Original article

MENDIVE
REVISTA DE EDUCACIÓN

Neuroscience in educational contexts: a systematic review of evidence based applications and prevalent neuromyths

Neurociencias en contextos educativos: una revisión sistemática de aplicaciones basadas en evidencia y neuromitos prevalentes

Neurociência em contextos educacionais: uma revisão sistemática de aplicações baseadas em evidências e neuromitos prevalentes

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ABSTRACT

The applications of neuroscience in educational contexts constitute a central trend in contemporary evidence based on pedagogy. However, myths regarding brain function during learning still persist in education. The objective of this article was to analyze the applications of neuroscience in education from evidence based on perspective. A systematic review was conducted, in accordance with PRISMA regulations, in the Scopus database. 264 studies were analyzed using bibliometric tools and 15 studies were analyzed using quantitative thematic analysis on the myths and evidence of the application of neuro-education in various school contexts. The thematic analysis was developed using the PICO model (population, intervention, comparison, and outcomes). As a result, an exponential increase in publications on neuro-education was observed in recent years, with European countries leading the scientific production and a very low representation of Latin American countries. Paradoxically, an increase in neuromyths has been found in Latin America, primarily associated with poor teacher training, infrastructure problems, and disconnects from research. Ethical debates on the applications of neuroscience principles in education persist in the literature due to the high prevalence of neuromyths associated with a disconnection from pedagogical practices with scientific approaches to teaching.

Keywords: school contexts; educational equity; evidence; interdisciplinarity; PICO model; neuro-education; neuromyths; systematic review.

RESUMEN

Las aplicaciones de las neurociencias en contextos educativos constituyen una tendencia central en la pedagogía contemporánea basada en evidencia. Sin embargo, aún persisten en la educación mitos referentes al funcionamiento del cerebro durante el aprendizaje. El objetivo del presente artículo estuvo dirigido a analizar las aplicaciones de las neurociencias en la educación, desde una perspectiva basada en evidencia científica. Se realizó una revisión sistemática, de acuerdo a la normativa PRISMA, en la base de datos de Scopus, que analizó 264 estudios mediante herramientas bibliométricas y 15 investigaciones mediante análisis temático cuantitativo sobre los mitos y evidencias de aplicación de la neuroeducación en diversos contextos escolares. El análisis temático se desarrolló bajo el modelo PICO (población, intervención, comparación y resultados). Como resultado se observó un aumento exponencial en los últimos años de las publicaciones sobre neuroeducación, con países europeos como líderes en producción científica y una muy baja representación de países latinoamericanos. Paradójicamente, en Latinoamérica se encontró un aumento de neuromitos, principalmente asociados a formación docente deficiente, problemas de infraestructura y desconexiones con la investigación. Persisten en la literatura los debates éticos sobre las aplicaciones de los principios de las neurociencias en la educación debido a la alta prevalencia de neuromitos asociados a una desconexión de las prácticas pedagógicas con enfoques científicos de enseñanza.

Palabras clave: contextos escolares; equidad educativa; evidencias; interdisciplinariedad; modelo PICO; neuroeducación; neuromitos; revisión sistemática.

RESUMO

As aplicações da neurociência em contextos educacionais constituem uma tendência central na pedagogia contemporânea baseada em evidências. No entanto, mitos sobre a função cerebral durante a aprendizagem ainda persistem na educação. O objetivo deste artigo foi analisar as aplicações da neurociência na educação sob uma perspectiva baseada em evidências. Foi realizada uma revisão sistemática, de acordo com os padrões PRISMA, na base de dados Scopus. Foram analisados 264 estudos utilizando ferramentas bibliométricas e 15 estudos utilizando análise temática quantitativa sobre os mitos e evidências da aplicação da neuroeducação em diversos contextos escolares. A análise temática foi desenvolvida utilizando o modelo PICO (população, intervenção, comparação e desfechos). Como resultado, observou-se um aumento exponencial nas publicações sobre neuroeducação nos últimos anos, com os países europeus liderando a produção científica e uma representação muito baixa de países latino-americanos. Paradoxalmente, observou-se um aumento de neuromitos na América Latina, principalmente associado à formação precária de professores, problemas de infraestrutura e desconexão com a pesquisa. Debates éticos persistem na literatura sobre a aplicação dos princípios da neurociência na educação devido à alta prevalência de neuromitos associados à desconexão entre práticas pedagógicas e abordagens científicas de ensino.

Palavras-chave: contextos escolares; equidade educacional; evidências; interdisciplinaridade; modelo PICO; neuroeducação; neuromitos; revisão sistemática.

INTRODUCTION

Neuro-education, according to Pradeep *et al.* (2024), is a field that combines neuroscience, psychology, and education. It also aims to improve the understanding of learning processes and develop effective educational interventions. This discipline, as Gallardo commented *et al.* (2023), is a fundamental tool in education, since it promotes meaningful learning based on educational principles supported by scientific evidence.

