I reflect on my practices and seek support from colleagues and institutions to continue growing. Although I may feel frustration along the way, I know that this experience is essential for my growth as an educator.

Hence, this analysis reveals a complex and challenging reality for teachers without pedagogical training, who seek to improve their skills despite the difficulties, demonstrating an attitude of overcoming and adapting to the challenges of teaching (Valenzuela et al., 2015). In contrast with Colmenares' theory (2017), teachers must self-evaluate and reflect on their work, strategies, mechanisms, and even their objectives, so that this provides them with information to reorganize and improve the methodologies they implement if necessary.

The information provided by the teachers and the insights from the consulted theory allow the researcher to deduce that the sense of challenge and the awareness of limitations experienced by teachers without pedagogical training when faced with teaching are crucial aspects that influence their learning process and professional growth.

Despite the initial difficulties, many teachers view these challenges as opportunities to improve their skills and actively seek support and reflection to overcome their limitations. These findings highlight the importance of providing continuous support and training to teachers so that they

can successfully face the challenges of teaching and provide quality education to students.

Table 2
Triangulation on the Educational Benefits of Information Technology Professionals in Educational Processes

Categories	Empirical Moment (direct quotes from key informants)	Theoretical Moment	Argumentative Moment
Updated Perspective	Technology professionals can offer a fresh and updated perspective on technology and its application in the modern world, which can be especially relevant for students pursuing careers in technology-related fields.	According to Durán *et al.* (2014), it is important to have an updated perspective in educational processes to stay aligned with advancements and changes in society and the world, which allows for providing a relevant education and preparing students for current and future challenges.	Having an updated perspective helps unlicensed teachers improve their teaching practice by staying informed about the latest trends, methods, and educational technologies. This allows them to offer more effective and relevant instruction to their students, which can increase student motivation and engagement in learning. Additionally, staying updated helps them better adapt to changes in the educational system and enhances their job opportunities.
Motivation Towards Technological Careers	Their experience and passion for technology can motivate students to become interested in related careers, thus encouraging participation in STEM fields and the development of technological skills.	Pursuing technological careers is beneficial for students' learning process because it provides them with a sense of purpose and relevance, increases their interest in technology-related subjects, and encourages active exploration and autonomous learning (Valenzuela *et al.*, 2015).	From all this, it can be inferred that teachers become role models, showing enthusiasm and passion for technology and demonstrating how it can be a rewarding and exciting career. By inspiring students in this way, teachers can play a fundamental role in fostering motivation towards technological careers.
Classroom Innovation	Innovation in the classroom can benefit learning by stimulating students' interest and offering them new ways to understand and apply concepts.	Currently, teachers are needed who motivate student participation through innovative strategies (Vera & García, 2010).	Innovation in the classroom is important because it promotes more dynamic, creative, and relevant learning for students, fostering their interest and active participation in the educational process. Additionally, it allows pedagogical practices to be adapted to current needs and contexts, preparing students to face the challenges of the contemporary world.
Connection with the Industry	The connection with the industry allows students to see the practical relevance of what they learn, better preparing them for the workforce.	Today's youth must be educated under the influence of technologies, as they are present in the areas of production and development in the era of globalization (Joyanes, 2017).	Establishing a connection with the industry is important for students because it provides them with the opportunity to apply their knowledge in real-world situations, understand the demands and trends of the job market, and build networks that can be valuable for their future professional careers. This allows them to acquire relevant skills and competencies for their academic and professional development.

Note: Own elaboration (2024)

Table 2 reflects the categories that emerged regarding the advantages of unlicensed IT teachers, showing that the updating of teachers in education is important to ensure that students acquire the necessary skills to succeed in a constantly evolving world.

Furthermore, they expressed that by staying up-to-date with the latest trends and advancements in education, teachers can offer more relevant and meaningful learning experiences. This not only benefits students by better preparing them for the future but also enriches teaching practice by fostering creativity, innovation, and adaptability in the classroom. As one of the interviewees highlighted:

An updated perspective in teaching is essential to keep up with new educational methodologies and technologies. It allows us to adapt to the changing needs of our students and continuously improve our teaching practices to provide a quality education.

In concordance with the interviewees' ideas, Beltrán (2021) emphasizes the need for teachers to receive continuous training that allows them to stay updated on novel strategies, student needs, and institutional guidelines. According to Callealta *et al.* (2020), it is imperative that teachers be innovative and adapt their teaching processes to new technologies to prepare students to face the challenges of this century.

In this sense, the researcher believes that constant updating in education is a fundamental requirement for excellence in teaching. By staying current with the latest trends, methodologies, and educational technologies, teachers can offer more effective and relevant learning experiences for students, better preparing them for future challenges. Hence, an updated perspective not only benefits students but also enriches teaching practice by fostering innovation, creativity, and adaptability in the classroom.

Regarding the emerging category of motivation towards technological careers, the interviewees highlighted the idea that the good performance and skills (knowledge) of the teacher can motivate students towards technological careers and encourage them to implement these skills in other subjects to obtain information, create concept maps, and mental maps by recognizing the programs for these tasks. Hence, one of the interviewees considers that:

> In my experience, motivating students towards technological careers involves showing them the relevance and positive impact they can have on the world. Through practical activities and interesting projects, I help them see the exciting potential and opportunities for personal and professional growth in the technology field.

This aligns with social cognitive theory, as noted in Castillo's (2020) research, which posits that motivation towards technological careers can be promoted through exposure to successful models in the field, the creation of an enriched learning environment, and the appreciation of students' technical and creative skills.

All this suggests that motivation towards technological careers can be fostered through educational programs that integrate emerging technologies and innovative pedagogical approaches. The research indicates that early exposure to technology, combined with practical experiences and collaboration with the industry, can significantly increase students' interest in these areas.

Another category that emerges from the informants' discourse is Innovation in the Classroom, highlighting that a teacher with extensive knowledge in their field has the ability to adapt content with novel strategies that capture student interest, thereby facilitating the practical aspect. In this sense, one of the teachers stated:

Innovation in the classroom involves not only using new technologies but also developing creative pedagogical approaches that stimulate critical thinking and problem-solving. For me, it is important to stay informed about the latest educational trends and adapt them to the specific needs of my students.

According to Cedeño (2021), from the perspective of educational innovation theory, classroom innovation refers to the implementation of novel practices and methods that significantly improve the teaching and learning process. According to Cruz (2019), this can include the use of technology, the design of interactive activities, and the promotion of a collaborative learning environment.

From the researcher's perspective, classroom innovation can improve the quality of education by increasing student motivation and engagement, as well as fostering the development of 21st-century skills such as creativity, collaboration, and problem-solving. Research shows that innovative teachers tend to achieve better academic results and higher student satisfaction.

Finally, the category of Connection with the Industry emerged, where the interviewees highlighted the importance of a teacher with technological training because it prepares students in this highly demanded field in the labor market. One of the interviewees stated that:

Establishing a connection with the industry is fundamental to staying updated on the demands of the job market and ensuring that my students acquire the necessary skills to succeed in the workforce. Through collaborations with companies and professionals in the field, I can enrich my curricula and provide practical learning opportunities.

In contrast to Aristizábal (2022), who considers that according to competency-based education theory, the connection with the industry is important to ensure that students acquire relevant and up-to-date skills for the job market. Collaboration with companies allows aligning the educational curriculum with the needs and expectations of the productive sector.

All this leads the researcher to infer that the connection with the industry can benefit students by providing them with practical experiences, authentic learning opportunities, and the possibility of establishing professional contacts. Research suggests that collaborations between edu-

cational institutions and companies can improve graduates' employability and contribute to local economic development.

Conclusions

The analysis of the interviewees' discourse, coupled with the consulted theories, highlights the urgency of strengthening the pedagogical training of unlicensed technology and informatics teachers in Colombia. It is essential that training programs address not only the technical aspects of technology and informatics but also the necessary pedagogical strategies for effective teaching in these areas. The integration of innovative and participatory educational methods, as well as the development of skills for managing diversity and inclusion, are key aspects that must be considered in the training of these teachers.

Additionally, special attention must be given to the continuous updating of pedagogical knowledge and skills, in line with technological advancements and the changing needs of society. Continuous professional development and access to updated educational resources are fundamental for teachers to stay current in an increasingly digitalized and dynamic educational environment. It is also important to promote a culture of collaborative learning among teachers, where they can share experiences, best practices, and resources, thereby enriching their educational work.

Finally, it is necessary for educational policies and teacher training programs to recognize and value the importance of pedagogical training in the teaching of technology and informatics. This involves ensuring adequate resources, both material and human, for the development of quality training programs. Additionally, it is crucial to establish monitoring and evaluation mechanisms to verify the impact of these actions on improving educational quality and developing competencies in technology and informatics among students.

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Emotional component and academic performance

Componente emocional y el rendimiento académico

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Abstract

The present article is part of a doctoral thesis, which emphasizes emotional components and academic performance, focusing on determining the relationship between emotional components and academic performance of students in educational institutions in Medellin, Antioquia. The study followed positivist paradigm procedures with a quantitative approach, using a basic study type and correlational level. The sample consisted of 24 teachers and 36 students, who were administered a 60-item instrument. The results showed a strong and significant positive correlation coefficient between the variables ($r = 0.878$, $p < 0.005$). This indicates that as the emotional component increases, so does academic performance. It was concluded that the strength of this correlation is high, supporting the relevance of addressing students' emotions in teaching. Furthermore, the statistical significance of the results indicates that this relationship is not random but a significant finding.

Keywords: emotional components, academic performance, relationship, education.

Resumen

El presente artículo hace parte de una tesis doctoral, en la cual se hace énfasis en los componentes emocionales y el rendimiento académico, por lo que su objetivo se centró en determinar la relación entre el componente emocional y el rendimiento académico de los estudiantes en las instituciones educativas de Medellín, Antioquia. El estudio siguió los procedimientos del paradigma positivista con enfoque cuantitativo, mediante un tipo de estudio básico y nivel correlacional. La muestra estuvo constituida por 24 docentes y 36 estudiantes, a quienes se les aplicó un instrumento de 60 ítems. Los resultados demostraron que existe un coeficiente de correlación positiva significativa fuerte y significativa entre las variables ($r = 0{,}878$, $p < 0{,}005$). Esto indica que a medida que aumenta el componente emocional, también lo hace el rendimiento académico. Por lo que se concluyó que, la fuerza de esta correlación es alta, lo que respalda la relevancia de abordar las emociones de los estudiantes en la enseñanza. Además, la significancia estadística de los resultados indica que esta relación no es aleatoria, sino que es un hallazgo significativo.

Palabras clave: componente emocional, rendimiento académico, relación, educación.

Introduction

The Covid-19 coronavirus affected societies worldwide, negatively disrupting individuals and production systems. Consequently, the educational system was influenced to an equal or greater extent than the production system to adapt to the measures adopted to curb the health crisis. Therefore, schools were closed, and students suspended in-person classes; the well-known unexpected nature of the problem forced authorities to take drastic measures and follow the control measures established by the World Health Organization (WHO, 2020). In this way, the educational system was obliged to migrate to virtual technological platforms as strategies to ensure the continuity of learning in schools.

Regarding this matter, the Economic Commission for Latin America and the Caribbean (ECLAC) and the United Nations Educational, Scientific and Cultural Organization (Unesco, 2020) stated that the health crisis transformed the educational process in several schools in more than 190 countries, in the quest to control the spread of the virus and thus try to reduce the chains of contagion. Reports from these organizations show that, since the beginning of the pandemic, more than 1.2 billion students worldwide and at all educational levels were forced to stay at home without being able to attend school.

Furthermore, Pérez *et al.* (2022) argue that it is potentially important from a biosociological perspective to work on emotions so that individuals can process the information they absorb through the stimuli presented in the social, family, and school environment. This means that it is important to develop emotional intelligence so that people can manage their emotions in the face of any problem that arises, applying capacities and skills to maintain successful mental health; these mechanisms for learning emotional skills influence behavior and how each human being faces specific situations.

Based on all of the above, it can be inferred that the role of emotions in educational situations is essential, hence the urgent need to delve into the incidence of emotional intelligence in determining students' learning achievements. For a long time, significant transformations have occurred in teaching and learning processes to promote the comprehensive education of students, developing their knowledge, skills, and abilities in the cognitive, social, moral, and emotional fields. This notion of competence includes the ability to adapt to changing realities and to integrate successfully into different environments that require proper emotional management. Therefore, it is especially important to develop emotional competence in primary grades (Villalobos & Riquelme, 2022).

According to the approach made by Lozano-Peña et al. (2022), following the upheaval that shook humanity in 2020 (SARS-COVID 19), which caused drastic changes in people's lives at an individual, social, and even productive level, the author highlights that this situation generated moments of distress and anxiety, especially in the child population who couldn't comprehend the situation and were subjected to health measures, such as ceasing to attend their schools.

According to Núñez & Llorent (2022), referring to the Latin American context, various studies have emphasized that the emotional impact of the pandemic has been significantly manifested in children. They were affected by fear and insecurity, developing behaviors that persist to this day, marking their behavior in the post-pandemic period. Thus, numerous students are still observed with traits of fear, insecurity, and withdrawal, among other emotional manifestations.

Similarly, according to data from Latin America, approximately 160 million students were unable to attend their schools, leading to widespread emotional disturbances. This situation exposed students to a comprehensive transformation in all aspects of their lives. Therefore, it is imperative that schools seek the necessary tools to facilitate children's adaptation to the new post-pandemic school environment, focusing especially on the development of their emotional intelligence (Si-

meón *et al.*, 2021).

However, what is observed in the socio-emotional competencies of students in other contexts does not differ from the reality in Colombia. Despite the fundamental mission of the school, which is to promote the development of both intellectual and emotional competencies in students, it is evident that they face similar challenges. The goal is for students to acquire emotional knowledge that allows them to evolve as individuals and to confront the challenges present in their social environment in a balanced manner.

In this regard, it is necessary for schools to work on socio-emotional competencies that lead to the psychological balance and stability of teachers, especially in post-pandemic times where behaviors of distancing among students, apathy, insecurities, and intolerance are observed, often leading to confrontations and shouting. It can be affirmed that emotions, both positive and negative, can have a significant impact on learning. Primarily, positive emotions facilitate learning, leading students to focus, overcoming any predispositions. Students may feel more interested and engaged with school, which leads to better retention and comprehension of the information provided to them (Acosta, 2022).

Conversely, from the perspective of negative emotions, these can interfere with learning. A person may feel blocked, distracted, and distressed, which interferes with learning processes and the ability to retain information. All of this highlights the need to recognize and manage emotions within pedagogical processes. It is not necessarily the case that a psychologist must intervene to address them; teachers can address them by acquiring appropriate scientific information and working on all those emotions that represent setbacks in relation to the academic and social development of the student (Ferreira et al., 2023).

In the same line of thought, according to Soto-Romero et al. (2023), teachers contribute to developing their students' emotional competencies in several ways, including practicing empathy and acumen: teachers need to relate to each student as an individual and understand that everyone has different needs and emotional situations. This information can be used to find new ways to manage their emotions and promote a sense of trust. Additionally, the teacher must create a safe and respectful environment, as a respectful, tolerant, and empathetic context is essential for students to feel safe sharing their emotions and feelings.On the other hand, Bermúdez (2022) points out that students cannot only be taught how to think and reason; their ways of thinking, acting, and above all, feeling, must be considered. Only then is education conducted with emotional intelligence in the Colombian educational system. Hence, teachers create environments fostering open communication and preventing discrimination. Additionally, they should carry out emotional exploration actions: teachers can design activities that help students examine and perceive their own emotions and those of others.

According to Acosta & Blanco (2022), teachers play an important role in the development of students' emotional intelligence, facilitating their understanding and effective management of emotions. Furthermore, they consider it relevant to highlight the influence of emotions on me-

mory, as there is an improvement in the ability to remember experiences when they are associated with positive emotions, while experiences linked to negative emotions can create barriers to knowledge retention. Therefore, it is relevant to consider emotional dimensions when designing educational strategies and methods.

According to Acosta & Blanco (2022), emotional components have a significant impact on the learning process. First, because emotions act as motivation for learning. When people are motivated or interested in the subject matter, they tend to be more receptive and pay more attention to all the information they receive. Second, if a student feels frustration, anxiety, or is stressed, they will hardly pay attention, as these emotions often interfere with learning processes and information retention, which can interfere with their ability to learn.

Likewise, emotions also affect memory. When an experience is rated positively, it enhances the ability to recall it over time. However, when an experience is associated with a negative emotion, it can create a barrier to knowledge retention because the brain avoids recalling the negative experience (Suárez & Castro, 2022).

Thus, Núñez & Llorent (2022) consider that emotional components should be related to emotional intelligence within educational institutions. By giving it the connotation of intelligence, it can be educated, being conceived as an area or dimension of the student that should be attended to as part of their comprehensive training. Just as mathematics is taught without neglecting language, cognitive competencies cannot be developed while neglecting emotional competencies.

In this regard, emotional intelligence refers to the way of self-awareness and self-control of one's own sensations and emotions in order to regulate behaviors and responses to any stimulus. Gardner (2016) defines it as the biosociological potential that every human being has to process information received through stimuli generated in their social and/or family environment. This means that this intelligence can be developed in such a way that individuals can regulate their reactions to certain circumstances. According to the author's approach, it is understood that this intelligence attributes skills and abilities to people for managing their feelings. This means that EI is a set of skills, attitudes, abilities, and competencies that determine a person's behavior, reactions, or mental state.

The study adhered to positivist processes with a quantitative and correlational approach. In this regard, Acosta (2023) defines the quantitative approach as those related to the positivist paradigm, meaning they adhere to its characteristics of a single method, mathematical analysis, and prediction of results. This paradigm examines the objectivity of a problem through causal empirical verification and its effects, rather than seeking subjective inferences from the facts. It examines the objectivity of the problem by collecting quantitative information about it. The study aims to evaluate the created situation through variables, dimensions, and indicators. These quantitative studies reflect a numerical mechanism, frequency, which allows for drawing specific conclusions that can be generalized as data to measure certain behaviors.

Based on the presented problem and the proposed objectives, the study aimed to measure two variables to see if they are related to the same topic and analyze correlations. According to Hernández & Mendoza (2018), the purpose of correlation studies is to determine the degree of relationship or association (not causality) between two variables. Hence, due to the nature of the study, it had a descriptive scope of the observed realities and was also considered basic, as it seeks to deepen the knowledge of emotional components to determine to what extent they are related to learning.

Additionally, it analyzes the problem to understand and describe the properties and dimensions of the variables involved in the study. A questionnaire was designed as an instrument for teachers to respond to the behaviors they observe in their students. Likewise, the students themselves provided insight into their actions and emotions, allowing the measurement of variables through their dimensions and indicators. The questionnaire was administered to 24 teachers and 36 seventh-grade students, who had the consent of their legal guardians. It is worth noting that the students were given a questionnaire that was easy for them to understand and complete with clear instructions. As for the teachers, they were given a questionnaire to measure their perception of the socio-emotional development of the students. The data were analyzed using SPSS version 21.

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Results

The results stem from grouping the information (data) into frequencies considering the responses from both teachers and students. In this regard, they were mainly tabulated in Excel tables, assigning a numerical value to each response option.

Table 1
Emotional component

Indicator	Levels											
	Low				Moderate				Alto			
	Students		Teacher		Students		Teacher		Students		Teacher	
	Fr	F%	Fr	F%	Fr	F%	Fr	F%	Fr	F%	Fr	F%
Emotional Component	9	25.0	6	25.0	27	75.0	18	75.0	0	0.0	0	0.0
Comunication	24	66.7	15	62.5	9	25.0	7	29.2	3	8.3	2	8.3
Self-control	24	66.7	18	75.0	11	30.6	5	20.8	1	2.8	1	4.2
Self-steem	36	100	12	50.0	0	0.0	12	50.0	0	0.0	0	0.0
Self-awareness	24	66.7	16	66.7	11	30.6	5	20.8	1	2.8	3	12.5
Total	36	100.0	24	100.0	36	100.0	24	100.0	36	100.0	24	100.0

Note: Author's own elaboration (2024).

EIn Table 1, the dimensions of the emotional component variable are shown from the perspective of both students and teachers. It can be observed that 75% of students and teachers rated themselves at a regular level on this variable, while 25% of both teachers and students rated themselves at a low level. Regarding the communication dimension, 66.7% of students have a low communication level, and 62.5% of teachers also consider them to be at a low level. 25% of students are at a regular level, as are 29.2% of teachers. Additionally, 8.3% of both teachers and students consider their communication level to be high.

Regarding the self-control dimension, 66.7% of students have a low level, while 75% of teachers believe they are at a low level. 30.6% of students have a regular level of self-control, and 20.8% of teachers consider themselves to be at a regular level. Only 2.8% of students have a high level, as do 4.2% of teachers.

Referring to self-esteem, it was observed that 69.4% of students have a low level, according to teachers' assessment of 75% at a low level. 27.8% of students have a regular level, and according to teachers, 29.2% have a regular level.

Regarding the empathy dimension, 72% of students have a low level of empathy, confirmed by

62.5% of teachers, while 22.2% are at a regular level, and 29.2% of teachers believe these figures are at a regular level. 5.6% of students have a high level of empathy, and teachers believe 8.3% are at a good level.

Finally, with regard to self-awareness, 69.4% of students are at a low level, while teachers believe 66.7% are at a low level. Additionally, 11.1% of students are at a high level, and teachers believe 12.5% are at that level.

Table 2
Academic performance

Indicator	Levels											
	Poor				Moderate				Efficient			
	Students		Teacher		Students		Teacher		Students		Teacher	
	Fr	F%	Fr	F%	Fr	F%	Fr	%F	FR	%r	Fr	F%
Academic performance	13	36.1	12	50.0	23	63,9	12	50.0	0	0.0	0	0.0
Student participation	26	72.0	17	70.8	9	25.0	4	16.7	1	2.8	3	12.5
Competency development	22	61.1	18	75.0	11	30.6	5	20.8	3	8.3	1	4.2
Learning motivation	22	61.1	18	75.0	12	33.3	4	16.7	2	5.6	2	8.3
Total	36	100.0	24	100.0	36	100.0	24	100.0	36	100.0	24	100.0

Note: Author's own elaboration (2024).

The results from Table 2 show the academic performance variable along with its dimensions. It can be observed that concerning the variable, 63.9% of the students exhibit a moderate performance, as perceived by 50% of the teachers. Meanwhile, 36.1% of the students have a poor performance, as indicated by the remaining 50% of the teachers. Regarding the dimension of student participation, 72.2% of the surveyed students stated that their participation is poor, and 70.8% of the teachers agree with this assessment. Only 2.8% demonstrate efficient participation, according to the students, while 12.5% are perceived as efficient by the teachers.

In terms of competency development, 61.1% of the students have a deficient level, as reported by 75% of the teachers. Additionally, 30.6% of the teachers rate the competency development as moderate, with 20.8% of the students falling into this category. Furthermore, 8.3% of the students exhibit an efficient level of competency development, but only 4.2% are seen as efficient by the teachers. Finally, concerning motivation for learning, 61.1% of the students have a deficient motivation level, according to both the students and teachers. Additionally, 33.3% of the students display a moderate level of motivation, while 16.7% are perceived as moderately motivated by the teachers. Only 5.6% demonstrate an efficient level of motivation, as reported by the students, while 8.3% are perceived as efficient by the teachers.

Table 3

Correlation coefficient of the emotional component variable and academic performance from the information obtained from the students

			Emotional Component	Academic Performance
Rho de Spearman	Emotional Component	Correlation Coefficient	1,000	0,878
		Sig. (bilateral)	0,000	0,005
		N	36	36
	Academic Performance	Correlation Coefficient	0,878	1,000
		Sig. (bilateral)	0,005	0,000
		N	36	36

Note: Author's own elaboration (2024).

Table 3 displays the Spearman correlation coefficients between the emotional component and academic performance, along with the associated significance values.

For the emotional component, a strong and significant positive correlation with academic performance is observed ($r = 0.878$, $p < 0.005$). This indicates that as the emotional component increases, academic performance also increases, and this relationship is statistically significant.

Conversely, academic performance also exhibits a strong and significant positive correlation with the emotional component ($r = 0.878$, $p < 0.005$), suggesting that as academic performance improves, so does the emotional component, and this relationship is also statistically significant.

These findings highlight a significant association between the emotional component and academic performance in the studied sample, emphasizing the importance of considering emotional aspects in the educational context.

Table 4

Correlation coefficient of the emotional component variable and academic performance from the information obtained from teachers

			Emotional Component	Academic Performance
Spearman's Rho	Emotional Component	Correlation Coefficient	1,000	0,892
		Sig. (bilateral)	0,000	0,000
		N	24	24
	Academic Performance	Correlation Coefficient	0,619	1,000
		Sig. (bilateral)	0,000	0,000
		N	124	24

Note: Author's own elaboration (2024).

In Table 4, the Spearman correlation coefficients between the emotional component and academic performance, as well as the associated significance values, are shown. For the emotional component, a very strong and significant positive correlation with academic performance is observed ($r = 0.892$, $p < 0.001$). This suggests that as the emotional component increases, so does academic performance, and this relationship is statistically significant.

Conversely, academic performance also shows a very strong and significant positive correlation with the emotional component ($r = 0.892$, $p < 0.001$), indicating that as academic performance increases, so does the emotional component, and this relationship is also statistically significant.

These findings suggest a strong association between the emotional component and academic performance in the studied sample, supporting the importance of considering emotional aspects in the educational context.

Discussion

Regarding the emotional components of the students, it was observed that the majority exhibit low levels of communication, self-control, self-esteem, empathy, and self-awareness; only a small percentage show average and high levels, indicating that indeed the students do not have good emotional management. This implies, from the perspective of Acosta & Blanco (2022), that emotions are factors that have a direct impact on people's lives, and their origin dates back to family relationships, whether due to permissive, repressive, or autocratic parenting styles. Ferreira *et al.* (2023), on the other hand, point out that dysfunctions and the parents' occupations to meet the family's basic needs and provide food often lead them to neglect the formation of their children's personality, feelings, and emotions.

According to Díaz & Palma (2017), considering that the emotional area of students is not being addressed from the family core, the school must intervene by presenting mechanisms to link cognitive teaching with emotional aspects. Therefore, Nussbaum (2014) argues that a central axis must be created to address skills that lead to balanced development (EI), so that the learner has tools that facilitate finding a balance between the emotional and the rational, working cognition together with emotions through learning strategies. Thus, the creation of didactic strategies is based on defining the procedures and resources to be used in pedagogy to stimulate the learning of students from the integrality of their being. That is, it involves how the teacher must consciously organize their activity to set and achieve goals consistent with the overall education of the students, adapting them to their needs (Núñez & Llorent 2022).

Based on the relationship between the emotional components from each of their dimensions and the processes of learning and/or academic performance, it is important to develop strategies that, in addition to being structured fundamentally according to the requirements of the students and the course requirements, where it is noted that the students' needs are not only learning, hence the methodologies to be developed must be oriented in the same proportion to the social and emotional needs due to extensive communicative instruction, self-control, self-

awareness, self-esteem, and communication. This suggests that it is not only about promoting students' cognitive progress. Therefore, the strategic structure aimed at promoting emotional intelligence must seek to develop skills to contextualize learning and elucidate the information received by students and, of course, cognitive improvement.

However, educational systems are not recognizing the structure of this strategy, as their practice has always been focused on developing cognitive mastery and following curriculum guidelines, which represents a weakness of the institutions that establishes that emotions must be taught because they are part of the student's personality.

In this sense, Acosta & Blanco (2022) propose that teachers must be responsible for promoting the integrality of their students, seeking their cognitive and emotional development. All this regardless of whether it is included in the educational plan or not. In this sense, it is necessary to create training strategies that promote the development of emotional education skills. The author's theoretical position reveals significant gaps in the structure of training strategies in emotional intelligence management in educational institutions in Medellín.

This is how deeply ingrained in its structure is the need to relate academic content to context, so teachers must know their students, as this allows them to relate content to their culture. This suggests that, to address emotions, strategies must be related or interconnected with students' culture and environment, as it reflects their emotions, their closeness to them.

