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Exploring neuropedagogical principles for Second-Language Acquisition in elementary learners

Explorando los principios neuropedagógicos para la adquisición de una segunda lengua en estudiantes de primaria

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Abstract

This literature review was conducted using a systematic methodology to investigate the role of neuropedagogical principles in enhancing second-language acquisition for elementary students. As well as the cognitive and emotional features of neuropedagogical approaches in early childhood development and teacher perceptions. Through the use of keywords, Boolean operators and exclusion criteria, a total of 17 scientific articles were selected for analysis. Four neuropedagogical strategies were found to encourage children to learn English as a foreign language: multisensory learning, technology and multimedia resources, Total Physical Response (TPR) and Project-Based Learning (PBL). It was concluded that neuropedagogical strategies encourage students to learn English by fostering active class participation and making vocabulary acquisition enjoyable. Neuropedagogical strategies were also effective in promoting brain plasticity and adaptability when acquiring new knowledge.

Keywords: neuropedagogy; elementary learners; strategies; neuroeducation; English languge

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Resumen

Esta revisión bibliográfica se realizó mediante una metodología sistemática para investigar el papel de los principios neuropedagógicos en la mejora de la adquisición de una segunda lengua en estudiantes de primaria. También se analizaron las características cognitivas y emocionales de los enfoques neuropedagógicos en el desarrollo infantil temprano y las percepciones del profesorado. Mediante el uso de palabras clave, operadores booleanos y criterios de exclusión, se seleccionaron 17 artículos científicos para su análisis. Se identificaron cuatro estrategias neuropedagógicas para fomentar el aprendizaje del inglés como lengua extranjera en niños: aprendizaje multisensorial, recursos tecnológicos y multimedia, Respuesta Física Total (RFT) y Aprendizaje Basado en Proyectos (ABP). Se concluyó que las estrategias neuropedagógicas incentivan el aprendizaje del inglés al fomentar la participación activa en clase y hacer que la adquisición de vocabulario sea amena. Asimismo, fueron eficaces para promover la plasticidad cerebral y la adaptabilidad al adquirir nuevos conocimientos.

Palabras clave: neuropedagogía; estudiantes de primaria; estrategias; neuroeducación; lengua inglesa

Introduction

During early childhood, the human brain experiences remarkable growth and development, making it a crucial time for learning. According to Sousa (2011), the process of language acquisition begins soon after birth and is most effective during a sensitive period that spans from birth to approximately 6 years of age. This window represents a time of heightened neuroplasticity, where the brain is biologically prepared to absorb and process language naturally. The peak of this period occurs between the ages of 2 and 5, during which children exhibit exceptional receptivity to phonological, syntactical, and semantic patterns.

Montessori's (1966), concept of sensitive periods aligns closely with these findings. She identified the early years as a time when children naturally focus on acquiring language, describing this process as part of the "absorbent mind." Montessori emphasized that this sensitivity to language development wanes after the age of 6, making early childhood a crucial period for introducing linguistic stimuli. Both Sousa and Montessori underscore the importance of creating environments rich in language to influence these sensitive periods completely.

As stated by Davronbek (2023), neuropedagogical theory implies that emotions and social life are important for learning. When students feel safe and happy in class, they can learn better and remember more. Also, the author emphasizes that the brain works well when students feel comfortable and that emotions help people think and be creative. Moreover, the author asserts that Emotional Quotient (EQ), which means understanding oneself and others' feelings, is equally important as Intelligence Quotient (IQ). It has also been highlighted that a friendly learning environment helps both children and teachers perform better.

Purpose of the Review

The primary goal of this review is to examine existing research on neuropedagogical principles applied in early childhood English language learning, identifying key trends and gaps. The

study aims to provide a basis for developing evidence-based instructional strategies that effectively address the distinct needs of young and elementary learners.

Research Questions

- **What are the key neuropedagogical strategies used in EFL classrooms for elementary learners?**
- **What impact can neuropedagogical strategies have on EFL acquisition in elementary school learners?**
- **What are teachers' perceptions of neuropedagogical teaching strategies in early EFL education?**

Theoretical Framwok

Conceptualization and principles of neuropedagogy

Hernández (2022), has provided some definitions for neuropedagogy through the relationship between neuroeducation, neurodidactics, teacher instruction and neuropedagogy, showing a strong correlation between them. In the author's view, comparative and differentiated neuroeducation is supported, which is the most important aspect of neuropedagogy to help identifying the periods of students' development and the most appropriate teaching strategies for each stage. In conclusion, neuropedagogy is conceptualized as the science that explains the human being in an educational context with neuroscience support.