Neuroscience applied to education, therefore, promises to improve teachers' understanding of students' learning processes and well-being (Thomas & Arslan, 2024). Such is the case that Gkintoni *et al.* (2023) argue that integrating neuroscience into educational practices can enhance learning and improve educational practices. However, a growing body of authors argue that ethical concerns must be addressed when implementing neuroscience-based findings in educational contexts, especially regarding their associated neuromyths (Hennes et al., 2023). *et al.*, 2024).

Among the most recurrent neuromyths in educational environments, the belief in learning styles as a scientific fact stands out (Da Nóbrega *et al.*, 2024), misconceptions about neurodevelopmental disorders (Armstrong-Gallegos *et al.*, 2023; Bei, 2023). In addition, the promotion of pseudotherapies without evidence is observed in the literature (Hennes, 2023). *et al.*, 2024; Sazaka *et al.*, 2024). In this sense, neuromyths in education persist due to cultural conditions and biases, and building bridges between neuroscience and education can improve scientific communication and reduce distortions in teaching approaches (Tsang *et al.*, 2024).

Despite the consensus on the potential of neuroeducation, a critical discrepancy persists between scientific advances and its effective application in the classroom. Recent studies (Bei, 2023; Armstrong-Gallegos *et al.*, 2023) reveal that teachers in diverse international contexts adopt practices based on neuromyths (such as learning styles or misconceptions about neurodevelopmental disorders), which maintains ineffective, and even counterproductive, pedagogical approaches. This lack of institutionalization of evidence-based neuroeducational practices influences, according to Sazaka *et al.* (2024), in teachers' practice, with sources including social media, teaching materials, books, and peer interactions.

In this regard, Ulusoy *et al.* (2023) argue that neuromyths in education contribute to pseudoscientific practices and must be identified and eliminated to improve teaching effectiveness and the reliability of the teaching profession and neuroscience research. Therefore, a rigorous analysis is urgently needed to identify and dismantle these myths, since their persistence compromises educational equity and the quality of teaching-learning processes.

Scientific evidence points to an increasing prevalence of neuromyths in education. According to Bei (2023), Italian teachers have significant misconceptions about neurodevelopmental disorders and how neurodivergent students process information to learn. This is consistent with what Armstrong-Gallegos *et al.* (2023) reported, who found that Chilean teachers and other education professionals have more neuromyths about neurodevelopmental disorders than general ones, with dyscalculia being the least well-known, where the belief that it is caused by a lack of effort on the part of students prevails.

On the other hand, German teachers believe that most of the neuromyths mentioned above are true, but specialists are more accurate in identifying them, compared to teachers and the general public (Hennes *et al.*, 2024). Furthermore, according to Da Nóbrega *et al.* (2024), students at the University of Brasilia have a positive view of learning styles, which suggests the need to debunk this neuromyth in initial teacher training.

Eliminating neuromyths in education, therefore, requires teaching neuroscience focused on future educators. Furthermore, according to Ulusoy (2023), addressing these myths in education implies detecting and eliminating them, as they contribute to pseudoscientific practices and can negatively affect the teaching profession and neuroscience research.

The relevance of this research lies primarily in the need to synthesize the available scientific evidence to differentiate neuroscientific findings, as applied in the educational context, from distorted interpretations. Furthermore, it highlights the urgent need to provide educators with evidence-based methodologies and tools to influence informed decision-making.

Therefore, this research differs from previous studies by addressing educational applications supported by neuroeducational evidence, while also debunking the prevalent myths associated with this field of study. This, taken together, justifies the need for a theoretical review that analyzes, from an evidence-based perspective, the scientific foundations and neuromyths associated with applied neuroscience in education. Therefore, the objective of this research is to analyze the applications of neuroscience in education (neuroeducation) from a perspective based on scientific evidence.

MATERIALS AND METHODS

Study design

This study was based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for conducting a systematic review of the literature (Page *et al.*, 2021). This review will explore the applications of neuroscience to education from evidence-based perspectives.

The conceptual framework of this research is aligned with the PICO model (Population, Intervention, Comparison and Results), according to Frandsen `s suggestions. *et al.* (2020). Based on their recommendations, the following research question was defined: What are the applications of neuroscience in education, and what scientific evidence supports its effectiveness at different educational levels?

Search strategy and document selection

Scopus database, using the flow diagram presented in Figure 1, in accordance with the PRISMA guidelines. The search string used was *ITLE-ABS-KEY (neuroeducation) AND PUBYEAR > 2013 AND PUBYEAR < 2025*. This yielded a total of 412 studies (Figure 1).