In this sense, activities are warranted to generate learning strategies related to emotional intelligence management, which in turn promotes emotional maturity, thus regulating students' behavior and improving their interpersonal relationships. According to Ferreira *et al.* (2023), another aspect to reflect on in emotional intelligence management activities within the structure of learning strategies is the flexibility to adapt to students' needs, motivate them, and engage them in the learning process and their emotional development, which requires coordinated work and guiding students so they can organize their function training simultaneously.

From a different perspective, the intention is to describe strategies from emotions and the social component that favors the communicative dimension of emotional intelligence in the school setting. During the learning process, there are evident difficulties in communication among students. In this regard, it is necessary to emphasize that such strategies are characterized by promoting an environment of safety and freedom of expression due to the interaction that occurs among students, which is correct considering the use of strategies such as cooperation, empathy, self-respect, and respect for others (Díaz & Palma, 2017).

There are also other characteristics of social component strategies that contribute to the communicative dimension of emotional intelligence Interaction with the physical environment - because it promotes students' social development, stimulating curiosity - because it motivates students to engage students, broadening the level of interpretation of emotional intelligence

response. These characteristics are reflected in experiential socialization strategies and problem-solving games. However, for these strategies to be effective in developing communicative skills, they must become the main objective, as this will allow teachers to focus on this, rather than divert their attention solely to the acquisition of cognitive skills.

However, Suárez & Castro (2022) state that when seeking to guide emotional intelligence, strategies should enhance students' ability to understand gestures, that is, acquire a bodily awareness that helps them recognize others' feelings, as well as the ability to identify feelings and emotions in themselves and others. This case will benefit the development of social skills. Therefore, teachers must promote the integration of culture and communication because students' environment can affect the social and personal functions of communication.

In this sense, while teachers recognize the characteristics of strategies that promote students' communicative skills, they point out that in educational institutions, the grammar of language subjects is derived with reference to the communicative process. This indicates a weakness in the development of communication skills, as students are limited to constructing grammatically well-structured sentences.

Conclusions

Based on the results, it can be concluded that there is a significant and positive correlation between the emotional component and the academic performance of students. This suggests that emotions play an important role in academic performance, highlighting the need to consider them in the educational setting. The strength of this correlation is high, supporting the relevance of addressing students' emotions in teaching. Additionally, the statistical significance of the results indicates that this relationship is not random but rather a significant finding. Therefore, these findings emphasize the importance of promoting a emotionally positive environment in educational institutions to improve students' academic performance.

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Theoretical-practical approach of the inclusion of students with intellectual disability in Colombia*

Enfoque teórico-práctico de la inclusión de estudiantes con discapacidad intelectual en Colombia

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Abstract

The study examined the inclusion of students with intellectual disabilities in Colombia, comparing the theoretical and practical aspects of educational inclusion. A quantitative and descriptive approach with a positivist methodology was used, surveying 59 teachers. The results revealed discrepancies between theory and practice in inclusion. While a significant percentage of teachers believe that the "Right to Equality" and "Non-discrimination" are addressed, few indicated that individualized learning plans are always developed. Regarding the "Right to Participation" and "Individualization," although positive actions are perceived, there is a lack of consistency in their implementation, especially in the removal of physical barriers and pedagogical obstacles. These findings suggest a disconnect between perception and practice in the implementation of educational inclusion in Colombia.

Keywords: intellectual disability, education, inclusion.

Resumen

El estudio examinó la inclusión de estudiantes con discapacidad intelectual en Colombia, comparando los aspectos teóricos y prácticos de la inclusión educativa. Se utilizó un enfoque cuantitativo y descriptivo con metodología positivista, encuestando a 59 docentes. Los resultados revelaron discrepancias entre la teoría y la práctica de la inclusión. Mientras que un porcentaje significativo de docentes considera que se aborda el "Derecho a la igualdad" y la "No discriminación," pocos indicaron que siempre se elaboran planes individualizados de aprendizaje. Respecto al "Derecho a la participación" y la "Individualización," aunque se perciben acciones positivas, hay una falta de consistencia en su implementación, especialmente en la eliminación de barreras físicas y obstáculos pedagógicos. Estos hallazgos sugieren una desconexión entre la percepción y la práctica en la implementación de la inclusión educativa en Colombia.

Palabras clave: discapacidad intelectual, educación, inclusión.

Introduction

Worldwide and specifically in Spain and Italy, attention to the educational processes of children with intellectual disabilities has evolved towards a more inclusive approach, centered on the individual needs of students. In the past, these children were often segregated in special schools or lacked access to formal education. However, Anta *et al.* (2024) indicates that in recent decades, there has been a movement towards educational inclusion, seeking to ensure that all children, regardless of their abilities, have access to quality education in inclusive environments.

This shift has been driven by increased awareness of the rights of people with disabilities, as well as research demonstrating the benefits of inclusion for all students. According to Pérez *et al.* (2024), many countries have now adopted policies and laws that promote educational inclusion, and measures have been implemented to support students with intellectual disabilities

in regular educational settings.

These efforts include training teachers in inclusive teaching methods, adapting curricula and educational materials to meet the individual needs of students, and providing additional support such as classroom assistants or assistive technology, as stated by Gallegos (2023). Although there are still challenges in the effective implementation of educational inclusion, significant progress has been made in improving educational processes for children with intellectual disabilities globally, according to Castillo (2021).

For García *et al.* (2023), educational inclusion is of vital importance for children with cognitive disabilities, as it provides them with the opportunity to access quality education tailored to their individual needs. When children with intellectual disabilities are included in a regular educational environment, they can reach their full potential, both academically and socially, by interacting with their non-disabled peers and receiving the support they need to overcome their difficulties, as mentioned by Manco & Tobón (2023). In this sense, Acosta and Villalba (2022) indicate that inclusion fosters acceptance and respect for diversity, promoting a culture of inclusion in society as a whole.

Inclusion also contributes to the social and emotional development of children with cognitive disabilities, allowing them to form relationships with other children and develop a sense of belonging in their school community. By participating in educational and extracurricular activities alongside their peers, these children can acquire skills for daily life and prepare for greater autonomy in the future, as noted by Silva *et al.* (2023). Therefore, educational inclusion is essential to ensure the right to education for all children, regardless of their abilities, and to promote a more inclusive and respectful society.

Much has been said about the inclusion of students with disabilities in the education system, but in practice, the reality shows a different side. Inclusion goes beyond having a teacher who attends to these children in the regular classroom. It is about providing the right conditions for them to fully participate in the educational process. According to Bermúdez (2022), this includes having multidisciplinary teams that can provide support and guidance to teachers, adapting the curriculum and educational materials according to the needs of each student, and creating an inclusive school environment that promotes acceptance and respect for diversity. Only in this way can true educational inclusion be achieved for all students.

In Colombia, attention to the educational processes of children with intellectual disabilities has experienced significant advances in recent years, although challenges in their full inclusion still persist. The country has adopted a series of policies and regulations that promote inclusive education and guarantee access to education for all children, regardless of their abilities.

It is worth noting that one of the main advances has been the implementation of Decree 1421 of 2017, which establishes the legal framework for the educational attention of students with disabilities. This decree recognizes the right of these students to receive inclusive education and establishes guidelines for their care in the educational system. According to Bolaño-García

(2023), the Ministry of National Education has implemented programs and strategies to strengthen educational inclusion, such as the Todos a Aprender Program, which seeks to improve the quality of education for all children, including those with intellectual disabilities.

Despite these advances, there are still challenges in the effective implementation of inclusive education in Colombia. One of the main problems is the lack of resources and training for teachers, which hinders adequate attention to students with intellectual disabilities. According to Valdés *et al.* (2023), social and cultural barriers persist that limit the full inclusion of these children in the education system. All of this allows us to infer that while Colombia has made progress in addressing the educational processes of children with intellectual disabilities, it still faces significant challenges that must be addressed to ensure their full inclusion in the education system.

On the other hand, Henao (2023) states that inclusive education in Colombia has faced several challenges that have hindered its success. Some of these challenges include the lack of adequate resources, insufficient teacher training in inclusive education, lack of access to support technologies for students with disabilities, architectural barriers in educational institutions, and social discrimination. Similarly, Cornejo-Espejo (2023) points out that the implementation of inclusive policies at the national level has been inconsistent and has faced difficulties in its effective application at all educational levels. These factors have contributed to the lack of expected success of inclusion in Colombia.

In some institutions in the Zona Bananera of Magdalena, Colombia, weaknesses in inclusive policies have been observed, indicating that students experience low academic performance and lack of participation in the educational process, which can affect their self-esteem and motivation. This affects their emotional and social well-being.

Furthermore, students without disabilities are also being affected by the lack of inclusion, as they commonly develop negative attitudes towards diversity and inclusion, which can perpetuate discrimination and exclusion in society. They may also miss out on the opportunity to learn important skills such as empathy and tolerance, which are crucial for living in an inclusive society.

This situation can result in learning difficulties for students who do not receive the necessary support, affecting their academic performance and overall development. Moreover, the lack of results in inclusive policies can have a negative impact on society as a whole, as quality education for all is crucial for the social and economic development of the country.

The foregoing allows us to infer that when inclusive policies fail to achieve their objectives, exclusion and inequality are perpetuated, which can have significant long-term consequences for the education system and society as a whole. Additionally, if teachers fail in the process of inclusion of students with intellectual disabilities, negative effects can be observed in all students, both those with disabilities and those without. Therefore, it is important for teachers to strive to create an inclusive educational environment that benefits all students. In this sense, the study sought to examine the theoretical-practical approach to the inclusion of students with intellectual

disabilities in Colombia. Additionally, it proposes to establish a comparison between the theoretical and practical components of educational inclusion processes in Colombia.

Methodology

The study is framed within a positivist paradigm and follows a quantitative approach, aiming to measure and analyze observable variables. According to Acosta (2023a, 2023b), positivism is based on the idea that knowledge is obtained through observation and experimentation, seeking general laws to explain phenomena. On the other hand, Arias (2016) considers that the quantitative approach is characterized by the collection and analysis of numerical data to establish patterns and relationships between variables.

The study is descriptive in nature, as it seeks to describe the characteristics and behaviors of a specific group of teachers who work with children with cognitive disabilities, without seeking to establish causal relationships. The study sample consisted of 59 teachers working with students with disabilities.

Regarding inclusion criteria, teachers with experience in caring for children with cognitive disabilities in the educational context were considered. Likewise, ethical considerations such as confidentiality of information and informed consent of participants were respected.

For data collection, the survey technique was used, applying a questionnaire to 59 teachers working with this group of students. The questionnaire was validated by five experts in the field and demonstrated high reliability, with a Cronbach's alpha coefficient of 0.968. The data obtained were processed using the statistical program SPSS version 27, which allowed for descriptive statistical analysis and the establishment of patterns and relationships between the variables studied.

Results

Next, the tables detailing the results for each proposed objective are presented.

Table 1
Research competencies of teachers

Indicators	Response options					
	Always		Moderately		Never	
	Fr	F%	Fr	F%	Fr	F%
Right to equality	25	42,3	34	57,6	0	0
Right to non-discrimination	50	84,7	9	15,2	0	0
Right to participation	27	45,7	32	54,2	0	0
Right to individualization	10	16,9	35	61,0	14	23,7
Total	59	100	59	100	59	100

Note: Source: Own elaboration.

In Table 1, the theoretical components of educational inclusion are presented, regarding the following indicators: Right to equality, where 57.6% highlighted that this right is always recognized in educational institutions from institutional guidelines, and 42.3% of teachers acknowledge that inclusion has been moderately addressed as a right for all children.

Regarding the Right to non-discrimination, 84.7% of teachers consider that non-discrimination towards students with disabilities is always actively promoted, while 15.2% consider this to happen moderately. Similarly, concerning the Right to participation, it is observed that 54.2% of the surveyed subjects stated that students with disabilities are moderately consulted about their preferences and needs in the educational environment, with 45.7% believing that this always occurs.

In terms of the Right to participation, a similar trend is observed, where the majority considers that students with disabilities are moderately consulted about their preferences and needs in the educational environment, but a significant percentage believe that this always happens, suggesting a good level of student participation in their own educational process.

When analyzing the indicator of Right to individualization, it is evident that 61.0% of teachers believe that sufficient resources and personalized support are offered to meet the individual needs of students with disabilities to some extent, while 23.7% consider that teaching plans are never adapted to address the specific needs of each student with disabilities, and only 16.9% mentioned that this is moderately fulfilled.

Table 2
Practical Components of Educational Inclusion Processes

Indicators	Response options					
	Always		Moderately		Never	
	Fr	F%	Fr	F%	Fr	F%
Development of individualized learning plans	5	8,4	20	33,8	34	57,6
Teacher training	0	0	27	45,7	32	54,2
Curriculum adaptation	25	42,3	25	42,3	0	0
Removal of physical barriers	10	16,9	30	50,8	19	32,2
Total	20	33,8	39	66,1	0	0

Note: Source: Own elaboration.

In Table 2, the results related to different indicators of the practical components of educational inclusion are presented. Regarding the development of individualized learning plans, it is observed that 57.6% of teachers consider these plans to be moderately developed, while 8.4% believe they are always implemented, and the remaining 33.8% indicate that they never occur.

Regarding teacher training, 54.2% of respondents think this training is done moderately, 45.7% believe it is never carried out, and no teacher indicated that this training is always done. In relation to curriculum adaptation, 42.3% of teachers consider this adaptation to be moderately

done, another 42.3% indicate that it is always done, and the remaining 15.4% think that the curriculum is never adapted.

Regarding the removal of physical barriers, 50.8% of respondents believe this removal is moderately done, 32.2% indicate that it is never carried out, and the remaining 16.9% think that these barriers are always removed. Finally, regarding the reduction of pedagogical obstacles, 66.1% of teachers consider this reduction to be moderately done, 33.8% indicate that it is always carried out, and no teacher thinks it is never done.

Table 3

Comparison between the theoretical and practical foundation of the inclusion of children with intellectual disabilities in Colombia

Indicators	Theoretical (Always)	Practical (Always)
Right to equality	42,3%	8,4%
Right to non-discrimination	84,7	0%
Right to participation	45,7%	0%
Right to individualization	16,9%	33,8%
Development of individualized plans	-	8,4%
Teacher training	-	0%
Curriculum adaptation	-	05
Removal of physical barriers	-	16,9%
Reduction of pedagogical obstacles	-	33,8%

Note: Source: Own elaboration.

In Table 3, the results are compared between the theoretical and practical components of educational inclusion for children with intellectual disabilities, showing differences in the perception and practice of surveyed teachers. Regarding the "Right to Equality," it is observed that 42.3% of teachers consider that this right is always addressed in institutional guidelines, but only 8.4% indicate that individualized learning plans are always developed, suggesting a gap between theory and practice in this aspect.

In the case of the "Right to Non-Discrimination," the contrast is even more evident, as 84.7% of teachers believe that non-discrimination is always actively promoted, but in practice, no teacher indicated that teacher training is always conducted in this regard, reflecting a disconnect between perception and action. Regarding the "Right to Participation," 45.7% of respondents believe that this right is always addressed, but no teacher indicated that physical barriers to participation are always eliminated, suggesting a lack of coherence in the implementation of this principle.

Regarding the "Right to Individualization," 16.9% of teachers consider that this right is always respected, but 33.8% indicate that pedagogical obstacles are always reduced, indicating greater attention to teaching adaptation than to the customization of learning plans. Hence, these results suggest that, although there is widespread awareness of the principles of educational in-

clusion, there is a significant gap between theory and practice in implementing these principles in the educational context.

Discussion

Considering the results of this study, we sought to contrast them with previous theories that would allow establishing the practical and theoretical importance of inclusive education in Colombia. In this regard, Chen-Quesada *et al.* (2023) argue that the right to equality in the education of students with intellectual disabilities is fundamental to ensuring their full development and participation in society.

However, equality in theory is not always reflected in practice, as many students with disabilities still face barriers to accessing inclusive and quality education. Larrazabal-Bustamante (2023) indicates that for this right to be effectively fulfilled, educational policies should focus on adapting educational environments, training teachers in inclusive pedagogies, and promoting a school culture based on acceptance and respect for diversity.

Furthermore, Colmenero *et al.* (2019) state that the implementation of concrete measures to ensure equality in the education of students with intellectual disabilities also contributes to building a more just and inclusive society. However, Castillo *et al.* (2023) argue that when these students are provided with the same educational opportunities as their peers, they are being empowered and allowed to develop their full potential. For Dorado & Benavides (2023), this not only benefits the students themselves but also enriches the school environment and prepares all students to live in a diverse and plural society.

Regarding the right to non-discrimination in the education of students with intellectual disabilities, Rivera-Vargas *et al.* (2023) consider that this implies that they should not be subjected to differential or unfavorable treatment in the educational setting due to their condition. According to Hoyos *et al.* (2023), to ensure this right in practice, it is essential to adopt measures that promote awareness and education in inclusive values. This includes training teachers in inclusive pedagogies and diversity management, as well as fostering a school culture that rejects any form of discrimination. Additionally, Arnaiz-Sánchez *et al.* (2021) emphasize the importance of promoting the active participation of students with disabilities in school life and in decision-making processes that affect them, so that they feel valued and respected in their educational environment.

According to the rights to participation, Rivera-Vargas *et al.* (2023) argue that this refers to creating a school environment that values and promotes the participation of students with disabilities on equal terms with their peers, as well as providing them with the necessary support to express their opinions and contribute actively to the teaching-learning process. Additionally, according to Moya *et al.* (2023), it is important to ensure that school facilities and educational resources are adapted to facilitate the participation of all students, regardless of their abilities.

In this regard, Mateus *et al.* (2017) points out that, to achieve effective participation, it is essential for teachers and school staff to be sensitized and trained in inclusive strategies that promote active participation of students with disabilities.

Likewise, Vallejo & Castro (2023) state that it is necessary to promote collaboration between the school, family, and community to ensure a supportive environment that fosters the full and effective participation of all students, in line with the principles of equity and non-discrimination. According to Ruiz-Bernardo (2016), to ensure this right to individualization, it is necessary for teachers to have the training and resources to design and implement individualized teaching plans that meet the particular needs of each student. This may include adapting educational materials, modifying teaching methodologies, and providing specific supports, such as educational assistants or assistive technologies.

According to Rodríguez & García (2024), it is important to promote a school culture that values diversity and recognizes the different ways in which students learn. This involves fostering an inclusive environment where individual differences are respected, and the skills and potential of each student are recognized and valued, regardless of their abilities.

The theories cited suggest that it is important for these indicators and the rights of inclusive education to translate into practical actions to ensure that the rights of students with intellectual disabilities are respected and their full participation in the educational system is promoted.

Conclusions

The discrepancy between the theoretical recognition of rights and their practical implementation can be attributed to several factors. Firstly, the lack of adequate resources, both material and human, to fully implement the principles of inclusion. This includes insufficient training for teachers and a shortage of specialized support and services to meet the individual needs of students with disabilities.

Furthermore, there are cultural barriers and negative attitudes towards disability that can hinder full inclusion. These attitudes may manifest in discriminatory practices and a lack of awareness about the importance of inclusion for the comprehensive development of all students. Additionally, the lack of coordination and collaboration among the different actors involved in the educational process, including teachers, administrators, families, and educational authorities, can impede the effective implementation of inclusion rights.

On the other hand, the absence of a clear and coherent educational policy regarding inclusion can also contribute to this gap between theory and practice. This indicates that the effective implementation of inclusion rights requires not only theoretical commitment but also a concerted effort to overcome practical and cultural barriers that hinder the full participation of all students in the educational system.

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Virtual education in Nicaragua: A challenge for university teachers

La educación virtual en Nicaragua: Un reto del docente universitario

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Abstract

The article addresses the challenges that teachers face in higher education to enhance student knowledge through digital platforms. The importance of dedication and training for both students and teachers is emphasized, as they must foster a dynamic environment. The research was based on a quantitative methodology, surveying teachers in virtual environments to analyze skills, knowledge, and challenges. These challenges include adapting to changes in virtual education, using digital tools to create interactive materials, and training in Information and Communication Technologies (ICT). In conclusion, the need to empower student knowledge is highlighted, underscoring the importance of teachers adapting to virtual education and mastering digital tools, requiring training programs that provide them with essential skills and knowledge..

Keywords: Tools, Moodle Platform, Teacher Challenges and technologies.

Resumen

El artículo examina los desafíos que enfrentan los docentes en la educación superior para potenciar el conocimiento estudiantil a través de plataformas digitales. Se destaca la necesidad de esfuerzo y capacitación tanto por parte de estudiantes como docentes, quienes deben crear un ambiente dinámico. La investigación empleó una metodología cuantitativa, encuestando a docentes de entornos virtuales para analizar habilidades, conocimientos y desafíos. Entre estos desafíos se encuentran la adaptación a cambios en la educación virtual, el manejo de herramientas digitales para crear materiales interactivos y la capacitación en tecnologías de la información y comunicación (TIC). Entre las conclusiones se destaca que es necesario empoderar el conocimiento estudiantil porque es crucial que los docentes se adapten a la educación virtual y dominen las herramientas digitales, exigiendo programas formativos que les proporcionen habilidades y conocimientos esenciales.

Palabras claves: Capacitación, Educación virtual, Herramientas, Plataforma Moodle, Retos del docente y tecnologías.

Introduction

In the face of the new educational challenges we currently encounter, it becomes imperative for educators to strengthen the digital competencies we have developed thus far. However, this reinforcement should not focus solely on learning the use of tools that may quickly become obsolete and be replaced by new ones. Two key aspects must be developed in this training: active methodologies in digital contexts and the use of digital technologies for assessment.

The application of digital tools in virtual education has fostered online learning, breaking many limiting barriers of traditional education such as space, time, quantity, and coverage (Maraza, 2016).

Virtual education has a significant objective, aiming to overcome limitations with time and

distance, as well as the appropriation and utilization of technological tools and methodologies designed for digital environments—a considerable challenge for us educators to make the class dynamic and interactive, which is often lacking in traditional education. Taking into account that the majority of students nowadays possess smart devices and internet access, optimizing the learning process through the use of existing technological resources.

Palloff & Pratt (2001), two specialists in virtual education, note that their experience with online teaching has significantly changed how they approach students in a traditional classroom. They no longer focus their teaching work on oral presentations of content from books; instead, they assume that students can read this content. As a result, the class is conceived as a space to stimulate collaborative and autonomous work.

The widespread emergence of digital media and technologies used in education has led to a diverse range of terms, such as distributed education, e-learning, virtual education, online education, blended learning, and mobile learning (Verdún, 2016). This surge in technologies enriches the virtual education system.

Moodle is one of the most popular platforms, emerging as a result of collaborative efforts by developers who worked on open-source code, turning it into a user-friendly learning management system. It is a free online learning management system that enables educators to create private websites filled with dynamic courses, extending learning at any time and from anywhere, catering to the needs of both teachers and students.

In the quest to understand the new challenges that university educators face in developing their virtual classes, previous works were found, as described below:

Mentioning the authors Guaña *et al.* (2015), they assert that:

> In the nineties, new technological trends emerged, such as networks, communications, the internet, among others, which gradually found a place in educational and learning processes. This marked the beginning of access to faster, more eloquent, and economical communication. In certain cases, people challenged technological boundaries. That is why, in the early 1991, Virtual Teaching-Learning Environments (VLE) offered spaces in growing computer networks as well as in digital technology" (p.7).

Building on the above, Mera & Mercado (2019), in their research article on distance learning and teaching, affirm that in virtual education:

> It primarily relies on internet devices, assuming the use and exchange of information obtained between the teacher and students virtually, either via email or platforms specifically created for this purpose. Through these, students review and download class materials, submit assignments, and even collaborate with their classmates (p.5).

We also have the work conducted by Ardini *et al.* (2020), titled: "Teaching in times of coronavirus: a look at teaching work and the educational experience in virtual environments within the framework of the ASPO due to the COVID-19 pandemic." Their objective was to highlight and analyze the pedagogical practices in virtual environments developed by university educators.

Methodology

The applied methodology consisted of a mixed approach where the competencies of UNITEC university professors were assessed. For this analysis, a sample of 30% of the teaching staff was taken. A questionnaire was designed on GoogleDrive to obtain a general understanding of the use of devices, connectivity, creation of interactive materials, and alternative instructional spaces to continue students' online studies. The implementation of technological resources was based on experience, difficulties, and preparedness.

Sampling, a method used to select components from the total population, was employed. "It consists of a set of rules, procedures, and criteria by which a set of elements from a population is selected to represent what happens in the entire population" (Mata *et al,* 1997, p.19). For this study, 30% of the total teaching population of UNITEC was included.

For the purposes of this research, an online questionnaire was used, defined by Sierra (1992, p.305) as "a set of questions prepared about the facts and aspects of interest in research, for response by the population or its sample to which the undertaken study extends." The questionnaire was administered to the sample of this research, consisting of teachers teaching in the second semester of the year 2023 in the various modalities offered by the university of technology and commerce. The aim was to collect information about the competencies they possess for developing their virtual classes, which will lead to significant changes in the teaching/learning process.

Results and Discussion

We worked with a convenience sample, as a percentage of the population, specifically administrative staff, is not directly involved in classroom teaching. In this context, only classroom teachers who utilize technological tools and media for the development of their virtual classes were considered.

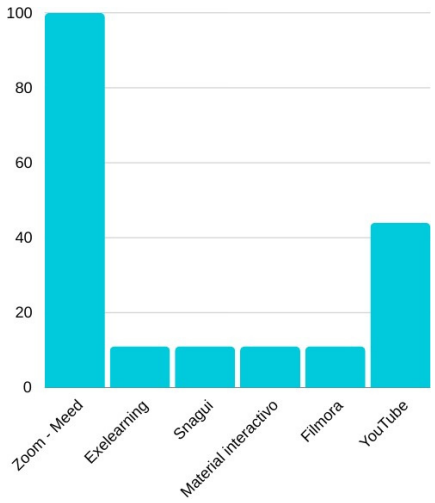
From the total population, we worked with 30% of the teaching staff who are directly involved with students in the delivery of virtual classes.

The results highlight the predominant use of laptops and smartphones by teachers for the development of their virtual classes.

Graph 1 illustrates the usage of basic tools that teachers employ for implementing their virtual classes. Notably, 100% utilize Zoom or Meed for conducting online classes. Additionally, 44% of the staff have their own YouTube channel. However, it is observed that only 33% utilize digital

tools for creating interactive and dynamic materials for the development of their virtual classes.

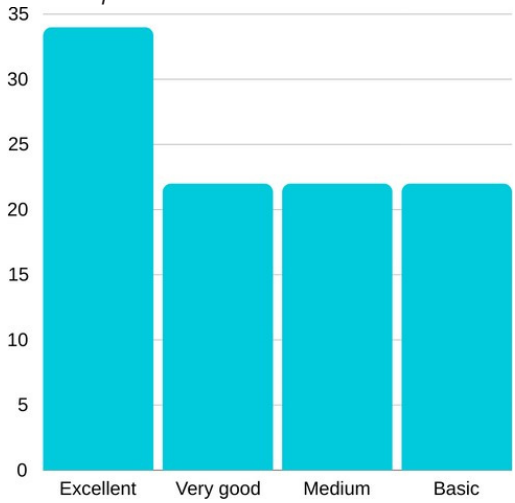
Graph 1
Comparative use of virtual tools at UNITEC



Note: Graph 1 shows the use of basic tools that teachers must use for the implementation of their virtual classes. Source: Mejía (2023).

In Graph 2, the percentage of teachers with usage and proficiency in the Moodle virtual environment is presented, reflecting that 34% have excellent mastery of this platform. Meanwhile, 44% fall between medium and very good proficiency. Additionally, 22% only handle the basics of this fundamental platform for virtual class development.

