VISUAL REVIEW | Vol. 18, 4, 2026 | ISSN 2695-9631
International Visual Culture Review / Revista Internacional de Cultura Visual
https://doi.org/10.62161/revvisual.------ (added by the editor)

THE NEUROCLASS MODEL IN TEACHER PROFESSIONAL DEVELOPMENT: EVIDENCE FROM EDUCATIONAL PRACTICE AND AUDIOVISUAL RESOURCES

EL MODELO NEUROCLASE EN EL DESARROLLO PROFESIONAL DOCENTE: EVIDENCIAS DESDE LA PRÁCTICA EDUCATIVA Y LOS RECURSOS AUDIOVISUALES

Sonia Guerra Iglesias [1]
Rudy García Cobas [2]
Andrea Pacheco Lemus [3]
Amarilys Campoverde [4]

[1] Universidad Bolivariana del Ecuador, Ecuador.
[2] Universidad Bolivariana del Ecuador, Ecuador.
[3] Universidad Bolivariana del Ecuador, Ecuador.
[4] Universidad Bolivariana del Ecuador, Ecuador.

How to cite this article: (ACCORDING TO APA 7 STYLE)

Guerra Iglesias, Sonia, García Cobas, Rudy, Pacheco Lemus, Andrea, Campoverde Amarilys (2026). The neuroclass model in teacher professional development: evidence from educational practice. *VISUAL REVIEW. Revista Internacional De Cultura Visual*, ##, pp-pp. (Book Antigua 12, justified). https://doi.org/10.62161/revvisual.------ (added by the editor)

CC BY NC ND

RESUMEN

La neuroclase, concebida como la organización del proceso de enseñanza-aprendizaje fundamentada en el funcionamiento cerebral y la caracterización psicopedagógica de los estudiantes, representa una concreción práctica de la neurodidáctica en el ámbito educativo. El objetivo de este estudio es construir y evaluar teóricamente el constructo neuroclase, reinterpretando la experiencia de trabajo desarrollada durante tres períodos académicos consecutivos (2023-2026) en la formación inicial docente, con maestros en ejercicio. La investigación adopta un enfoque mixto, de alcance exploratorio-propositivo con un diseño predominantemente documental/ transeccional con inserción aplicada, estructurado en tres niveles de análisis (epistemológico, conceptual y praxiológico-teórico). Se sistematizó la praxis en el seguimiento al proyecto neuroclase en el programa de estudio, con tres cohortes independientes de estudiantes, permitiendo evaluar las características, los ajustes y los resultados obtenidos durante su implementación. El análisis integró métodos teóricos y empíricos, procedimientos de la estadística descriptiva, análisis temático, triungulación de fuentes, triangulación metodológica y etapas de la investigación-acción reflexiva para contrastar la teoría con la evidencia empírica acumulada. Los hallazgos evidencian la evolución y consolidación del constructo neuroclase, materializado en una concepción holística que articula las contribuciones del Proyecto Neuroclase a la formación docente. Se demuestra la estabilidad del modelo formativo y su capacidad de adaptación a través de las sucesivas cohortes. Se concluye que la inserción de la neuroeducación mediante el Proyecto neuroclase constituye una aportación relevante al desarrollo profesional docente, fundamentada en buenas prácticas sostenidas en el tiempo y respaldadas por un seguimiento sistemático de las competencias docentes.

Palabras clave: buenas prácticas, Desarrollo profesional, neuroclase, neuroeducación, neurodidáctica y competencias docentes.

ABSTRACT

The neuro-class (*neuroclase*), conceived as the organization of the teaching-learning process grounded in brain functioning and the psychopedagogical profiling of students, represents a practical realization of neurodidactics in education. This study aims to construct and theoretically evaluate the neuro-class construct, reinterpreting the work experience developed over three consecutive academic periods (2023-2026) in initial and in-service teacher training. The research adopts a mixed-methods approach with an exploratory-propositive scope, featuring a documentary-cross-sectional design with applied insertion, structured into three levels of analysis (epistemological, conceptual, and praxiological-theoretical). The praxis of the Neuro-class Project was systematized across three independent cohorts of in-service teachers, allowing for the evaluation of characteristics, adjustments, and outcomes obtained during its implementation. The analysis integrated theoretical and empirical methods,

descriptive statistics, thematic analysis, methodological triangulation, and stages of reflective action research to contrast theory with accumulated empirical evidence. Findings demonstrate the evolution and consolidation of the construct, materialized in a holistic conception that articulates the contributions of the Neuro-class Project to teacher professional development. Furthermore, the stability of the training model and its adaptability across successive cohorts are established.It is concluded that the integration of neuroeducation through the Neuro-class Project constitutes a relevant contribution to pedagogical praxis, grounded in sustained best practices supported by systematic monitoring of teaching competencies.

Keywords: good practices, professional development, neuro-class, neuroeducation, neurodidactics, teaching competencias.

1. Introduction

In recent decades, universities that offer teacher education degrees as part of their academic and curricular provision have approached the relationship between neuroscience and education with growing interest in research, in outreach activity, and in educational practice. In the context of higher education, this response is oriented toward the need to provide empirical evidence relating to psychopedagogical and pedagogical decisions in the educational field and, with it, the development of professional competencies that favor good classroom practices in educational institutions, whose inclusive approach makes it possible to empower teachers with regard to how the brain learns, moving beyond approaches based solely on intuition or on poorly tested didactic traditions.

A critical review of the foundations of the teaching role makes it possible to refute both the position that denies the usefulness of the neurosciences in education and the one that demands an unfeasible neuroscientific specialization. In contrast to these polarized perspectives, the case for an educator with a solid neuroeducational profile is gaining ground. According to Mora (2022), "a new kind of teacher is emerging: neuroeducators"

On this premise, it is argued that teacher training should make it possible to interpret neuroscientific findings critically and translate them into teaching strategies that are inclusive, effective, and focused on respect for student diversity at different educational levels. Multiple systematic reviews agree in pointing to a persistent gap between the neuroscientific knowledge available and its effective incorporation into initial and continuing teacher education programs, as noted by Jolles & Jolles (2021) and Navarro (2021). This situation limits the possibilities for teachers to develop competencies for designing learning experiences aligned with principles such as brain plasticity, the emotion-cognition relationship, selective attention, and memory consolidation, among others.

In this regard, Garay, Lagos, and Campos (2026) report that the incorporation of neuroscientific knowledge into teacher education programs remains uneven and fragmented. Nevertheless, neuroeducation and neurodidactics have gained ground through an interdisciplinary approach to the stimulation of brain activity, with a highly valuable point of didactic-curricular and methodological intersection: the

neuroclass, that is, the grounding and planning of the lesson using sensory methodologies and other alternatives of this kind.

The neuroclass is a project that emerges as a practical realization of the diversification of methodological actions and alternative activities that are systematized in a way of organizing academic activity centered on the particularities of the brain and on the profile of the students, and oriented in addition toward the appropriation of knowledge, the development of competencies, the generation of cognitive and social interests, and emotional management. Authors such as Ocampo (2019) regard it as the microcurricular didactic design (at the level of the session or didactic unit) that aligns the teaching-learning process with brain functioning within the framework of neurodidactics:

"Neurodidactics, through its theories, foundations, and strategic and methodological realization, will in some way allow an efficient development of the learning and teaching process" (Ocampo, 2019, p. 18).

Teacher professional development involves not only updating content, but transforming practice through reflection and evidence. The neuroclass offers a concrete framework for that process, since it allows the teacher to design experiences that respect brain plasticity, manage cognitive load, integrate the emotional dimension, and promote active and meaningful learning.