Neuropedagogy consists of research in the fields of pedagogy and neurobiology. Therefore, its purpose encompasses collecting information on neurobiological aspects of educational reality, an analysis of this context, and the interconnections and interdependence between these scientific fields and their explanations and changing this present educational context by employing the diffusion of the acquired knowledge (Chojak, 2018). According to Kamenická (2022), neuropedagogy "aims to answer the question of how to stimulate the brain areas and create neural pathways in order to maximize learning and thus learn effectively – i.e. with a maximal effect from the invested effort" (p. 36). Additionally, Davronbek (2023), describes as neuropedagogical principles the role of emotions in learning and the brain's ability to process information, which are conceptualized in Table 1.

Table 1. Neuropedagogy principles

Neuropedagogy principles					
1. The role of emotions in learning			**2. The brain's ability to process information**		
Emotional factors in thinking and creativity.	Emotional intelligence vs. Intelligence quotient (IQ).	The importance of a comfortable learning environment.	Simultaneous conscious and subconscious activity.	Analysis and synthesis in teaching.	The role of memory systems in learning.

Neuropedagogy principles					
1. The role of emotions in learning			2. The brain's ability to process information		
Emotional factors play a crucial role in the development of students' thinking and creativity.	Emotional intelligence is just as important as the intelligence quotient in the learning process.	A comfortable learning environment is necessary for effective learning and retention of information.	The brain's ability to simultaneously process information consciously and subconsciously allows for a larger amount of information to be retained.	The interaction of analysis and synthesis is crucial in the development of the thought process and requires appropriate teaching methods.	The presence of two memory systems in the brain, visual spatial and "learning", affects the way information is assimilated and retained.

Source: prepared by Davronbek (2023), adapted from System of Principles of Neuropedagogy.

Relationships between neuropedagogy and EFL learning implications

In a literature review, Medvedieva et al. (2023), stated that neuroscience roots provide the educational community with benefits for learning EFL. One is increasing learning results by recognizing how the brain processes information for significant knowledge acquisition. This allows learning personalization, which helps students to work on their own learning style and rate. Furthermore, neuropedagogy supports teacher instruction by developing innovative teaching methodologies based on how their students learn, and principally taking care of their emotional and mental well-being, considering mindfulness activities to release stress and anxiety, and creating encouraging and positive learning environments.

In the same research line, Vovk et al. (2022), have considered the relationship between neuropedagogy and foreign language learning as a domain that helps find the different cognitive profiles of students. This aims to understand the lateralization of the cerebral hemispheres, addressing topics such as memory, attention, personality, motivation, how to act face to stress and pressure, their multisensory perceptions and their most pronounced multiple intelligences.

Table 2 shows the neuropedagogical and psychopedagogical characteristics of very young learners, who are 0-7 years old. This group of children corresponds to pre-primary or starting primary education, who haven´t yet acquired the reading or writing skills. So, the cognitive development of these learners is benefited by multisensory learning and TPR (Total Physical Response) strategies for learning English as a second language (Kamenická, 2022).

Table 2. Characteristic of a very young learner

Early and elementary level of education (0-7)	
Literacy	cannot read or write yet often already able to use smartphones, tablets, computers, etc.
attention	have a very short attention span – important to catch their immediate interest and often alter activities are curious – they enjoy riddles, problem-solving, etc.
Imagination	have a very vivid imagination
confidence	are rather egocentric

Early and elementary level of education (0-7)	
Cognitive development	are more sensitive than rational benefit from sensory input and multisensory learning –TPR (Total Physical Response) is recommended are unable to understand very abstract concepts are unable to understand theoretical explanations
Psychological development	are rather egocentric
Social development	prefer individual work – they are not mature enough to work in pairs or groups

Source: Prepared by Kamenická (2022).

Based on the neuropedagogical and psychopedagogical characteristics of this group of learners, Kamenická (2022), states that young children are very curious and imaginative, have a short attention span, are unable to understand very abstract concepts and theoretical explanations. As they are still rather egocentric, the role of the teacher is to facilitate the acquisition of the contents through innovative strategies, taking advantage of their strengths. Therefore, the acquisition of English skills can be highly developed by sensory input, by using technology resources, by employing the TPR methodology and by developing projects through exploration.