Of these 412, 74 duplicate files were eliminated and 35 were marked as unreadable. Pre-established inclusion and exclusion criteria were applied to the remaining 303 (language filters were applied for English, Spanish, and Portuguese, and document type for scientific articles, reviews, and books or chapters), resulting in the elimination of 39 studies. A total of 264 publications were selected for bibliometric analysis. Subsequently, the most relevant publications analysis was applied for literature mapping, where the 20 most cited articles were selected. Of these, five were eliminated due to thematic relevance, and the remaining 15 were qualitatively analyzed.

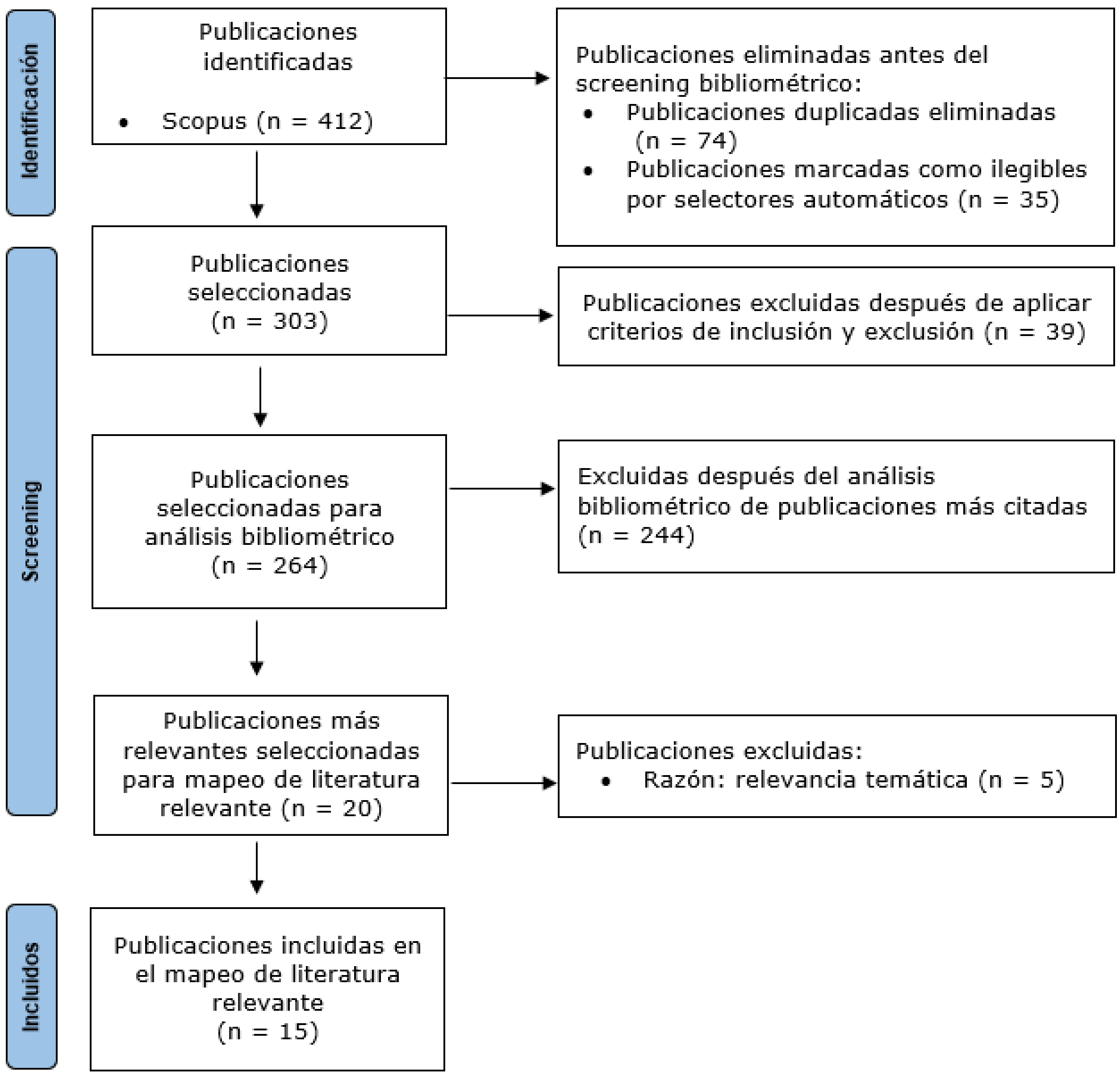

Figure 1. PRISMA flow diagram

Source: own elaboration

Throughout this process, duplicate texts were eliminated using the bibliographic management software EndNote. In addition, two researchers performed a qualitative evaluation of the titles and abstracts to verify that the automatic filtering based on the pre-established inclusion and exclusion criteria was correct. In the event of disagreement regarding the inclusion or exclusion of a document, a third researcher was consulted to act as a mediator to reach a consensus. The texts preselected for bibliometric and thematic analysis were structured based on their alignment with the PICO criteria.