The analysis of various precedents made it possible to introduce the neuroclass project from an innovative approach into the Neuroeducation program of the Education Sciences degree at the Universidad Bolivariana del Ecuador (UBE). In 2023, certain limitations to its implementation were found, associated with methodological and organizational change: there was a degree of insecurity about how to apply the strategies, a preference for already familiar methods and erroneous interpretations of certain neuroeducational principles, as well as little knowledge of neuroinclusion supported by digital resources, low initial participation , and difficulty in self-regulating learning, mainly among trainee teachers already working in the education sector. This led to the research being conducted within the framework of the institutional research line **Society, inclusion and diversity.**

A scientific question therefore arises: In what way does the critical reinterpretation of the training experience implemented during the period 2023-2026 in initial teacher education make it possible to structure and validate the theoretical model of the neuroclass from the standpoint of neuroeducation and inclusion?

The research was carried out at the Universidad Bolivariana del Ecuador (UBE), which has various initial teacher education programs. The Neuroclass Project was progressively incorporated as an educational innovation strategy in the Neuroeducation course, with a didactic, innovative, and professionally practical approach. It was conceived as a training experience aimed at strengthening the relationship between neuroeducational theory and pedagogical practice, promoting the construction of didactic proposals grounded in scientific evidence on learning in inclusive contexts of different kinds.

- Objective

To design and assess the theoretical model of the neuroclass through the reinterpretation of the initial teacher education experience developed over three consecutive academic periods between 2023 and 2026.

3. Methodology

The present research was conducted from a mixed approach, integrating quantitative and qualitative methods in a complementary manner. The methodological strategy is structured in three interrelated levels. To this end, the following methods are used: the historical-logical method, to reconstruct the evolution of the neuroclass construct; the analytic-synthetic method, to break down the essential elements concerning neuroeducation, neurodidactics, and the neuroclass and then synthesize the common elements to be taken into account in the methodological perspective of the study; content analysis, which makes it possible to identify the content of this category and its theoretical deconstruction; and theoretical modeling, to construct a conceptual representation of the neuroclass project.

Stages of action research are introduced in combination with a focus group made up of 14 university teachers. Finally, source triangulation and methodological triangulation make it possible to arrive at concrete contributions, centered on a three-dimensional triangulation (neurobiological bases – neurodidactic mediation – sociocultural contextualization) for evaluating the neuroclass project.

Level I corresponds to the theoretical foundation. This level focuses on the evolution and resignification of the neuroclass construct. It addresses the conceptual genealogy of the term, its historical development, and its integration into the academic field of the education sciences. A critical resignification of the construct in the contemporary context is proposed, establishing the theoretical bases that guide the subsequent levels.

Level II is oriented toward teacher training based on applied neuroscience. It analyzes the research architecture needed to study the intersections between neuroeducation, neurodidactics, and everyday pedagogical practice. It focuses on the theoretical and methodological contributions that make it possible to connect neuroscientific knowledge with the design and development of training processes.

Level III incorporates methodological integration through educational design studies supported by mixed methodologies aimed at co-creating, implementing, and refining neurodidactic interventions directly in the classroom. Action research and the focus group with 14 teachers, used as a device for co-construction and validation, are combined in a complementary manner. On the basis of an initial model for the design and application of the Neuroclass project, the students (in-service teachers) systematically evaluate the strengths and the needs of the neurodidactic strategies embodied in that project.

The study is defined as mixed, theoretical, multi-cohort, and longitudinal research in which the unit of analysis consists of the neuroclass projects produced by students of the Education Sciences degree who are in-service teachers.

4. Results

4.1. Analysis of the evolution of the neuroclass construct

The analysis carried out around the neuroclass makes it possible to bring together the theoretical foundation, the practical dimension of teacher training, and the integration of design studies with the participation of different actors. The study made it possible to apply the methods of systematic review, content analysis, and thematic analysis to different works, which led to an epistemological deconstruction in which different criteria coexist as part of pedagogical discourse.

Among the fundamental findings is that the reference to the neuroclass is not always explicit; the evidence tends to be found as the neurodidactic application to the lesson or as the neurocognitive lesson, among others. The specific search on the Neuroclass Project (Proyecto Neuroclase/Neuroclass) reveals no evidence that it has been the subject of longitudinal or cross-sectional studies published in high-impact scientific journals indexed in Scopus Q1-Q2, WoS/JCR, and SSCI. The results located correspond mainly to academic teacher-training materials, course projects, student presentations, and documents on educational application, not to peer-reviewed research.

There is robust evidence on neurodidactic interventions, executive functions, metacognition, self-regulated learning, neuroeducation, and Universal Design for Learning (UDL), which can serve as a basis for defining quality criteria for the Neuroclass Project; there is as yet no internationally recognized model called "Neuroclass" as a consolidated theoretical construct.

The interpretation of the teaching profession in this changing world, shaped by advances in science, technology, and artificial intelligence, requires, according to Ibernón (2022), guidelines that make it possible to glimpse horizons for critical lifelong training. This is evident in the study of the evolution of the term, which finds that neuroclass is not a classic term in the history of the neurosciences applied to education, but an applied derivative that arises within the rise of neuroeducation and neurodidactics. In this framework, “neuroclass” functions as a concrete tool of application: the planning and delivery of the lesson itself according to neuroscientific principles (motivation, curiosity, emotion, meaningful repetition, etc.). It forms part of the proliferation of terms with the prefix “neuro” (neuroeducation, neurodidactics, neurolearning, neuropedagogy), which constitutes a good reference point for inclusive processes.

In this regard, it has been noted:

“In the university setting, inclusion is understood as an educational process that provides for the participation of students with diverse needs and conditions.” (Chanta, Díaz, & Prado, 2025, p. 1)

It is a dynamic process under constant construction, whose aim is to guarantee equity and equal opportunities throughout all stages of academic training, with special attention to students with disabilities.

In the different settings, the term neuroclass is related to neurodidactics and has the potential to be enriched at the theoretical level through its inclusion and monitoring in training processes in the Ecuadorian context.

The clearest documented use of the term appears in the work of the Bolivian educator and researcher David Ocampo Eyzaguirre, a specialist in neuroscience, neurodidactics, and competency-based education. In his book Neurodidáctica:

Aportaciones al proceso aprendizaje y enseñanza, published in 2019, he devotes a specific section to the "neuroclass plan as a realization of neurodidactics in the learning and teaching process," presenting it as a practical organizational strategy that starts from the recognition of the student as an active subject and from the functioning of the nervous system. It is a term used in Spanish-speaking America, which may be more consistent with the epistemologies of the Global South.

In this framework, "neuroclass" functions as a concrete tool of application: the planning and delivery of the lesson itself according to neuroscientific principles (motivation, curiosity, emotion, meaningful repetition, etc.). There is no consensus as to whether it forms part of the proliferation of terms with the prefix "neuro-" (neuroeducation, neurodidactics, neurolearning, neuropedagogy) that seek to translate findings about the brain to the classroom; however, it is a framework for action that, when theoretically grounded, can open up new perspectives in the educational field.

The neuroclass ceases to be understood merely as a physical space conditioned by neurobiology and is resignified as a sociocognitive and ecocultural construct, in which brain plasticity is inseparably linked to attention to diversity. This has practical implications for the Neuroclass project, since it is reconceptualized as a scaffold that operates in praxis while translating neurobiological complexity into inclusive pedagogical and didactic-curricular tools, which makes it possible to avoid segregation by attending to neurological profiles related to the neuropsychopedagogical characterization of students, as recognized by Guerra and Bodero (2025), thereby promoting equity in the classroom.

One thesis upheld in this analysis, which assigns the teacher the category of enhancer of brain development, consists in recognizing that "the teacher in the classroom modifies that organ every day through educational experiences; it has been scientifically demonstrated that the brain changes physically through the acquisition of knowledge and the development of skills, through the establishment of synapses between neurons and the reinforcement of those neural connections...." (Díaz-Cabriales et al., 2021, p. 61).

With regard to the second level, the approach moves from abstract theory to curriculum design and teacher mediation, establishing how to train educators from a rigorous neurodidactic paradigm. It goes beyond critical neuroscientific literacy and beyond superficial training courses, since the trainee teacher must acquire competencies in neuroscience applied to the field of learning in order to strengthen working memory, executive functions, and emotional and attentional processing, mediated by didactics and its specificities.