Methodology

The present article is a systematic review that allowed the researcher to explore neuropedagogical principles for second-language acquisition in elementary learners (Matos et al., 2023). This literature review had considered the articles with a quantitative, qualitative and mixed research methods, considering those that provide an understanding of the key neuropedagogical strategies, improvements and teacher perceptions for EFL acquisition.

The data sources selected included ResearchGate, ERIC, Atlantis Press, Google Scholar, Dialnet and Scielo, which were chosen for their comprehensive coverage of studies in education, neuroscience, multisensory learning, EFL and linguistics. These databases provide access to high-quality, relevant research on neuroeducation, L2 acquisition, and EFL pedagogy.

Moreover, the search employed a combination of keywords and Boolean operators to ensure the quality and relevance of the studies involved in the review. Examples of keywords include: “neuroeducation AND EFL AND young learners”, “brain-based teaching strategies AND early childhood”, “second-language acquisition AND ages 4-6”, “multisensory learning AND phonics AND EFL” and “ kindergarten OR elementary education”

This systematic review focused on articles published from 2015 to 2025, which provide insight and recent analysis for neuropedagocial strategies, their effectiveness and improvements and teacher perceptions in the EFL learning. Additionally, an effort was made to evaluate the reliability of findings by examining research design, sample ages, data collection techniques, key trends

and gaps and analytical frameworks across studies. This approach ensured a balanced assessment of the validity and applicability of neuropedagogical principles in EFL classrooms. Consequently, the researcher considered the criteria for inclusion and exclusion, as specified in Table 3, which was employed to support the quality and relevance of the research.

Table 3. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Focus of the article	Neuroeducation and EFL pedagogy, Articles that contribute directly to the EFL teaching-learning process. Empirical studies	Articles do not address neuroeducation or EFL specifically. Articles that focus only on neurology. Theoretical studies
Types of the article	Quantitative, qualitative, and mixed methods	Types that do not answer the research question
Publication date	2015 to 2025	Articles published before 2015
Language	English, Spanish	Any other language will be excluded
Participant	Early and elementary students' levels. Teachers of primary schools Private or public education. Urban or rural area.	Teenagers, higher education, adults

Source: own elaboration

A considerable list of articles was read and analyzed, but some papers did not match the relationship between the principal keywords and the inclusion criteria. While some articles addressed the two central variables investigated in this study, neuropedagogy and EFL learning, the samples were aimed at high school students and adults. For this reason, these articles were not taken into account. Similarly, other articles covered neuropedagogical features in different areas of education without specifying the EFL learning, so, as well, these were also excluded.

Development

This section details the most significant findings for this systematic review. Seventeen research papers were analyzed to answer the research questions proposed. After reviewing each of the selected papers, four key neuropedagogical strategies for EFL learning were found, whose results are shown in Tables 4, 5, 6, 7 and 8, including important information about the articles.

Table 4 details the four key neuropedagogical strategies for EFL learning, as well as the keywords that helped search for the relationship between the two variables.

Table 4. Related keywords for the neropedagogical strategies for EFL learning

Multisensory learning	Integration of technological and multimedia resources	Total physical response (TPR)	Project based learning
Neurodidactic	Technology	Early Childhood	Childhood education
English langue	Kindergarten	English	Cognitive abilities
Language Skills	Devices	Method	Project based learning and English Language
Aesthetic expressions	Digital tools	Neuroeducation and the Total Physical Response	Pre-schoolers
Brain-based	Technology-based learning		Students' interaction
Music - songs			

Source: own elaboration

Table 5 lists articles that support how the multisensory learning strategy improves EFL learning in early childhood education.