Data extraction and analysis process

For data extraction and analysis, VOSviewer version 1.6.20 was used, along with the search, filtering, and analysis functions integrated into Scopus. Both tools were used to examine annual production metrics, collaboration networks, and citation patterns.

For the qualitative thematic analysis, the results were organized according to the categories derived from the PICO recommendations themselves. In addition, based on manual coding, the results were analyzed based on categories predefined by the authors of this research: persistence of neuromyths and challenges in teacher training, neuro-educational interventions in school settings, and theoretical foundations and implementation challenges.

It should be noted that, although neuromyths were not established as an independent category, given their cross-cutting nature, their analysis was intrinsic to the manual coding process. This allowed us to identify how these pseudoscientific beliefs distort the design of neuroeducational interventions, are perpetuated in specific school contexts, and bias the interpretation of educational outcomes.

Ethical considerations and limitations

In order to minimize the bias inherent in a scientific literature review, a double review was implemented in the selection of documents, using specialized software and through human review. Furthermore, it is recognized that restricting the search only to the Scopus database may omit relevant works not indexed in this system. On the other hand, it is acknowledged that filtering by year may omit older but seminal texts in this field of study. Furthermore, even though three languages were selected for inclusion, it is acknowledged that English is overrepresented in the literature, which could lead to an underrepresentation of texts in other languages.

RESULTS

Bibliometric analysis of the literature

The analysis of annual scientific production indicates a marked exponential growth in recent years (see Figure 2). From a statistical perspective, the annual production graph was complemented with a trend analysis of the results, based on linear and exponential statistics. A significant increase in publications is observed, with two studies starting in 2014; the highest peak is observed in 2024 with 55 publications, representing a growth of 2650% (26.5%) compared to the base year (Figure 2).

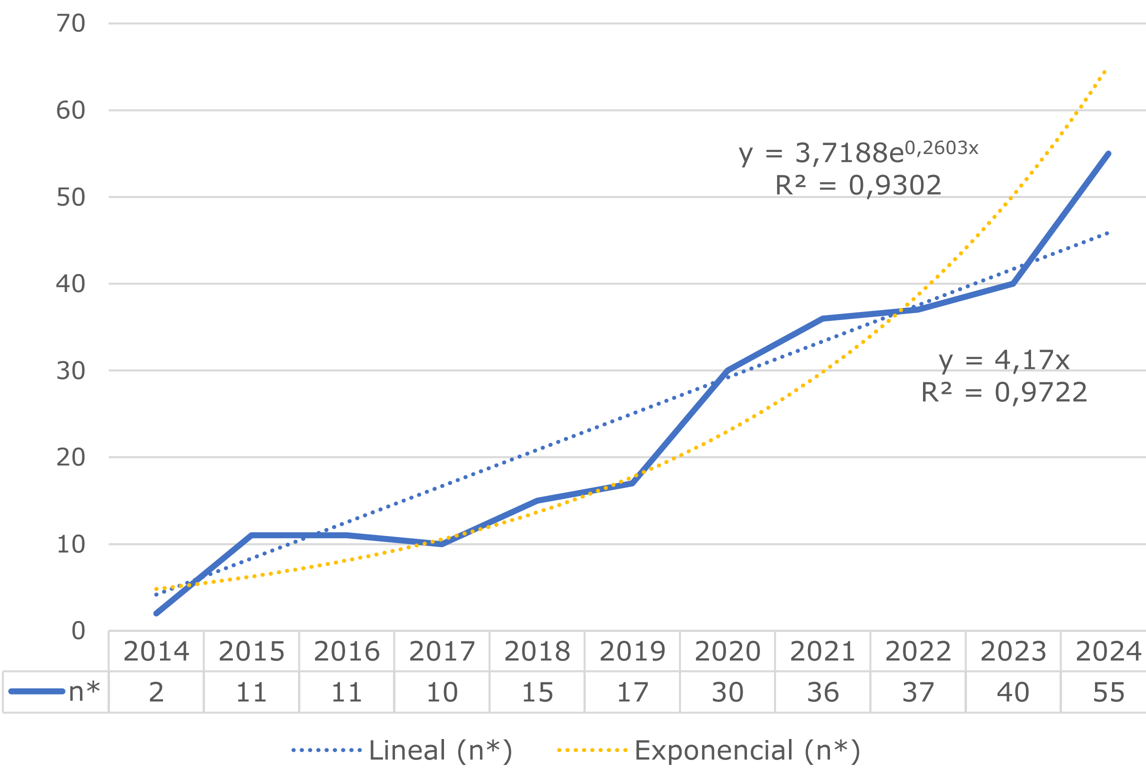

Figure 2. Annual scientific production

Note: * = number of publications

Source: authors' elaboration based on data from Scopus

The linear trend equation (y = 4.17x) indicates that the slope of the line is highly linear, with an average growth rate of approximately 4.17 per year. In addition, the coefficient of determination R2 (.9074) indicates that the linear model correctly explains 90.74% of the variability in the data. In parallel, the analysis of the exponential trend model clearly indicates a growth rate that increases over time, so it is not fixed. The compound annual growth rate ($y = 3.1788e^{0.2603x}$) yields an approximate value of *y* (number of publications predicted in a given year) of 1.297, indicating an annual growth of 29.7%. The value of R^2 (.8431) explains 84.3% of the variation; this indicator is high, although lower compared to the linear model. Both models therefore indicate an almost perfectly linear growth in scientific production on neuroscience applied to education, with sustained and stable growth.