Transformative pedagogical praxis is taken as a reference point for action, with the integration of the principles of Universal Design for Learning (UDL), grounded in the affective, recognition, and strategic brain networks, allowing teachers to design classroom experiences that respond to real neurodiversity without labeling, and much less pathologizing, individual differences.

4.2. Results on theoretical and methodological references on neuroeducation and neurodidactics focused on the lesson

Among other findings and contributions of longitudinal studies related to the object of study, over a period selected for these theoretical inquiries running from 2015 to 2025, the most general element used was the evolution of the application of neuroeducation and neurodidactics in teacher education programs, with data of interest that appear in Table 1.

Tabla 1. *Estudios sobre la evolución y la continuidad de la formación docente en neuroeducación*

Año	Autores	Foco en evolución o continuidad	Diseño y muestra	Aportaciones principales
2015	Cantó Doménech	Implementación en aula tras un periodo formativo (educación infantil, 3 a 5 años)	20 docentes que aplicaron hallazgos neurocientíficos después de formarse	Documenta la implementación práctica y propone la retroalimentación entre universidad y escuela como vía de mejora.
2019	Schwartz et al.	Cambio en la planificación docente tras un curso de 36 horas	Piloto pretest-postest con docentes de áreas no científicas	Mejoró significativamente la comprensión neurocientífica, y las planificaciones revisadas integraron pedagogías más centradas en el estudiante.
2019	Tan et al.	Ciclos de mejora colaborativa del aula	Dos ciclos de *learning study* con 8 docentes de primaria en Columbia Británica	El *learning study* funciona como modelo de desarrollo profesional donde la teoría neurocientífica se aplica y se prueba en el aula.
2021	Chang et al.	Uso posterior de lo aprendido en la práctica real	Seguimiento cualitativo de 14 docentes que cursaron un programa de 3 semanas; 6 aceptaron observación de clase y entrevistas	Usaron los conceptos para justificar decisiones pedagógicas, organizar la clase, comprender a sus estudiantes y responder a su contexto.
2022	Guberman et al.	Evolución de competencias durante y después del curso	Análisis de informes reflexivos de 19 docentes de matemática de primaria	Las competencias pasaron de listar datos a analizar su sentido, y luego a valorar aplicaciones e intentar integrarlas en la enseñanza.
2024	González Velásquez et al.	Estudio de caso longitudinal (2019–2022)	Docentes universitarios colombianos de ciencias; entrevistas y prueba de desempeño antes y después	El programa modificó el conocimiento didáctico y la forma de vincular disciplina, didáctica y neurociencia cognitiva.
2024–2025	Muchiut et al.	Trayectoria de varios años del mismo proyecto neurodidáctico	Estudio iniciado en 2021 con avance en 2024 y cierre de tres instancias en 2025 (30 estudiantes de secundaria en el cierre)	Es la única secuencia hallada con seguimiento por etapas de un mismo proyecto aplicado en aula.

Source: Research team
Source(s): Research team, 2026

The search focused on evolution, continuity, and type of study highlights the following central elements:

- The sample of participating teachers undergoing training is relatively small, given that it includes from 8 to 20 trainee teachers.
- The training periods range from weeks to 3 years, depending on the nature of the training process.
- The longest follow-up cycles were those of the studies by Guberman et al. and Muchiut et al., both of 3 years, which is why they are regarded as an important reference for the present research.
- The longitudinal study by Álvaro Muchiut, Paola Vaccaro, Marcos Pietto, and Belén Sánchez showed significant improvements in planning, working memory, cognitive flexibility, inhibitory control, and attention when these functions were incorporated into the school curriculum.
- Use of quantitative, qualitative, and mixed methodologies in tracking pre- and post-intervention trajectories.

Methodological criteria of interest for the development of lessons applying neurodidactics are also derived, such as the following:

- The need to document neuroeducational evidence in lessons
- Neurodidactics in the classroom requires the lesson to be organized in advance
- The neuroeducational and neurodidactic resources to be implemented must go through assessment, integration, and application.
- The need for concrete practical applications according to the particular characteristics of the students.
- Feedback between the university and schools as a means of improving the integrative lesson, with the incorporation of neurodidactic methodologies.
- The importance, in the first instance, of understanding the neurosciences applied to education.
- Use of learning studies as a model of professional development.

The quantitative data show consistent results. A two-year quasi-experimental study conducted in Spain (Caballero-Cobos & Llorent, 2022) with 209 secondary school students demonstrated that training their teachers in neuroeducation produced significant effects on reading competence, mathematical competence, and empathy (socio-emotional area) compared with the control group, following repeated-measures analysis of variance (ANOVA). Recent systematic reviews confirm similar patterns. A review based on the PRISMA protocol *(*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*)* (2018-2024) concludes that teacher training in neuroeducation improves participants' disciplinary, behavioral, and emotional competencies, with a positive cascade effect on their students.
Likewise, various technology-mediated training interventions, including online courses, MOOC-type programs, and neuroeducation training experiences, have shown significant increases in the neuroscientific literacy of future teachers and reductions in adherence to educational neuromyths. Authors reporting favorable results through pretest-posttest or quasi-experimental designs include Grospietsch and Mayer (2018), Ferrero et al. (2020a, 2020b), Menz et al. (2021), McMahon et al. (2019), and Chang et al. (2021). These studies show that conceptual refutation strategies, explicit training in neuroscience, and virtual learning environments contribute to strengthening neuroeducational literacy and critical thinking with regard to neuromyths.

Tabla 2. *Resumen de estudios sobre formación docente en neuroeducación*

Autor(es)	Año	País	Diseño	Participantes	Intervención	Resultados	Limitaciones
Caballero-Cobos y Llorent	2022	España	Cuasi-experimental longitudinal (2 años; pretest-postest con grupos experimentales y control)	209 estudiantes de 1.º de ESO (tres colegios de una misma localidad; ~53 % chicas; M = 12,18 años). Efectos medidos en el alumnado tras la formación de sus docentes	Programa de formación docente en neuroeducación (principios de neurociencia educativa aplicados al aula)	Efecto significativo sobre competencia lectora, matemática y empatía en los grupos experimentales frente al control (ANOVA de medidas repetidas)	Grupos no equivalentes; contexto local limitado; no se detallan las características de los docentes formados ni el seguimiento más allá de los dos años
Segura Delgado y Ramírez Bahena	2026	España	Cuasi-experimental pretest-postest (con controles históricos; análisis transversal)	Docentes en formación inicial (Grado en Maestro de Educación Primaria, Universidad de Salamanca); dos grupos experimentales (GE1 y GE2)	Experiencias educativas virtuales mediadas por MOOC: una teórica (EVT, «Neuroeducación para educadores») y otra práctica (EVP, con Guía NeuroPlaneador Docente)	Incremento significativo de la alfabetización neuroeducativa en ambos grupos (GE1: d de Cohen = 1,49; GE2: d = 0,93)	Controles históricos (no contemporáneos); diseño transversal; posibles sesgos de autoselección o de implementación virtual; evaluación centrada en conocimiento, no en transferencia al aula
JohnBull y Hardiman	2023/2024	EE. UU.	Cuasi-experimental pretest-postest	Tres cohortes de docentes en servicio	Desarrollo profesional (DP) en neuroeducación: conocimiento pedagógico basado en ciencias del aprendizaje y estrategias instruccionales. Dos cohortes: 5 meses; una: 2 semanas	Aumento de las creencias de autoeficacia docente en todas las cohortes. El marco neuroeducativo ayuda a traducir la investigación en práctica	No se detalla un grupo control equivalente; una cohorte de duración muy corta; resultados centrados en autoeficacia (no en la práctica observada ni en el aprendizaje del alumnado)
Gutshall	2020	EE. UU.	Intervención pretest-postest a nivel de escuela (cuasi-experimental)	Docentes de primaria	Enseñanza de conceptos introductorios de neurociencia (neurodesarrollo, neuroplasticidad, sueño, estrés, ejercicio, mentalidad de crecimiento, autorregulación y *grit*)	Impactos significativos en la mentalidad, la eficacia, el enfoque de aprendizaje y el *grit* docentes; mayor aumento en mentalidad de crecimiento	Muestra a nivel de escuela (generalización limitada); no se reportan detalles completos del grupo control ni tamaños exactos; evaluación de creencias más que de cambios conductuales a largo plazo

Nota. ESO = Educación Secundaria Obligatoria; GE = grupo experimental; EVT = experiencia virtual teórica; EVP = experiencia virtual práctica; MOOC = curso en línea masivo y abierto; DP = desarrollo profesional; M = media; d = d de Cohen.