Table 5. Strategy 1: Multisensory learning

Title	Author	Type Of Study	Sampling	Improvements
Neurodidactic strategies in the area of English Language in kindergarten and elementary education.	González et al. (2022).	Non-experimental or ex post-facto, descriptive and survey-based design	111 teachers of initial and elementary levels of education. 200 centers in the Region of Murcia.	Auditory memory by using music, executive function by task planning, freedom to make decisions, critical thinking training,
Methodological Strategies for the Development of Language Skills in Elementary School Children.	Mendieta & Reyes (2022).	Quantitative approach, of an exploratory type, bibliographic review, scientific methods.	20 teachers, 50 students and 50 parents.	Development of language skills are given by how the teacher carries out activities through songs, stories, and games, accompanied by stimulation of their speech.
Impacts on Phonological Awareness (PA) among Young ESL Learners in a Rural Setting.	Raihan & Hua (2020).	Quasi-experimental research design	A total of 60 pupils: 30 comparison group and 30 treatment group.	Using a multisensory learning approach will greatly support the development of PA in learners and further promote their progress in reading the target language.
Pedagogical strategies for English language development in early childhood education.	Quevedo & Huanani (2024).	Quantitative approach and descriptive	50 teachers, 100 students of initial education level	Game-based learning and the use of songs and rhymes helps maintain students' attention and engagement. Flashcards help strengthen vocabulary, facilitate the understanding of abstract concepts, and create mental associations that facilitate language retention.
Teaching-learning strategies of English as a second language using aesthetic expressions.	Freire, R., León, M., Espin, L., & Maldonado, G.	Qualitative approach	20 students which was then divided into five (5) learning subgroups	The sensory interconnection with aesthetic expressions triggered the students' neural networks, fostering brain plasticity and adaptability to new knowledge (vocabulary, grammatical innovation, pronunciation styles and forms, and body language during conversation or discussion).

Source: own elaboration

As stated by González et al. (2022), the auditory memory was improved by using music, as well as the executive function through task planning, free decision-making and critical thinking

training. Similarly, Mendieta and Reyes (2022), claim that the way teachers develop their lessons through songs, stories, and games, aligned with encouragement of their speech helps to increase their language skills. This is associated with the statements of Quevedo and Huanani (2024), in that songs and rhymes encourage students' attention and engagement and flashcards help strengthen vocabulary retention. Additionally, aesthetic expressions as a multisensory strategy activate the learners' neural networks, boosting brain plasticity and adaptability to new information (Freire et al., 2025). Lastly, Raihan and Hua (2020), established that multisensory learning considerably benefits the phonological awareness in reading skills of a foreign language.

The data in Table 6 suggest the integration of technological and multimedia resources as a neuropedagogical strategy for EFL learning.

Table 6. Strategy 2: Integration of technological and multimedia resources

Title	Author	Type Of Study	Sampling	Improvements
Innovation in the Teaching-Learning Process of the English Language in Basic General education	Luna et al. (2024).	Mixed method	50 teachers of primary and secondary school	Innovative technological strategies and resources, such as interactive multimedia, gamification, augmented/virtual reality, and AI voice assistants improve the teaching and learning of English listening skills.
The Effectiveness of Using Technology in English Language Classrooms.	Hossain & Flint (2015).	Action research	15 ICT schools AND 15 schools that did not use the supplementary audiovisual content in the classroom English Class 4	Audiovisual content fosters learner-centered classrooms. Through the use of technology, it became possible to observe students' behavior and thought processes, leading to an improvement in their questioning skills
Teachers' perspectives on technology-based learning for the kindergarten students	Rustan et al. (2023).	Qualitative research	Three schools and eight teachers	Technology granted kindergarten teachers with enjoyable and interactive environment, improved the quality of their listening and reading skill
Developing an Electronic Device to Teach English as a Foreign Language: Educational Toy for Pre-Kindergarten Children	Abdi & Canvus (2019).	quantitative and qualitative methods	20 pre-kindergarten children 4 - 5 years old 8 girls + 12 boys Average age 4.6 years old	The educational toy with 5 different games helps the children to learn the alphabet, numbers, colors, shapes and increase the English vocabulary

Source: own elaboration

This section describes how interactive multimedia, gamification, augmented/virtual reality, AI voice assistants, audiovisual content and educational toys are employed by kindergarten teachers. Since technology is very attractive for children who are considered digital natives, teachers consider it highly important to use these technological resources, which are a means for creating an enjoyable and interactive environment, with the advantage of improving the quality of their listening and reading skills (Rustan et al., 2023).

Notably, the results in Table 7 highlight the importance of using TPR to encourage kindergarten children to learn English through the implementation of music, dancing, body movement and following orders in the English classrooms.