The analysis of cross-country collaboration indicates the presence of four networks. The first, and largest, has a global reach, comprising seven countries (Australia, Brazil, Germany, Greece, Italy, the Russian Federation, and the United Kingdom). The second collaboration network includes four countries, with a Spanish-speaking reach (Canada, Ecuador, France, and Spain). Meanwhile, the third and fourth networks include two countries each, and both have a regional reach of geographic proximity (Chile and Colombia, Mexico and the United States) (Figure 3).

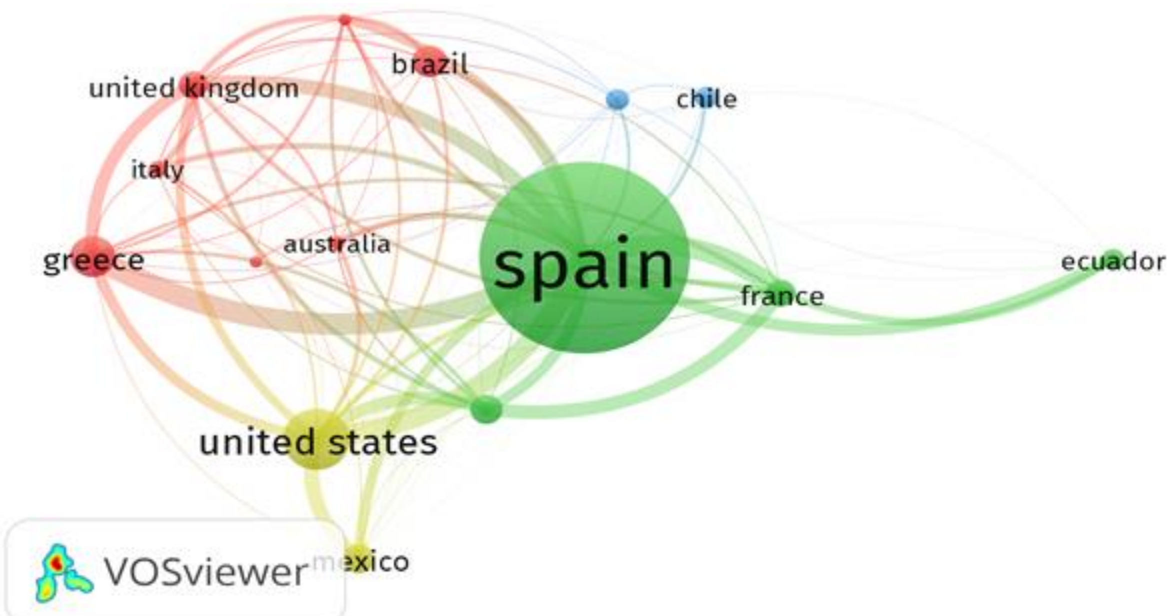

Figure 3. Collaboration networks between countries
Source: authors' elaboration based on VOS viewer

Of the 264 documents that make up this review, only 72.7% (192) of them have received citations in 1594 publications, with an h-index of 19. The statistical results in a linear equation model indicate a slope of 40.655, which translates to an approximate increase of 40.66 citations per year on a constant basis. This growth is not purely linear, since the quality of fit explains only 79.8% of the variance. However, the constant and sustained growth in citations per year indicates that the topic has been gaining academic relevance over time, with a growth of 76.19% in 2024 compared to the previous year (Figure 4).