Source(s): Research team, 2026

The analysis carried out on the basis of the foregoing data provides theoretical and methodological elements for modeling the Neuroclass Project and applying it at the Universidad Bolivariana del Ecuador (UBE) as a route to teacher professional development, conceived as a continuous, systematic, and transformative process in which educators update, deepen, and restructure their knowledge, pedagogical competencies, ethical stances, and didactic practices throughout their professional careers, which, in the words of Varela & García (2024), involves reflection on one's own practice, which they link to didactic strategies.

4.3. Longitudinal study and methodological route of the neuroclass project

The longitudinal study was based on a qualitative-quantitative approach for outlining the methodological route, combining the focus group and reflective action research, as well as source triangulation for empirical data and methodological triangulation. The

logic followed makes it possible to delimit the methodological and intervention actions, as presented below:

- Implementation of the prior methodological training protocol.
- Support and mentoring for the application of the neuroclass project.
- Exploratory action guide for formative feedback.

4.4. The prior methodological training protocol

The 6-week training program served as the methodological bridge for creating the teachers' orienting basis through rigorous, research-based praxis, which ensured that the projects were not designed in an empirical and spontaneous manner, but through reflective action research. The protocol is one of the fundamental contributions of the process and comprises the following operational cores:
Neurocognitive awareness-raising and epistemological empowerment: understanding of neural networks, brain plasticity, neurodevelopment, circadian rhythms (sleep-learning), and socio-emotional self-regulation.
Explicit dismantling of neuromyths: deconstruction of erroneous beliefs about brain functioning in learning through critical analysis of the literature, together with the exemplification of cases and dilemmas.
Situated psychopedagogical diagnosis: neuropsychopedagogical characterization of students through case studies and interviews in order to identify learning potential and barriers.
Design of brain-compatible environments: mastery of neural networks, microcurricular planning through the grading of tasks by levels of cognitive complexity, and techno-inclusive supports.
Emotional management and digital narrative: production of conceptual-emotional maps, semantic networks, and pedagogical *storyboarding* based on stories and fables.
Socio-educational engagement and innovation: community transfer through "Neuronoticias" (neuro-news), family neuroeducational activities, and simulations of attention to neurodiversity as a cross-cutting element in the school-family-community relationship.
The application of this protocol is fitted to 6 weeks, which creates the orienting basis for action in the grounding, didactic processing, and modeling of the neuroclass.
Consequently, the neuroclass transcends mere didactic planning based on neuroscientific principles and is consolidated as a theoretical model for framing and systemic analysis, in which the neuroscientific foundations, the competencies of the inclusive neuroeducator, the sociocultural context, and the critical selection of educational resources converge.

4.5. Design and phases of the operational methodological route

The transformative longitudinal study unfolds over a three-year cycle (2023–2026), taking as its unit of analysis the performance of 40 working groups made up of trainee teachers at undergraduate level, who developed a total of 400 neuroclass projects. The operational methodological trajectory was structured in three interrelated phases:

Phase of historical and descriptive reconstruction: based on the documentary analysis of the microcurricular planning, the assessment records, and the productions of the three cohorts, which made it possible to track the evolution of the projects over time and to identify the critical variables of change between cycles.
Phase of interpretation, coding, and categorization: focused on source triangulation, on the basis of empirical data under the dimensions for evaluating the neuroclass. Its purpose was to identify recurrent patterns, didactic contradictions, and learning gaps for the reinterpretation and enrichment of the original proposal.
Phase of systemic theoretical modeling: the conceptual synthesis was integrated to formalize a more consolidated theoretical model, whose implementation guidelines take the form of a situated training intervention project, generated within the framework of university teacher education and applied by the teachers themselves in the course of their work in Basic General Education classrooms.
The transformation of the neuroclass project through its different phases gives the experience a particular meaning as a project of situated practice, preceded by empowerment in the epistemic bases and training in the application of protocols. Teacher training is combined with the improvement of classroom practice, with emphasis on the transition from what is learned at university to practice in Basic General Education; another important practical and methodological contribution concerns how the teacher is trained while acting in their own context, so that the impact extends in cascade. Emphasis is placed on the formal integration of Universal Design for Learning (UDL) as a hospitable approach on account of its didactic and curricular openness, interdisciplinary microcurricular analysis, pedagogical creativity, and adaptive assessment.
The systematic support given to the three cohorts by the university teachers made it possible to move from an orienting guide for exploratory action toward a theoretical and methodological framework of high value for initial teacher education.

4.6. Comparative longitudinal evaluation of the cohorts

The longitudinal quantitative data shown in Table 4 demonstrate the progression and consolidation of project completion over time.

Table 4.
Summary of longitudinal data by cohort

Cohort	Groups	Planned projects	Completed T0	Completed T1	Completed T2	Intermediate progress	Final completion
C1	12	120	0	66	120	55.0 %	100 %
C2	14	140	0	81	140	57.9 %	100 %
C3	14	140	0	85	140	60.7 %	100 %

Total	**40**	**400**	**0**	**232**	**400**	**58.0 %**	**100 %**

The values for completed projects are cumulative.

Source(s): Research team, 2026

As shown in Table 4, the three cohorts achieved final completion of 100% of the planned projects. At the intermediate measurement (T1), progress ranged from 55.0% to 60.7%, with cohort C3 showing the highest level of partial execution. Overall, the 40 groups completed the 400 planned projects by the close of the study.

The results set out in Table 4 show a favorable and sustained evolution in the execution of the projects planned by the cohorts analyzed. Although at the beginning of the process (T0) no cohort reported completed projects, at the intermediate follow-up point (T1) levels of progress above 50% are observed in all cases, which suggests adequate planning and management capacity from the initial stages of implementation.

Specifically, cohort C3 showed the highest percentage of intermediate progress (60.7%), followed by C2 (57.9%) and C1 (55.0%). These differences, although moderate, indicate slight variability in the pace of execution between cohorts, possibly associated with organizational factors, availability of resources, or contextual characteristics of the participating groups. However, the convergence observed at the close of the process shows that these initial differences did not affect the achievement of the final objectives.

It is also noteworthy that the three cohorts reached 100% completion at T2, completing all 400 planned projects. This result reflects the high effectiveness of the monitoring model implemented and highlights the capacity of the groups to sustain their work processes until the planned goals were attained. From a longitudinal perspective, the data show a trajectory of progressive and consistent growth, with no losses in cumulative productivity between measurement points.

Overall, the cumulative progress of 58.0% recorded at T1 constitutes a solid indicator of intermediate performance and anticipates the full completion subsequently achieved. These findings suggest that the strategies of support, monitoring, and feedback developed during the process favored the persistence, continuity, and successful completion of the projects. The results therefore support the effectiveness of the intervention and provide empirical evidence of the feasibility of achieving optimal levels of completion when systematic mechanisms of monitoring and support are available over time.

The qualitative characterization of the evolution by cohort makes it possible to highlight particular features of the process followed in each cohort.

Cohort 1 (2023) was characterized by basic literacy in and introduction to neuroscientific knowledge. Initial didactic tensions arose from the attempt to insert neurodidactics solely within traditional lesson plans. Progress made it possible to incorporate neuroscientific foundations and identify specific competencies, although a homogeneous replication of objectives predominated, focused mainly on instrumental areas (Reading, Writing, and Mathematics).