Table 7. Strategy 3: Total Physical Response

Title	Author	Type Of Study	Sampling	Improvements
Neuroeducation and the Total Physical Response Method	López & Villafuerte (2021).	Action research qualitative and quantitative approaches	Second-grade students (35 in total) from primary schools in Ecuador	Dancing and body movements increase students' motivation, class participation and vocabulary acquisition
The Implementation of TPR Method in Teaching English for Early Childhood	Sumihatul (2017).	qualitative descriptive	30 students aged 6 to 7 years, including 14 boys and 16 girls.	Students prefer learning English through imitation, memorization, repetition, drills, and demonstrations, often using (TPR) techniques, it allows the teachers to monitor the learners' actions
Teaching Kindergarten Children English Vocabulary by TPR in Physical Education Courses	Coşar & Orhan (2019).	quasi-experimental and quantitative study	32 kindergarten students aged 6	Children find learning a foreign language vocabulary more enjoyable, better, and simpler when TPR techniques are combined with sports and games.
Implementation of TPR Method in Learning English in Barunawati Kindergarten	Khairma & Suryana (2019).	qualitative with descriptive research design	Researcher conducted this study in Barunawati kindergarten, Padang City.	The primary activity in the TPR method for learning English involves giving commands to kindergarten students, prompting them to respond through physical actions. This approach motivates learners and helps them retain previously learned vocabulary.

Source: own elaboration

As Sumihatul (2017), reported that students showed more interest in learning English when the teacher used imperative drilling and modelling concepts. Also, it is central to state that students felt self-confidence and happiness because they responded appropriately to the teacher's directions (Khairma & Suryana, 2019). Dancing and body movements are other relevant strategies that children enjoy a lot, which increases students' motivation, class participation, and better vocabulary acquisition (López & Villafuerte, 2021).

The data in Table 8 indicates that Project-Based Learning (PBL) is significantly impacted by both internal and external influences in the educational setting.

Table 8. Strategy 4: Project-based learning

Title	Author	Type Of Study	Population	Improvements
Teachers' perception of the implementation of project-based learning in early childhood education in Indonesia	Aisyah & Novita (2025).	Quantitative approach	270 Early childhood education teachers	PBL, as a student-centered approach, engages learners in real-world problem-solving projects, which promotes active learning and critical cognitive processes

Title	Author	Type Of Study	Population	Improvements
Implementation of PBL Method in Developing Cognitive Abilities of Children Aged 5-6 Years Through Loose Parts Media	Putri et al. (2024).	Descriptive qualitative approach	Children aged 5-6 years	Through active engagement in learning activities, the children demonstrated improvements in problem-solving, logical reasoning, and symbolic thinking
The Effect of PBL in Teaching EFL Vocabulary to Young Learners of English: The Case of Pre-school Children	Kimsesiz et al. (2017).	Experimental design including a control and an experimental group	preschoolers aged 5-6 years, with 14 children assigned to the experimental group and 14 to the control group.	The integration of PBL concepts through designing vlogs in English vocabulary classes has significantly enhanced students' vocabulary mastery. It also assists teachers in facilitating problem-solving skills through collaborative or individual projects
The Effectiveness of Project-Based Learning through Vlog to Improve Pre-Schoolers' Vocabulary Mastery	Yunita et al. (2022).	Experimental design	60 preschool students	The results also indicated a significant effect of PBL on both learner motivation and vocabulary learning performance.

Source: own elaboration

According to Aisyah and Novita (2025), the school environment includes infrastructure, facilities, and administrative support, which play a crucial role in facilitating effective PBL, while parents´ involvement enhances students' motivation and access to resources. Internal factors like students' curiosity can drive engagement but may also cause disruptions if not well-managed, requiring collaboration among teachers to maintain balance (Putri et al., 2024). Moreover, PBL has been shown to enhance learners' motivation, encourage natural language use, and promote active participation (Kimsesiz et al., 2017). These findings together emphasize the multifaceted benefits of PBL when conducive environments and collaborative efforts support it.

Conclusion

This systematic review included the analysis of 17 articles with the aim of stating the most relevant neuropedagogical strategies for EFL learning, progress and viewpoints from teachers. The information gathered provided the researcher with insights to address the research questions mentioned at the beginning of this systematic review.

What are the key neuropedagogical strategies used in EFL classrooms for elementary learners?