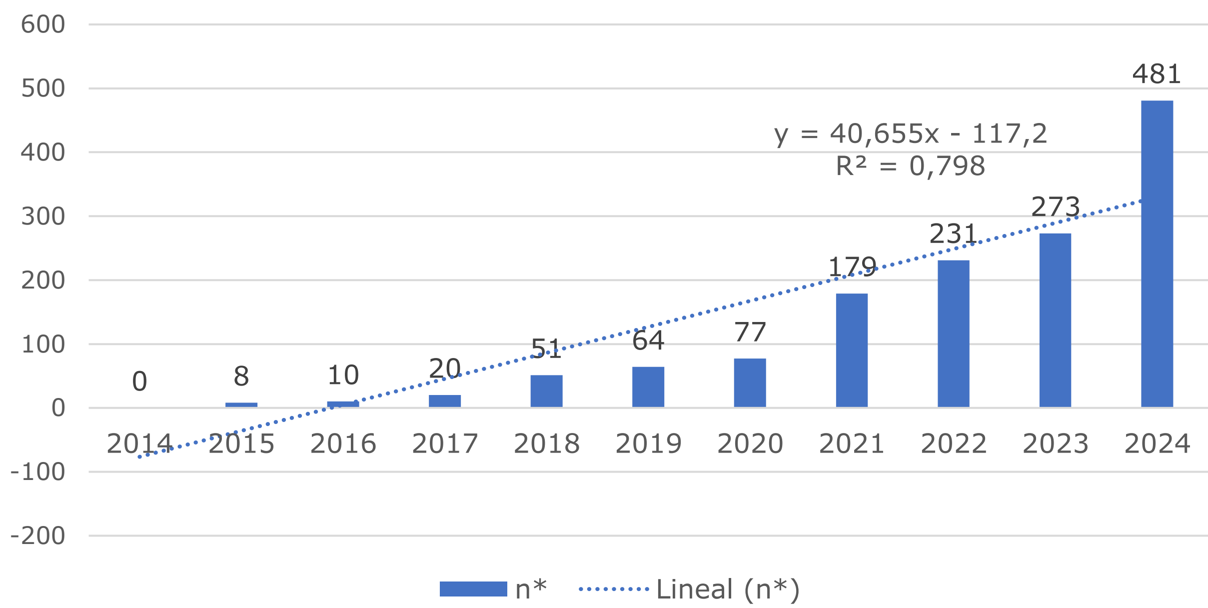

Figure 4. Annual distribution of citations by year

Note: * = number of publications

Source: authors' elaboration based on data from Scopus

Trends in the application of neuroscience in school contexts

An analysis was conducted of the 15 most cited references in the literature within the predefined time range (Table 1). Prior to performing the interpretive analysis, it was assumed that the texts most cited by the scientific community are, in fact, those with the greatest impact.

Furthermore, to truly elucidate the impact of these investigations on separating neuroscientific evidence from neuromyths in the classroom, the studies were classified according to PICO standards. Additionally, through the thematic coding process, thematic content units were designed to encompass themes reiterated in several of these publications.

Table 1. Classification of the 15 most cited articles in the literature according to PICO standards

Code	Appointment	Main objective	Population (P)	Intervention (I)	Comparison (C)	Results (O)
NE1	Espino-Díaz *et al.* (2020)	Optimizing the work of education professionals during the pandemic through ICT and neuroeducation	Education teachers	Use of ICT and neuroeducation	Traditional education without ICT / neuroeducation	Proposal to reduce stress and improve meaningful learning
NE2	Torrijos-Muelas *et al.* (2021)	To review the prevalence of neuromyths in educators and analyze causes / consequences.	Educators (in service / training)	Systematic review of studies	Lack of training in neuroscience	Neuromyths persist due to lack of scientific knowledge and communication
NE3	Papadatou-Pastou *et al.* (2017)	Assessing neuroscientific knowledge and neuromyths in future Greek teachers.	Education students (Greece)	Knowledge and Attitude Survey	Educational level (undergraduate vs. graduate)	Need for neuroscience training to combat neuromyths
NE4	Dubinsky *et al.* (2019)	Explore how professional development in	Teachers (in training / active)	Neuroscience courses with active methods	Traditional teaching	Greater understanding of

		neuroscience improves pedagogical practices.				student-centered pedagogies
NE5	Giovagnoli *et al.* (2017)	To compare the effects of cognitive training, music therapy, and neuroeducation in patients with Alzheimer's.	Alzheimer's patients	Cognitive training vs. music therapy / neuroeducation	Control group (no intervention)	Improvement in initiative (cognitive training) and psychosocial aspects (others)
NE6	Jolles & Jolles (2021)	Propose essential neuroscientific content for teachers and analyze barriers in neuroeducation	Educational professionals	Neuroscience literacy	Lack of interdisciplinary integration	Four key issues for teachers and the need for collaboration
NE7	Feiler & Stabio (2018)	Define neuroeducation through a systematic review of its literature.	Academic literature (neuroeducation)	Thematic analysis of definitions	Different disciplinary approaches	Three pillars: application, interdisciplinarity and language translation
NE8	Horvath & Donoghue (2016)	Bruer 's argument about neuroeducation and levels of	Neuroeducation researchers	Theoretical framework of "bridges" between	Traditional one-way approach	Need for behavioral translation for educational applications