Graph 2
Usage and Mastery of Moodle Platform

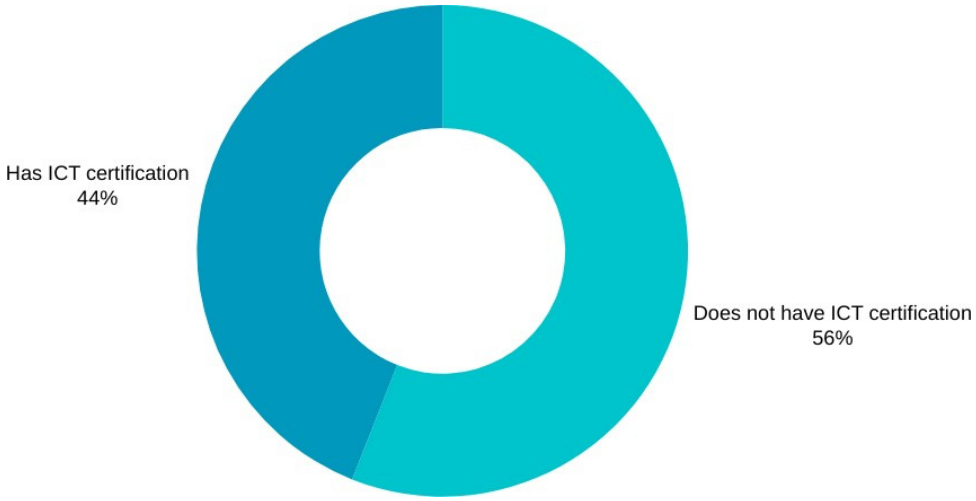


Note: Graph 2 displays the percentage of usage and mastery of the Moodle platform for scheduling virtual classes. Source: Mejía (2023)

In the new fundamental context, the first requirement is their specialization title, followed by their ICT certification, and as the third requirement, their specialization in university teaching.

Graph 3 illustrates the percentage of teachers with certification in ICT classrooms, showing that 44% possess certification while 56% do not.

Graph 3
Usage and Mastery of the Moodle Platform.



Note: Graph 3 shows the percentage of teachers with certification in UNITEC's ICT classrooms. Source: Mejía (2023).

In the current world, significant economic and social changes make innovation in education a key factor in academic training. Innovation involves joint actions where teacher participation is essential to confront new realities.

Technological demands are a prerequisite for social interactions to occur and to achieve a knowledge society, which requires profound structural changes in current societies (Lalangui & Valarezo, 2017).

In the case of teachers, they face challenges that require them to train in distance education, connectivity, and digital tools to create a social context that ensures the physical and emotional well-being of students (Roger, 2020). These challenges are not exclusive to novice teachers but stem from the dynamic and complex changes in the society we live in, requiring teachers, due to their social role, to update and innovate to meet educational demands (Eirín *et al.*, 2009).

It is worth noting that the initiation into teaching is the transitional stage where teachers shift from being students to educators. The initial experiences are crucial in shaping their perceptions and behaviors regarding teaching, involving intense learning characterized by trial and error, leading to the emergence of their main difficulties (Aloguín & Feixas, 2009). This period generates anxieties, stress, and concerns while consolidating teaching competencies until becoming

an autonomous professional as part of the professional development process. There is agreement that the transition from novice to expert spans three years of initiation (Aloguín & Feixas, 2009; Marcelo, 2009).

Despite this, it is not common for young individuals to consider virtual education as an option when planning their future. Therefore, it is the responsibility of us, teachers who conduct virtual classes, to encourage others not to give up and to continue working on their professional development.

In terms of organization, teachers face the demand for adapting content, methodology, and class session preparation rapidly and abruptly due to the speed with which changes had to be implemented to avoid interrupting or discontinuing the academic year. On the other hand, the organization of teaching time is complex, with virtual classes undeniably requiring a larger session time commitment from teachers.

First and foremost, seamless virtual communication allows students to contact teachers without restrictions on schedule and time. This is made possible through virtual communication tools provided by the teacher, such as WhatsApp messages, messages via virtual platforms, phone calls, among others. Regarding this, the teacher's availability becomes continuous, as stated by Rizo (2020, p.35):

> Distance teacher-student communication implies a closeness of the student to their familiar and traditional environment. Even if not physically the same, it provides the student with the assurance of the teacher's attention to their challenges and progress in an attentive and responsible manner.

This entails "a cultural transformation in the university experience" (BID, 2020, p.7), involving assertive teacher-student communication as a fundamental pillar for the success of the transition to virtual modality.

In light of the above, each and every student must be fully willing to participate and integrate into both academic and non-academic activities facilitated by the teacher. In my experience, simple activities such as initial greetings, open-ended questions about their mood, recent daily activities, or information about the health status of their family members can represent a significant approach to the student.

Conclusions

The application of digital tools in virtual education has promoted online learning, breaking many limiting barriers of traditional education such as space, time, quantity, and coverage.

Virtual education must overcome limitations with time and distance.

Teachers must appropriate and leverage technological tools and methodologies designed for

digital environments, presenting a significant challenge for us teachers to make the class dynamic and interactive, aspects that are often lacking in traditional education.

In the new educational context, a professional aspiring to be a university teacher must possess three fundamental aspects: first, their specialization title; second, their ICT certification; and as a third requirement, their specialization in university teaching.

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Review articles
Artículos de revisión

Emotional education as a tool to improve the educational process in Colombia: A documentary review

Educación emocional como una herramienta para mejorar el proceso educativo en Colombia: Una revisión documental

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Abstract

Emotional education has become a key tool to improve the educational process in Colombia, according to a documentary review carried out. The objective of this study was to analyze the impact of emotional education on academic performance, school coexistence and emotional well- being of students. The theoretical findings highlight that emotional education promotes skills such as self-awareness, self-regulation, empathy and social skills, which contributes to better personal and academic development of students. In addition, it was shown that emotional education helps reduce anxiety, stress and aggressive behaviors in the school environment. In conclusion, emotional education is an effective tool to improve the educational process in Colombia, promoting a healthier school environment that is conducive to learning.

Keywords: Education, emotion, pedagogical practice, Colombia.

Resumen

La educación emocional se ha convertido en una herramienta clave para mejorar el proceso educativo en Colombia, según una revisión documental realizada. El objetivo de este estudio fue analizar el impacto de la educación emocional en el rendimiento académico, la convivencia escolar y el bienestar emocional de los estudiantes. Los hallazgos teóricos encontrados resaltan que la educación emocional promueve habilidades como la autoconciencia, la auto regulación, la empatía y las habilidades sociales, lo que contribuye a un mejor desarrollo personal y académico de los estudiantes. Además, se evidenció que la educación emocional ayuda a reducir la ansiedad, el estrés y los comportamientos agresivos en el entorno escolar. En conclusión, la educación emocional es una herramienta efectiva para mejorar el proceso educativo en Colombia, fomentando un ambiente escolar más sano y propicio para el aprendizaje.

Palabras clave: Educación, emoción, práctica pedagógica, Colombia.

Introduction

In the contemporary educational sphere, the recognition of the importance of emotions in the learning process has gained increasing relevance. Emotional education has positioned itself as a fundamental tool to enhance the integral development of individuals, promoting skills that go beyond mere academics. In this context, there arises the need to thoroughly explore the impact of emotional education in the educational field, with the purpose of deeply understanding how it can influence the quality of teaching and learning.

The main objective of this article is to conduct a comprehensive literature review on emotional education as a tool to improve the educational process. Through a detailed analysis of previous research, empirical studies, and relevant theories, the aim is to address the importance of inte-

grating emotional education into educational systems, identify its benefits and challenges, and explore how it can significantly contribute to the academic, social, and emotional development of students. In this context, the central question guiding this literature review is: To what extent can emotional education improve the quality of the educational process and promote more meaningful and balanced learning in students? To answer this question, it is essential to analyze in-depth how emotional competencies impact academic performance, emotion management, conflict resolution, empathy, and interpersonal relationships in the school context. Additionally, the intention is to explore how the integration of emotional education into the educational curriculum can contribute to the comprehensive formation of students, preparing them more effectively to face the challenges and demands of today's society.

Throughout this article, various aspects related to emotional education and its impact on the educational process will be addressed. Firstly, a theoretical review will be conducted on the concept of emotional education, its historical evolution, psychological and pedagogical foundations, as well as the most relevant models and approaches in this field. Key emotional competencies sought to be developed through emotional education will be analyzed, such as emotional awareness, emotional regulation, empathy, stress management, and conflict resolution.

Subsequently, the benefits of emotional education in the educational sphere will be examined, focusing on how it can improve the school climate, strengthen relationships among members of the educational community, reduce violence and bullying, as well as enhance the emotional well-being and academic performance of students. Empirical evidence supporting the effectiveness of emotional education programs in different educational contexts will be presented, and the practical implications of their implementation will be discussed.

Additionally, the challenges and limitations associated with integrating emotional education into the education system will be analyzed, such as resistance to change, lack of teacher training, assessment of emotional competencies, and the need to adapt programs to the specific characteristics and needs of students. Strategies to overcome these obstacles will be explored, and recommendations will be proposed to promote greater inclusion and effectiveness of emotional education in schools. Therefore, reflection will be made on the role of emotional education in the formation of competent, responsible citizens committed to their social environment, capable of facing the challenges of an increasingly diverse and changing society.

Hence, in the Colombian context, where there are high levels of violence, social inequality, and lack of opportunities, emotional education can play a crucial role in the integral development of students. By providing them with the necessary tools to understand and manage their emotions, they are empowered to face challenges more effectively, thus promoting their well-being and academic success. Therefore, by understanding its importance and potential impact, it is expected that this study will contribute to strengthening educational policies and practices in the country, promoting a more comprehensive approach focused on the well-being of students.

Challenges of the Colombian Education System and Emotional Education

The Colombian education system faces a series of challenges that directly impact the quality of education provided to students. Among these challenges are social inequality, lack of resources, the digital divide, violence in schools, and emotional disconnection in the classroom. In this context, emotional education emerges as a fundamental tool to address these challenges and promote a more inclusive, equitable, and enriching educational environment.

Social inequality in Colombia is reflected in the marked disparities in access to quality education. According to Blanco (2022), the country has made significant progress in terms of educational coverage; however, challenges related to quality and equity persist. The lack of resources in many educational institutions, especially in rural and marginalized areas, limits students' learning opportunities and hinders the work of teachers.

The digital divide is another major obstacle facing the Colombian education system, especially exacerbated by the COVID-19 pandemic. Although distance learning strategies have been implemented to ensure the continuity of learning, many students lack access to devices and adequate connectivity, deepening existing inequalities. This situation highlights the need to strengthen teachers' digital skills and ensure inclusive and accessible education for all.

Violence in schools poses an additional challenge that affects the emotional well-being and academic performance of students. Bullying, discrimination, and peer mistreatment are issues that can generate high levels of stress, anxiety, and trauma in students, hindering their learning and personal development process. It is essential to implement strategies to prevent and address violence in schools, promoting a safe and welcoming environment for all members of the educational community.

Emotional disconnection in the classroom is also an aspect that influences the quality of education imparted in Colombia. The lack of attention to students' emotional needs and the absence of tools to manage their emotions can limit their ability to concentrate, self-control, and interpersonal relationships. Emotional education presents itself as a response to this issue, offering a comprehensive approach that promotes the development of socio-emotional skills in students (Verdugo, 2021). In this sense, emotional education is the educational process through which skills are acquired to effectively recognize, understand, express, and regulate one's own and others' emotions. By incorporating emotional education into the school curriculum, students are provided with the opportunity to develop key competencies such as emotional awareness, empathy, conflict resolution, and self-esteem, which are fundamental to their personal well-being and academic success (García, 2012).

According to Ensuncho & Aguilar (2022), emotional education not only focuses on the development of individual skills but also promotes the creation of more positive and collaborative educational environments. By fostering emotional intelligence in the classroom, relationships among students, teachers, and families are strengthened, creating a school climate conducive

to learning and coexistence. Additionally, emotional education contributes to preventing school bullying, improving the school climate, and promoting values such as empathy, tolerance, and solidarity. In the Colombian context, the implementation of emotional education faces several challenges that require attention and action from educational authorities, teachers, parents, and society as a whole. It is essential to provide ongoing training in emotional education to teachers so that they can effectively integrate these competencies into their pedagogical practice and support students in their emotional development.

Emotional Climate in Learning Environments

Emotional climate in learning environments is a fundamental aspect that directly influences the teaching-learning process. It refers to the set of emotions, feelings, and attitudes experienced and perceived in the educational environment, whether in the classroom, in the school institution, or any other space where learning takes place. These emotions can be both positive and negative, and their impact on academic performance and the emotional well-being of students is significant.

Therefore, it is related to the quality of interpersonal relationships between teachers and students, among students themselves, and among the different members of the educational community. According to Fierro *et al.* (2021), a positive emotional climate in the school context is characterized by the presence of emotional support, respect, trust, open communication, collaboration, and an atmosphere of psychological safety. On the other hand, a negative emotional climate is characterized by conflict, lack of support and respect, distrust, inadequate communication, and an atmosphere of insecurity.

The impact is evident in various aspects. First, it affects students' academic performance. Studies have shown that a positive emotional climate in the classroom is related to greater academic engagement, higher motivation to learn, better performance in assessments, and greater satisfaction with the educational experience. Conversely, a negative emotional climate has been associated with lower academic performance, higher levels of anxiety and stress, and a negative attitude towards school and learning.

Additionally, the emotional climate in learning environments also influences the emotional well-being of students. A school environment that promotes positive emotions such as joy, satisfaction, gratitude, and self-esteem contributes to the emotional well-being of students, fostering their personal development and mental health (Barrientos *et al.*, 2019). Conversely, a school environment marked by negative emotions such as fear, sadness, frustration, and loneliness can have adverse effects on students' emotional health, increasing the risk of problems such as depression, anxiety, and post-traumatic stress.

Similarly, it is not limited solely to students but also affects teachers and other members of the educational community. A positive emotional climate in the school is reflected in greater emotional well-being and higher job satisfaction among teachers, which in turn translates into grea-

ter motivation to teach, higher pedagogical effectiveness, and a lower burnout rate (Tapia & Nieto, 2018). Conversely, a negative emotional climate can lead to increased job stress, lower job satisfaction, and decreased commitment to teaching.

Consequently, it is important for education stakeholders, both at the governmental and school levels, to pay attention to the emotional climate in learning environments and promote strategies to foster a positive emotional atmosphere. Therefore, it is crucial for teachers and members of the educational community to show empathy and understanding towards the emotions and needs of students. Empathy helps create bonds of trust and respect and fosters an atmosphere of acceptance and mutual understanding. Additionally, communication plays a crucial role in building a positive emotional climate. It is important for teachers to encourage open and assertive communication in the classroom, where students feel safe to express their emotions, opinions, and concerns without fear of judgment.

However, students need to feel emotionally supported and accompanied in their learning process. Teachers and other members of the educational community can offer guidance, support, and affection to students, reinforcing their self-esteem and self-confidence. Collaboration and teamwork in the classroom promote the creation of a positive emotional climate, where solidarity, cooperation, and respect for differences are encouraged. Teachers can implement collaborative activities that foster teamwork and the integration of all students (Collazos & Mendoza, 2006). Therefore, it is a determining factor in the teaching-learning process. A school environment marked by positive emotions enhances academic performance, emotional well-being, and satisfaction for students, teachers, and other members of the educational community. Conversely, a negative emotional climate can have detrimental effects on the emotional health and academic performance of students, as well as on the motivation and job satisfaction of teachers.

Emotional Education as a Transformative Reference in Pedagogical Practice

Emotional education has emerged as a transformative reference in pedagogical practice in recent years, as it has been demonstrated that the development of emotional competencies in students is fundamental for their well-being and academic success, as well as for their personal and social development. In this sense, emotional education focuses on the development of skills to identify, understand, express, and regulate emotions in a healthy and constructive manner.

According to Goleman (1995), emotional intelligence is defined as the ability to recognize one's own feelings and those of others, to motivate oneself, and to manage emotions effectively in oneself and in relationships with others. This definition highlights the importance of emotional skills in the holistic development of individuals and their relevance in various life domains, including the academic sphere. In the educational context, emotional education has become a fundamental tool for promoting students' emotional well-being, fostering a positive school climate, preventing bullying and other violent behaviors, improving school coexistence, and enhancing academic performance. According to García & Roqueta (2017), emotional education

contributes to the comprehensive formation of students, allowing them to develop skills to cope with stress, resolve conflicts appropriately, improve interpersonal communication, and foster empathy and cooperation.

In this regard, emotional education has become a transformative reference in pedagogical practice, as it drives a paradigm shift in the way education is conceived, moving from a focus solely on students' cognitive development to an approach that integrates emotional development as a fundamental part of the educational process. For Vivas (2003), emotional education promotes a holistic approach to education, which recognizes the importance of emotions in learning, motivation, and students' well-being.

Taking into account the contributions of García (2012), emotional education is based on the model of emotional skills, which include emotional awareness, emotional self-regulation, self-motivation, empathy, and social competence. These skills are essential for the development of healthy emotional intelligence, which allows students to cope with stress, regulate their emotions appropriately, maintain a positive attitude in the face of challenges, understand others' emotions, and establish healthy interpersonal relationships.

Moreover, emotional education helps students develop empathy, i.e., the ability to understand and share the feelings of others. In this regard, Rodríguez *et al.* (2020) state that empathy is a fundamental skill for establishing healthy interpersonal relationships and resolving conflicts positively. Therefore, it is important for educators to foster empathy among their students through activities that promote collaboration, respect, and solidarity. Another important aspect of emotional education in pedagogical practice is the promotion of an emotionally safe and welcoming environment in the classroom. Therefore, students learn best when they feel safe, accepted, and understood by their teachers and peers. Hence, it is essential for educators to create an atmosphere of trust and mutual respect in the classroom, where students feel free to express their emotions and opinions without fear of judgment.

Therefore, emotional education is a transformative reference in pedagogical practice, as it promotes the development of students' emotional intelligence, helps them manage their emotions healthily, develop empathy, and establish positive interpersonal relationships. Therefore, it is crucial for educators to integrate emotional education into their pedagogical practice and focus on cultivating an emotionally safe and welcoming environment in the classroom, where students can develop holistically.

Conclusions

Emotional education emerges as a fundamental tool to improve the educational process in Colombia, as it allows for the comprehensive development of students, strengthening their socio-emotional skills. The documentary review conducted highlights the importance of including emotional education as part of the educational curriculum in Colombia, considering its positive impact on students' well-being and academic performance. Similarly, the implementation of

emotional education programs in Colombian educational institutions could contribute to the prevention of issues such as bullying, school violence, and low academic achievement, promoting a more inclusive and respectful school environment.

Likewise, teachers play a key role in promoting emotional education, as they directly interact with students and can significantly influence their socio-emotional development. It is necessary for educational authorities in Colombia to promote continuous training for teachers in socio-emotional skills and in the implementation of emotional education strategies in the classroom to ensure the success of these programs. Emotional education not only benefits students but also teachers, who can improve their emotional well-being and their ability to manage conflict situations in the classroom.

The inclusion of emotional education in the Colombian education system requires commitment from authorities, teachers, parents, and the community at large to work together to strengthen students' socio-emotional skills. All of this serves as an effective tool to improve the educational process in Colombia, fostering the comprehensive development of students and promoting a school environment conducive to learning and peaceful coexistence. Its implementation requires a comprehensive and collaborative approach among all stakeholders in the education sector.

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Role of epistemology in scientific production

Papel de la epistemología en la producción científica

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Abstract

The essay analyzes the importance of epistemology in scientific production. Epistemology seeks to understand things in their essence and causes, reflecting on the creation of knowledge and scientific disciplines. This approach transforms ontological and gnoseological convictions into scientific work standards, linked to different scientific communities. Thus, it enables the management of perspectives to conceive, develop, and evaluate scientific processes, encompassing the production of research and epistemological trends. Science, in constant evolution, has developed an intimate relationship with epistemological reflection. The positivist paradigm is applied through the hypothetico-deductive research system, while the dialectical-critical and interpretative approaches are applied through hermeneutic research. Scientific production, a social process that occurs in an organized or institutionalized manner, has scientific communities as its main protagonists, highlighting the relevance of epistemology in this context.

Keywords: Epistemology, research paradigms, scientific production..

Resumen

El ensayo analiza la importancia de la epistemología en la producción científica. La epistemología busca entender las cosas en su esencia y causas, reflexionando sobre la creación del conocimiento y las disciplinas científicas. Este enfoque transforma convicciones ontológicas y gnoseológicas en estándares de trabajo científico, vinculados a distintas comunidades científicas. Así, posibilita manejar perspectivas para concebir, desarrollar y evaluar procesos científicos, abarcando la producción de investigaciones y tendencias epistemológicas. La ciencia, en constante evolución, ha desarrollado una relación íntima con la reflexión epistemológica. El paradigma positivista se aplica a través del sistema de investigación hipotético-deductivo, mientras que los enfoques dialéctico-crítico e interpretativo lo hacen mediante la investigación hermenéutica. La producción científica, un proceso social organizado e institucionalizado, tiene a las comunidades científicas como protagonistas, resaltando la relevancia de la epistemología en este contexto.

Palabras clave: Epistemología, paradigmas de la investigación, producción científica.

Introduction

Epistemology as the science of knowledge, philosophy of science, or theory of research provides us with the tools and guidance in research processes to seek new knowledge that answers the many questions we have about our reality. Many authors have defined epistemology as the part of science that aims to construct scientific knowledge, which must be recognized by the scientific community itself.

Human beings, as protagonists of universal existence, develop explanations of the objects and processes that make up their reality; for this reason, we can say that humans are knowing subjects who constantly contrast metaphysical explanations and empirical knowledge to find answers to the present realities of their existence.

Science seeks truth through rigorous and exhaustive procedures, but it is also known that science is not objective by nature. It originates from a knowing subject and requires something to monitor, control, and thus ensure that it approaches reality. It is within the framework of achieving this goal that epistemology emerges. Epistemology relies on and is supported by scientific analysis, as it studies scientific practice. Since science is an accumulative process, studies conducted must be conceived as being in a "process of becoming," or in the "making of science," that is, a science in construction.

Scientific production is conceived as the way through which the knowledge resulting from intellectual work through scientific research in a specific area of knowledge is expressed, whether published or unpublished; it contributes to the development of science as a social activity. Scientific production is a social process that occurs in an organized or institutionalized manner only, and its main actors are the scientific communities, that is, the physical or virtual collectives formed by scientists from different disciplines who interact with each other to generate, disseminate, discuss, and critique ideas, data, problems, hypotheses, theories, questions, and answers.

The process of scientific production encompasses a wide range of activities, including the development and discussion of theoretical concepts and propositions, the acquisition of empirical analyses and data, and the circulation of all this among scientists in the form of formal documents that contribute to scientific communication. Therefore, this essay aims to analyze the importance of epistemology in scientific production.

Epistemology: Concepts

When referring to epistemology, it is necessary to briefly review the basic concepts that explain it, since there is a general minimum agreement that it is related to knowledge. For some, epistemology studies knowledge in general, from a philosophical point of view, making the term roughly synonymous with "gnoseology." For others, epistemology is restricted to one type of knowledge - scientific knowledge - making it synonymous with expressions such as "Philosophy of Science," "Theory of Science," "Theory of Scientific Research," among others.

Epistemology, or philosophy of science, is the branch of philosophy that studies Epistemology is a reflection on the production of scientific disciplines and scientific knowledge. In this regard, Brunet & Morell (2001, p. 32) define it as:

> Reflection on what scientific disciplines is producing, it seeks to evaluate the nature and quality of their scientific knowledge, the truth or falsity of their theories, how they provide adequate explanations, what the formal and conceptual structure of their theories is, and what relationship should exist between the explanation and the prediction of a phenomenon. Additionally, it addresses the problem of choosing between different methods and questions the nature of scientific regularities and laws.

Considering that the first step in scientific research is to delve into the background of the chosen topic, knowing epistemology will put us one step ahead. Nonetheless, the scientific utility of

epistemology lies in the role it plays in the scientific research process, and since this process has many parts, epistemology shows a correlation with at least the majority of them.

In this sense, Cazau (2011, p. 111) states that one of the most important meanings of the term epistemology is related to the study of science, and he affirms:

> An epistemologist studies what scientists do to study reality and what distinguishes them from non-scientists, how and why they construct their theories about the world, what methods they use, how they try to test their hypotheses, what special characteristics scientific language has, what reasoning they employ, and to what extent research is influenced by the worldviews of each era and by political, economic, and other determinants. The epistemologist studies the tools of the scientist, their methods, their logic, among other aspects.

Epistemological Approaches

Within this epistemological journey, Padrón (2007, p. 5) synthesizes epistemological criteria into two variables:

> One of a gnoseological type, referring to convictions about the source of knowledge, simplified into two values: empiricism/rationalism; and another of an ontological type, referring to convictions about the relationship between the subject and reality, deriving two values: idealism/realism.

From the perspective of the cited author, the intersection of these variables leads to four Epistemological Approaches: the empiricist-realist approach (measurements, experiments, controlled induction...), the empiricist-idealist approach (ethnography, cohabitation designs, reflective induction...), the rationalist-realist approach (abstractions, logical-mathematical systems, controlled deduction...), and the rationalist-idealist approach (free interpretations, broad languages, reflective argumentation...), as shown in the table.

Table 1
Epistemological Approaches

	Gnoseological Variables	
Ontological Variables	Empiricism	Rationalism
Idealism	Ethnography, cohabitation design, reflective induction...	Free interpretations, broad languages, reflective argumentation...
Realism	Measurements, experiments, controlled induction	Abstractions, logical-mathematical systems, controlled deduction...

Note: Padrón (2007).

In this context, the epistemological approach translates into a function that transforms certain fundamental convictions, which are unobservable and of an ontological and gnoseological nature, into specific scientific work standards. These standards are associated with different scientific communities, as these epistemological approaches enable the management of perspectives from which scientific processes are conceived, developed, and evaluated. This includes the production of research as well as trends in epistemological evolution.

Epistemology studies the historical, psychological, and sociological circumstances that lead to the acquisition of scientific knowledge, as well as the criteria by which it is invalidated. It also involves the clear and precise definition of the most commonly used epistemic concepts, such as truth, objectivity, reality, and justification. Epistemology analyzes, evaluates, and critiques the set of problems presented by the process of scientific knowledge production. For example, it addresses issues concerning the definition and characterization of scientific concepts and the problem of constructing the theoretical terms of science.

Idealism

Idealism is generally the school of thought opposed to materialism and realism. Contrary to realism, idealism maintains that physical objects cannot exist apart from a mind that is conscious of them. Throughout its long history, idealism has taken on many different forms and expressions, but all of them can be characterized by the central importance given to consciousness, ideas, thought, the subject, and the self in the process of knowledge.

According to Ferrater (1985), idealism refers to any doctrine or attitude in which the most fundamental aspects, and those by which human actions are supposed to be governed, are ideals, whether realizable or not, but almost always imagined as realizable. From this perspective, idealism contrasts with realism, which is understood as the doctrine or simply the attitude in which the most fundamental aspects, and those by which human actions are supposed to be governed, are realities, tangible facts. This sense of idealism is often ethical or political, or both.

When referring to idealism, we encounter two tendencies. On the one hand, there is objective or logical idealism (of Plato, Leibniz, Hegel, and other philosophers), in which objects are generated, in one way or another, by factors, causes, beliefs, or ideas that are independent of human consciousness. On the other hand, there is subjective idealism (of Berkeley, in particular), which holds that the objects we know correspond to our sensations: the existence of objects consists in being perceived. They are only ideas; hence the term idealism.

Kant, for his part, based his transcendental idealism on the argument that knowledge relies on sensations related to a world composed of phenomena (which he calls things in themselves). However, while the mind and reason cannot impose a structure on reality as such, they can do so on appearances since reason possesses certain a priori categories (such as substance and cause) that are independent of all sensory experience. According to these assertions, Kant insisted that his position did not cast any doubt on science and that, on the contrary, it was the only way to save

it from skepticism. Science tells the truth, he claimed, but only the truth about appearances.

Rationalism

There are various forms of rationalism, such as metaphysical (all reality is of a rational nature), psychological (thought is superior to emotions and will), and epistemological or gnoseological rationalism, whose central concepts are more relevant to our topic of the philosophical assumptions of social sciences. In this form, rationalism asserts that it is possible to know reality through pure thought, without the need for any empirical premise. Essentially, this is the position of three of the most prominent representatives of rationalism: Descartes, Leibniz, and Spinoza. For example, Descartes proved the existence of God and the physical world based on the rationally indubitable premise "I think, therefore I am."