According to the explored information and tendencies, four key neuropedagogical strategies were identified for EFL learning, considering the cognitive process of early and elementary students. From the results, it is clear that the neuropedagogical strategies should be framed in the

following main principles: multisensory learning, emotion regulation, mindfulness, feedback and personalization (Medvedieva et al., 2023).

Other results were broadly in line with Kamenická (2022), who explained characteristics for the cognitive development of early and elementary learners, as well as the insight to work in class with them. The first neuropedagogy strategy suggested is multisensory learning, the second one is the integration of technological and multimedia resources, the third one is the Total Physical Response and lastly, Project-Based Learning as the fourth strategy. This proposal is directly in line with previous findings, which suggest the use of these strategies for EFL learning.

Music, stories and games as a multisensory learning strategy have been used by different authors to improve the auditory memory and other language skills (González et al., 2022; Mendieta & Reyes, 2022). English listening skills development has also been shown to improve when employing interactive multimedia, gamification, virtual reality, and AI voice assistants as technological strategies (Luna et al., 2024).

Moreover, TPR as a neuropedagogy strategy was employed among early and elementary contexts, concluding that dancing and body movements increase students' motivation, class participation and vocabulary acquisition (López & Villafuerte, 2025). Lastly, some vlogs were developed as a PBL strategy for improving students' vocabulary, showing a positive impact for teachers to manage problems through individual or group projects (Kimsesiz et al., 2017).

Without a doubt, the implementation of neuropedagogical strategies is very beneficial for English teachers at early and elementary levels of education. From the neurobiological and cognitive perspective of working with children, teachers today face the great challenge of understanding how children's brains learn. It is important to mention that teachers currently work with these strategies, but without the theoretical foundations that this entails. The greatest limitation we English teachers face is the lack of adequate training in the implementation of neuropedagogy. In addition, teachers have limited access to pedagogical resources and institutional infrastructure.

What impact can neuropedagogical strategies have on EFL acquisition in elementary school learners?

This section details the aspects of EFL learning that can be improved through the use of neuropedagogical strategies in elementary education. Among the most important results are motivation to learn and active class participation, development of English language skills, cognitive process and connection of new neural networks.

Students feel more motivated when their bodies are moving. As López and Villafuerte (2021), stated that dancing and body movements increase students' motivation, class participation and better vocabulary acquisition. Similarly, in the research of Sumihatul (2017), students prefer to acquire English skills by using imitation, memorization, repetition, drills, and demonstrations facilitated by the TPR method. In contrast, Khairma and Suryana (2019) and Yunita et al. (2022),

have been found that the primary activity in the TPR methodology for teaching English involves giving commands to kindergarten students., which generates a positive response and serves as motivation to remember previously learned words.

Comparably, some English language skills have been improved by using neuropedagogical strategies. For example, language skills can be developed through songs, stories and games (Mendieta & Reyes, 2022) as well as pronunciation through expansions of phonological awareness (PA) (Raihan & Hua, 2020).

Additionally, the results show multiple studies that have incorporated the use of technology such as interactive multimedia, gamification, augmented/virtual reality and AI voice assistants to improve the teaching and learning of English (Adbi & Canvas, 2019; Cosan & Orhan, 2025; Luna et al., 2024).

Another significant improvement in EFL is achieved by implementing neuropedagogical strategies, including multisensory learning, training auditory memory by using music and exercising the executive functions by task planning, free decision-making and critical thinking drilling (González et al., 2022). Tools such as flashcards help strengthen vocabulary, facilitate the understanding of abstract concepts, and create mental associations that facilitate language retention (Quevedo & Huanani, 2024). In general, Freire et al. (2025), claimed that the sensory interconnection with aesthetic expressions activated the students' neural networks, fostering brain plasticity and adaptability to new knowledge about vocabulary, grammatical innovation, pronunciation styles and forms, and body language during conversation or discussion.

What are teachers' perceptions of neuropedagogical teaching strategies in early EFL education?

In line with Quevedo and Huamani (2024), educators' attitude is positive face to multisensory learning, since it incorporates games, songs, and storytelling, which are associated with early students´ growing necessities and interests. In comparison with the study of Gonzáles et al. (2022), teachers perceive this learning strategy as an alternative for improving student engagement, motivation, and retention of language concepts. However, some teachers indicated their worries about the lack of effective training and appropriate tools to implement these strategies in language education. Likewise, other educators included their aspirations of having the institutional support for continuous professional growth (Mendieta & Reyes, 2022).