		scientific organization.		neuroscience and education		
NE9	Bos *et al.* (2019)	Evaluate the impact of augmented reality (AR) on student attention.	Students	RA vs. traditional methods	Conventional interface	Increased attention with RA (measured by EEG)
NE10	Flogie & Aberšek (2015)	Analyze attitudes toward a transdisciplinary model of neuroeducation in STEM.	Students and teachers (STEM)	Transdisciplinary teaching (neuroeducation)	Conventional education	Improvement in motivation and attitude towards learning
NE11	Nowinski (2021)	Review the evolution of brain atlases and their applications in neuroeducation / clinics.	Researchers / clinicians	Using advanced brain atlases	Traditional atlases	Clinical and educational applications with innovative tools
NE12	Chang *et al.* (2021)	Investigate how teachers apply neuroscientific concepts (NSC) in classrooms.	Non-scientific teachers	Neuroscience course for teachers	Previous pedagogical practices	Greater integration of ENC into lesson design and student understanding.
NE13	Doherty & Forés Miravalles (2019)	Discuss the relationship between physical activity and	Students (primary / secondary)	Incorporating movement into classes	Traditional sedentary classes	Cognitive and neurophysiological benefits of movement.

		cognition in educational settings.				
NE14	De Vos (2015)	Criticize the "neurologization" of education and its relationship with psychologization.	Education theorists	Genealogical analysis (psychology vs. neuroscience)	Non-neuroscientific educational approaches	Fundamental incompatibility between neuroscience and education.
NE15	Grospietsch & Lins (2021)	Review the persistence of neuromyths and propose strategies to combat them.	Educators / Researchers	Review of studies on neuromyths	Existing educational interventions	Gaps in methodology and effective interventions against neuromyths.

Source: prepared by the authors

Persistence of neuromyths and challenges in teacher training

The studies included in this systematic review suggest a rise in concerns about neuromyths among educators. They emphasize that this occurs despite decades of research in neuroscience applied to education.

Publications NE2 and NE15 together demonstrate that misconceptions about brain organization and function are increasingly present in teaching practices. Both groups of authors infer that this phenomenon is due to the lack of scientific training in teaching staff and the disintegration of relationships between teachers and researchers.

This situation is concisely demonstrated in NE3, in whose study Greek preservice teachers demonstrated strong beliefs in neuromyths, and most strikingly, especially in special education. The systematic review conducted in NE15 reveals three gaps that, in the authors' opinion, are critical due to their implications: the need to assess the real impact of neuromyths on the teaching-learning process, develop effective interventions to combat them, and establish standardized methodologies for identifying them.

These findings, viewed from the synthetic-analytical perspective of this study, point to the urgent need to strengthen training programs in neuroscience concepts for teachers, as noted in NE4 and NE6. This, according to both publications, must be achieved by incorporating neuroscience content based on evidence-based practices.

Neuro-educational interventions in school contexts

In parallel with the previous thematic line, which concluded by establishing the need for training programs for teachers, this thematic line aims to elucidate these interventions based on the literature reviewed. Regarding this topic, NE1 highlights the potential of Information and Communication Technologies (ICT), combined with neuroscientific principles of learning during the pandemic. This was achieved, as the authors note, due to the support it provided to teachers, as it served as a tool to mitigate the stress of these new teaching conditions.

In the field of educational technologies, the NE9 study used electroencephalography (EEG) as an objective method to assess the impact of augmented reality on students' attention. The authors used this neuroimaging technique to scientifically compare attention levels during augmented reality activities versus traditional passive learning methods. The EEG results demonstrated measurable differences in brain activity patterns associated with attention, allowing the researchers to conclude that augmented reality generates a more favorable cognitive response than conventional approaches.

For its part, NE13 presents solid arguments for the cognitive benefits of incorporating movement into the classroom. From a neuroscientific perspective, this is supported by the fact that physical activity leads to improvements in attentional, mnemonic, and motivational systems through neurophysiological mechanisms, especially associated with the activation of the autonomic nervous system and the contributions of psycho-neuro-inmuno-endocrinology.

These neuroscience-based approaches were supported by NE10. In this study, the authors develop a transdisciplinary model of cognitive training in STEM (Science*, Technology, Engineering and Mathematics)*. This, a priori, showed promising results in improving motivation and attitude in students in these areas; although NE5 offers a more cautious perspective on the application of these neuroscientific principles in cognitive training. For these authors, these strategies show benefits in patients with Alzheimer's, but with temporary effects. This is interesting because in the early stages of the disease, the concept of cognitive reserve becomes relevant, which points to the need for cognitively stimulating activities throughout the life cycle.

Theoretical foundations and implementation challenges

At this point, it is clear that the application of neuroscientific principles in education faces challenges in theory and practice. At the theoretical level, a gap persists between advances in neuroeducation and their effective pedagogical translation, often mediated by simplistic or mythologized interpretations. In practice, evidence-based interventions confront diverse school realities, where teacher training, available resources, and local educational cultures determine their implementation. This tension points to the need to develop action frameworks that organically articulate neuroscientific knowledge with the real dynamics of educational contexts.