Knowledge is genuinely such when it has logical necessity and universal validity. Only reason can allow one to say that something is as it is and cannot be otherwise. Only reason has the capacity to obtain, by itself, through deduction from innate ideas, other types of knowledge such as "every effect has a cause," which is evident as it establishes a necessary relationship. Such concepts are known as synthetic judgments, which, having their origin in reason, are a priori knowledge!

It is important to recognize the various forms that modern rationalism has taken; however, these differ from the more extreme pretensions of rationalism that emerged in the 17th and 18th centuries. Nonetheless, the importance of reason in the knowledge of reality remains relevant within the various uses of the term "rationalism." Among these are the epistemological positions of Gaston Bachelard and Karl Popper, which highlight the role of reason and empirical experience in scientific investigation.

Empiricism

Empiricism is a philosophical school which holds that all knowledge is based on experience, a claim that directly opposes rationalism, for which knowledge derives largely from reason. For radical empiricism, the mind is like a "blank slate" that merely records information from experience. There are three types of empiricism: 1) psychological empiricism, which asserts that knowledge originates entirely from experience; 2) epistemological empiricism, which maintains that the validity of all knowledge is based on experience; and 3) metaphysical empiricism, which posits that there is no other reality than that which comes from experience, particularly sensory experience. This school of thought was developed by several English philosophers, notably Locke, Hume, and Mill.

Empiricism denies the existence of innate ideas, invoked by rationalists, who argue that these can be broken down into simpler concepts derived from experience or that these concepts are not genuine since no meaning can be assigned to them. In this same order, according to rationalists, empiricists deny that there are necessary truths a priori; but based on experience, unlike rationalists for whom such judgments would be self-evident truths, valid independently of experience. Finally, empiricism rejects all metaphysics and, conversely, gives high value to science

as a superior means of acquiring knowledge.

It is noteworthy that a significant part of research in social sciences is based on some of the main assumptions of empiricism, notably the value placed on experience as the origin of knowledge and as the ultimate criterion for testing theories. This is why, in recognizing that science is composed of theories, scientific empiricism acknowledges the role of reason in scientific practice and the development of science. One of the most prominent thinkers in this position is Emile Durkheim, who, for his opponents, is one of the most notable empiricists within the social sciences, also recognized as a positivist due to the importance he gave to the methods of natural sciences in social research.

Realism

Just as in the philosophical schools discussed earlier, it is possible to distinguish several types of realism. As metaphysical realism, the term was first used to denote the position that general or universal ideas, as they were called, have real existence independent of being thought of or not. As epistemological realism, it asserts that knowledge is possible without the need for consciousness to impose its own categories on reality. Among contemporary philosophers and epistemologists in this tradition are Bertrand Russell, Moore, and Mario Bunge, all of whom oppose all forms of idealism.

Within the context of epistemological realism, three versions are distinguished: 1) naive realism, which holds that knowledge is an exact reproduction of reality; 2) critical realism, which asserts that we cannot uncritically accept the knowledge provided by the senses and must examine such knowledge to determine to what extent it corresponds to reality as it is; such examination aligns this type of realism with rationalism; and 3) scientific realism, which posits that science provides the best knowledge of reality, where reason and experience are both necessary to know the truth. According to its basic principle, scientific rationalism rejects other types of knowledge that claim to have truth value, such as ordinary knowledge, religious knowledge, mystical knowledge, and metaphysical knowledge.

From these considerations, Bunge (1981, p. 29), from the position of scientific realism to which he adheres, tends a bridge to materialism in the following way: "All this material is changeable at least with regard to its position relative to other material entities. To put it negatively, at no time has science affirmed the immutability of matter." Hence, contemporary science can be characterized as the study of material objects through the scientific method to find and systematize the laws of such objects. In other words, scientific research presupposes a materialist ontology and also enriches it.

Materialism

In general terms, materialism is the doctrine (or doctrines) according to which everything that exists is matter; that is, ultimately, there is only one type of reality, which is material reality. Matter is thus the foundation of all reality and the cause of all transformations that occur within it. In

the 20th century, materialism is mainly represented by dialectical materialism and physicalism. Dialectical materialism is the philosophical position of Marx and Engels.

Dialectical materialism has as one of its central concerns the change of reality. Consequently, it considers the world as a process in which historically new and increasingly complex phenomena emerge from simpler ones, following the laws of dialectics: a) the law of transformation of quantitative changes into qualitative changes; b) the law of interpenetration of opposites, which recognizes the existence of contradictions in nature; and c) the law of the negation of the negation, meaning a given situation is replaced by another, so that the new emerges from the negation of the previous situation, which is then negated and replaced by another new situation.

The term dialectic in the philosophy of Marx and Engels derives from Hegel's concept to refer to the process of change in history and nature. But whereas for Hegel the basis of such a process was the spirit, for Marx and Engels that basis was matter. Hence, it is said that Hegel's dialectic was turned on its head by Marx and Engels. Physicalism is a form of materialism that emerged in the 20th century, whose proponents come from logical positivism, known as the Vienna Circle. According to their views, a statement only has meaning if it can be verified. When referring to psychological statements, they only have meaning if they are expressed in bodily behavior. Thus, it is noteworthy that behaviorism, which admits only observable data, is a form of physicalism.

Paradigms of Social Research

The term paradigm constitutes one of the most debated and analyzed categories that has been incorporated into the discourse of the scientific community, which, over time, has experienced significant growth and development. In the particular case of social research, as a scientific inquiry process, it has made considerable advances. This term became widely known and was particularly assimilated by the social sciences starting in the 1960s with the publication of Thomas Kuhn's work "The Structure of Scientific Revolutions." In this work, despite introducing the term paradigm to the debate, it presents, from its very appearance, a great polysemy of meanings and applications. To the extent that its author, in an expansion of the mentioned text edited in 1978, titled "Second Thoughts on Paradigms," attempts to delimit and clarify its sense and meaning.

Regarding this, Kuhn (1975, p. 13), when referring to the term paradigm, states:

> (...) The most important thing is that, spending a year in a community composed mainly of social scientists, confronted me with unforeseen problems about the differences between such communities and those of natural scientists among whom I had received my training. Primarily, I was amazed at the number and extent of the apparent disagreements among social scientists about the nature of accepted scientific problems and methods (...) In trying to discover the origin of this difference, I came to recognize the role played in scientific research by what I have since called paradigms. I consider these to be universally recognized scientific achievements that, for a time, provide model problems and solutions to a scientific community.

Kuhn's referenced work has had significant repercussions and has generated ongoing discussions that have grown since its appearance. Consequently, there have been criticisms, clarifications, interpretations, and reformulations revolving around the term paradigm. This does not diminish the importance, impact, and recognition it has had within the social scientific community.

Considering the interest in the concept of paradigm manifested by some researchers in the social and human sciences, there has been a proliferation of diverse positions regarding it. In this regard, Paz (2003, p.78) argues:

> Since Kuhn, an evident relativism in the criteria of demarcation between science and non-science has been accepted. Against the rationalist assertion that there are logical, universal, and ahistorical criteria to assess the scientific nature of theories, the conviction that the only possible criterion is the consensual approval of the scientific community is increasingly gaining strength.

Knowledge of research paradigms helps us to better understand the methodological model or models in which we intend to frame an empirical study. Conducting research requires understanding the phenomena being developed to generate proposals for continuous improvement within a context of professionals, researchers, and students who share similar conceptions about the approaches chosen for the research. In this sense, one starts from a reality, and its approach is made from a determined paradigmatic position. Regarding this, Pérez (1994, p. 15), states:

> Reality involves a methodological process that must be understood [...]. The investigation of social reality should be a systematic and planned activity, aimed at providing information for decision-making with the goal of improving or transforming reality, facilitating the means to achieve this.

From these positions, science and philosophy redefine their roles within the frameworks of knowledge, as the idea of identifying science with certain and demonstrated knowledge is established, in contrast to common knowledge, religion, and speculation. In line with this, some key elements of the fundamental paradigms for scientific production in the social sciences are presented: positivism, interpretive, and socio-critical.

Positivism

Positivism began as a research model in the physical or natural sciences and was later adopted in the field of social sciences. It was Auguste Comte who marked the birth of positivism when he published his "Discourse on the Positive Spirit" in 1849, which heralded the significant start of the positivist paradigm in research.

The positivist paradigm is also known as: quantitative, empirical-analytical, rationalist. It has become the dominant paradigm, and despite the emergence of opposing paradigms, it remains the hegemonic paradigm due to its strong presence in research processes in both natural and

social sciences, with particular emphasis in educational sciences. This paradigm is considered a philosophical school that upholds certain assumptions about the conception of the world and the way to understand it. It is important to recognize that this research paradigm accepts only verifiable, measurable, and observable knowledge as valid. Additionally, it is worth noting that positivism does not acknowledge the relevance of other perspectives, methodological procedures, or types of knowledge for interpreting reality; from this worldview, quantification is what matters.

Ricoy (2006, p. 14) states that the "positivist paradigm is characterized as quantitative, empirical-analytical, rationalist, systematic, managerial, and scientific-technological." Therefore, the positivist paradigm supports research aimed at testing a hypothesis through statistical means or determining the parameters of a specific variable through numerical expression. Positivism began as a research model in the physical or natural sciences and was later adopted in the field of social sciences.

In this same vein, the methodological question arises. From the positivist paradigm, the answers to a research question are of interest only if measurements can be made on the phenomenon under study. In this perspective, experimental methods are valid, where independent variables are intentionally manipulated at various levels of experimentation.

Interpretive Paradigm

In the context of studying epistemology as scientific knowledge, we find a series of paradigms understood as a set of beliefs and attitudes with a theoretical framework for pursuing and understanding the world, used by a group of scientists. Within this context, the interpretive paradigm emerges as an alternative to the limitations of the positivist paradigm in the field of Social Sciences and Education, considering the differences between these fields and the Natural Sciences. This paradigm has its historical antecedents in phenomenology, interpretive symbolic interactionism, ethnography, anthropology, and more. Its proponents originate from the German school, with Husserl considered its founder. Among its most representative authors are Dilthey, Baden, Berger, Schutz, Mead, Blumer, and Lukman.

The qualitative nature that characterizes the interpretive paradigm seeks to delve deeper into research, proposing open and emergent designs from a holistic and contextualized perspective. The most common data collection techniques include participatory observation, life histories, interviews, diaries, field notes, profiles, and case studies, among others. According to Ricoy (2005, p. 136), "Both the conclusions and the discussions generated by research adhering to the interpretive paradigm are fundamentally linked to a specific educational setting, also contributing to understanding, knowing, and acting in other situations." As Pérez (2004, p. 26) expresses, the interpretive paradigm emerges as:

> ...an alternative to the rationalist paradigm, as the disciplines in the social domain encompass various problems, issues, and restrictions that cannot be fully explained or un-

> derstood through quantitative methodology alone. These new approaches primarily stem from anthropology, ethnography, symbolic interactionism, and so on. Several perspectives and currents have contributed to the development of this new era, whose premises coincide with what has been called the hermeneutic, interpretive-symbolic, or phenomenological paradigm.

The reason behind the multiplicity of terms used to refer to the interpretive research paradigm is perhaps its constructivist epistemological basis. Its focus is qualitative, aiming to develop concepts that help understand social phenomena in natural settings, giving due importance to the intentions, experiences, and opinions of all participants.

Socio-Critical Paradigm

This paradigm is contextualized in a research practice characterized by action-reflection-action, which implies that the researcher seeks to generate change and liberation from oppressions in a specific social context. According to Ricoy (2006, p. 23), "the search for social transformation is based on participation, intervention, and collaboration from critical personal reflection in action."

The aspects that characterize the critical paradigm, according to Escudero (1987), are: (1) having a holistic and dialectical view of what is conceived as real, (2) the relationship between the researcher and the phenomenon under study is characterized by the active and committed involvement of all participants in the research process towards social change, (3) the research process is generated in action, that is, in practice, and from this point, the social understanding of the needs, problems, and interests of the human group under study begins, (4) the pursuit of a transformation of social structures, based on the liberation and emancipation of the individuals that make up the social research context.

This Critical or Socio-Critical paradigm is defined by Jiménez (2003, p. 197) as: "a strategy that man has devised for himself not only to describe, explain, predict (positivists), interpret, and understand (hermeneutics), but also to act and transform that world in order to make man and his world more just and free."

From this perspective, the author asserts that the socio-critical paradigm is grounded in critical social science and the critical social theory proposed by, among others, Habermas (1987), Carr & Kemmis (1988). It transcends interpretation as it aims to contribute to transformations in the realities under study. Therefore, it is essential to explain the underlying socio-political conditions in the problems studied to incorporate alternatives beyond the interpretive and seek the roots of educational problems with the aspiration of transforming social structures that impede the development of equity and social equality.

Currently, the epistemological debate tends towards a point of clarification regarding the relative scope of quantitative and qualitative approaches. When situating recent research processes, it

is observed that there is a progressive overcoming of both approaches, integrating them to favor the selective and qualified use of the different procedures, techniques, and instruments that comprise them. This situation, which is general in the field of social sciences, is especially strong in the field of educational research.

Under the denomination of the socio-critical paradigm, a range of research methods born in response to neopositivist and naturalist traditions are grouped. Aiming to overcome the reductionism of the former and the conservatism of the latter, it proposes the possibility of a social science that is neither purely empirical nor solely interpretative.

The socio-critical paradigm includes neo-Marxist positions, critical approaches, and participatory research in general. Some authors place it as a particular proposal within the naturalist paradigm, but its orientation towards solving practical problems and its marked emphasis on social change and the participatory nature of research processes give it a particularity that justifies understanding it as a distinct paradigm.

Conclusions

Epistemology is highly valuable in the scientific research process, as it endows us with a unique critical capacity linked not only to the deployment of a specific methodology but also to the foundational principles of scientific research.

Traditionally, epistemology has been considered a philosophical discipline responsible for, among other things, the analysis and critical evaluation of the products derived from scientific activity. In this sense, it has been regarded as a second-level theory, given that its object of study consists of scientific theories, which correspond to a first level and refer to a certain ontological domain. However, new perspectives and fields of application of epistemology have emerged in the social and human sciences, contributing to the development and production of knowledge. Among the most significant developments are those from Marxism, psychoanalysis, and genetic psychology, as well as educational and sociological theories. These theories, due to their broad explanatory power, have managed to encompass scientific knowledge itself. This explains the importance of epistemology for social researchers in the context of scientific investigation.

Epistemology, as the science of knowledge, guides us in our research processes. Through it, we can be led towards scientific production, thereby finding justification or validity for the answers discovered. This facilitates the understanding of our disciplinary actions and enhances the development of our thinking structures. The role of epistemology in scientific production is of great significance, and its application should be continuous and permanent within the scientific community. This is essential if we aim to contribute to new scientific achievements necessary in the modern world.

The processes of knowledge production point to the consideration of the epistemic models required for scientific production, which can be approached from a scientific culture. Therefore, it is relevant to consider the importance of researcher training, based on the development of

transdisciplinary, epistemological, and experiential knowledge, enabling scientific production through knowledge creation.

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Transpersonal management: the new trend in the business world

Administración transpersonal: la nueva tendencia en el mundo empresarial

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Abstract

The study investigated the relationship between administration management and transpersonal competencies, giving rise to a new management model to improve business efficiency. Organizational learning management was identified as key, creating an environment conducive to acquiring knowledge and skills. This contributes to the continuous development of the company, allowing adaptation and innovation. Theories on competencies and transpersonal psychology were recognized, applied to business management. Highlighting the influence of organizational culture and the relevance of transpersonal competencies. Adopting a quantitative and deductive approach, the influence of organizational culture on management and the relevance of transpersonal competencies was highlighted. The conclusion highlights the need for a renewed managerial approach, integrating transpersonal skills to drive socioeconomic progress at Fundaunamor. These competencies promote holistic management, supported by specific strategies such as cultural promotion and creating an enabling environment.

Keywords: Model, Management, Administration, Culture, Learning, Innovation.

Resumen

El estudio investigó la relación entre la gerencia de administración y las competencias transpersonales, dando lugar a un nuevo modelo gerencial para mejorar la eficiencia empresarial. Se identificó la gestión del aprendizaje organizacional como clave, creando un entorno propicio para adquirir conocimientos y habilidades. Esto contribuye al desarrollo continuo de la empresa, permitiendo la adaptación y la innovación. Se reconocieron teorías sobre competencias y psicología transpersonal, aplicadas a la gerencia empresarial, destacando la influencia de la cultura organizacional y la relevancia de las competencias transpersonales. Se adoptó un enfoque cuantitativo y deductivo, se destacó la influencia de la cultura organizacional en la gestión y la relevancia de las competencias transpersonales. La conclusión resalta la necesidad de un enfoque gerencial renovado, integrando habilidades transpersonales para impulsar el progreso socioeconómico en Fundaunamor. Estas competencias promueven una gestión holística, respaldada por estrategias específicas como la promoción cultural y la creación de un ambiente propicio.

Palabras clave: Modelo, Gestión, Administración, Cultura, Aprendizaje, Innovación.

Introduction

In a world of transformation and change, leadership and management are crucial for business excellence and organizational learning. Today, social, environmental, and ethical awareness is essential for sustainable success, driving the emergence of conscious organizations that integrate a holistic vision and a commitment to well-being, marking a new trend in the contemporary business market.

Managerial models are valuable tools for improving organizational management. Common problems include rigidity in changing environments, limiting standardization, and lack of focus on the human factor. There is a recognized need to adapt models to the specific culture and objectives of each entity, as no single model is suitable for all organizations.

The purpose of this research is to explore how transpersonal competencies, which transcend individual limits, can underpin a managerial model aligned with the values and mission of conscious organizations. It analyzes how these competencies affect corporate culture, decision-making, communication, and the achievement of sustainable results.

The analysis examines theories related to transactional leadership. According to Koontz & Weihrich (2008, p. 458), "leaders strive to ensure organizational effectiveness and efficiency". These studies support the idea that leaders play a crucial role, working to achieve optimal results in terms of effectiveness and efficiency, fostering clear communication, and collaborative motivation.

Regarding transformational leadership, Hellriegel & Slocum (2009, p. 301) go beyond predicting trends, "inspiring new visions, and fostering the development of leadership skills. They also focus on creating a learning community within the organization, facilitating the facing of challenges and obtaining significant rewards".

Therefore, charismatic leaders, as noted by Stoner et al. (1996, p. 534), exert significant influence, "generating an emotional impact on their followers that goes beyond their individual skills and characteristics. Their ability to inspire, motivate, and mobilize others towards common goals is a distinctive trait, making them figures who transcend and bring about changes in organizations".

In business administration management, the importance of adapting leadership to the particularities of each project and team is highlighted. To achieve this effective adaptation, transactional, transformational, and charismatic leadership theories are used, offering diverse approaches depending on the needs and dynamics of each work environment. Business administration management is the key to success, influencing not only efficiency in facing challenges but also the ability to seize opportunities in a dynamic business environment. Flexibility drives innovative strategies, which are key to sustainability in a dynamic market.

To make sense of the findings, the article is developed and contextualized as follows: it represents a review of the literature and key terms such as managerial administration model, organizational culture, organizational learning, conscious organizations, competencies, transpersonal psychology, and transpersonal competencies, among others. This action is essential for a deep understanding of each concept and constitutes a fundamental prerequisite for exploring theoretical and empirical perspectives. Then, the methodology is presented, followed by the discussion of the obtained results, and finally, the conclusions.

Methodology

The study employed an explanatory methodology to understand the underlying causes of a specific phenomenon, aligned with the theoretical foundations of Carrasco (2006). A non-experimental and cross-sectional approach was used, following the guidelines of Hernández *et al.* (2016). The investigated population included 169 participants from Fundaunamor, with a sample of 63 individuals selected through stratified sampling. Data were collected through observations, surveys, and a 30-item questionnaire based on the Likert scale. The instrument was validated by experts and demonstrated high reliability with a Cronbach's Alpha coefficient of 0.777. Data were analyzed using statistical techniques of frequency distribution. This methodological approach allowed for a detailed evaluation of the properties and attributes of the managerial management model implemented at Fundaunamor as a solution to the investigated issue.

Results

Table 1
Variable: Modelo gerencial de administración. Dimensión: Organización

Response Category		Always		Almost Always		Rarely		Never		Weighted Average	Category
Indicators	Ítems	4		3		2		1			
		Fa	%	Fa	%	Fa	%	Fa	%		
Organizational Culture	1 - 4	44	17,46	52	20,63	76	30,16	80	31,75	2,23	Low Level
Organizational Learning	5 - 8	56	22,22	72	28,57	68	26,98	56	22,22	2,50	Low Level
Total		100	19,84	124	24,60	144	28,57	136	26,98		
Dimension Average		2,36									
Dimension Category		Low Level									

Note: Authors' own elaboration (2024).

Table 1 reveals crucial aspects of "organizational culture" within the surveyed organizations, showing a concerning distribution in the adoption of cultural practices. 31.75% of the responses indicated an absence ("never") of these practices, and 30.16% reported their occurrence as "rarely." In contrast, 20.63% stated that these practices occur "almost always," and 17.66% see them "always." The average of 2.36% reflects a low level of application, evidencing insufficient implementation of organizational culture practices. This result highlights the lack of recognition of individual contributions and suggests that few people believe the organization fosters the adoption of new beliefs and styles.

In the realm of "organizational learning," the responses of the surveyed were balanced, with 22.22% reporting both the absence ("never") and constant presence ("always") of learning. 28.57% affirm that this learning occurs "almost always," while 26.98% see it "rarely," leading to an average of 2.50, indicating a moderately low level of application. Although a notable portion of participants perceive a good level of organizational learning, the lack of transformational leadership suggests a limitation in its effectiveness. These results underscore the critical need to address and improve these areas to promote a stronger environment of organizational learning.

In the "organization" dimension, the majority of responses lean towards "rarely" (28.57%) and "never" (26.98%), with lower percentages for "almost always" (24.60%) and "always" (19.14%), averaging 2.36. This indicates a low level of adoption of organizational practices, highlighting deficiencies in management and the need to strengthen organizational culture. The distribution of responses emphasizes the importance of reviewing and improving strategies to foster a cohesive work environment that promotes innovation and change, valuing individual contributions.

Table 2

Variable: Transpersonal Competencies. Dimension: Organization

Response Category / Indicators	Ítems	Always		Almost Always		Rarely		Never		Weighted Average	Category
		4		3		2		1			
		Fa	%	Fa	%	Fa	%	Fa	%		
Bioneuroemotion	9 - 12	9	3,57	12	4,76	16	6,35	215	85,32	1,26	Low Level
Levels of Consciousness	13 -16	12	4,76	5	1,98	51	20,24	184	73,02	1,38	Low Level
Meditation	17-20	13	5,16	13	5,16	39	15,48	167	74,21	1,41	Low Level
Spiritual Leadership	21-24	5	1,98	7	2,78	52	21,83	185	73,41	1,31	Low Level
Transpersonal Leadership	25-28	10	3,97	12	4,76	44	17,46	186	73,81	1,39	Low Level
Total		49	3,88	49	3,88	202	16,28	957	75,96	1,35	
Dimension Average		1,35									
Dimension Category		Low Level									

Note: Authors' own elaboration (2024).

The data in Table 2, focusing on "Transpersonal Competencies" within the "organization" dimension, show specific results for various indicators. For the "Bioneuroemotion" indicator, the majority of respondents, 85.32%, indicated they "never" experienced it, followed by 6.35% who said "rarely," 4.76% who chose "almost always," and 3.57% who responded "always." This results in an average of 1.26, evidencing a very low implementation of this competency.

Regarding "levels of consciousness," 73.02% of participants chose "never," 20.24% "rarely," 4.76% "always," and 1.98% "almost always," resulting in an average of 1.38, also indicating a low level of application. Finally, for the "meditation" indicator, the highest percentage was for "never" at 74.21%, followed by "rarely" at 15.48%, while the options "almost always" and "always" combined for 13%. The average for this indicator was 1.41, similarly reflecting a low level of application.

The results highlight the lack of integration of transpersonal competencies such as Bioneuroemotion, levels of consciousness, and meditation within the organization, showing significant room for improvement. Regarding "spiritual leadership," a predominant 73.41% indicated they "never" practice it, followed by 21.82% who said "rarely," with only 2.78% and 1.98% choosing "almost always" and "always" respectively, resulting in an average of 1.41, indicating minimal application. Similarly, "transpersonal leadership" reflected a low level of application with 73.81% choosing "never," suggesting an urgent need to strengthen these key areas within the organization.

The evaluation of the "organization" dimension in transpersonal competencies reveals an average of 1.35, indicating a low level of application and highlighting the critical need to reinforce and integrate these skills within the organizational context. This situation presents an essential opportunity to enhance the efficiency and performance of leaders through the development of these competencies. Implementing them would not only improve internal management but also promote a more harmonious and productive work environment, thereby strengthening the organizational culture. It is imperative to invest in the development of these competencies to ensure the sustainable growth and long-term success of the organization.

Discussion

The data in Table 2, focusing on "Transpersonal Competencies" within the "organization" dimension, show specific results for various indicators. For the "Bioneuroemotion" indicator, the majority of respondents, 85.32%, indicated they "never" experienced it, followed by 6.35% who said "rarely," 4.76% who chose "almost always," and 3.57% who responded "always." This results in an average of 1.26, evidencing a very low implementation of this competency.

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Conclusions

The adoption of the managerial model at Fundaunamor has catalyzed a positive transformation in its organizational culture, favorably impacting acceptance, adaptation, and unity among senior management, employees, and other members. The incorporation of transpersonal competencies emerges as a fundamental pillar for sustainable development and the consolidation of organizational resilience, demonstrating its value and effectiveness across all hierarchical levels of the entity.

The data underscore the urgency of integrating transpersonal competencies within Fundaunamor to address the identified difficulties in organizational culture. The adoption of practices such as Bioneuroemotion and meditation could not only improve well-being and workplace synergy but also enhance cohesion, communication, and team performance. This holistic approach to employees' personal and spiritual development would promote a more conscious and harmonious work environment, crucial for innovation and sustainable growth.

Evidence points to a notable absence of transformational and spiritual leadership at Fundaunamor, negatively affecting its effectiveness and internal cohesion. Implementing a leadership approach that goes beyond immediate tangible results, focusing on integral well-being and spiritual development, is essential to motivate and unite the team around a shared vision. This shift towards more inclusive and holistic leadership, resonating with individual and collective values, is crucial for cultivating a resilient and adaptive work culture capable of facing current and future challenges.

Findings demonstrate an insufficient understanding of levels of consciousness within the organization, resulting in errors and a lack of self-control and confidence. Evaluating and developing levels of consciousness, along with adopting meditative practices, are crucial for organizational learning. By fostering a "learning community" that values exchange and collaboration, Fundaunamor could overcome these weaknesses, promoting comprehensive and sustainable learning that improves both the quality of work and employee commitment, aligning with the vision of a culture oriented towards excellence and constant growth.

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Learning by Discovery: the key to revolutionizing the teaching of biology in Colombia*

Aprendizaje por descubrimiento: la clave para revolucionar la enseñanza de la biología en Colombia

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Abstract

This bibliographic review article focuses on discovery learning as a key to revolutionizing the teaching of biology in Colombia. The central objective of the study is to exhaustively analyze how this methodology can improve scientific education in the country. To do this, different research and theories related to discovery learning and its application in the field of biology were reviewed. The theoretical findings highlight that it promotes critical thinking, creativity and motivation in students, which can potentially lead to greater interest and understanding of the area. In addition, it was found that it promotes autonomy and the development of cognitive skills in students. In conclusion, it is postulated that discovery learning could be an effective tool to improve the teaching of biology in Colombia, allowing students a greater understanding and appreciation of this scientific discipline.

Keywords: Discovery learning, revolution, teaching, biology, Colombia.

Resumen

El presente artículo de revisión bibliográfica se enfoca en el aprendizaje por descubrimiento como clave para revolucionar la enseñanza de la biología en Colombia. El objetivo central del estudio es analizar de manera exhaustiva cómo esta metodología puede mejorar la educación científica en el país. Para ello, se revisaron diferentes investigaciones y teorías relacionadas con el aprendizaje por descubrimiento y su aplicación en el campo de la biología. Los hallazgos teóricos destacan que promueve el pensamiento crítico, la creatividad y la motivación de los estudiantes, lo que potencialmente puede llevar a un mayor interés y entendimiento del área. Además, se encontró que fomenta la autonomía y el desarrollo de habilidades cognitivas en los estudiantes. En conclusión, se postula que el aprendizaje por descubrimiento podría ser una herramienta efectiva para mejorar la enseñanza de la biología en Colombia, permitiendo a los estudiantes una mayor comprensión y apreciación de esta disciplina científica.