In Cohort 2 (2024), a qualitative leap was evident in the teacher's didactic mediation through the design of universal didactic sequences and the explicit use of techno-inclusive resources. Titles, objectives, and proposals were diversified and contextualized to multiple areas of knowledge and educational levels.

In Cohort 3 (2025–2026), a high degree of autonomy was achieved in the application of neuroeducation without falling into reductionism or segregation.

The assessment of the foregoing results leads to the assertion that the progression observed between T0, T1, and T2 shows a longitudinal pattern of stable development, with intermediate execution above 55% in all cohorts and a final completion rate of 100%, which constitutes an indicator of high performance and of the sustainability of the processes implemented. The proposals were implemented in real educational settings and subsequently reviewed through processes of mentoring and professional feedback, which promoted processes such as the following: the search for scientific evidence, pedagogical discussion, didactic planning, resource design, and the collaborative construction of knowledge.

Since the projects are applied in educational institutions linked to professional placements, they strengthen university community-engagement activities and other training settings. Implementation allowed the students to contrast neuroeducational principles with authentic teaching and learning situations. Finally, mentoring and professional reflection took place through the support processes provided by the 14 university teachers, by means of observation of the experiences through different channels, monitoring of the projects, specialized feedback, critical analysis of results, and review for the improvement of the proposals. Mentoring is a cross-cutting component of the development of the project and favors the progressive consolidation of professional teaching competencies.

4.7. Role of the university teacher. A twofold flow of transformation

The systematic support given to the three cohorts made it possible to move from an orienting guide for exploratory action toward a theoretical and methodological framework of high value for initial teacher education. The longitudinal evaluation revealed the existence of a twofold flow of pedagogical transformation among the actors in the process (university teachers and trainee teachers). On the basis of the analyses and strengths observed in the focus group and the project defenses, the university teacher educators enriched the initial protocol, while the trainee teachers evolved from a technical-instrumental conception of the lesson to a stance as reflective co-researchers of their own practice.

Within the longitudinal sequence, work was carried out with 14 higher education teachers who teach the Neuroeducation course at the Universidad Bolivariana del Ecuador (UBE), with between 10 and 30 years of experience. Groups at the same stage of the academic term were selected, so that the protocol could be updated and the consultations carried out under homogeneous conditions.

The qualitative analysis of the focus group interactions reveals three main contributions perceived by these teachers regarding the potential of the neuroclass.

- Reconceptualization of practice: they report that the participating students describe a shift from earlier models toward the design of neuroclasses, which operate as sessions centered on motivation, the

activation of prior knowledge, active learning, and the emotional management of the classroom.

- Greater professional confidence: an understanding of principles and constructs relating to brain plasticity, neurodevelopment, synaptic pruning, and the emotion-learning relationship reduces the sense of improvisation and strengthens well-founded decision-making.
- Identification of barriers and facilitators: because it places the characterization of students at the center of planning, it makes it possible to see more precisely what in the classroom context helps or hinders learning.
- The students identify lack of time, scant institutional support, and the lack of systematic continuing training as the main obstacles. As facilitators, they point to collaborative work among peers, lesson observation, and the possibility of experimenting in real settings.

In the focus group, an interesting proposal emerged for the new stage of the research in the sequence of cross-sectional studies, centered on the transformation of the trainee teachers and not only on the stability and sustainability of the Neuroclass Project and its elevation to the level of a model, which is the fundamental objective of the present study.

A neuroeducational evaluation guide is outlined, designed and structured in seven dimensions: epistemic foundation, with emphasis on neuroeducational aspects; didactic planning; cognitive processes; emotional dimension; educational inclusion; pedagogical innovation; and assessment of learning. Each dimension will be rated on a four-level scale: 1 (Deficient); 2 (Basic); 3 (Adequate); 4 (Excellent). This scale constitutes the main instrument for the cohort study that will address the relationship between the neuroclass project and the teacher's neurodidactic competence. At this stage of orientation and practical implementation, this finding was used to determine the content validity and the qualitative feasibility of the dimensions selected by the university teachers.

The conceptual structure of the focus group is used for the participatory validation of the dimensions, defining precisely what each dimension means in daily practice, which ensures a certain level of ecological validity so that the instrument responds to their reality and not only to theory.

Work is also under way on the collaborative construction of a preliminary item bank for a qualitative pilot with 4 prototype items per dimension, which proved useful for adjusting the system of instruments to be applied in interpreting future quantitative improvements in relation to practical, contextualized, and lasting training.

5. Toward a holistic conception of the neuroclass model in initial teacher education

The accumulation of evidence derived from the systematic review of high-impact literature, combined with the critical systematization of the experience implemented over three independent cohorts (2023–2026), requires moving beyond the fragmented models that have historically characterized the intersection between neuroscience and

education. Traditionally, training proposals have tended toward a biologistic reductionism that pathologizes, labels, and pigeonholes the student in connection with psychopedagogical diagnosis.

As an integrative synthesis of this study, the Theoretical Model of the Neuroclass Project is proposed, conceived as a three-dimensional conceptual architecture that organically brings together the epistemological foundation, the formative curriculum design, and longitudinal methodological validation. It is understood as the construction, representation, and modeling of an organizational and functional unit of neurodidactics that links curriculum, pedagogical mediation, neurocognitive processes, metacognition, inclusion, and neuroformative assessment, with the purpose of optimizing deep, transferable, and self-regulated learning on the part of students, with teacher mediation.

5.1. Theoretical model of the neuroclass project: a sustainable professional ecosystem

5.1.1. Main components of the theoretical model

The model rests on the premise that pedagogical practice cannot transform classroom work unless it is grounded in an ecological understanding of the unity of the affective and the cognitive. Its structure is made up of three interdependent dimensions:

General foundations: at the philosophical, sociological, legal, neurobiological, pedagogical, didactic, and curricular levels, in a set of influences that converge on the neuroclass construct in action.

Epistemological dimension (Complexity of the neuroclass construct)

It redefines the teaching-learning space not as a homogeneous enclosure, but as a sociocognitive and neurodiverse ecosystem. It addresses the very nature of the *neuroclass*. It defines what it is, what its limits are, and how it avoids biologistic reductionism, establishing that learning is not only a synaptic discharge but a sociocultural process mediated by the biology of the brain, and it integrates executive functioning and brain plasticity with cultural capital (Bourdieu), ensuring that neuroeducation and neurodidactics serve as a tool for equity and inclusion, and not for the segregation or deterministic classification of students.

Curricular dimension (Approach situated in and from teacher training)

It establishes the training pathway of teachers under an approach of critical didactic transposition, in which the trainee teacher does not memorize neuroanatomy but develops competencies for linking attentional functions, working memory, and emotional regulation with Universal Design for Learning (UDL). It values the situated

approach, learning by doing, reflection on one's own practice, and the conscious structuring of the phases of the lesson (activation, processing, and consolidation).

Methodological dimension (Stability, sustainability, and systematization in the medium and long term)

It validates praxis through multi-cohort follow-up (2023-2026). It demonstrates that the maturation of teaching competencies requires iterative cycles of intervention, in which theory informs practice and, in turn, the frictions of the real classroom feed back into and refine the initial theoretical model.

Inclusive dimension

It attends to the neurodiversity of students. This translates into the capacity to design didactic sequences that respond to the real neurodiversity of the classroom. It transfers theory to the training design for teachers. It focuses on how the teacher who teaches through neuroeducation learns**.** It encompasses the classroom dimension and the links with the family and the neurodiverse potential of contexts. It is the operational culmination in the real classroom. It ensures that the neuroclass is neither elitist nor rigid, but a safe, emotionally regulated, and universally accessible space, so-called neuroinclusion, in which the sustainability and development of the teaching project are evaluated continuously.

This model has practical implications of a reflective and situated nature, as an exercise in learning by doing: future teachers design, simulate, critique, and adjust their own didactic sequences applying neuroscientific principles.