In this regard, NE7 proposes that there are three fundamental pillars of neuro-education: application, interdisciplinary, and language translation. In parallel, NE11 explores the role of brain mapping as a proposal to enrich teacher training and, as an added value, educational practice.

Although the benefits of understanding brain activation and processing patterns in education are evident, NE8 and NE14 warn about the limits of generalizing neuroscientific findings directly to the classroom. These groups of authors argue in their respective studies that this requires cautious mediation that operates through behavioral sciences and pedagogical practices.

The latter aligns with two key studies in this review, which agree that the success of applied neuroscience in education will depend on overcoming disciplinary barriers (as highlighted in NE6) and developing robust theoretical frameworks based on empirical evidence (according to NE7). Furthermore, the authors of this paper add to these suggestions the creation of effective channels for translating research into contextualized teaching practices.

DISCUSSION

To this point, the findings of this study indicate that neuro-education, even if it bases its practices on replicable scientific evidence, operates between ethical, contextual and epistemological challenges. In this sense, Giraldo and Osorio (2024) argue that the challenges facing educational systems in Latin America include social and economic inequality, limited access to quality education and the homogenization of ideas influenced by capitalism and globalization.

Regarding the above, González-Gómez *et al.* (2024) found that lower educational levels in Latin America are associated with reduced brain volume and connectivity, and educational disparities drive differences in brain health across regions. Regarding this, Justus *et al.* (2024) propose that neuro-education communicators can help translate neuroscience educational research into practice through grassroots professional learning communities, addressing urgent educational needs and improving students' mental health.

A general analysis of the most cited texts reflects the predominance of interventions based on contextual theories that involve neuroscientific precepts in educational contexts, such as mindfulness techniques and emotional and behavioral self-regulation (Charnonnier *et al.*, 2023; Khan & Jameel, 2024). In Cuba in particular, there is a growing body of researchers focused on enhancing these socio-emotional competencies in educational contexts, especially in Higher Education (Hernández-Lugo *et al.* 2025).

Additionally, in Brazil, mindfulness and socio-emotional learning interventions have been developed, incorporating elements of *mindfulness* and socio-emotional learning to improve emotional, behavioral, relationship, and prosocial behavior (Waldemar & De Freitas, 2024). In parallel, in Cuba, interventions to improve self-regulated learning as a protective factor against academic stress from a neuropsychological perspective have been shown to increase students' metacognitive abilities and foster motivation toward the educational environment (Díaz-Guerra *et al.*, 2024).

Another significant aspect of this review is the high prevalence of erroneous beliefs about the principles of neuroscience applied to pedagogical contexts in Latin America. Such is the case that Ahuerma *et al.* (2024) suggest that neuromyths about learning styles, brain anatomy, and neurochemicals prevail among students and teachers in Mexico, negatively impacting the teaching-learning processes. Similarly, younger Brazilians have a better understanding of neuroscience, while the northern and southern regions have a poorer understanding of the subject (Arévalo *et al.*, 2022). Furthermore, according to Hoyos (2024), teachers in Colombian public institutions have little knowledge and mastery of neuro-education, which recommends a change in teaching strategies based on brain-based learning.

Finally, there is a relative consensus in the literature that interventions to dispel educational neuromyths include refutation texts integrated into short training sessions, personalized texts, reflective experiences, and immersive experiences within research groups (Rousseau, 2024). Furthermore, incorporating information about the brain into education courses can be an effective way to promote critical thinking and dispel common neuromyths among pre-service teachers, according to Seccia & Alle (2024).

Neuro-education is emerging as a promising field for transforming pedagogical practices, although its implementation faces significant challenges. It is striking how these advances coexist with the persistence of deep-rooted neuromyths, particularly in regions with limited access to scientific teacher training.

This phenomenon is particularly relevant in Latin America, where recent studies have shown that a large proportion of educators hold pseudoscientific beliefs about learning styles and neurodevelopment. This discrepancy could be explained by multiple interconnected factors, where the lack of access to validated information perpetuates ineffective practices. However, there is a growing body of authors demonstrating that initiatives focused on teacher training can break this cycle. Their approach, which combines neuroscientific foundations with active methodologies, has shown encouraging results in reducing erroneous beliefs.

A crucial aspect that emerges from the analysis is the need to balance scientific rigor with practical applicability. STEM interventions illustrate how transdisciplinarity can build bridges between laboratories and classrooms. However, the risk of oversimplifying neuroscientific findings is noted as a pending challenge.

The exponential growth in publications suggests that the field is reaching maturity, although tensions persist between its transformative potential and contextual limitations. It is important to note that solutions require systemic approaches that integrate policies that foster international collaboration and teacher training programs that prioritize critical thinking aligned with neuro-educational evidence.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.

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