Palabras clave: Aprendizaje por descubrimiento, revolución, enseñanza, biología, Colombia.

Introduction

The teaching and learning process in the field of biology has been the subject of constant research and debate worldwide. In Colombia, the way this discipline is taught in schools and universities has been a concern for many educators due to the low levels of understanding and retention of content by students. In response to this scenario, discovery learning emerges as an innovative and effective alternative to revolutionize the teaching of biology in the country.

Discovery learning is a pedagogical approach based on the idea that students construct their own knowledge through exploration and experimentation. Instead of passively receiving information, students are encouraged to discover concepts and principles for themselves, allowing them to develop critical thinking, problem-solving, and teamwork skills. This approach is based

on constructivist theory, which holds that learning is an active and meaningful process built from the individual's interaction with their environment.

The central objective of this literature review article is to explore the different research and educational experiences that support the effectiveness of discovery learning in biology education, specifically in the Colombian context. It analyzes the benefits of this pedagogical approach in terms of student motivation and engagement, their ability to retain and apply acquired knowledge, and their development of cognitive and metacognitive skills. Additionally, it examines the strategies and resources that teachers can use to effectively implement discovery learning in the classroom.

In this context, the question arises: How can educators in Colombia adopt discovery learning as a pedagogical strategy to transform the teaching of biology and promote the holistic development of students? To answer this question, it is necessary to delve into the theory of discovery learning, as well as the experiences and studies that support its effectiveness in education. Moreover, it is important to consider the challenges and obstacles that may arise during the implementation of this approach and propose solutions to overcome them.

Throughout this article, various aspects related to discovery learning are addressed, from its theoretical foundation to its practical applications in the classroom. Studies demonstrating improvements in academic performance and student motivation exposed to this approach are reviewed, as well as strategies and techniques proven effective in fostering active and meaningful learning in the field of biology.

Furthermore, the implications of discovery learning for developing key 21st-century skills, such as problem-solving, decision-making, and effective communication, are analyzed. Possible adaptations and adjustments that educators need to make in their pedagogical practices to successfully integrate this approach into the biology curriculum, considering the particularities of the Colombian educational context, are also explored.

Thus, discovery learning is presented as a powerful tool to transform biology teaching in Colombia and improve the quality of education in the country. Through this approach, students not only acquire solid and lasting knowledge but also develop fundamental skills and competencies for their holistic formation and success in today's society. This article aims to provide a broad and updated perspective on discovery learning in the context of biology and inspire educators to rethink their pedagogical practices towards a more meaningful and transformative education.

Pedagogical Practice of Biology in Colombia

The pedagogical practice of biology in Colombia is a topic of great relevance today, as it is fundamental for the education of students in this field of knowledge. However, various problems affect the quality of biology teaching in the country, highlighting the need to improve the methodologies and pedagogical strategies employed in educational institutions.

First, it is important to note that the teaching of biology in Colombia faces several challenges, among which the lack of teacher training in this area of knowledge stands out. According to Serrato (2020), many of the teachers responsible for teaching biology classes in the country's schools and colleges do not have the necessary academic training to adequately address the content of this discipline. This is partly because, in many cases, teachers are assigned to this subject without having specific training in biology, which makes it difficult to convey knowledge clearly and precisely.

Additionally, it is worth highlighting that teaching is affected by the lack of adequate resources and didactic materials for class development. According to Roa (2020), educational institutions in the country do not have the necessary equipment to carry out laboratory practices or experimental activities in the classroom, limiting teachers' ability to teach biology concepts practically and dynamically. This results in theoretical and rote teaching that does not stimulate students' interest or participation in learning biology.

Another issue affecting the pedagogical practice of biology in Colombia is the lack of curricular content updates and the absence of a connection with the country's reality. According to Moreno and Ussa (2018), biology study plans in educational institutions do not align with Colombia's environmental and social needs and problems, making it difficult for students to understand the importance of biology in their daily context. Additionally, the lack of curricular content updates prevents teachers from teaching the most recent scientific and technological advances in the field of study.

Furthermore, it is important to note that the teaching of biology in Colombia is affected by students' lack of motivation and interest in this discipline. According to Acevedo *et al.* (2021), many students perceive biology as a boring and difficult-to-understand subject, which affects their low academic performance and lack of interest in learning more about this field of knowledge. This situation is exacerbated by the lack of innovative pedagogical strategies that could stimulate students' curiosity and motivation toward biology.

Given these problems, it is evident that improving the pedagogical practice of biology in Colombia is necessary to ensure comprehensive and quality education for students in this field of knowledge. To achieve this, it is essential to implement innovative pedagogical strategies that promote the meaningful learning of biology content, as well as the continuous training of teachers in this discipline. In this regard, authors like Ausubel (1968) have emphasized the importance of promoting meaningful learning among students by creating relationships between new knowledge and previously acquired knowledge. This implies that teachers should design activities that allow students to relate biology concepts to their daily lives so they can understand the relevance and applicability of this knowledge in their environment.

In this regard, Vygotsky (1978) has highlighted the importance of fostering collaborative learning in the classroom to stimulate students' active participation in constructing their knowledge. Therefore, teachers should promote teamwork and group activities that enhance cooperation and the exchange of ideas among students, thus fostering the development of social and cognitive skills in the field of biology.

Moreover, it is fundamental that teachers receive continuous and specialized training in this discipline to update their knowledge and strengthen their pedagogical skills. According to López (2023), teacher training is a determining factor in the quality of biology teaching, as a well-prepared teacher can clearly and effectively transmit the concepts and content of this discipline to their students. Hence, it is considered pertinent for educational institutions in Colombia to allocate more resources and support for the development of laboratory practices and experimental activities in the classroom to strengthen practical teaching. Experimental activities are essential for students to concretely understand theoretical biology concepts and stimulate their curiosity and interest in the discipline.

Similarly, it is necessary to review and update the biology curricular content in Colombia to ensure a connection with the country's environmental and social issues. Biology study plans should be periodically reviewed to include current and relevant topics that allow students to understand the importance of biology in environmental conservation, public health, and sustainable development. Regarding students' motivation towards biology, it is essential to implement innovative pedagogical strategies that stimulate their curiosity and interest in the discipline. Considering the contributions of Alcívar & Alcívar (2021), teachers can use technological resources such as videos, simulations, and interactive applications to make biology classes more attractive and promote active student learning. It is also important to encourage extracurricular activities such as field trips and scientific workshops, allowing students to explore and experiment with biology concepts practically.

In this context, the pedagogical practice of biology in Colombia faces various problems that affect the quality of teaching in this field of knowledge. To improve biology teaching in the country, it is essential to implement innovative pedagogical strategies that promote the meaningful learning of content, as well as the continuous training of teachers in this discipline. Promoting practical and experimental activities in the classroom, updating curricular content, and fostering students' motivation towards biology are crucial to ensuring comprehensive and quality education in this discipline. Only through a joint effort of educational institutions, teachers, and students will it be possible to improve the pedagogical practice of biology in Colombia and contribute to the development of excellent scientific education in the country.

Teacher Training in the Field of Biology

Teacher training in the field of biology in Colombia is a topic of utmost importance today, as it is an area of knowledge that is constantly evolving and requires updated and well-trained teachers to effectively convey scientific advances to their students. In this regard, it is essential that biology teachers stay abreast of new discoveries, teaching methodologies, and technologies applied to education.

In Colombia, teacher training in biology has seen significant progress in recent years, with the implementation of continuous training programs and the promotion of participation in conferences, symposia, and update sessions in the field. However, challenges remain that must be

overcome to achieve a true improvement in the quality of biology education in the country (Guevara *et al.*, 2022). One of the main challenges faced by teachers is the lack of resources and institutional support for professional development. Many teachers do not have the time or resources necessary to attend courses, training sessions, or academic events that would allow them to stay current in their discipline. Additionally, in some educational institutions, priority is given to training in areas considered more "priority," relegating biology training to a secondary position.

Another significant challenge is the lack of incentives for teacher professional development in the field of biology. Often, teachers do not receive recognition for their continuous effort to train, which demotivates their participation in update activities. Additionally, the lack of clear policies and professional development plans in the field of biology makes it difficult to plan and execute concrete actions to improve teacher training. It is crucial for educational authorities to implement concrete measures to promote teacher professional development in the field of biology. This can include creating continuous training programs, promoting scholarships and financial aid for attending academic events, including professional development as part of teacher performance evaluations, among other actions (Afanador, 2022).

It is important to highlight that teacher professional development in the field of biology benefits not only the teachers themselves but also their students. An updated teacher can more effectively convey knowledge to their students, fostering their interest in the discipline and promoting meaningful learning. Additionally, teacher professional development contributes to the overall improvement of educational quality, which positively impacts the country's development.

Regarding current trends in teacher professional development in the field of biology in Colombia, it is important to highlight the role of information and communication technologies (ICT) in teacher training. ICT offers very useful tools for professional development, such as virtual training platforms, online courses, digital educational resources, among others. The use of ICT in the training of biology teachers allows quick and easy access to updated information, facilitating continuous professional development in the discipline (Alcívar & Alcívar, 2021).

Another important trend in teacher professional development in the field of biology is the promotion of research and educational innovation. Teachers who participate in research projects in the field of biology have the opportunity to stay updated with the latest scientific advances and develop new teaching methodologies that favor student learning. Educational innovation in the teaching of biology is key to adapting to the changes and challenges of the 21st century and promoting meaningful learning in young people.

In this context, training biology teachers in digital competencies and active methodologies emerges as a fundamental aspect of professional development. Teachers must acquire skills in the use of digital tools, the creation of multimedia educational resources, and the design of interactive activities, among others, to enrich their pedagogical practice and improve the quality

of biology education. It is relevant to consider collaboration between educational institutions, government entities, academic organizations, and society in general. Creating support networks and spaces for exchanging experiences and best practices in the training of biology teachers can favor professional development and improve the quality of education in the country.

Nonetheless, it is essential to promote teacher autonomy and leadership in professional development (Valles *et al.*, 2015). Biology teachers must be the protagonists of their own training process, identifying their needs and seeking the necessary tools and resources for their professional development. Self-management of learning and continuous reflection on teaching practice are key aspects for the professional growth of teachers.

Transformation of the Pedagogical Process of Biology Through Discovery Learning

The teaching of biology has undergone a significant transformation in recent decades, shifting from a traditional focus on knowledge transmission to a more student-centered approach emphasizing active learning and discovery. This shift in the pedagogical process has been driven by advances in educational neuroscience and learning psychology, which have highlighted the importance of active student participation in their own learning process.

The discovery learning approach in biology education is based on the idea that students learn best when they are active participants in their learning process rather than passive recipients of information. This approach is grounded in constructivist learning theory, which posits that students construct their own knowledge from their prior experiences and interactions with their environment (Eleizalde *et al.*, 2010). According to the discovery learning approach, the role of the teacher is to facilitate learning rather than directly transmit knowledge. The teacher becomes a guide who provides students with the necessary tools to discover and construct their own knowledge through exploration and experimentation. This form of teaching promotes critical thinking, problem-solving, and teamwork, which are fundamental skills in the formation of a scientist.

One of the most important aspects of biology teaching based on discovery learning is the use of scientific research as a pedagogical tool. Arias and Oblitas (2014) state that students have the opportunity to conduct experiments, make observations, and analyze real data, allowing them to experience the scientific process firsthand and develop practical skills such as decision-making, critical analysis, and effective communication. Additionally, discovery learning fosters students' curiosity and interest in biology by allowing them to explore topics of interest and discover answers to their questions independently. This not only increases students' motivation towards learning but also helps them develop a deeper and more lasting understanding of biological concepts by connecting theory with practice and providing meaningful context.

However, despite its benefits, teaching biology through discovery learning also presents challenges for teachers, who must find a balance between guiding and allowing students freedom

in their learning process. Moreover, some critics argue that this approach may be less time-efficient as it requires more resources and planning from teachers. Despite these challenges, the trend towards a more discovery-centered approach in biology teaching is increasingly evident, as it has been shown to improve students' motivation, understanding, and engagement with the subject. Additionally, implementing this approach in the classroom has proven beneficial for student diversity, allowing each individual to learn at their own pace and style.

Therefore, according to Castillo *et al.* (2020), the transformation of the pedagogical process of biology through discovery learning has brought about a significant change in how this subject is taught, shifting from a traditional knowledge transmission approach to a more active learning and student participation-centered approach. This approach has proven beneficial in enhancing students' motivation, understanding, and engagement with biology, allowing them to explore, discover, and construct their own knowledge through experimentation and scientific research.

Conclusions

Discovery learning presents itself as an innovative educational strategy with the potential to revolutionize the teaching of biology in Colombia. Through the literature review conducted in this article, various studies have been identified that support the effectiveness of this methodology in fostering curiosity, intrinsic motivation, critical thinking, and deep understanding of biological concepts.

Discovery learning is based on constructivist theory, which posits that learning is an active process in which students construct their own knowledge through exploration, experimentation, and reflection. In the context of biology teaching, this methodology promotes the development of skills such as observation, inference, experimentation, and argumentation, which are fundamental for scientific thinking.

Throughout the literature review, it is observed that discovery learning has been successfully applied in different educational contexts, both at the school and university levels. In the school setting, research projects have been developed that involve students in formulating research questions, designing and conducting experiments, collecting and analyzing data, and presenting results. These experiences not only allow students to acquire conceptual knowledge but also to develop scientific skills and positive attitudes toward science.

In the educational context, these experiences have proven effective in promoting critical thinking, peer collaboration, autonomy, and responsibility in learning. Additionally, it has been shown that discovery learning can positively impact student motivation. By allowing them to explore and discover on their own, this methodology stimulates curiosity, interest, and intrinsic satisfaction with learning. Students become more active and engaged in their learning process, leading to better academic results and maintaining a positive attitude toward biology and science in general.

Regarding the understanding of biological concepts, it has been observed that discovery lear-

ning favors the construction of deeper and more meaningful knowledge. When faced with problematic and challenging situations, students are compelled to reflect, compare, integrate, and apply their prior knowledge to solve problems and make informed decisions. This type of active and contextualized learning allows students to fully understand the concepts rather than superficially memorizing disconnected information. It also promotes the development of transversal skills such as effective communication, teamwork, ethical decision-making, and adaptability to changing environments. These skills are essential for professional success and active participation in today's society, where biology plays a crucial role in understanding and solving health, environmental, and biodiversity problems.

In the Colombian context, the implementation of discovery learning in biology teaching presents a series of challenges and opportunities. On one hand, a paradigm shift is required in the way teaching and learning are conceived by both teachers and students. It is necessary to foster a culture of collaboration, exploration, and experimentation in the classroom, where mistakes are seen as learning opportunities and the diversity of ideas is valued. All of this requires institutional support and adequate resources for development. Teachers need to be trained in effective pedagogical strategies, provided with spaces and materials for experimentation and research, and continuously evaluated to improve educational practice.

In this regard, it is important to highlight the importance of formative assessment in discovery learning. Beyond traditional assessment based on exams and grades, it is crucial to implement evaluation strategies that allow monitoring student progress, identifying their strengths and weaknesses, and providing constructive feedback on their learning. Formative assessment promotes metacognition, which is the students' ability to reflect on their own learning and regulate their process autonomously.

In conclusion, discovery learning presents itself as a valuable tool to revolutionize the teaching of biology in Colombia. Through exploration, experimentation, and reflection, students can construct deep and meaningful knowledge of biological concepts, develop scientific and transversal skills, and maintain a positive and motivated attitude toward science. However, its implementation requires a paradigm shift, institutional support, and formative assessment to ensure its effectiveness and long-term sustainability

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Universe of environmental education linked to presocratic philosophy from the perspective of complexity

Universo de la Educación Ambiental vinculada a la Filosofía de los Presocráticos desde la complejidad

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Abstract

The critical review of the development and progress of philosophical humanity where the pre-Socratics instructed the so-called myth to the logos, where rational thought begins. In this way, man is the place par excellence where nature and human beings converge, occupying the thinkers of Miletus towards the basic principle of things, nature or the element that makes up the world and universe. From the methodological point of view, the study is located within the qualitative paradigm in which the dialectical hermeneutic method is used. However, the absence of ethics and ignorance of the sensitivity of the habitat has allowed the irrational destruction of human beings in their path. This is how Aristotle chronologically organized the preclassical history of Western philosophy where the Greeks inherit objects from the Egyptians and Babylonians. In the same way, they give this heritage a vigorous effort provided with lucidity, reason and logic, likewise, it corresponds to the improvement of environmental education, by virtue of these points, the need arises to consider a study oriented to document the environmental concern that show their relationships, ecological behavior and cognitive models from the pre-Socratics.

Keywords: Environmental education, development, progress, philosophy, pre-Socratics, nature, human being.

Resumen

La revisión crítica del desarrollo y progreso de la humanidad filosófica en donde los presocráticos instruyeron al llamado mito al logos, donde se inicia el pensamiento racional. De esta manera, el hombre es el lugar por excelencia donde converge naturaleza y ser humano, ocupó a los pensadores de Mileto hacia el principio básico de las cosas, la naturaleza o elemento que conforma el mundo y universo. Desde el punto de vista metodológico, el estudio se ubica dentro del paradigma cualitativo en el cual se hace uso del método hermenéutico dialéctico. Sin embargo, la ausencia de ética y el desconocimiento de la sensibilidad del hábitat ha permitido la destrucción irracionalmente del ser humano en su paso, fue así como Aristóteles organizó cronológicamente la historia preclásica de la filosofía occidental donde los griegos heredan objetos de los egipcios y babilonios, del mismo modo, le dan a esa herencia un pujante esfuerzo proporcionado lucidez, razón y lógica, asimismo, corresponde al mejoramiento de la educación ambiental, en virtud de estos señalamientos, surge la necesidad de plantearse un estudio orientado a documental la preocupación ambiental que muestre sus relaciones, conducta ecológica y modelos cognitivos desde los presocráticos.

Palabras clave: Educación ambiental, desarrollo, progreso, filosofía, presocráticos, naturaleza, ser humano.

Introduction

Given the complexity of modern society, characterized by advances in technology, sciences, mass media, as well as issues of poverty, social deterioration, and ecological damage to the

planet, an integral education with agile educational management under a strategic approach that includes citizen participation is required.

Referencing Morin (2003), a complex vision understands reality and manifests simultaneously from all possible perspectives, seeking to channel the best possible strategy in a complex and global manner. Dividing it into small parts to facilitate study limits the scope of knowledge, meaning that to understand it, we cannot be reductionist or holistic. Instead, we must adapt to reflexivity, requiring public organizations to reform their adaptive capacity to minimize harmful environmental effects.

The genesis of social sciences embraces the complexity of reality and the diversification of theoretical and epistemological possibilities. It is transdisciplinary and transdimensional, studying phenomena related to human reality through economic theories, sociology, political science, anthropology, geography, history, philosophy, culture, technology, and more. This focus on individual and collective existence breaks various paradigms set by ideologies and assumptions of scientific communities.

In achieving an interactive process between man and the environment within the social context, individuals should focus on respect for nature and environmental awareness. These aspects determine positive activities concerning axiological processes, ways of organizing collectives, interpersonal relationship systems, successful ways of addressing socio-natural problems, methods of conveying collective feelings, expectations, formative actions, and altruistic and philanthropic actions.

Humans have coexisted in intimate relation with their environment, leading to interaction in knowledge construction based on reason and experience. At many points in history, humans have promoted various approaches in this knowledge construction process. In particular, students come to understand concepts and theoretical constructs to solve everyday problems, from the perspectives of Plato and Aristotle to the current visions of Morin and Cury.

The Presocratics broke away from traditional cognition and reductive knowledge, maintaining philosophical thought as the center of knowledge transmission, with the goal that transformation and innovation processes move away from stable schemes and embrace transcomplex and transdisciplinary perceptions.

Another aspect to consider is the Nuremberg Code, implicitly related to mathematical thought as a mental structure, conventionally focusing on specific scientific disciplines separated from each other. While this may help obtain partial knowledge, it maintains and strengthens the separation, even when consuming a large amount of information without real epistemic meaning.

However, the Presocratics champion knowledge, a core aspect of philosophy, emphasizing its growing importance in modern science from a realistic perspective. The materialist sense of na-

ture benefits humanity from both ethos and pathos, without being solely driven by reason.

It is important to note that the United Nations Development Programme (UNDP) asserts that human development places people at the center of development, promoting the potential development of individuals, increasing their possibilities, and ensuring the freedom to live the life they value. Analyzing this, human societies are in constant social change, not only due to technological advances but also in all aspects related to social development. Hence, human development has gradually separated from economic globalization to incorporate other equally relevant aspects of life, such as culture, which has also redefined its role in development.

The outlined indications of human and philosophical development, as well as complexity, predict that the ecological crisis will create local and global environmental problems due to overpopulation, pollution, and the destruction of natural resources. These issues impact the health of ecosystems and the planet as a whole, resulting from the relationship humans have established with the environment throughout history.

The importance of this article lies in the universe of environmental education linked to the philosophy of the Presocratics from a complexity perspective. Consequently, there is a need for a study oriented toward a hermeneutic analysis of environmental concern, showing its relationships and ecological behavior, the importance of the Presocratics in nature, and cognitive models of environmental concern. Therefore, the following questions are considered: (a) Why do we harm the environment? Have we lost our environmental beliefs? (b) Why do we pollute so much if we know the damage we cause? Have we lost personal values due to complexity? (c) What guidelines can be established to generate Presocratic ecological awareness and restore life to the planet by renewing faith?

Methodology

The development of this article arises from a qualitative study of a hermeneutic-dialectical type, whose approaches are considered for the fulfillment of the objectives outlined for the research process. According to Hurtado & Toro (2004), the hermeneutic method is the most appropriate for the study of human action, where the interpretation and detailed study of significant human phenomena for man and his environment are involved. This method takes into account the individual's need to interpret various situations occurring in daily life and their surroundings to achieve a definitive interpretation.

According to Hurtado & Toro (2004), the hermeneutic method considers the following suggestions: (a) Knowing that human beings are intuitive by nature. (b) Hermeneutic discourse cannot be formalized; everything must be interpreted. (c) New interpretations must be placed, as human beings can learn through interaction and commitment. (d) Hermeneutics is deconstructive because only by deconstructing can life be reconstructed. (e) The hermeneutic method allows researchers to exchange experiences with the research subjects to obtain data that guide conceptual frameworks and thus fulfill the objectives of the method that interprets and unders-

tands the meaning of things.

Moreover, this hermeneutic method is used by social sciences as a fundamental object for research intervention. It is not only applicable to the interpretation of facts, documents, among others, but also in scientific advances of social reality. This allows a tacit visualization of its field of action, directing its study of human behavior both individually and generally, through observation, considering repeating it as many times as possible.

Results

Background

Osorio & Suárez (2020) conducted a study titled "Environmental and Energy Education in Doctoral Theses of Angola Defended in Pedagogical Sciences in Cuba" at the Universidade Rainha Njinga a Mbande in Angola. This research outlined that in the genesis of humanity in the 21st century, there are enormous challenges to address, such as scientific and technical advancements and the rapid increase in environmental problems that severely affect the planet due to irresponsible human actions. For this reason, environmental education becomes a priority for all countries, depending on their level of development. Therefore, the Republic of Angola must continue its efforts to transform social practices regarding environmental issues, aiming to meet the 2030 Agenda for Sustainable Development Goals. These results highlight the importance of the current work by emphasizing the capacity for transformation and the complexity of development in different countries, reaffirming the need to educate new generations for harmonious coexistence among all environmental components.

Arias & Ramírez (2018) presented a scientific article titled "The Organization-Company: A Living System? Contributions of Complexity Theory and Environmental Philosophy to Administrative and Organizational Theory." The purpose was to understand the administrative-organizational phenomenon in the context of organizational society and environmental crisis. It involves comprehending the social organization as a living social system that establishes intricate relationships with its environment, affecting the development of its operations and processes. They premise that the living company is flexible in its processes and assumes organizational social responsibility as a strategy to compete and survive in the market amidst a world in crisis, marked by a society dependent on nature and facing numerous civilizational problems stemming from classical administrative thought. Nonetheless, they attempt to contribute an epistemic discussion in the field of Organizational and Administrative Theories, viewed through the theoretical lens of Complexity and Chaos Theories and Environmental Philosophy.

Environmental Education

Every pedagogical theory implicitly carries a set of educational intentions, axiological and epistemological principles, and conceptions about educators and learners, addressing different eras and schools of thought. Understanding the complexity of the environment as the core of envi-

ronmental education offers a variety of psychological and pedagogical approaches to achieve a shared conception, recognizing the naturalistic theory since the mid-18th century among its antecedents.

Rousseau (cited in Leff 2006, p. 679) states, "the relationship between man, education, school, science, and industry must be exalted in the planetary crisis." According to the author, since the early 1970s, there has been ecological concern within education, progressively creating concepts and critical explanations about environmental issues, acquiring an educational sense.

Although there is no single definition of Environmental Education, most authors agree that this discipline should have an integrative, holistic, and interdisciplinary approach, where knowledge, information, and local wisdom are articulated. Likewise, it should encompass an ethical, political, and pedagogical vision that provides theoretical and practical elements to establish, support, and enrich knowledge in this area.

Gutiérrez (2011, p. 148) defines Environmental Education as:

> ...the process that consists of recognizing values and clarifying concepts to foster the skills and attitudes necessary to understand and appreciate the interrelationships between man, his culture, and his biophysical environment. Environmental Education also entails practicing decision-making and formulating a code of conduct regarding environmental quality issues.

Therefore, Environmental Education aspires for humans to understand the complex nature of the environment resulting from the interaction of biological, physical, social, and cultural components. Consequently, it should enable individuals and communities to interpret the interdependence of various elements in space and time to promote a reflective and prudent use of the planet to meet humanity's needs (Torres, 2006).

Thus, it should be involved as a process that produces changes in individual thought and the behavior of community or social groups, changes in social and conceptual aspects, attitudes, and values. Additionally, Environmental Education is ideological, has grand goals, prioritizes practice, and is immersed in a realm where different paradigms are present. It should also contribute to forming individuals so that their actions do not harm their surrounding environment and allow them to contribute to the development of the communities they inhabit.

Considering the ideas of Chagollan *et al.* (2008, p. 17), Environmental Education:

> Is the process that consists of bringing people closer to a global conception of the environment, acquiring knowledge, elucidating values, and developing attitudes and skills that allow them to adopt a critical and participatory stance regarding issues related to the conservation and proper use of resources and quality of life.

With environmental education, the goal is for individuals to understand the realities of their environment, develop a sense of belonging to their surroundings, and be responsible for its use and conservation. Therefore, reclaiming the planet's complex order requires teachers to change their epistemic attitudes, ways of relating to their environment, and conceptions of teaching from a complex perspective to understand human actions as causes and consequences of environmental deterioration.

Traditionally, the purpose of Environmental Education is to transmit knowledge, instill values, and develop competencies and behaviors that can favor understanding and solving environmental problems. It should be a continuous process involving everyone, allowing an analysis of the main problems affecting the environment and identifying possible solutions. Despite the concern for the environment and the recognition of the role education plays in its improvement, different authors propose ways to conceive and practice educational action in this field, as highlighted by Ortega (1998, p. 144).

Environmental education is not about nature conservation, resource management, or a new program to add to the already overloaded school system. It constitutes a new approach to the relationships between humans and their environment and how they influence each other. It aims to form responsible citizens committed to improving the quality of life through the appropriation of ecological values and democratic coexistence.

The Environment

The environment is, above all, the person himself, his thoughts, dreams, utopias, beliefs, and of course, everything he does in his world. His relationship with his natural setting (nature) is where philosophy and ethics reside, although it is not a new reality, it remains an important topic from a human perspective.

Environmental Education is a complex dimension of global education, characterized by a great diversity of theories and practices that address the concept of teaching and learning, the environment, and social development from different viewpoints. Here, the environment is not just a topic but a vital, everyday reality, and this education should be placed at the center of a human development project (Sauvé, 2006).