The findings also show teachers express a strong willingness to use technology and multimedia resources to capture students' interest and to motivate their participation through task-based learning, gamification, and contextualized activities. Likewise, audiovisual materials are considered as a positive means to increase students' engagement, making language learning more available and pleasant for them (Luna et al., 2024; Hossain & Flint, 2015). Nevertheless, some teachers are concerned about the likely negative impact of screen time on infants' health and the lack of appropriate and age-suitable didactic applications, also, other professionals in education recogni-

ze that technology should function as an optional rather than a primary way during the learning process (Rustan et al., 2023). These challenges significantly affect the integration of technology in kindergarten classrooms.

A similar pattern of results was obtained for the TPR strategy. Teachers' views report that including music, dance, and physical activities for early English language learners improves students' motivation, engagement, and vocabulary retention. However, López and Villafuerte (2021), identify the lack of empirical studies in incorporating arts, music, and physical movement into EFL instruction as a limitation, thus, there is limited information about their efficiency. In comparison with the study of Sumihatul (2017), and to support student engagement and guarantee effective learning, teachers need to plan carefully the activities and adopt various roles, such as model, instructor, and monitor, which can be demanding, making it difficult to implement the TPR approach in the classroom.

Ultimately, teachers have a positive perception of the Project-Based Learning strategy, which has been useful for educators to encourage a dynamic and interactive learning environment for students and for giving them opportunities to explore their social abilities through the development of group projects (Aisyah & Novita, 2025). As well as Educators highlight that this strategy fosters the cognitive abilities of children aged 5–6, promoting deeper understanding and retention of knowledge (Putri et al., 2024). Even though some limitations have been identified at the moment of working with PBL by teachers, these include the long time and effort required for planning and managing projects, fairly assessing student performance, and the need for adequate resources and authorities' support (Kimsesiz et al., 2017).

In conclusion, neuropedagogical strategies imply understanding neurobiology and pedagogy principles, intending to identify the most suitable activities to work with early and elementary learners in the EFL classrooms. It is essential to state that this group of students learn better by using different senses; therefore, along this systematic review, students prefer to work with strategies that imply movement, like TPR and multisensory learning. Additionally, students showed more interest in dynamically resolving problems, as is the case with PBL and more highly significant, since this group of students is considered digital natives, technology is fundamental to catch their attention. All of these neuropedagogical strategies have an effective improvement in EFL learning, which were useful for motivating students to learn more, encouraging class participation, boosting listening, speaking and reading skills, increasing their English vocabulary and finally, addressing their cognitive process and brain plasticity. Based of all, teachers also showed a positive attitude at the moment of implementing neuropedagogical strategies, underlining some weaknesses, principally with the lack of professional development and access to limited resources.

Recommendations for future research

Most of the investigations about neuropedagogy strategies are developed in Indonesia and Turkey, and the educational and cultural context in Ecuador is different. Therefore, future research should develop action research studies about English learning in Ecuador.

Assessment and evaluation tools for neuropedagogy strategies are also required for the correct development of teachers. This is a wide area for future research, particularly how to evaluate learning outcomes effectively for very young children. Teachers expect to be provided with formative and summative assessment tools according to the students' age.

Considering the lack of specialized teachers in how to manage some neuropedagogical strategies, future researchers should design teachers' training programs integrating neuroscience-based pedagogical techniques into EFL instruction and how it could impact the welfare of teachers and students.

Since these strategies are innovative for the educational community, many teachers struggle to align with neuropedagogy principles, thus, future studies could investigate how neuropedagogy strategies can be systematically integrated into national or institutional early childhood education Curriculum without compromising required principal competencies.

References

Abdi, A., & Canvus, N. (2019). Developing Electronic Device to Teach English as a Foreign Language: Educational Toy for Pre-Kindergarten Children. *International Journal of Emerging Technology in Learning, Kassel, Germany, 14*(22). https://doi.org/10.3991/ijet.v14i22.11747

Aisyah, S., & Novita, D. (2025). Teachers' perception of the implementation of project-based learning in early childhood education in Indonesia. *Congent Education, 12*(1), 1-17. https://doi.org/10.1080/2331186X.2025.2458663

Barabanova, I., & Kazlauskiene, A. (2020). Neuropedagogy: preconditions for application of neuroscience results in the education process while providing feedback /. *Techniumscience,* 2, 112-122.