The research respected the ethical and bioethical principles applicable to educational studies. The confidentiality of the information, the protection of participants' identity, and the use of the data exclusively for academic and scientific purposes were ensured. Likewise, student participation took place within the framework of regular curricular processes of teacher training, without generating academic or personal risks for the participants.

The neuroclass takes shape as a comprehensive didactic unit centered on inclusive learning and the neurocognitive development of students. Its structure brings together four complementary dimensions: diagnosis and grounding, didactic planning, inclusive implementation, and reflective follow-up. The neuropsychopedagogical characterization of the group and the neuroeducational grounding constitute the basis for pedagogical decision-making.

On this basis, objectives, strategies, and activities are defined that are aimed at stimulating cognitive, emotional, and social processes. Implementation is supported by resources, alternatives for neurobehavioral management, and inclusion strategies that guarantee the participation of students with different learning profiles. Finally, formative assessment and metacognition make it possible to monitor progress, foster self-regulation, and continuously feed back into the educational process, consolidating a model consistent with the principles of neuroeducation and inclusive education.

The triangulation of quantitative and qualitative data confirms that training in neuroeducation makes relevant contributions to teacher professional development, but its impact depends on the quality of the training design. The most effective interventions combine theoretical knowledge, the dismantling of neuromyths, the

design of applicable strategies, and follow-up in the classroom. When these conditions are met, improvements are observed in both teachers and students with regard to practices, culture, and socio-emotional competencies.

The methodological closure of this process makes it possible to identify the convergences, divergences, strengths, and gaps at the key moments. It starts from the theoretical foundation of the neuroclass construct, moves on to the practical dimension of training, integrates the participation of teachers through action research and the focus group, sustains the longitudinal follow-up of the corpus of projects, and closes with methodological triangulation. At the level of qualitative analysis, importance is attached to maximizing the relationships between neuroeducation, neurodidactics, inclusion, innovation, teaching competencies, and comprehensive education. The analysis revealed a high presence of neuroeducational components in the projects evaluated: pedagogical innovation, emotional activation of learning, and active learning strategies. The greatest opportunities for improvement are identified in neuroeducational assessment, the application of Universal Design for Learning (UDL), specific curricular adaptations, curricular adjustments, and rational plans for individualized adjustment.

In general, most of the projects reached high levels of neurodidactic quality, reflecting an adequate understanding of the principles associated with brain functioning and their application in educational practice. The students ceased to conceive of teaching as the transmission of content and came to see it as an active process of meaning-making, involving the development of neurodidactic competencies and the incorporation of strategic alternatives such as strategies related to focused attention, multisensory learning, emotional management and self-regulation, metacognition, and gamification.

All of this sets guidelines for strengthening educational inclusion; there is evidence of growing concern to respond to the diversity of needs, interests, and learning paces present in the classroom. An innovative vision can be seen in the neuroclass projects, with a broad incorporation of active methodologies, digital technologies, and interactive resources that favor student participation and the consolidation of professional teaching identity. The preparation of neuroclasses promoted processes of pedagogical reflection that strengthened professional autonomy and the capacity to ground educational decisions in scientific evidence.

Discussion

The findings confirm that the integration of neuroeducation into initial teacher education can generate significant transformations in both the conceptions and the pedagogical practices of future teachers, in agreement with Bueno (2025), who links neuroscience with scientific competencies.

The mixed-methods study carried out makes it possible to affirm that the neuroeducational perspective makes relevant contributions to teacher training. The most notable include the strengthening of teachers' scientific literacy, the reduction of

erroneous beliefs about brain functioning, the development of competencies for designing learning experiences in keeping with the way the brain learns, and the positive impact on students' learning processes and well-being (Sánchez, C. L., 2023).
However, these benefits do not come about automatically. Their consolidation requires training programs with a practical orientation, a duration sufficient to favor the appropriation of knowledge, mechanisms for monitoring and evaluation, and institutional policies that promote continuing professional development. In this regard, it is recommended that progress be made toward training models that integrate processes of action research, the assessment of neuroeducational competencies, and spaces for collaborative work among teachers.
The neuroclass emerges as an innovative strategy that facilitates the transfer of scientific knowledge about the brain to real teaching contexts, reducing the traditional gap between educational theory and practice. Likewise, the results show that students develop a deeper understanding of the interaction between emotion, cognition, and learning, a fundamental aspect for building inclusive, meaningful, and effective educational environments.
The combination of quantitative and qualitative analyses made it possible to demonstrate not only the incorporation of neuroeducational principles into the pedagogical proposals designed by the participants, but also the professional transformations they undergo during their training. This evidence makes it possible to understand both the quality of the products developed and the conceptual and methodological changes associated with their development.
The results suggest that the neuroclass can be consolidated as a model in teacher training grounded in neuroeducational principles, with the potential to be implemented, adapted, and evaluated in diverse educational contexts. Its main strength lies in offering a concrete tool for transferring knowledge about brain functioning to everyday classroom practice (Díaz-Cabriales et al., 2021).
The available evidence indicates that, when it is incorporated rigorously, contextually, and in a sustained manner into processes of teacher professional development, the neuroclass contributes to strengthening teachers' pedagogical competencies and favors better learning outcomes and well-being among students. Its potential lies in transforming knowledge about the brain into more intentional, motivating, and inclusive pedagogical decisions.
Moving in this direction involves overcoming the limitations still present in traditional teacher training and strengthening the generation of contextualized evidence from classrooms themselves, so that educational practices are grounded in relevant and applicable scientific knowledge.
In an educational context characterized by complexity, diversity, and permanent change, teacher training calls for professionals capable of understanding and responding to the multiple needs of students. In this scenario, an understanding of processes related to attention, memory, emotion, motivation, and executive functions is essential for designing more effective and inclusive learning experiences. From this perspective, neuroeducation provides scientific foundations that make it possible to rethink teaching and learning from a vision centered on brain functioning and on the individual characteristics of each student.

In sum, the Theoretical Model of the Neuroclass Project transcends the mere application of isolated neurodidactic techniques. It takes shape as a **holistic and sustainable system** that provides teachers with epistemological and methodological autonomy. By being sustained over time and validated through independent cohorts, the model ensures that initial teacher education evolves from the uncritical assimilation of popular neuroscience to the construction of well-founded, rigorous, and contextually situated good pedagogical practices.

Conclusions

The present theoretical study and three-year longitudinal systematization (2023-2026) has made it possible to consolidate the Neuroclass Project as a well-founded, rigorous, and applicable proposal for initial teacher education. From the articulation of the three levels addressed, the following conclusions are drawn:

From the epistemological and conceptual dimension (Level I): It has been possible to deconstruct the biologistic reductionism and the proliferation of neuromyths that have traditionally characterized the incursion of the neurosciences into education. The resignification of the neuroclass construct transcends the purely anatomical view and establishes it as a sociocognitive and ecocultural construct, in which neurodiversity and brain functioning are inseparably linked with the socioeconomic contexts and cultural capital of students, guaranteeing an approach of equity and pedagogical inclusion.

From the curricular and formative dimension (Level II): It is demonstrated theoretically that teacher training in neuroscience should not be reduced to the memorization of neurobiological concepts, but should be oriented toward a critical didactic transposition. The training design derived from the Neuroclass Project equips teachers to connect executive functions, attentional processes, and emotional regulation with Universal Design for Learning (UDL), allowing the teacher to move from conceptual assimilation to autonomous and well-founded decision-making in classroom work.

From the methodological dimension and the systematization of praxis (Level III): The metatheoretical analysis and the multi-cohort longitudinal implementation (2023–2026) provide robust validation of the model. The use of independent cohorts of student teachers made it possible to demonstrate the stability, maturation, and adaptability of the training model in the face of the frictions of educational reality. Methodologically, this design overcomes the limitations of cross-sectional or single-cohort studies, establishing a benchmark for how the systematization of empirical experience can feed back into and elevate pedagogical theory.