Moreover, it must be approached from an inter- and transdisciplinary perspective, which implies openness to various fields of knowledge to enrich the analysis and understanding of the complex realities of the environment. It cannot be developed through passive learning methods; therefore, the acquisition of knowledge must be conceived as a complex process of knowledge construction.

In this context, Environmental Education can be characterized as having a systemic vision that allows for participation and the development of attitudes and values with an interdisciplinary focus. It aims for holistic development in students by combining the acquisition of knowledge

specific to their field of study with interaction with other disciplines. According to Gutiérrez (2011, p. 13), "transdisciplinary planning is seen as an expedient way for teaching Environmental Education in the university context, promoting understanding rather than memorization when facing real-world situations."

The teaching practice in Environmental Education involves internalizing the social, historical, official, and technological context in which one is immersed to understand the influence that theory might have within that context and to guide relevant action through practice. This highlights the importance of the hypothesis as a fundamental element for problem-solving in everyday life, which implies the scientific analysis of human history.

It is in this context that the transdisciplinary approach can contribute to the search for a new educational trend based on the four (4) fundamental pillars: learning to know, learning to do, learning to live together, and learning to be, as outlined in the Unesco Delors Report. All four types of learning are important in the educational process of the sciences. However, special emphasis should be placed on learning to BE for teaching Environmental Education at the university level.

Philosophy of the Presocratics

The Presocratics, known in the history of ancient philosophy as pre-Platonic and pre-Aristotelian philosophers, were the earliest thinkers of the Western world who initiated philosophical discourse. Their most prominent representatives include: Thales of Miletus (640-545 BCE), Anaximander of Miletus (610/11-547 BCE), Anaximenes of Miletus (585-528/5 BCE), Xenophanes of Colophon (570-470 BCE), Heraclitus of Ephesus (6th-5th century BCE), Pythagoras of Samos, Alcmaeon of Croton, Parmenides (540-450 BCE) of Elea, Zeno of Elea (464/41 BCE), Melissus of Samos, Empedocles of Agrigento (492/90-435 BCE), Philolaus of Croton, Archytas of Tarentum, Anaxagoras (499-428 BCE), Leucippus of Abdera, and Democritus of Abdera (460-370 BCE).

"Everything is One and the same," a principle coined by the Greeks, applies to Homo sapiens and all species cohabiting on planet Earth. Thales of Miletus (640-545 BCE), considered one of the seven sages, was the first to delve into natural philosophy (Eggers & Juliá, 1978, p. 64). Thales did not completely detach from myth but stated that water is the principle and end of all things, attributing a natural element to the expression of physis.

With Thales, it is evident that since the beginning of time, a harmonious relationship has linked man with nature, indicating that the reflection on what things are and what they are made of has been based on the cosmos and its components, including humans.

Thus, by reasoning about the foundation that makes each thing what it is, man manages to appropriate known elements: water, air, earth, and fire. This reflective discovery indicates a permanent dialogue between man and nature, between the essence of things and the interaction of common values observed and understood.

Similarly, just as Thales of Miletus admired nature to seek the arche or founding principle of the existence of things, Alexander the Great is considered a Homo sapiens demens for his intervention in ancient civilizations, many of which were extinguished, leaving us with very little of their ancestral wisdom.

Philosophical thought, according to Gil (2015, p. 522), expresses "Thought as a genuine philosophical anthropology endowed with a strong humanistic, propositional, affirmative, and essentially critical sense, both from a methodological perspective and, above all, an attitudinal one.". This means that the decisive intellectuality provided by ideas placed in the cloud surrounding the reasoning of the teacher for self-criticism, experimentation, and imagination of cognitive production is vital. There are elements that characterize this thought, such as sensitivity to sensations received, intellectuality of the knowledge of things, understanding of being, and conceiving the reality of the environment in the breadth of ideas that their mental structures provide

Proposal

The philosophy of the Pre-Socratics suggests that environmental educational programs become communities as an option in solving their environmental problems, in ecological, economic, social, and cultural terms. If synergistic participation of the communities is achieved, it will enable the planning of actions directed and committed to governmental entities and private institutions to collaborate with the planetary catastrophe that is leading us to an eco-cultural limbo.

Anthropocentrism should be questioned from an ethical standpoint, not only because of the irresponsible attitude towards the environment and the cosmos in general but also because of its drive for consumption and utility without self-criticism. Similarly, the human perspective seen from cosmogony and human centrism will not improve the crisis due to its ego to achieve the alpha and omega of the planet. There must be an appropriate interaction between sociocultural, economic, and ecological systems that ensures sustainable management of biodiversity.

At the same time, the complex vision of ecological problems will compel humans to address them in an interdisciplinary and transdisciplinary manner. This is when systemic work involves the participation of communities, politicians, and government management prospects, as well as scientists and technicians from universities and institutes. Axiology is the pillar of the existence of environmental values that are methodologically difficult to measure. These valuation techniques do not aim to bestow the value of biodiversity per se, but rather estimates of the economic value associated with certain goods or services compatible with planetary conservation, which transforms our common home.

Conclusions

Modernity is marked by autonomy, which is the event where thinking resides in humans after centuries in which the word was revealed by the sacred scriptures. It is from the "I think, therefore I am" of the philosopher René Descartes (1596 – 1650) that subjectivity becomes the possibility

of doubting, experimenting, elaborating, and constructing knowledge autonomously. However, despite his intelligence, man is not the most powerful species of all, because from birth he needs the care of the mother. His physiological-anatomical apparatus is inferior to that of many animal or plant species.

Therefore, nature is superior to the human condition; Montesquieu (1748, p. 8) wisely pointed out: "But one cannot say that the intelligent world is also governed like the physical world". And even: "Plants in which we do not perceive feeling or knowledge fulfill the laws better" (p. 8). Despite man's desire for dominance, he has accumulated knowledge, which Lorentz (1979) calls the human spirit, built upon the primary faculties of living beings.

The philosophical currents that support the pre-Socratics base their conceptions on phenomenology and hermeneutics, under the perspective that makes observation possible no longer as a predetermined end, as traditional aspects proposed, but which can have diverse visions depending on how philosophers are involved in their own thoughts, needing to meditate on sustainability not as a political responsibility but as an environmental necessity that encompasses us from our environmental beliefs to care for and safeguard biodiversity, the survival of humanity as one more species living on planet Earth.

However, Environmental Education has not been seen as a learning process in which knowledge, values, skills, and experiences are transmitted to all social groups through educational institutions, media, governmental organizations, and non-governmental organizations that seek to solve environmental problems through individual and collective actions.

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Cyberspace and emerging research: A transepistemic and transdialogic vision from transcomplexity

El ciberespacio y la investigación emergente: una visión transepistémica y transdialógica desde la transcomplejidad

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Abstract

This paper analyzes cyberspace as an emerging research setting from the perspective of transcomplexity, exploring humanity's migration towards digitality and the possibilities for transcending traditional research frameworks. Through an exhaustive literature review, concepts and theories related to cyberspace, transcomplexity, and social research are identified. The results suggest that cyberspace forms an integrative and extensive worldview through connectivity, interactivity, and immediacy. From the standpoint of transcomplexity, it enables research activities that challenge classical epistemic mapping, detaching from conventional gnoseological, methodological, and teleological structures. The emerging state of the art is configured as an expression of freedom and awareness, incorporating ontological, epistemic, praxeological, technological, methodological, axiological, and ecological dimensions. Thus, cyberspace is presented as a transdisciplinary and transmethodological research setting, challenging traditional frameworks and promoting a conscious and open-ended narrative.

Keywords: Cyberspace, Transcomplexity, Social Research, Paradigmatic Migration, Emerging State of the Art.

Resumen

Este escrito analiza el ciberespacio como un escenario de investigación emergente desde la transcomplejidad, explorando la migración del hombre hacia la digitalidad y las posibilidades de trascender los esquemas tradicionales de investigación. A través de una revisión exhaustiva de la literatura, se identifican conceptos y teorías relacionados con el ciberespacio, la transcomplejidad y la investigación social. Los resultados sugieren que el ciberespacio configura una cosmovisión integradora y profusa mediante la conectividad, interactividad e inmediatez. Desde la transcomplejidad, permite actividades investigativas que desafían la cartografía epistémica clásica, desapegándose de estructuras gnoseológicas, metodológicas y teleológicas convencionales. El estado del arte emergente se configura como una expresión de libertad y conciencia que incorpora dimensiones ontológicas, epistémicas, praxeológicas, tecnológicas, metodológicas, axiológicas y ecológicas. Así, el ciberespacio se presenta como un escenario de investigación transdisciplinario y transmetódico, que desafía los esquemas tradicionales y promueve una narrativa consciente e inconclusa.

Palabras clave: Ciberespacio, Transcomplejidad, Investigación Social, Migración paradigmática, estado del arte emergente.

Introduction

The nature of society is dynamic and flexible, reflecting humanity's efforts to understand and transform its environment through various paradigmatic approaches, one of which is technology. In contemporary times, under the concept of cyberspace, society is immersed in the realms of intangibility, interactivity, and interconnectivity, where different activities intertwine and submerge

into digitality. This state, through a paradigmatic transition, promotes a divergent, profuse, and significant cultural fabric that surpasses the classical instrumental focus embedded in linear causality, characteristic of positivist linearity, and introduces new perceptions associated with the construction of the State of the Art, impacting the vision of being from a metacomplex perspective.

In this regard, the purpose of this paper is to reflect on the paradigmatic journey humanity has embarked upon towards digitality, and the influence of transcomplexity, which supports a paradigm exchange that allows cyberspace to be envisioned as an investigative scenario, redefining everyday life and transcending conventional paradigmatic beliefs.

Based on the above, this paper is divided into two parts. The first part, appealing to humanity from the perspective of digitality, aims to provide a reflective and philosophical view of the human-technology relationship on its path to digitality. The second part, titled "Transparadigmatic Vision of Cyberspace and Investigative Development," focuses on presenting cyberspace as an emergent research space, offering social researchers a kaleidoscopic perspective to study society from a transdialogical and transepistemic discourse, alternative to the prevailing specular discourse of some academic communities, allowing for the construction of an emergent, flexible, and open state of the art.

Humanity in the Age of Digitality

In contemporary times, the importance of the internet in daily life is evident, as it indirectly and/or directly intervenes in the processes that shape human and societal activities. According to Hernández (2020), cell phones, computers, tablets, refrigerators, and microwave ovens are some of the devices that have been restructured to take advantage of the benefits and implications of the internet. This restructuring is an attempt to stay relevant in a society where connectivity and interactivity introduce new ways of rethinking and engaging with daily life.

Information and Communication Technologies (ICT) have become a bridge between classical and advanced technologies. The latter, often referred to as smart and/or digital, seek to distinguish themselves from analog counterparts by remaining associated with concepts such as connectivity, interaction, immediacy, and interdependence. These technological expressions are a representation of innovation, creativity, and inventiveness, naturally embodying the processes of change and transformation in human activity. In this sense, technology serves as a means to change the environment and provide a new lens for perceiving daily life. Thus, technology represents not only an object but also exemplifies human thought and the continuous ability to reshape reality.

This indicates that technology itself represents a paradigm. As Pérez (2009) points out, a paradigm is closely related to changes, transformations, and transitions associated with ways of thinking, acting, and researching, shifting from an imperative situation to various scenarios that, individually or collectively, contribute to generating a metamorphosis of the social complex. Technology as a paradigm is not unique; instead, it encompasses multiple perspectives to envision its possibilities and implications.

In this context, societal development is the product of a dialogic relationship between different paradigms, one of which is technology. This relationship has given rise to various transitions and interpretations. Technology as a new form of thought represents a paradigmatic shift through recursion and dialogue. In other words, the emergence of new technology does not signify the obsolescence of its predecessor. Instead, it integrates characteristics of its predecessor into its fabric and establishes hybridizations to incorporate other technological paradigms, thereby expanding its reach and response in society in a continuous and synergistic reflection. In this way, technological change is viewed as a paradigmatic transition, demonstrating how humanity, through technology, situates itself in a relationship that disrupts the linear causality associated with positivism. This allows for a state of change, flexibility, and relevance, establishing new ways to complement different approaches and undertake a complex approach to phenomenal reality.

These transitions imply migrations, not in physical terms but paradigmatic ones, to bring individuals closer to new epistemic interpretations and induce a state of consciousness. Hernández (2020) defines paradigm migration as a dialectical relationship between humans and their environment, where an individual reflects on a paradigm and integrates it into their personal paradigm framework or worldview. This process results in new re-significations that allow the individual to delve into daily life with an expanded awareness of the surrounding cosmos, entering multiple transparadigmatic structures or worldviews.

The telos of paradigm migration is a personal, reflective, and open process where the individual decides whether it is convenient to reflect on and integrate a particular paradigm into their framework. Regarding this, the criterion of compatibility, as Hernández (2020) indicates, refers to the affinity of ideas, actions, and thoughts that a paradigm or technology represents. Its acceptance or rejection varies according to the individual's paradigm framework, so there is no specific path or moment for transitioning between paradigms. This transition occurs according to their interests, availability, lifestyle—in other words, their daily life.

It is important to mention that the migratory telos is never complete, as it stems from constant reflection, learning, and integration of epistemic positions to generate a state of consciousness aiming at a transparadigmatic vision and inducing an emerging state of the art. Thus, paradigm migration can be synonymous with detachment, freedom, and disobedience, as it involves a transition between different ways of thinking, avoiding attachment or the creation of a comfort zone, which can reduce human openness to the world.

This indicates that the societal fabric from the technological paradigm is in constant transition and does not have a closing point; its rate of change and transformation only slows down or accelerates according to its possibilities and interests. From this standpoint, humanity has transitioned through various technologies, or paradigms, to restructure the societal complex. An author who describes this relationship is Toffler (1980), who, under the concept of the "Wave," symbolizes the transition of humanity through different stages. Here, technology as a paradigm has been a key event in generating significant disruptions in social development, configuring new worldviews in the process and marking a before and after.

Toffler's Wave represents an accumulation and paradigmatic integration that offers an intertwined and complex vision of reality. Viewed through the lens of transcomplexity, it induces a deep and reflective worldview, triggering significant onto-epistemic changes that redefine the societal fabric. From this perspective, there are three Waves, which are multiparadigmatic scenarios. The First Wave refers to the transition between hunting and agricultural technologies, giving rise to agricultural society and the first settlements. The Second Wave refers to the Industrial Revolution, the emergence of machinery, and the early signs of modern automation. Meanwhile, the Third Wave represents post-industrial society, where ICTs have redefined the present and induced new perceptions through interconnectedness.

From the standpoint of Paradigmatic Migration, Toffler's Waves highlight two key points. The first is that the presence of a paradigm or technology does not signify its universal adoption by all of society, leading to a dialogical relationship between the current and preceding paradigms. The second point is that despite the contributions and importance of an emerging paradigm, it does not represent a conclusive answer. Therefore, paradigmatic migration is about establishing a state of awareness and coexistence between new and old paradigms, ensuring the individual's openness to different paradigmatic possibilities.

In this context, the coexistence of generational technologies becomes evident, as they persist in the individual's daily life depending on their paradigmatic framework and openness. Currently, the coexistence of analog and digital technologies forms part of the development of the Third Wave. Since the introduction of computers and software that redefines intangibility, the concept of virtuality has begun to simulate processes and activities, establishing bridges between the physical and digital realms. According to Hernández (2020), virtuality is a dialogical representation between the physical and digital, continually recreating activities and adjusting the human experience in relation to its physical counterpart.

Virtuality, in this context, represents a hologrammatic structure, as it seeks to comprehend and interpret presence from the whole and its parts. From the perspective of complex thought, according to Morin (1995), it is a way of understanding phenomena and analyzing how the whole is present in each of the parts and vice versa. Computer codes provide the conditions so that no part is overlooked and most components of presence can be emulated.

In this sense, virtuality symbolizes autopoiesis, that is, a constant and integrative restructuring of different paradigmatic positions of presence according to computing capabilities. It aims to offer a rich and interactive perception of reality, implying a multiparadigmatic representation that points to a transparadigmatic vision.

This involves a metanoic cycle based on self-organization, suggesting continuous construction, deconstruction, and reconstruction, with the intention of renewing and expanding the transparadigmatic and meaningful vision of humanity regarding virtuality and the options it offers. In this regard, virtuality sustains a dialogical, recursive, and integrative nature that separates it from the specular discourse and causality of positivist epistemology, regulating itself in a multiepistemic continuum, conceiving a reflective and integrative worldview, as constituted by cyberspace.

Cyberspace is a response to virtuality in its attempts to redefine intangibility and appropriate theoretical positions from presence. According to Vilches (2002), it is represented as a scenario transcending spatial-temporal concepts, lacking a center or periphery, and representing a context that facilitates the development of economic, political, and social activities without the traditional limitations of presence. Viewed in this way, cyberspace is a scenario continuously nourished by virtuality, providing channels to facilitate communication and exchange between users and their paradigmatic structures, representing various ways of acting, thinking, and expressing, fostering diverse phenomenological reinterpretations that give rise to an identity transcending epistemic and disciplinary positions, building a recursive and integrative concept like digitality.

Digitality is a multifaceted representation stemming from cyberspace, which, beyond presenting a culture derived from presence through virtuality, configures itself as an integrative and recursive paradigm that describes commercial, political, and cultural activities and interprets emerging ideas, thoughts, and representations. In other words, it refers to a societal framework that affects presence, virtuality, and itself, which, according to Negroponte (1995), maintains a common language, intercultural understanding, multimedia content, social networks, emerging professions, and economic and political models, positioning the internet as the epicenter of daily life, with connectivity and interactivity as the foundations to ensure access, exchange, and communication.

A Transparadigmatic Vision of Cyberspace and Research Development

The path to digitality demonstrates that the dialogue between humans and technology has traversed different epistemic models and paradigmatic representations. Humanity's arrival in cyberspace is an integration of multiple paradigms that configure a worldview in constant construction, sustaining a fabric between certainty and uncertainty, involving new nuances to envision society and the processes contemplated therein, including research. For this, digitality transforms into an axis that connects all converging paradigms, constituting a transparadigmatic identity.

Digitality, in this sense, represents an opportunity to establish new perceptions regarding how society operates and how social research is conducted. The societal fabric, with the presence of cyberspace, is characterized by promoting a citizen who remains in constant connection, immersing themselves in a multicultural cosmos, unrestricted in obtaining and/or producing knowledge associated with their immediate context. Thus, a multireferential vision is maintained that transcends physical barriers and promotes thinking that blurs boundaries and induces a vision without traditional limits.

For the social researcher, cyberspace is a form of expression, convergence, and reflection. It provides users with the opportunity to present their paradigms from different latitudes and integrate their ideas and thoughts on a higher level, involving a reflective and integrative discourse that does not overlook their locality but considers aspects inherent to planetary education described by Morin, which promotes a glocal stance—an equilibrium between the global and local. This relationship does not seek to generate an absolute theory but aims to find relative realities that highlight the fundamental ambiguity of all human beings.

As Maffesoli (1979) points out, this approach aims at a comprehensive sociology that requires breaking away from a dominant and totalitarian positivism and generating research on everyday life, whose trivialities promote distinct and complementary investigations. For this, detachment from any paradigmatic stance is required, as these constitute biases that prevent seeing the everyday life of cyberspace as a rich source of study.

From the Telos of paradigm migration, the researcher must remain in motion, maintaining a reflective and open stance. Reflexivity ensures that the individual is aware of existing paradigms and their possibilities, while openness prevents clinging to a specific way of thinking, as it hinders the arrival of other paradigms and the construction of one's own thought structures, which constitute alternative paradigms to the existing ones. In research terms, this means staying in motion, aware of the paradigmatic reality without falling into attachment, affiliation, or establishing a comfort zone that is restricted to a specific gnoseological, methodological, or even teleological structure, leading to linear, sequential development that detracts from various possibilities of granting freedom to thought.

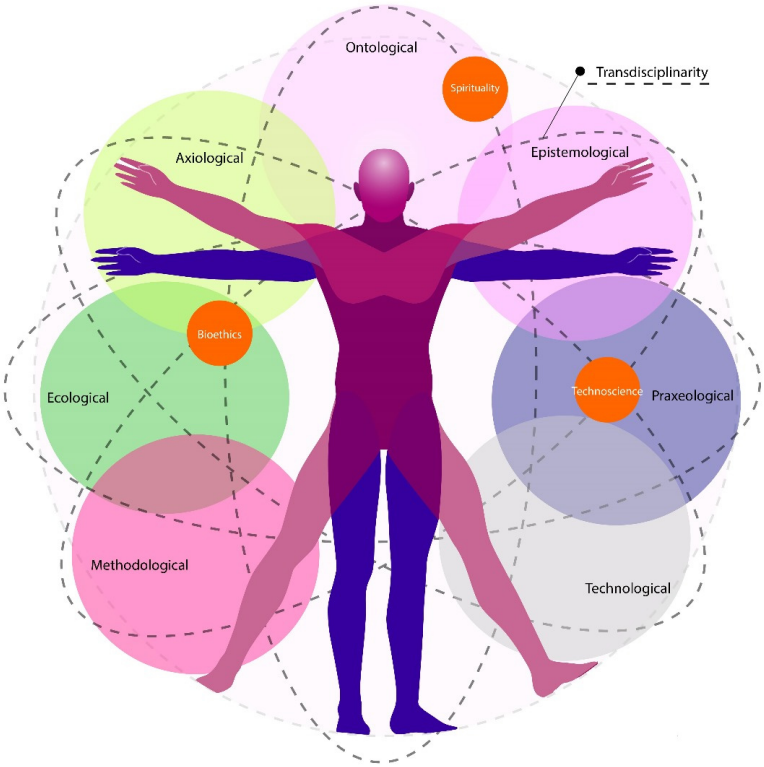
In this canon, freedom of thought corresponds to a state of change and awareness, as to know if a person is free, they must be aware of the positions that prevent such a condition. In the research endeavor, some researchers, like Balza (2020), state that the freedom of thought of a researcher must lead to a state of paradigmatic disobedience, an epistemological irreverence to separate from the hegemony of singular thought, belonging to scientific rationality.

These situations allow the researcher to be aware of the instrumental paradigms associated with mathematics, physics, and computer science that constitute the structural foundations of cyberspace. However, as Martínez (2015) points out, they cannot be used or conceived as parameters of the Life Sciences. It is not a matter of denying their disciplinary value but of emphasizing their non-exhaustive dimension in human research. Therefore, a state of awareness allows the researcher to recognize the existence of diverse positions, structures, and paradigmatic forms, and prevents an approach to these. All of this enables the researcher, in their process of thought and understanding of reality, to build their own gnoseological coordinates and identify a divergent logic allied with the heuristic process, that is, an abductive expression that implies an alternative to the linearity and sequentiality of processes and involves alternative ways to conduct research.

What is described facilitates the development of research from uncertainty, to venture into unknown territories, and to explore new nuances regarding cyberspace, which are not limited to its structural foundations and enable different research perspectives. For this, the individual's state of consciousness, part of the paradigmatic migration, must be located in a transdisciplinary exercise as a way to broaden their phenomenal awareness through the complementarity and recursion between disciplines. Regarding this, Balza (2010) indicates that the transdisciplinary perspective allows the researcher to think about and reproduce human life and society, from within and beyond the domain of disciplines. This emphasizes the need for new kaleidoscopic views to visualize reality, allowing for reinterpretations to respond to emerging phenomena.

An example of these new reinterpretations lies in the Emerging State of the Art, coined by Campos & Hernández (2021), an expression that allows us to approach scenarios whose interconnections are changing, complex, paradoxical, ambiguous, and uncertain, requiring other forms to generate science, which in turn promotes another vision of being.

Figure 1
Emerging State of the Art



Note: Campos & Hernández (2021).

As Campos & Hernández (2021) point out, transcomplexity leads to a new vision of being, where the traditional state of the art is insufficient to cover the totality of relationships that sustain everyday life. Paradigmatic migration, as previously discussed, is synonymous with reflective, open, and continuous movements between different epistemic stances, encompassing explanation, understanding, and critique. The emerging state of the art is an expression of freedom and awareness, allowing an individual to delve into uncertainty and, through the process of exploration, understand new interactions from a dialectical logic that responds to the nebulosity characterizing contemporary times.

Consequently, a transepistemic shift occurs, described by Balza (2019) as a way of thinking and understanding reality from new gnoseological itineraries with the intention of transcending the dilemma of methods and venturing into the unknown. As illustrated in Figure 1, emerging constructs require divergent logics that foster a gestalt dynamic in the search for new meanings.

In this way, new paths are forged, and in the case of cyberspace, the subject of this writing, it leads the researcher to a movement without limitations, making a significant leap from humanism to a neo-Renaissance, unhindered by the persistent deficiencies, limitations, and inadequacies of conventional epistemic stances.

The ontological, from cyberspace, entails embracing the convergence of physicality, virtuality, and digitality, signifying the integration and interaction among three ontic expressions that reverberate across different levels of existence. Ontologically, it detaches from classical physicality and reaffirms the need for paradigmatic migration to observe the disciplinary relationships that coexist and are vital in new societal dynamics. Thus, it allows for the observation of the different foundational paradigms that guide various shared viewpoints.

From this standpoint, the epistemic, as per Balza (2019), entails a worldview, as an emerging episteme that sprouts to offer multiple possibilities for re-understanding or re-signifying reality, both objective and abstract, enabling the emergence of new higher logics. On the other hand, the praxeological must be understood as a perspective on various aspects associated with human action to act and transform individually and collectively. In this regard, praxeology assumes a hybridization between praxis, poiesis, and human behavior. It serves, according to Bédard (2003), as a way to reflect on happenings and people's actions from a disciplinary standpoint, providing the being with an experience that recognizes the particular, individual, and contingent, endowing it with sensitivity.

Thus, praxeology, in Bédard's words (2003), is a way of observing the sensible part of the iceberg, meaning those human exemplifications that are visible through the senses. It differs from Ontology, as it seeks to highlight situational and momentary aspects in a certain space-time. While the ontological suggests understanding the fundamentals of reality, implying a profound framework where ideas have their roots and are complex to penetrate, as it contemplates not only the natural world but also the dispositions of societal fabric. In Hernández's words (2024), it involves introducing new variables that provide other perspectives for exercising innovation and social impact. The aim is not only to engage in research from a philosophical depth but also to develop a critical view of each dimension and associate them with processes, among other approaches, that may incite other critical-constructive logics. In the case of cyberspace, it is an analysis of how digitality influences human praxis and how this, in turn, shapes the dynamics of cyberspace. Exploring the praxeological dimension would help envision other forms of interaction, collaboration, and knowledge creation in this emerging scenario.

The technological dimension emerges as an innovative frontier, transcending mere instrumental expression of human capability. It represents a mode of thought that integrates multiple paradigms, manifesting at all levels of human existence as both instrument and form of cognition. Additionally, it provides new ontic scenarios through which humanity navigates, reinforcing the study of cyberspace not only in theoretical terms but also in practical applications. This perspective allows for the analysis of its influence on nature and societal fabric. It offers a lens to study the relationship between humans, technology, and reality, reflecting

on how technological advancements, applications, platforms, and innovative tools shape research possibilities with an emphasis on individual and collective events that encompass the individual.

Approaching the method from Hernández & Campos's (2021) perspective is not about emphasizing the use of a specific method, as this limits the author's capacity to seek new onto-epistemic manifestations. The methodology focuses on recognizing the need to chart a course free from pre-established methods, allowing the researcher to analyze all existing possibilities regarding an investigative reality. It also serves as a way to blur existing methodological classifications, permitting other expressions to construct the research. Such views affirm that cyberspace is an emerging scenario to sustain paradigmatic freedom, as it ensures a journey free from initial methods, exploring possibilities by selecting those that contribute to constructing new pathways for accessing and managing the art of intellectual creation. For this, a reflexive development is crucial. Here, the researcher, as part of the gestalt awakening that transcomplexity implies, reflects in a continuum under an inductive, deductive, abductive, and intuitive cycle, with the latter serving as an impetus to delve into the uncertain.