Finally, it is concluded that the integration of neuroeducation through the Theoretical Model of the Neuroclass Project constitutes a significant advance for teacher professional development. By bringing together a critical epistemological framework, a curricular pathway based on neurodidactics, and a methodology of longitudinal follow-up sustained over time, the proposal provides initial teacher education with solid tools for consolidating good pedagogical practices that are rigorous, contextualized, and sustainable in contemporary educational work.

The Neuroclass Project constitutes a model for teaching practice and functions as a teacher training model based on the application of neuroeducational principles to the design of innovative, inclusive, and contextualized learning experiences. Its purpose is to develop professional competencies that allow future teachers to understand learning processes from a scientific perspective and to transfer that knowledge to the design of effective pedagogical practices. Future research could examine in greater depth the psychometric validation of the Neuroclass evaluation instruments and analyze their impact on the professional performance of graduate teachers.

5. References

Álvarez, E., Rosales, M., & Bernal, R. (2004). *Fundamentos de anatomía y fisiología humana para maestros*. Pueblo y Educación.

Arango, J. C., Rivera, D., & Clabarrieta, L. (2017). *Neuropsicología infantil*. Manual Moderno.

Blanco, C. (2014). *Historia de la neurociencia: El conocimiento del cerebro y la mente desde una perspectiva interdisciplinar*. Editorial Biblioteca Nueva.

Chanta, M. C., Díaz, A. R., & Prado, E. J. (2025). *Inclusión en contextos universitarios: Una revisión sistemática para el fortalecimiento de la enseñanza superior*.

De Melo, T. J. (2012). *Neurociencia + pedagogía = neuropedagogía: Repercusiones e implicaciones de los avances de la neurociencia para la práctica educativa*. Universidad Internacional de Andalucía.

Díaz, A., López, R., & Bocanegra, L. (2023). Formación, autopercepción y prospectiva de neuroeducación en los docentes de nivel primaria. *Revista UNMAR*.

Fernández, R., & Méndez, [inicial pendiente]. (2015). *Neuropedagogía: Hacia una educación cerebro-compatible*. Editorial Bonum.

Figueredo, E. (2012). *Progresión de aprendizajes básicos: Una perspectiva ontogenética*. Ediciones Prono.

Garay, V., Lagos, N., & Campos, R. A. (2026). Neurociencia y formación docente: Evidencias y aplicaciones pedagógicas desde una revisión sistemática. *Revista Complutense de Educación, 37*(3), 447-469.

Garrido, C. E., & Sanjinez, G. (2010). *Aprendizaje de las matemáticas en el contexto del trastorno por déficit de atención e hiperactividad*. Juan Pablo II Ediciones.

Guerra Iglesias, S., & Bodero Arizaga, L. C. (2026). Integración de saberes y multienfoques: Una nueva mirada a la caracterización neuropsicopedagógica. *European Public & Social Innovation Review, 11*, 1-15. https://doi.org/10.31637/epsir-2026-2487

Guevara Kaiser, G. (s. f.). *Neurociencias y matemática emocional*. eLibro. https://elibro.net/es/lc/ube/titulos/106365/

Jolles, J., & Jolles, D. (2021). On neuroeducation: Why and how to improve neuroscientific literacy in educational professionals. *Frontiers in Psychology, 12*, Article 778620. https://doi.org/10.3389/fpsyg.2021.778620

Mora, F. (2022) Neuroeducador. Una nueva profesión. Editorial Alianza.

Navarro, M. C. (2021). *El perfil del neuroeducador*. Editorial Inclusión. https://www.researchgate.net/publication/355022918_EL_PERFIL_DEL_NEUROEDUCADOR

Parra, N. (2018). *Neuroeducación: Trazos derivados de investigaciones iniciales*. UNACENSE; UNAM.

Salvado, J. J. (2020). Las potencialidades del uso del lenguaje positivo en el proceso de enseñanza-aprendizaje. *Tecnología, Ciencia y Educación*.

Semionovna, L. (1999). *Neuropsicología del intelecto: Análisis neuropsicológico de la alteración y el restablecimiento de la actividad intelectual y del pensamiento lógico-verbal en caso de lesiones locales del cerebro*. Facultad de Psicología, Universidad Autónoma del Estado de México.

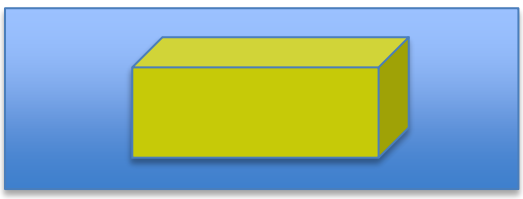
Torrens, D. B. (2019). *Neurociencia para educadores: Todo lo que los educadores siempre han querido saber sobre el cerebro de sus alumnos y nunca nadie se ha atrevido a explicárselo de manera comprensible y útil* (1.ª ed.). Ediciones Octaedro. https://www.perlego.com/es/book/1865314/neurociencia-para-educadores-todo-lo-que-los-educadores-siempre-han-querido-saber-sobre-el-cerebro-de-sus-alumnos-y-nunca-nadie-se-ha-atrevido-a-explicrselo-de-manera-comprensible-y-til-pdf

	Título de la columna	**Título de la columna**	**Título de la columna**
Título de la fila			
Título de la fila			

Fuente(s): Autor, Año de publicación.

Figura 1. **(Book Antigua 10, negrita, alineado a la izquierda)**

Título de la figura *(Book Antigua 10, cursiva, alineado a la izquierda)*



Fuente(s): Autor, Año de publicación.

5. Discusión **(Book antigua 12, negrita, justificado, interlineado sencillo)**

Texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal... (Book Antigua 12, justificado, interlineado sencillo).

5.1. Título de 2º nivel (Book Antigua 12, negrita y cursiva, justificado interlineado sencillo)

Texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal... (Book Antigua 12, justificado, interlineado sencillo).

5.1.1. Título de tercer nivel y sucesivos (Book Antigua 12, cursiva, sangría izquierda a 1,25 cm., justificado e interlineado sencillo)

Texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal... (Book Antigua 12, justificado, interlineado sencillo).

6. Conclusiones (Book antigua 12, negrita, justificado, interlineado sencillo)

Texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal, texto normal... (Book Antigua 12, justificado, interlineado sencillo).

7. Referencias (Book antigua 12, negrita, justificado, interlineado sencillo)

Neurociencia y formación docenteevidencias y aplicaciones pedagógicas desde una revisión sistemática

Asiri, A., Panday-Shukla, P., Rajeh, H. S. y Yu, Y. (2021). Broadening perspectives on CALL teacher education: From technocentrism to integration. *TESL-EJ*, *24*(4), 1-23. https://www.tesl-ej.org/pdf/ej96/a8.pdf

Cayton, C., Sherman, M., Walkington, C. y Funsch, A. (2018). Technology integration in secondary mathematics textbooks. *Conference Papers -- Psychology of Mathematics & Education of North America*, 1235–1238.

Delamont, S. (Ed.). (2013). *Handbook of qualitative research in education*. Cardiff University.

Deliveli, K. (2021). Application of sentence-based sound teaching method for first reading and writing in education. *Participatory Educational Research*, *8*(2), 330–356.

Films Media Group. (2013). *Germany's education system: Dan Rather reports on global education systems*. *Films On Demand*. https://fod.infobase.com/PortalPlaylists.aspx?wID=97665&xtid=114473

Gillen, J. (2021). Learning to connect: relationships, race, and teacher education. *Radical Teacher*, 119, 85-87. https://doi.org/10.5195/rt.2021.902

Hanna, J. M. (2015). *The quality of education leadership doctoral dissertations in the United States: An empirical review* (Orden No. 3742189). Education Collection; Education Database. (1752116829). https://ezproxy.roosevelt.edu:2048/login?url=https://www.proquest.com/dissertations-theses/quality-education-leadership-doctoral/docview/1752116829/se-2?accountid=28518

Hobbs, T. D. (2021). Cheating at school is easier than ever—and It's rampant. *Wall Street Journal (Online)*. https://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=150290106&authtype=sso&custid=cls58&site=ehost-live&scope=site

Jefferson, B. (2020). Education and school reform. En A. C. Washington y B. D. Brady (Eds.), *The comprehensive history of educational practice* (pp. 258-325). Highcourt Publishing.