In this regard, the heuristic vision maintains that, in the process of exploration and delving into uncertainty, the method should be conceived from a transmethodological stance, enabling the integration of various research methods, utilizing hermeneutic reflection. This implies a dialectical and creative logic, characterized by positioning the researcher in the unknown through a dialogical interaction between the recursive and the argumentative. This recursive dialogic approach is a way to obtain a kaleidoscopic discourse, meaning multi-referential, demonstrating the complexity and interrelationships existing between seemingly compatible or opposing elements.

However, this type of displacement can lead to various crossroads, resulting from the relationships with which the individual may encounter, potentially leading to a kaleidoscopic labyrinth. Therefore, it is relevant to reflect on the axiological and ecological dimensions, which are obligatory perspectives due to the depth of the relationships situated in the emergent. Axiology involves recognizing the importance of values and how they permeate the researcher-reality relationship. It is a way to study ethics alongside morality and how these help in understanding and analyzing human behavior on both individual and collective levels. Its mission is to guide the researcher in labyrinthine scenarios and serve as a halo of light, fostering a conscious investigative activity that promotes responsibility, the value of life, and, according to Shamoo & Resnik (2009), reinforces collaboration, cooperation, and trust among various actors, emphasizing the importance of intercollaboration in transcomplexity.

In the study of cyberspace, as Campos & Hernández (2022) note, ethics must uphold an integral vision focused on solving problems or needs, surpassing the consumerist and imposing conditions of the industrial halo, and implying a synergistic understanding that, from a praxeological standpoint, provides theoretical benefits to the societal fabric, recognizing the emergent relationships that configure a constantly developing framework.

Finally, the ecological dimension seeks to study the relationship between living beings and their environment from a descriptive, evolutionary, and functional perspective. It is a way to respond to the current ecosystem crisis and visualize the impact of research from a sustainable standpoint, incorporating an ecosophical outlook in the researcher. In the case of cyberspace, this dimension allows for reflection on how its development has altered environmental dynamics due to the depth and impact of its structures, revealing relationships beyond the societal that encroach upon the natural world, resulting from the profound technoscientific and algorithmic networks that blanket the planet.

The interaction of all these dimensions enables disciplinary exchange and re-signification through an epistemic mapping that can reframe investigative actions. This process favors the presence of concepts, positions, and approaches that reaffirm the presence of transdisciplinarity, benefiting the exchange, confrontation, and complementarity among various social actors, epistemic models, and holoidal interpretations. All this aims to transcend linear discourse and sustain a deep, reflective, but not conclusive, framework. It should act as a catalyst for new theoretical perspectives considered as emergent. In the words of Deroncele *et al.* (2021), it means engaging with cyberspace as an emergent relational field through a reflective exercise that transcends academic discourse and promotes a socio-productive logic capable of providing answers and innovating society from an emergent standpoint.

The aforementioned points allow for the study of cyberspace to construct a harmonious thread that addresses presence, virtuality, and digitality through hermeneutic reflection. To achieve this, it is useful to employ problematizing nodes, which are points of reflection that consider randomness, uncertainty, and contingency as ways to deepen theoretical construction and present an emergent, reflective, and inconclusive discourse that exposes a reality in constant construction. It is here that research on cyberspace should be approached from emergent relationships that undermine the fictitious thinking mentioned by Zemelman (2021), which has practical consequences. Research should serve as a catalyst for constructing upon immediate reality, paying attention to the current epoch, and generating an interaction between theory and reality. This avoids research that fosters artificial perceptions, which are disconnected and lack reflexivity concerning reality and its particularities. The key is to visualize new research scenarios from multiple perspectives, encouraging a new generation of productions that are relevant to the needs of the epochal context.

Cyberspace is an unfinished concept, constantly undergoing metamorphosis through paradigm shifts, evolving into an integrative and expansive worldview. From its virtual foundation, it continuously integrates diverse paradigmatic perspectives in its effort to simulate presence and impact reality at all levels within a culture rooted in digitality, where connectivity, interactivity, and immediacy are part of everyday life.

This prolific worldview, while acknowledging the existence of conventional paradigms that ensure its functioning and expansion, possesses a multidimensional character. Through a transparadigmatic vision, it facilitates investigative activities that disrupt the classical research cartography,

which is often tied to gnoseological, methodological, and teleological structures that constrain the researcher's thought and hinder the exploration of all aspects of digital reality, thus reaffirming the classical linearity and causality of positivism.

This disruption underscores the importance of paradigm migration, symbolizing from the researcher's perspective the opportunity to generate a state of consciousness that allows for a transepistemic, transdisciplinary, transmethodological development immersed in transcomplexity. In other words, it promotes a researcher who recognizes existing paradigms and epistemic stances but distances themselves to create their own gnoseological, methodological, and teleological structure, affirming their freedom and/or paradigmatic detachment. Accordingly, it provides a re-signification of the state of the art through emergent perspectives and incorporates other dimensions necessitating a review in research to understand the emergent relationships characterizing everyday life, where traditional frameworks prove insufficient.

What has been described here is a window into new perceptions and even other dimensions that lead to an open and flexible state of the art, capable of reaffirming the presence of concepts, stances, and approaches immersed in a transcomplex web, allowing the researcher, based on their development, to understand other convergent relationships and perspectives. This necessitates recognizing the importance of ethics, values, and sustainability in constructing these new frameworks, which can enhance humanity's vision and understanding of phenomenological reality and its possibilities.

The re-signification of each of these dimensions supports a dynamic, reflective, and intuitive exercise that provides different perspectives to reveal, understand, and critique, as necessary, the emergent relationships among references, epistemic stances, and individuals. As previously mentioned, the transmethodological approach dismisses the initial use of a single method and suggests a recursive and reflective hermeneutic spiral that upholds complementarity and dialogue in the process. This describes a conscious and unfinished narrative that incites emergent perspectives to foresee reality.

The aim is to foster a superior and dissident logic to what is established, leading to true freedom beyond the existing traditional paradigmatic barriers. This prevents the researcher from falling into pseudo-free structures that, in the end, conceal a teleological and methodological burden within their structural components, guiding the researcher and fostering a false sense of innovation and divergence. This may seem novel to the researcher but is well-known in the research cartography.

Consequently, transcomplexity upholds a vision that allows for awareness of existing investigative coordinates and involved structures. Through paradigmatic detachment, it fosters a different path that overflows from known cartographies. Cyberspace, being a worldview, as it expands over safe and manageable certainty, generates a hidden and uncertain side. This, through investigative boldness, can erect daring, rebellious, and audacious narratives, building upon the cosmos's darkness and shedding light on the constantly moving and expanding paradigmatic multiverse.

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Educational games: unlocking the potential of playful learning

El juego educativo: desbloqueando el potencial del aprendizaje lúdico

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Abstract

The educational approach based on learning through play has experienced significant growth in terms of recognition and acceptance in recent years. This article delves into the exploration of how play can play a fundamental role as a facilitator of learning, offering a detailed perspective on its benefits and essential considerations. From a historical standpoint, key elements of playful learning in Greek and Roman civilizations are examined, along with the adaptation of specific games to address the particular needs of students..

Keywords: Educational play, cognitive benefits, social skills, intrinsic motivation, examples of educational games.

Resumen

El enfoque educativo basado en el aprendizaje a través del juego ha experimentado un crecimiento notable en términos de reconocimiento y aceptación en los últimos años. Este artículo se sumerge en la exploración de cómo el juego puede desempeñar un papel fundamental como facilitador del aprendizaje, ofreciendo una perspectiva detallada sobre sus beneficios y consideraciones esenciales. Desde una mirada histórica, se examinan los elementos clave del aprendizaje lúdico en las civilizaciones griega y romana, junto con la adaptación de juegos específicos para abordar las necesidades particulares de los estudiantes.

Palabras clave: Juego educativo, beneficios cognitivos, habilidades sociales, motivación intrínseca, ejemplos de juegos educativos.

Introduction

In the vast landscape of learning, play has endured as an unbreakable thread weaving through the human experience since the early stages of civilization. This article embarks on a fascinating journey, unraveling the intricate relationship between play and education throughout history. From the oldest archaeological evidence to oral traditions passed down through the centuries, we will explore the evidence indicating that play has been a constant companion in humanity's journey.

We will delve into Roman society, where play reached its zenith in events such as gladiator battles and circus games. However, we will also discover how play was ingrained in everyday life, from children's mischief to the political strategies of adults. In our journey, we will clarify the essence of playful learning, emphasizing that it goes beyond playing for fun. This concept encapsulates an educational purpose, merging the joy of play with solid pedagogical objectives.

We will explore how play not only entertains but also stimulates critical thinking, problem-solving, and creativity. We will analyze studies supporting how play-based educational methods enhance memory and information retention. Additionally, we will examine how games play a vital role in the development of social and emotional skills, fostering collaboration, communi-

cation, and empathy in educational settings.

Diving deeper, we will explore how the playful element enhances students' intrinsic motivation, turning the learning process into an engaging and meaningful experience. Finally, we will provide concrete examples of successful educational games, highlighting their positive impact on student learning across various educational levels and subject areas. This journey illuminates the educational power of play, unlocking its potential to enrich the journey of knowledge.

ducativo del juego, desbloqueando su potencial para enriquecer la travesía del conocimiento.

Game in Antiquity and Classical Rome

Since the dawn of civilization, play has been an intrinsic manifestation of human nature. In antiquity, play not only constituted a form of entertainment but also played a significant role in the social, cultural, and educational life of various civilizations. Far from being a modern trend, play is deeply rooted in the history of humanity. From ancient times, various civilizations, including the Greeks and Romans, recognized and employed play as an integral part of daily life, using it for amusement. However, González *et al.* (2016) mention that in the case of the Egyptians and Indians, play was used to practice and improve motor skills.

Plato makes a reference to the use of play in antiquity in his work "The Laws." In it, the philosopher gives practical value to play as an autotelic activity, suggesting that three-year-old children should use authentic tools on a reduced scale for future builders. Aristotle, in his book "Politics," considers the education of youth and advocates for a balance between study and play. He argues that education should not be solely academic but should also include recreational and sports activities to promote the complete development of the individual. According to Aristotle, play and recreation contribute to character formation and the overall well-being of society.

The Stagirite, in the eighth book of "Politics," describes the need to include music and gymnastics in the education of young people. Music, in this context, does not only refer to music itself but to all arts and cultural activities. Gymnastics, on the other hand, refers to physical exercise and sports. He mentions the need for play for rest in the following terms: "games must be introduced, carefully timing their use, with the intention of applying them as a medicine, as the emotional movement they produce is a relaxation, and through this pleasure, rest is achieved" (VIII 35, 1528).

In "Nicomachean Ethics," Aristotle examines the idea of eudaimonia, which refers to the full and flourishing realization of life. Although he does not directly refer to play, his concepts about the pursuit of well-being and happiness suggest that recreational and playful activities can play a significant role in achieving a fulfilled life.

The influence of play in Roman society was profound and varied, with events such as gladiator battles and circus games playing a prominent role in everyday life and the social structure of

ancient Rome. Gladiator battles were an extremely popular spectacle that attracted various social classes. These events were held in amphitheaters, such as the Colosseum, and featured thrilling battles between armed gladiators.

In addition to being entertainment, gladiator battles had strong political and social symbolism. Roman emperors used these events to consolidate their power and gain favor with the people. In the case of circus games, especially chariot races in the Circus Maximus, they were exciting and massive events. Charioteer teams competed in intense races, and favoritism for a team could divide society. Also, in Rome, games were associated with religious festivals and public celebrations. They were events that united the community and served as a showcase for the magnificence of the Empire.

The games reflected Roman values such as bravery, competitiveness, and resilience in the face of adversity. Gladiators, despite being slaves, could gain renown and admiration through their performance in the arena. However, constant exposure to violence in the games, especially in gladiator battles, may have contributed to a certain desensitization of Roman society to cruelty and brutality. The games also highlighted social inequalities, as many participants were slaves or marginalized individuals, emphasizing the social divisions of the time, educational games, motivation, and engagement.

Playful Learning

Playful learning, also known as educational play, is a pedagogical strategy that uses games as a tool to facilitate learning and skill development in students. In the early years of formal education, educational play is presented as an inseparable tool for learning. During this initial period, teaching through play is not only welcomed but considered essential for the cognitive and social development of students. However, as students progress in their educational journey, play tends to be progressively relegated, ceasing to be an integral part of the school experience.

According to Franco (2022), it is particularly noticeable that upon reaching university, the perception towards play undergoes a significant shift. Too often, play is associated with a lack of seriousness, and its presence in academic contexts can be misunderstood as a sign of lack of commitment or low-quality learning. This transition from considering play synonymous with learning to perceiving it as unserious suggests a shift in cultural and educational perception as students advance in their education.

In the current times where new teaching models have been developed, it is necessary to consider structural changes in teaching and learning, which is why a renewal of the methods that teachers use has been necessary. This is where play becomes important as it promotes the development of competencies in the student (learning) rather than the teacher's instruction. Díaz (2012) asserts that play promotes motivation for learning, participation, and stimulation.

On the other hand, Stojanović *et al.* (2016) emphasize that, according to the degree of student

involvement, learning outcomes are favored. Rodríguez *et al.* (2017) mention that the use of playful strategies in the learning process during early childhood is recognized as the most favorable and meaningful methodology for connecting with the curriculum content. This approach not only benefits the acquisition of knowledge but also enhances the children's ability to inquire and solve problems.

The implementation of these strategies not only sparks scientific curiosity but has proven to be extremely positive at various educational levels. The inclusion of playful activities not only results in a more engaging educational environment but also effectively stimulates the interest and active participation of students, promoting comprehensive and lasting learning.

According to Burgos *et al.* (2017), inquiry-based scientific exploration emerges as a path to meaningful learning for students. This approach not only allows them to express themselves freely but also encourages the formulation of questions, reflection, creativity, proposal presentation, and discovery. Active and participatory interaction in the process of scientific inquiry not only enriches the educational experience but also enhances students' autonomy by actively engaging them in their own learning process, thus promoting a more dynamic and enriching educational environment.

An Integrated Perspective on Cognitive Benefits of Play

Play is a powerful tool in the development of essential skills such as critical thinking, problem-solving, and creativity, which are fundamental to learning and human development. These capabilities enable individuals to navigate the complexity of the current world, adapt to rapid changes, and face emerging challenges.

In this regard, critical thinking is defined as the ability to rigorously analyze and evaluate evidence, formulating well-founded judgments. It is the foundation for the analysis and evaluation of information and arguments. Paul and Elder (2006) expand this definition, stating that critical thinking also includes the ability to actively analyze information, question assumptions, and reach well-founded conclusions, emphasizing its importance for informed decision-making and problem-solving in everyday life. Betancourt-Zambrano *et al.* (2020) highlight the relevance of developing this skill from childhood, not only in academic but also in work and personal contexts.

On the other hand, problem-solving is identified as a key cognitive process for finding solutions to complicated situations, involving understanding the problem, generating strategies, and applying critical thinking techniques. Mayer & Wittrock (2006) argue that this process goes beyond the simple use of strategies, being fundamental in various disciplines and aspects of daily life.

As for creativity, it is characterized by the ability to generate new and valuable ideas, solutions, or products. Amabile (1996) proposes that it arises from the interaction between individual ability, the creative process, and the social or cultural environment, highlighting its essential role not only in the arts but also in science, technology, education, and business to foster innovation and adaptation.

Finally, according to the arguments presented, it is important to emphasize that educational games promote cognitive and social development in the educational process, as noted by Betancourt-Zambrano *et al.* (2020). These games, when properly designed, offer a platform to teach young people to analyze information, formulate relevant questions, and make informed decisions, also facilitating the acquisition of important social skills such as collaboration, communication, and teamwork.

Educational Games and the Development of Social Skills

Educational games are a key tool in the development of social skills in children and young people, providing an interactive and engaging platform for learning and practicing essential life skills. Through play, participants can experience simulated situations that reflect real social challenges and contexts, allowing them to develop and strengthen a variety of social skills in a practical and meaningful way.

Firstly, educational games often require players to communicate with each other to achieve common goals, exchange information, or negotiate roles and responsibilities. This process promotes the development of verbal and non-verbal communication skills, including active listening, clear expression of ideas, and proper interpretation of others' messages.

Secondly, many games are designed to be played in groups, encouraging participants to collaborate and work together towards a shared goal. This experience teaches the importance of teamwork, including task delegation, mutual trust, peer support, and constructive conflict management.

Thirdly, by interacting in playful environments, players are exposed to different perspectives and needs, which can foster empathy and interpersonal understanding. Games that simulate social situations or require participants to take on specific roles can help children and young people empathize with others and develop a greater sensitivity to others' emotions and viewpoints.

Fourthly, educational games can also serve as a testing ground for conflict resolution strategies. The inherent challenges in the game and interaction with other players can generate conflicts that require negotiated solutions, teaching participants to effectively resolve disagreements, compromise, and find solutions that benefit all parties involved.

Fifthly, during the course of a game, children and young people face critical decisions that can influence the outcome of the game for themselves and their team. These situations promote the development of decision-making skills and can foster leadership qualities, such as initiative, team motivation, and the ability to guide others towards common goals.

Sixthly, educational games often incorporate rules and norms that reflect society's expectations of appropriate behavior. Through play, participants learn the importance of following rules, acting with integrity, competing fairly, and showing respect for other players.

Educational Games as Motivation and Engagement

Ryan & Deci (2000) provide a fundamental theoretical framework when discussing how intrinsic motivation, that motivation that arises from interest or enjoyment in the task itself, plays a crucial role in learning. They argue that when students find pleasure and satisfaction in the learning process, they are more inclined to engage deeply and persist in the face of challenges.

Additionally, in the work of Plass & Kaplan (2016), titled "Emotional Design in Digital Media for Learning," explores how elements of emotional design, including playful aspects of learning materials, can enhance motivation and learning by making the content more appealing and personally relevant to students. This study emphasizes the importance of considering how playful elements can emotionally impact students, enhancing their interest and commitment to learning.

On the other hand, Hamari *et al.* (2016) in their article "Challenging Games Help Students Learn: An Empirical Study on Engagement, Flow and Immersion in Game-Based Learning," demonstrate how games designed to be challenging and engaging can facilitate a state of flow in students. This flow state, characterized by total immersion in the activity, is indicative of high intrinsic motivation and is associated with positive learning outcomes. The cited study provides empirical evidence that playful elements, when effectively integrated into educational design, can be a powerful tool to capture students' attention and foster sustained engagement.

Games That Can Be Adapted to Address Specific Student Needs

There are various games that have proven to be adaptable to address specific student needs, whether to strengthen cognitive skills, enhance the learning of specific concepts, or foster the development of social skills. Some examples of games that can be adapted to meet diverse educational needs are as follows:

Lumosity App: It is a platform that offers a variety of games designed to improve cognitive skills such as memory, attention, and reasoning (Lumosity, 2024). These games can be adapted according to the cognitive areas that students need to reinforce, customizing the training approach.

Studies conducted by López & Venustiano (n.d.) have found that students using the Lumosity App in the Problem-Solving Module expand on the theoretical content acquired in the classroom and increase interest in academic activities, enhancing their cognitive skills. The class becomes more interactive, and students' attention improves more easily.

Minecraft: Education Edition: The educational version of Minecraft: Education Edition presents itself as a versatile tool capable of adapting to the teaching of various concepts, from mathematics and sciences to history and literature. Educators have the ability to design customized worlds focusing on specific topics they want to address. Pérez *et al.* (2019) support this claim by

stating that the software provides teachers with instant and continuous feedback, which can facilitate learning through trial and error.

A standout feature of this game is that children can engage in a wide range of activities without fear of making mistakes or taking improper actions. Unlike the real world, in the Minecraft: Education Edition environment, there are no punishments or reprimands for inappropriate behavior, fostering a more open and motivating learning environment. This freedom allows students to explore, experiment, and learn in a unique way, contributing to a more participatory and engaged approach to the educational process.

Among Us: A game of deception and deduction, can be adapted to foster social skills such as communication, collaboration, and group decision-making. Educators can design in-game activities that promote teamwork and problem-solving.

Kerbal Space Program: This space simulation game can be adapted to teach scientific and mathematical concepts related to physics and engineering. Students can design and launch rockets, applying scientific principles in a playful environment. Regarding this, the Communication and Pedagogy Center (2013) states that Kerbal Space Program offers the possibility of gaining a deeper understanding of the various elements that impact the trajectory of spacecraft and the process of their development.

Scrabble: A classic game that can be adapted to reinforce language skills. Educators can customize the rules to focus on specific vocabulary, spelling, or even grammar, providing a language-centered educational experience. Puente & Puente (2015) argue that using Scrabble allows students to set individual goals, increase the difficulty level as they learn, and earn points as they complete different phases of the activity.

Civilization VI: A historical strategy game that can be adapted to teach concepts related to history, geopolitics, and decision-making. Educators can integrate customized missions and scenarios aligned with the study topics. Burguete (2020) mentions that this game offers opportunities for reflection from the very beginning of the game.

Mario Maker: Allows students to create their own levels in the Mario world. This tool can be adapted to foster creativity and problem-solving as students design and share their challenges.

Dragon Box Numbers: According to Gutiérrez *et al.* (2015), it is a game designed for tablets and computers that offers interactive teaching of mathematical concepts aimed at elementary and secondary school students. This game has the versatility to be adapted by educators to address specific areas of mathematics, such as fractions, geometry, or algebra.

It is important to highlight that the software provides immediate feedback, allowing the user to identify errors as they occur. Additionally, this interactive learning approach recognizes and respects the fact that each student progresses at their own pace. This aspect facilitates the imple-

mentation of discovery learning, allowing students to explore and understand mathematical concepts autonomously.

Conclusions

Collectively, gladiatorial contests and circus games were key elements in the social and cultural life of ancient Rome, providing entertainment, reflecting values, and playing a fundamental role in the consolidation of power and social cohesion in the vast Roman Empire.

It is concluded that play, by opening the imagination and fostering exploration, is fundamental to creative development. Through participation in games, individuals practice idea generation, adaptation, and the search for creative solutions—essential skills for creativity.

Educational games are a valuable pedagogical tool for the development of social skills. By integrating play into the educational process, educators and parents can provide learning experiences that are not only fun and engaging but also prepare children and youth to interact effectively and positively in diverse social contexts.

The role of playful elements in education has been widely studied and appreciated for its ability to increase students' intrinsic motivation, making the learning process more appealing and meaningful. In this context, various authors have contributed research highlighting how the integration of playful strategies in the educational environment can facilitate deeper engagement with learning materials and promote an enriching educational experience.

Similarly, the literature suggests that playful elements can be a catalyst for enhancing students' intrinsic motivation toward learning. The ability of games and playful activities to capture students' interest, coupled with the potential to promote positive emotional states and flow experiences, underscores their value in creating attractive and meaningful learning environments. These findings urge educators and curriculum designers to consider playful strategies as integral components of the educational experience to facilitate deep and lasting learning.

This article has showcased various games that can be adapted to address specific educational needs, offering a versatile and motivating tool in the educational environment. The key lies in the creativity of educators to personalize and tailor these gaming experiences according to the objectives and specific needs of students.

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Essay
Ensayos

Education in the use of artificial intelligence through prompt engineering*

Eduética en el uso de la inteligencia artificial a través de la ingeniería de prompts

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Abstract

The present essay aims to address the topic of ethical education in the use of Artificial Intelligence (AI) through Prompt Engineering. AI represents a constantly growing and evolving discipline, seeking to endow machines with human-like capabilities such as learning, perception, and reasoning. Prompt Engineering, on the other hand, refers to the technique used to guide and control the behavior of artificial intelligence systems through specific instructions. In this sense, it is essential to analyze the importance of eduethics, i.e., ethics applied to education, in the context of artificial intelligence, to ensure a responsible and beneficial use of this technology in various fields.

Keywords: Eduethics, Artificial Intelligence, Prompt Engineering.

Resumen

El presente ensayo tiene como objetivo abordar el tema de la educación ética en el uso de la Inteligencia Artificial (IA) a través de la Ingeniería de Prompts. La IA representa una disciplina en constante crecimiento y desarrollo, que busca dotar a las máquinas de capacidades humanas como el aprendizaje, la percepción y el razonamiento. La Ingeniería de Prompts, por su parte, se refiere a la técnica utilizada para guiar y controlar el comportamiento de los sistemas de inteligencia artificial mediante instrucciones específicas. En este sentido, resulta fundamental analizar la importancia de la eduética, es decir, la ética aplicada a la educación, en el contexto de la inteligencia artificial, para asegurar un uso responsable y beneficioso de esta tecnología en diversos ámbitos.

Palabras clave: Eduetica, Inteligencia Artificial, Ingeniería de Prompts.

Education in the use of artificial intelligence through prompt engineering

In today's rapidly evolving world, the use of Artificial Intelligence (AI) through large Natural Language Models (NLMs) is becoming increasingly common across various disciplines. This trend makes it essential for the current educational sector to be proficient in utilizing AI. However, the rise in AI use, coupled with the lack of proper instruction in AI, has led to the distorted use of Natural Language Models such as CHAT GPT, BING, PERPLEXITY, GEMINI, AITHOR, among others. This has resulted in significant consequences, particularly in the generation of prompts in a specific manner or their large-scale use under a wide range of orders (Prompt Engineering).

The unfair application of AI, especially when it is not cited as a source of consultation or its arguments are not verified for reliability, poses a manifest risk in the Facilitator-Participant relationship. A Facilitator-AI-Participant triad is created, which, without the proper knowledge of Prompt Engineering by the educator, can push the Facilitator into a completely passive role. This prevents the generation of critical contributions in the teaching-learning process amidst the unstoppable use of Artificial Intelligence currently occurring.

This essay will argue that education in the use of AI is necessary and that Prompt Engineering can help improve education through the application of AI, as well as prevent the misuse of technology. However, there are also opposing views that maintain that education involving AI interaction is neither necessary nor efficient in all educational settings. Additionally, misuse of AI can still occur repeatedly, even with proper knowledge of the tools that comprise Prompt Engineering and the types of prompts that should be requested from the language model.AI is becoming increasingly common in many sectors of daily life (both academic and professional), making training in its ordinary application necessary. Various scientific fields are already using AI to enhance efficiency and accuracy. As a result, the demand for professionals with AI skills and the potential of students and facilitators in this field is increasing. Without technical knowledge, a large sector of society may struggle to adapt immediately to the changing academic and professional world surrounded by Artificial Intelligence, making this knowledge crucial for the present and future professional workforce.

However, although Artificial Intelligence through the use of Natural Language Models (NLM) provides immediate answers to questions much faster than the basic thought process generated by humans, intellectuals like Chomsky, linguist Roberts, and AI expert Watumull (2023) have expressed that:

> ...the "supposedly revolutionary" advances presented by AI developers are a source of "both optimism and concern." On the optimistic side, these advancements can be useful in solving certain problems. However, on the concerning side, "we fear that the most popular and trendy variety of artificial intelligence (machine learning) may degrade our science and debase our ethics by incorporating into technology a fundamentally flawed conception of language and knowledge.
>
> As useful as these programs may be in specific areas (such as computer programming, for example, or suggesting rhymes for light verse), we know from the science of linguistics and the philosophy of knowledge that they differ profoundly from the way humans reason and use language (p. 13).

This therefore leads to a duality in the rise of Artificial Intelligence and consequently the mode of reasoning presented by the use of Prompt Engineering. Regarding the critical factors that characterize and represent human-machine interaction, the introduction of Artificial Intelligence (AI) into the educational context can be compared to the phenomenon described by Hannah Arendt as the "banality of evil." Arendt (2013) asserts that some individuals act within the rules of the system to which they belong without reflecting on their actions. They do not worry about the consequences of their actions, only about following orders. The mechanization that AI through Prompt Engineering can provide may yield similar results.

On another note, authors like Margaret Boden, Ray Kurzweil, and Eliezer Yudkowsky have emphasized the importance of AI and Prompt Engineering as significant tools for the advancement of humanity. Boden, an AI specialist at the University of Sussex, Kurzweil, Director of AI at Google,

and Yudkowsky, an AI expert known for his theory of Friendly AI, have highlighted the potential benefits of these technologies.

However, Boden (2023), from a more conservative perspective, argues that balance is necessary. She asserts that we must differentiate between the knowledge of AI and the wisdom that the human mind has developed over its evolution. In this context, embracing the precepts of these authors gives rise to the concept of Eduethics, a set of principles aimed at maintaining balance between technological advances and human knowledge.

Therefore, Prompt Engineering can help improve education oriented towards AI knowledge by providing a structured approach to designing these advances with integrity and efficiency. Educators can identify areas where students may need additional support with the assistance of AI. By using Prompt Engineering, educators can create a curriculum that meets the needs of all students and prepares them for the future academic and professional market. It is in this dimensioning of Eduethics in AI applicable to Prompt Engineering that the opinion of researcher Bryson (2024) is relevant, who states that:

> Ethics in AI goes beyond being a mere theoretical discourse; it is a fundamental pillar for keeping our society united. Ethics presents itself as a form of policy that can be improved through greater scientific and social knowledge. By adopting a human-centered, transparent, safe, and responsible approach, we ensure that AI is used in a way that benefits people and the planet (p.2).

Thus, ethics, when focused strictly on education, can help prevent the misuse of technology, which can have severe consequences, including discrimination and bias. Educated individuals are less likely to misuse AI and more likely to use it responsibly and coherently, avoiding Arendt's (2013) concept of banality, as previously explained, and instead generating a collective benefit.

Education in AI may not be necessary for all fields, especially in the social sciences, where it is crucial to look through various critical perspectives at major social issues and reflect on them. Thus, a balanced approach to AI as an auxiliary, a support, a helper to facilitate certain tasks, does not imply that it replaces human thought entirely. Issuing orders or prompts often should provide referential scenarios rather than conclusive elements, given that all environments and groups are heterogeneous.

Therefore, eduethics dictates that the educational realm must uphold a series of values to sustain a healthy interaction with Artificial Intelligence, such as:

- **Equity:** AI through Prompt Engineering should be used equitably and without discrimination.
- **Transparency:** AI systems should be transparent and understandable to users, avoiding prompts that may cause confusion.
- **Privacy:** Personal data must be protected.

- **Responsibility:** Those responsible for using AI in education must be accountable for their decisions, ensuring that the orders given do not exceed what is requested.

By basing eduethics on these fundamental values, the necessary balance in the teacher-AI-student relationship can be promoted. Factors like student information should only be collected for specific educational purposes with the consent of students or their parents, and data should be anonymized. Additionally, orders and prompts should be designed to minimize bias and be regularly audited to detect and correct biases that could affect the validity of the information obtained.

Eduethics also aims to inform students about the use of AI in education. It seeks to create regulations clarifying that AI is a helper, not a tool for triviality, establishing mechanisms for lodging complaints and claims regarding its distorted use. In the realm of research, students should learn about AI's potential and the ethical risks and challenges of its misuse. They must also be critical and authentic about the outputs provided by AI, recognizing that these outputs are neither infallible nor entirely reliable. It is essential to eradicate the glorification of cheating through the use of orders or prompts and instead build a fully transparent scenario that allows for proper evolution.

In conclusion, this essay has outlined the impact of AI, addressing various terms, critical stances from both detractors and proponents, its effect on education, and the need for ethical alignment for its existence. The author asserts that AI has the potential to improve education in many ways, but it also presents challenges that must be considered. Only through constructing models designed for its use can these be addressed effectively.

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Optimizing comprehensive care: current approaches in pedagogical didactics for students with special educational needs

Optimizando la atención integral: enfoques actuales de la didáctica pedagógica para estudiantes con necesidades educativas especiales

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Abstract

Pedagogical didactics is considered an integrating element within the teaching-learning process, whose objective is to implement in the teacher a linkage of strategies for the education of students with special educational needs (SEN) from a social, educational, and pedagogical perspective, in an organized manner to achieve short, medium, and long-term objectives. It is imparted in various educational tasks by the teacher through a globalizingdidactics that ensures the application of specific attention techniques, resulting in the real diagnosis corresponding to the functioning of the psychofunctions according to the interests and needs of each student, through technocratic education based on experience. This will facilitate the acquisition of competencies guided by the execution of educational programs that allow the application of strategies to maximize the development of skills and abilities within the different levels or modalities of the Venezuelan educational system.

Keywords: Didactics, special educational needs, psychofunctions, globalizing didactics, technocratic education.

Resumen

La didáctica pedagógica es considerada un elemento integrador dentro del proceso de enseñanza-aprendizaje, cuyo objetivo consta de implementar en el docente una vinculación de estrategias para la formación del estudiante con necesidades educativas especiales (NEE) desde una perspectiva social, educativa y pedagógica, de manera organizada para la consecución de objetivos a corto, mediano y largo plazo, siendo impartida en las diferentes tareas educativas por parte del docente mediante una didáctica globalizadora que garantizará aplicar técnicas específicas de atención, que arrojará el diagnóstico real correspondiente al funcionamiento de las psicofunciones según sean los intereses y necesidades de cada escolar, a través de la educación tecnocrática basada en la experiencia, lo cual propiciará adquirir las competencias orientadas por la ejecución de programas educativos que permitan aplicar estrategias que facilitarán en los escolares el máximo desarrollo de sus habilidades y destrezas dentro de los diferentes niveles o modalidades del sistema educativo venezolano.

Palabras clave: Didáctica, necesidades educativas especiales, psicofunciones, didáctica globalizadora, educación tecnocrática.

Optimizing Comprehensive Attention: Current Approaches in Pedagogical Didactics for Students with Special Educational Needs

Currently, education has undergone a series of changes where the teacher must be at the forefront of the transformation, driving them to continue researching and innovating to offer educational alternatives to students with special educational needs. This is due to the need for implementation of strategies that can foster meaningful learning in students, aimed at the full development of cognitive and socio-emotional functions, which will strengthen their academic

skills. This is achieved through programs that, at the curricular level, the teacher ensures adjustments and adaptations aimed at fostering abilities and skills within the educational institution.

Hernández (2014) highlights the following:

> Didactics must be assumed as the discipline that responds to teaching processes, which implies addressing the why, what, and how of teaching. It also attends to the structuring of the teaching processes of each teacher, who is subject to adapting their methodology to the educational organization, the conditions of the context, the socio-cultural conditions, and any kind of conditioning that integrates the environment and the formation of each student. (p.100)

It is worth noting, the author refers that didactics prompts teachers to face the challenge of responding correctly to Special Educational Needs (SEN), amidst concerns about how to implement inclusion or which strategies and tools are appropriate, which may result in unresolved questions (in some cases) becoming barriers that hinder the pedagogical development of the student, highlighting the need for research and ongoing training to be able to generate learning situations and positively impact processes.

Subsequently, the review of the concepts of Pedagogy and Didactics, which allows delving into their definitions and objectives, taking into account the aspects that coincide and make a difference, impacting from the clarification of notions, in optimizing pedagogical didactics aimed at addressing Special Educational Needs. To define Pedagogy as a science focused on understanding the principles, fundamentals, and theories of learning, and Didactics as a branch of the former, based on the fact that it directly refers to the methodology and means used by the teacher during the teaching and evaluation of learning, it is necessary to have practical aspects which will provide methodologies, techniques, and specific activities, guiding the selection of materials and determining the appropriateness when selecting the form of evaluating knowledge.

On the other hand, pedagogy, on the one hand, is a broad discipline that seeks to understand the foundations of education, focusing on philosophical, sociological, psychological, and anthropological aspects, among others, to address not only cognitive but also affective, social, and ethical elements, pursuing the development not only academic but integral of the individual. Likewise, didactics is considered a discipline that relates the values, resources, and training of the teacher at the time of executing their educational practice since, in an operational way, it designs and formulates strategies aimed at facilitating and evaluating learning, through adaptations concerning the interests and needs of their students in order to minimize interferences, this is achieved through teamwork for integral education.

It is worth mentioning that the construction of knowledge arises from the experiences of the learners, this construction allows them to understand the information transmitted by the teacher when diversifying their resources and creating bridges to a diversity of strategies or methodo-

logies to access more efficiently and relevantly the learnings derived from educational practice. For Abreu, Gallegos *et al.* (2017) express:

> Didactics has been defined interchangeably as the art of teaching, artifice, treatise, normative, learning scientific study, intellectual education study of man and systematic knowledge, auxiliary science, incentive technique, instruction theory, speculative science, general doctrine, method, technique, procedure, particular discipline, branch of Pedagogy, pedagogical discipline, normative practical pedagogical discipline, reflective applied discipline. (p.84)

Therefore, the authors present didactics applied to the reality that the teacher experiences within the learning spaces because they themselves generate a practice aimed at providing an intervention with a psychopedagogical approach, being an experience mediated by the resources obtained during their training. For this reason, it is possible to promote together with their students a set of knowledge that will lead to building a baggage for the acquisition of knowledge that will provide them with resources for decision-making in solving a certain problem within and outside the learning space, with this preparation framed in Socratic processes (which gives it a dialectical character) that allows stimulating and promoting both critical thinking (an aptitude considered one of the four basic skills for learning) as well as otherness, which supports the culture of inclusionFollowing this, UNESCO (2021), in its report on inclusion and education reflects: "Developing inclusive teaching and learning strategies and practices and ensuring that they are suitable for all, particularly for those most excluded from ECI and AEPI programs and schools." (p.5)

Taking as a reference what is stipulated by UNESCO, education is a dynamic and unpredictable activity, timely of modern societies, which requires continuous review and progress, hence part of the teaching role which plays an irreplaceable role. At the same time, being able to autonomously use the knowledge and distinctive techniques for the benefit of their students, the teacher must deploy very special characteristics of technical, scientific, and why not, social and cultural techniques.

Exactly, educational quality concerns the experience of everything that dignifies the student's life, through a school environment rich in experiences and possibilities that encourage students with Special Educational Needs to examine theory and practice in a continuous innovation process, which strengthens overcoming failures and highlighting the achievements of teaching performance, circumscribed within the realm of quality and assimilated with professionalism. This generates a positive and supportive school climate, to develop actions aimed at achieving its noblest objective, efficiently promoting student learning.

The teacher is a professional who relates technical experience and whose social function is in daily tasks such as assessing knowledge, pedagogical and didactic action, whose level of development of intercultural competences as corresponds, the teacher's autonomy starts from evoking effectively and efficiently every learning process, such as assessing and acting. In addition to understanding and proceeding with educational practice, which are fundamental when per-

forming teaching, as a promoter of educational experiences, with the capacity to monopolize strategies and resources that lead to the improvement of creativity in students, good use of knowledge, skills and abilities for real-life situations and the development of attitudes and values.

Therefore, teaching as a socializing practice forms a dimension that is directed towards the socialization of students with Special Educational Needs, guiding them through the learning process. Specifying an action originated through knowledge, where teaching as an institutional and community practice is organized by explicit and implicit cultural mandates, contained within the designated institutional culture. With all this, the dimension of the teaching exercise is sought, through institutional and community insertion, according to the complexity of this social skill, as well as the multidimensionality of the profession, requiring a systemic understanding that every decision made, whether it be from work contexts, school organization, curriculum policy, is managed in the profession as a whole.

In this way, the objectives of didactics are to favor the adequate teacher-student relationship, and this adequate relationship is based on the fact that the teacher must know their students in order to then develop a didactics adjusted to both their interests and needs, as well as the educational curriculum and context. This form of knowledge is directly associated with understanding their abilities, talents, and skills, as well as socio-cultural, family, and clinical realities.

Now, Rojas (2022) infers:

> With the passing of the years, didactics has been manifesting various changes or contributions due to new knowledge in education. There are several definitions of didactics such as: the art of teaching, study of intellectual and intelligent education, erudition, technique, discipline of pedagogy, teaching theory, practice, among others, but it mainly focuses on science. (p.34)

That is to say, the author reflects the importance of didactics as the means that allows the teacher to transmit effective teaching through a positive climate where the student with Special Educational Needs strengthens their desire to learn based on the imparted dynamics, in this way developing their cognitive processes according to their interests and needs.

Therefore, it is clear that didactics as a branch of pedagogy allows for a clear vision of the teacher's profile, defined as the grouping of knowledge, skills, and personal, occupational, specialized, or prospective abilities that an educator must have or obtain to carry out their work. Some of its functions are to facilitate, guide, and motivate in the learning process, allowing the teacher, a researcher by nature, to create their own hypotheses by reflecting on their pedagogical work and the adaptation of their practice, acting as a mediator in the dynamics developed in the learning space, which, it is worth saying, is not limited to the classroom but encompasses the school as a living, changing, and dynamic entity.

In this way, didactics guides the pedagogical action of teachers and facilitates student learning,

in an educational context that seeks social inclusion and attention to diversity. Didactics must be flexible, innovative, and adapted to the needs of each student, especially those with special educational needs. In this way, the role it plays in the classroom reflects the educational reality, with strengths and weaknesses, and where improvements can be made to enrich the teaching practice and experience for all stakeholders involved.

At the same time, optimizing didactics involves expanding, diversifying, and improving the didactic resources that teachers use when designing and planning their activities, allowing them to offer a more effective and personalized educational response. This optimization benefits not only students but also teachers, as it enhances their role and professional prestige, as well as their self-confidence and ability to face educational challenges.

Adding to the above, educational didactics is directed towards meeting the needs of students with special educational needs, where it is vital to emphasize encouraging assertive and efficient communication that will, first and foremost, allow access to a fundamental right: being part of a learning space, and subsequently, responding to positive stimuli for the development of skills that will facilitate the appropriation of the range of knowledge provided by the teacher and, therefore, consolidate the competencies required by the curriculum of the grade being pursued.

To this end, didactics manifests a set of pedagogical knowledge implemented by teachers to set objectives that, through diagnoses, neuropsychological characterizations, and knowledge of the student's socio-family and cultural context, establish a comprehensive vision by developing academic and pedagogical objectives. This is part of the development of psychoeducational programs and attention aimed at both minimizing interference and developing skills, which is carried out through family support, exchange with specialists, review of clinical reports and educational backgrounds, interviews with previous teachers and family members, as well as evaluations aimed at observing their academic performance during different situations presented in educational practice, so that their performance can be assessed.

In light of the above, as expressed by Pila *et al.* (2023): "Didactics is a discipline of the educational sciences committed to teaching-learning processes, in order to achieve the integral formation of the student. There are many definitions and what teachers expect from this discipline to guide their work with students." (p.375)

It is essential to highlight that the authors emphasized that building a more comprehensive vision of students with special educational needs exponentially improves the chances of intervention success. It is also fundamental to set goals and develop objectives related to personal growth and coexistence, situated within the four pillars of educational inclusion.

It is worth considering the impossibility for teachers to develop tailored care plans if the student is not present; necessary actions must be taken to ensure the student's presence not only in the classroom but in every class. Participation refers to the fact that the student is involved in

activities, and in a way, these pillars are staggered, where on must be achieved to move on to the next.

Once the student with special educational needs is present, it is time to encourage their participation through strategies and techniques tailored to their physical and cognitive profile. The educator's contribution, through knowledge of the student's abilities, skills, and needs, generates avenues for them to contribute to the development of activities, as well as being part of the educational process. Thus, the student must contribute, and it is the teacher who, through the design of the action plan, will seek ways for this to happen. This contribution should, as far as possible, be visible to their peers, which impacts the recognition and appreciation of the student's abilities, thereby granting them a place in the social universe of their peers.

In the case of relationships, the student's relationship with the teaching staff prevails, linking the student's relationship with their peers and the student's relationship with a natural peer. The development of pedagogical didactics designed for the student should allow, first and foremost, and by virtue of the teacher's holistic understanding of the student, the establishment of a bond with them, which will then facilitate appropriate interaction with the rest of their peers and, in turn, the encounter with a natural peer who accompanies the student with Special Educational Needs in their journey through the institution through the bond of friendship.

Teachers in the different modalities of the Venezuelan educational system create didactic strategies that provide the teaching and learning process for students with special educational needs. In these strategies, they must consider work that enhances social skills as a cross-cutting element, seeking to train a student capable of solving problems according to their level of development. This work is aimed at stimulating individual and social thinking that enables them to navigate the educational social environment and grasp the relevant contents of the curriculum, extrapolating this experience to their immediate family and social environment.

To this end, interdisciplinary and transdisciplinary approaches play a significant role in optimizing educational didactics for the attention of Special Educational Needs in schools, carried out by the teacher and interdisciplinary team to build, from a comprehensive and holistic vision, the cognitive profile of the learner, a didactic proposal that allows them to navigate the school while respecting their individuality.

In all educational planning, it starts with the teacher's creativity as well as the resources available. Teachers innovate to tailor curricular adjustments and adaptations to the student's interests and needs so that they can grasp the objective corresponding to each presented content. The construction and consolidation of this content should facilitate the subsequent evaluation of the didactics used through the student's performance and their acquisition of knowledge, allowing for the reevaluation or maintenance of teaching methods, techniques, activities, resources, and time frames that favor the development of the school day and thus positively impact school inclusion.

With each planning, the teacher must bear in mind the guidelines for breaking down content

that is flexible and dynamic, easily understandable for the student, where the educator must be able to recognize and empathize with them without expecting the student to adjust to the teacher's perspective. This is to achieve tailored planning and improve the acquisition of competencies in line with the objectives set within the learning space. In the development of a strategy, it is essential to start with a purpose based on the existing reality, as adaptations arise based on the interests and needs of the population, where the teacher implements techniques, activities, and resources that will be beneficial for students to discover learning originating from their context within which they are immersed.

It is pertinent to note that the committed teacher must maintain a positive, critical, and reflective attitude towards teaching situations, based on their role as a manager, where they acquire efficient management in educational planning by organizing a class and maintaining a balanced control of the situations that arise. They should also be a guide for the entire process assertively when necessary, manifesting a climate of trust and security among all participants, leading to the establishment of open communication channels and also assuming their role as an evaluator of teaching to determine the performance of students within the teaching and learning process.

Within this framework, Dainese (2016) reveals:

> Learning is generated through a participatory and shared construction within the components of the classroom group, and the eventual special resources (human and material) necessary to meet the needs of students with disabilities must be reintegrated into a framework of plurality and become part of the learning activity intended for all. (p.22)

While it is true that the author highlights the role that schools and teachers must play in addressing holistic development through individual educational needs and training cognitive skills, always considering the student's profile, this allows for the proposal of content associated with their abilities, skills, and needs through updated strategies that ensure their successful academic progression. This attentional paradigm is focused on cognitive and constructivist pedagogical models that conceive learning as a mental phenomenon involving cognitive processes, with a succession of elements and phases that imply students actively create knowledge and understanding through their experiences, cognitive schemes, and interactions with the respective context.

Among the objectives set forth in the Agenda (2023) for Sustainable Development:

> By 2030, ensure that all students acquire the theoretical and practical knowledge needed to promote sustainable development, including through education for sustainable development and sustainable lifestyles, human rights, gender equality, promoting a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and the contribution of culture to sustainable development. (p.29)

In this perspective, the agenda explains the function of education as it employs models that conceive strategies, methods, and techniques that will improve the administration and mana-

gement of time within the teaching process, valuable not only for the daily work of the teacher but for the projection of the processes that the student must develop in the educational institution. Time in addressing students with Special Educational Needs must be measured both in the short, medium, and long term. The construction of an educational intervention program should not be based on immediacy or urgency, but rather include overarching goals or general objectives to then build specific short and medium-term objectives from there. This does not mean that pressing needs should not be addressed, but rather that in balance, the perspective of what is to be achieved in the long term as a result of the intervention program and care plans, both in the classroom, small groups, or individually, should be maintained.

According to Pila *et al.* (2023), they state: The role of didactics is to design motivating tasks for students, starting from real-life problem situations and adapting to the different rhythms and learning styles of each student, fostering the ability to learn by themselves, and promoting teamwork. (p.385)

This approach related by the authors is aimed at developing an effective and efficient work, united and indispensable with the family and the institutional technical team, which provides the creation of reasonable adjustments and adaptations aimed at enhancing learning skills within their corresponding cognitive, emotional, and social abilities, resulting in the integral development of the individual and the consolidation of the competencies established in the curriculum mesh always based on the characteristics of the learner.

In light of the exposition by Clavijo & Bautista (2020), "inclusion in the educational sphere entails attitudes of deep respect for differences and a responsibility to make them an opportunity for development, participation, and learning." (p.1)

It is worth noting that for the authors, the inclusion of various strategies and techniques aimed at guiding the teaching and learning process allows for the acquisition of academic competencies. Some of these strategies are traditional but remain relevant; their innovation lies in how they are developed in contexts, the inclusion of novel elements, and how they are tailored to modern generations. Examples of these strategies and techniques include exposition, demonstration, simulation, debate, group work, concept mapping, mind mapping, summarization, paraphrasing, and self-assessment. Other more contemporary strategies and techniques may involve the use of technological resources, formative assessment, cooperative work, constructive feedback, and the application of active methodologies such as gamification, project-based learning, problem-based learning, collaborative projects, service learning, and flipped classroom.

For example, the choice of the most suitable strategies and techniques depends on various factors such as content, context, student profile (especially that of students with Special Educational Needs), and available resources. The purpose of these strategies and techniques is to provide the development of competencies, skills, and attitudes that enable students to learn meaningfully, autonomously, and critically, thereby fostering the development of academic skills (reading, writing, and mathematics).

There are techniques specifically developed for working with certain populations that should (and must) be included in educational didactics: sign language, braille language, social stories, pictograms, sign language, bimodal language, and visual thinking are some of the most well-known. Teachers' knowledge of the cause or root of the Special Educational Needs of their students and their knowledge of their neuropsychological profile (mediated by research and study) guide the inclusion of these techniques to enhance the achievement of the objectives set out in planning, in addition to complying with the creation of reasonable adjustments and curricular adaptations, as established in international conventions.

According to Unesco's guidelines for inclusion (2008), it:

> can be conceived as a process that allows addressing and responding to the diversity of the needs of all learners through increased participation in learning, cultural and community activities and reducing exclusion within and outside the educational system. The above implies changes and modifications of contents, approaches, structures, and strategies based on a common vision that encompasses all school-aged children and the conviction that it is the responsibility of the regular education system to educate all children. The goal of inclusion is to provide appropriate responses to the broad spectrum of learning needs in both formal and non-formal education environments. (p.8)

Regarding this topic, the inclusion of students with special educational needs begins with the relationship established by the teacher with the teaching dynamics, adapting resources that are favorable according to the interests and needs of students with particular conditions that require a mediator teacher capable of instructing and guiding their learning process by innovating and adapting activities that allow strengthening their skills and abilities in line with the theme used by the teacher within the learning space, thus fostering psychofunctions in the different tasks developed within the learning space.

Play as a didactic tool, previously reviewed these related concepts; as mentioned earlier, didactics is the art and science of teaching, based on principles, methods, and techniques to facilitate learning. Play is the set of activities carried out for fun, to stimulate creativity, and develop skills. Likewise, didactics has an explicit pedagogical intention, is based on prior planning, requires evaluation of results, and is oriented towards knowledge transmission, while play may or may not have a pedagogical intention, may arise spontaneously or improvised, focuses on the development of attitudes and values, and does not necessarily require being structured or evaluated due to its free and flexible nature.

Many pedagogical and academic objectives can be achieved through playful techniques and games applied in the classroom environment. Playfulness and games as elements associated with the development of attitudes, values, skills, flexibility, enjoyment, and voluntariness are widely incorporated by teachers in the application of didactics.

Didactic resources are seen as the means that facilitate the development of ideas, the construction of models, and the use of materials that will be the link to develop the objectives esta-

blished by the teacher in the exercise of their work with students with SEN within learning spaces. They also constitute a means that fosters in the student the development of attitudes to construct meaningful learning, giving sense and significance to the object of learning. Playfulness and games have historically and transversally been the best vehicle for the acquisition of competencies.

According to Lindao (2015), the term Special Educational Need is used to identify the difficulty of a student's acceptance towards a specific learning, that is, when a student's learning capacities are presented with greater difficulty (p.6). It is necessary to be clear about the differences of each student with special educational needs, considering them as biopsychosocial beings who respond at their own pace and interests, observing interferences in their teaching process, which requires a psychoeducational program to minimize the deficiencies presented in the learning space.

In other words, school (and thus education) ultimately becomes a central axis within society because it finds its purpose in the process of humanization and integration of the individual into society (socialization), starting from an understanding of their abilities, potentials, limitations, and desires (individualization) amidst a cyclical process and as a distinct cultural element of our community (Sarramona, 2000). This defining presence prompts questions such as: Is the didactics currently used in classrooms aligned with the interests and needs of the student population? Is research and continuous, updated training of the teaching staff encouraged? Is there a teacher performance evaluation process that reinforces and acknowledges the commitment to ensuring comprehensive attention? And most importantly, does the educational didactics currently predominantly used in various modalities of the educational system aim to guarantee educational inclusion and comprehensive attention while also reducing the expulsion of students with Special Educational Needs from education?

Ultimately, educational quality undoubtedly has a significant influence on educational health. Education is a dynamic and flexible activity that requires continuous review and progress. Hence, the role of the current teacher emerges, who plays an irreplaceable role. It is the teacher who must autonomously employ knowledge and distinctive techniques in favor of their students but must also deploy very special peculiarities of approaches, methods, techniques, scientific elements, combined with psychological and emotional aspects, equally in favor of their students. Therefore, the educational didactics developed by the teacher allow each student with special educational needs to acquire knowledge from a wide variety of factors aimed at guiding their process, not only educational but also integral development, seeking to provide the tools that .enable them to be an active element not only in the community but also in their own life project

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https://redip.iesip.edu.ve/ojs/ojsdata/formatos/Requisitos%20para%20el%20arbitraje%20de%20ensayos%20cient%C3%ADficos.pdf

In the case of a scientific article, the aspects to be evaluated can be consulted at the following link:
https://redip.iesip.edu.ve/ojs/ojsdata/formatos/Requisitos%20para%20evaluaci%C3%B3n%20de%20manuscritos%20de%20art%C3%ADculos%20cient%C3%ADficos%20para%20revisores%20externos.pdf

Procedure Followed in the Reception, Selection, and Evaluation of Originals

The researcher must submit their article on the selected platform to ensure an auditable electronic record of the interactions between the publication and the authors. Upon submission, the editorial board reviews those originals that meet the publication's objective and scope according to the Publication Guidelines regarding text length, the presence of an abstract, keywords, the citation and reference system used, originality, thematic relevance, and gender appropriateness, among others.

After passing this screening, the texts continue with the Redip editorial process. The review system is a "double-blind peer review." In the peer review process, the following cases may occur.

- Complies with REDIP's guidelines and profile: proceeds to the review process.
- Does not comply with REDIP's guidelines or profile: returned to the author for necessary adjustments.
- Not relevant to REDIP's profile: returned to the author. In any case, any decision is communicated to the author.

Subsequently, all articles (except for those requested by the journal's editorial board from experts with recognized expertise) are subjected to an evaluation process by professors and researchers who are specialists in the article's topic, whether local, national, or international, and who have extensive experience in academic and scientific writing. Each article is sent to a reviewer without any elements or references that could identify its authorship.

Along with the article, a communication is sent to the reviewer in which the REDIP editorial board requests the evaluation of the article, emphasizing that if the reviewer accepts, they must respond within the next 30 days. Additionally, to guide the evaluation, the REDIP Publication Guidelines and the Protocol for Evaluation and Review of Articles for REDIP are sent to the reviewer, along with an evaluation form that includes diagrammatic, linguistic, discursive, methodological, and conceptual aspects to be considered in the evaluation of the articles.

Upon completing the article's evaluation, the reviewer must send the REDIP editorial board the evaluation form with their corresponding assessment and the decision, duly justified, regarding the publication or non-publication of the article and any respective recommendations, if any. The decision of the review committee is final.

The decision can be:

- Accepted without modifications.
- Accepted with substantive modifications.
- Accepted with minor modifications.
- Rejected.

Finally, the journal's editorial board communicates the decision of the review committee and any recommendations to the author. Once the communication informing the author of the re-

quired corrections is sent, the author has 21 business days to make the corrections. If the corrections are not sent within that time, it will be understood as a decision not to publish the work in REDIP.

The work with the corrections is sent again to the reviewer responsible for the initial evaluation to determine if the requested changes were made. If so, the meritorious work is added to the REDIP article repository; otherwise, the author is informed and requested to send the respective corrections within no more than 15 business days.

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