Ladson-Billings, G. (2018). The social funding of race: The role of schooling. *Peabody Journal of Education*, *93*(1), 90-105.

Ladson-Billings, G. (2021). Three decades of culturally relevant, responsive y sustaining pedagogy: What lies ahead? *Educational Forum*, *85*(4), 351-354. https://doi.org/10.1080/00131725.2021.1957632

Sarroub, L. K. y Nicholas, C. (2021). *Doing fieldwork at home: The ethnography of education in familiar contexts*. Rowman & Littlefield Publishers.

Smith, C. (2013). *Leadership lessons from the Cherokee nation: Learn from all I observe (Audio Book)*. McGraw-Hill.

Tharp, D. S. (2020). *Doing social justice education: A practitioner's guide for workshops and structured conversations*. Stylus Publishing LLC.

Tidwell, S., Young, D. J., Wahed, J., Doron, T., Bauer, A., McGirr, M., Ludsin, S. A., Moore, C., Miro, M. y Rodgers, G. (2012). Letters to the editor. *Wall Street Journal - Eastern Edition*, *259*(107), A12.

Warren, C. A. (2021). About centering possibility in Black education. school: Questions. En *Teachers College Press*. Teachers College Press.

Wegner, G. (4 de enero de 2019). First Lego league wrap 2018. *Graham Wegner-Open educator*. https://gwegner.edublogs.org/

Ameneyro, H. M., Sánchez Pulido, M., Padilla Hernández, M. J., Soto Sánchez, A., & Acoltzi Bautista, E. (2016). Software e-learning de Dinámica basado en la neurodidáctica para estudiantes de Ingeniería del Tecnológico Nacional de México. Latin American Journal of Physics Education, 10(4). https://dialnet.unirioja.es/descarga/articulo/6014059.pdf

Ameneyro, H. M., Acoltzi Bautista, E., García Ríos, A. F., González García, G. A., & Soto Sánchez, A. (s. f.). Emoción y cognición durante el aprendizaje del cálculo integral [Ponencia]. 2.° Congreso Internacional de Transformación Educativa, Tecnológico de Apizaco, México. https://transformacion-educativa.com/2do-congreso/ponencias/Eje-7/L1-32.html

Ortiz Ocaña, A. (2009). Cerebro, currículo y mente humana. Ediciones Litoral

Brod, G., Bunge, S. A., & Shing, Y. L. (2017). Does one year of schooling improve children's cognitive control and alter associated brain activation? Psychological Science, 28(7), 967–978. https://doi.org/10.1177/0956797617699838

Caballero-Cobos, M., & Llorent, V. J. (2022). Los efectos de un programa de formación docente en neuroeducación en la mejora de las competencias lectoras, matemática, socioemocionales y morales de estudiantes de secundaria: Un estudio cuasi-experimental de dos años. Revista de Psicodidáctica, 27(2), 158–167. https://doi.org/10.1016/j.psicod.2022.04.001

Elouafi, L., Lotfi, S., & Talbi, M. (2021). Progress report in neuroscience and education: Experiment of four neuropedagogical methods. Education Sciences, 11(8), Artículo 373. https://doi.org/10.3390/educsci11080373

Huber, E., Donnelly, P. M., Rokem, A., & Yeatman, J. D. (2018). Rapid and widespread white matter plasticity during an intensive reading intervention. Nature Communications, 9, Artículo 2260. https://doi.org/10.1038/s41467-018-04627-5

Muchiut, Á., Vaccaro, P., Pietto, M., & Sánchez, B. (2024). Intervención neurodidáctica sobre las funciones ejecutivas en adolescentes. JONED. Journal of Neuroeducation, 4(2). https://revistes.ub.edu/index.php/joned/article/view/42417

Muchiut, Á., Vaccaro, P., Pietto, M., & Sánchez, B. (2025). Impacto en el funcionamiento ejecutivo de adolescentes a partir de una intervención neurodidáctica: Estudio longitudinal en el nivel secundario. Revista Iberoamericana de Neuropsicología, 8(1), 39–54.

Muchiut, Á., Vaccaro, P., Pietto, M., & Sánchez, B. (2025). Comprensión lectora en estudiantes de primer año del secundario: Un estudio preliminar. JONED. Journal of Neuroeducation, 5(2), 25–39. https://doi.org/10.1344/joned.v5i2.48536

Nolden, S., Brod, G., Meyer, A.-K., Fandakova, Y., & Shing, Y. L. (2021). Neural correlates of successful memory encoding in kindergarten and early elementary school children: Longitudinal trends and effects of schooling. Cerebral Cortex, 31(8), 3764–3779. https://doi.org/10.1093/cercor/bhab046

CONTRIBUCIONES DE AUTORES, FINANCIACIÓN Y AGRADECIMIENTOS
(Book antigua 12, negrita, centrado, interlineado sencillo)

Contribuciones de los autores:

Conceptualización: Guerra Iglesias, Sonia; García Cobas, Rudy y Pacheco Lemus, Andrea. **Metodología:** Guerra Iglesias, Sonia y Campoverde, Moscol, Amarilys, Nombre. **Software**: García Cobas, Rudy. **Validación**: Guerra Iglesias, Sonia y García Cobas, Rudy. **Análisis formal**: Campoverde Moscol, Amarilys y Pacheco Lemus, Andrea.**Curación de datos**: García Cobas, Rudy. **Redacción-Preparación del borrador original**: Guerra Iglesias, Sonia. **Redacción-Revisión y Edición**: Guerra Iglesias, Sonia. **Visualización**: García Cobas,Rud. **Supervisión:** Pacheco Lemus, Andrea. **Administración de proyectos**: Guerra Iglesias, Rudy. **Todos los autores han leído y aceptado la versión publicada del manuscrito** Guerra Iglesias, Sonia, García Cobas Rudy, Pacheco Lemus Andrea, Campoverde Moscol, Amarilys

Financiación: Esta investigación recibió o no financiamiento externo.

Agradecimientos: Ejemplo: El presente texto nace en el marco de un proyecto CONCILIUM (931.791) de la Universidad Complutense de Madrid, "Validación de modelos de comunicación, empresas, redes sociales y género".

Conflicto de intereses: si los hubiere.

AUTOR/ES **(Book Antiqua 12, negrita, justificado, interlineado sencillo):**

Nombre y apellidos completo del 1º autor: Sonia Guerra Iglesias

Síntesis del currículo del autor de 150 palabras (Book Antigua 10, justificado, interlineado sencillo)

sguerrai@ube.edu.ec
Orcid ID: https://orcid.org/0000-0003-0853-1036
Google Scholar: =3IcTdtkAAAAJ&hl=es
ResearchGate: 38443648
ResearchGate: 39177416
Academia.edu: URL clicable al perfil

Nombre y apellidos completo del 2º autor: Rudy García Cobas

Síntesis del currículo del autor de 150 palabras

correoelectronico@dominio.com en la línea siguiente
Orcid ID: URL clicable al perfil
Google Scholar: URL clicable al perfil
ResearchGate: URL clicable al perfil
Scopus: URL clicable al perfil
Academia.edu: URL clicable al perfil

Nombre y apellidos completo del 3º autor: (Andrea Pacheco Lemus

Síntesis del currículo del autor de 150 palabras (Book Antigua 10, justificado, interlineado sencillo)

correoelectronico@dominio.com en la línea siguiente
Orcid ID: URL clicable al perfil
Google Scholar: URL clicable al perfil
ResearchGate: URL clicable al perfil
Scopus: URL clicable al perfil
Academia.edu: URL clicable al perfil
Nombre y apellidos completo del 4º autor: Amarilys Campoverde Moscvol