Chojak, M. (2018). Neuropedagogy as a Scientific Discipline: Interdisciplinary Description of the Theoretical Basis for the Development of a Research Field. *International Journal of Educational and Pedagogical Sciences, 12*(8), 1-4. https://doi.org/10.5281/zenodo.1474341

Coşar, Z., & Orhan, R. (2019). Teaching Kindergarten Children English Vocabulary by Total Physical Response in Physical Education Courses. *Journal of Physical Education and Sports Management, 6*(2), 70-76. https://doi.org/10.15640/jpesm.v6n2a8

Davronbek, Y. (2023). System of Principles of Neuropedagogy. *The European Journal of Education,* (4), 126. https://doi.org/10.29013/EJEAP-23-4-126-129

Freire, R., León, M., Espin, L., & Maldonado, G. (2025). Teaching-learning strategies of English as a second language using aesthetic expressions. *Pontificia Universidad Católica del Ecuador, Quito, Ecuador, 1*(2), 1821-1839. https://doi.org/10.23857/pc.v10i2.9003

González, F., Cascales, A., & Gomariz, M. (2022). Neurodidactic strategies in the area of English Language in kindergarten and elementary education. *Multidisciplinary Journal of Education*, *15*(31), 43-56.

Hernández, A. (2022). Neuropedagogy and neuroimaging. *exto Livre,* 15. https://doi.org/10.35699/1983-3652.2022.40453

Hossain, R., & Flint, S. (2015). The Effectiveness of Using Technology in English Language Classrooms in Government Primary Schools in Bangladesh. *FIRE: Forum for International Research in Education, 2*(5), 47-59.

Kamenická, J. (2022). *Brain-Based TEFL.* Faculty of Education of Constantine the Philosopher University.

Khairma, F., & Suryana, D. (2019). Implementation of TPR (Total Physical Response) Method in Learning English in Barunawati Kindergarten. *Advances in Social Science, Education and Humanities Research,* 337, 257-260. https://doi.org/10.2991/picema-18.2019.53

Kimsesiz, F., Dolgunsoz, E., & Konca, Y. (2017). The Effect of Project Based Learning in Teaching EFL Vocabulary to Young Learners of English: The Case of Pre-school Children. *International Journal of Languages' Education and Teaching, 5*(4), 426-439.

López, J., & Villafuerte, J. (2021). Educational innovation into English as a Foreign Language Practices for Early Children: Neuroeducation and the Total Physical Response Method. *The Asian Institute of Research, 4*(3), 377-389. http://dx.doi.org/10.31014/aior.1993.04.03.346

Luna, K., Chicaiza, R., Heredia, E., & Schettini, T. (2024). Innovation in the Teaching-Learning Process of the English Language in Basic General Education. *Revista Científica Arbitrada Multidisciplinaria PENTACIENCIAS, 6*(4), 66-76. https://doi.org/10.59169/pentaciencias.v6i4.1127

Matos, J., Piedade , J., Freitas, A., Pedro, N., Dorotea , N., Pedro , A., & Galego, C. (2023). Teaching and Learning Research Methodologies in Education:A Systematic Literature Review. *Educ. Sci., 13*(2), 1-23. https://doi.org/10.3390/educsci13020173

Medvedieva, S., Stepanova, I., Nykyporets, S., & Ibrahimova, L. (2023). The application of a neuropedagogical approach while teaching English to students of higher educational establishments. *Prospects and innovations of science, 26*(8). http://dx.doi.org/10.52058/2786-4952-2023-8(26)-13-24

Mendieta, D., & Reyes, O. (2022). Methodological Strategies for the Development of Language Skills in Elementary School Children. *InternationalJournal of Linguistics, Literatureand Culture, 8*(4), 210-217. https://doi.org/10.21744/ijllc.v8n4.2146

Montessori, M. (1966). *The secret of childhood.* Ballantine Books.

Putri, M., Sudarti, S., & Zar'in, F. (2024). Implementation of Project-Based Learning Method in Developing Cognitive Abilities of Children Aged 5-6 Years Through Loose Parts Media. *Journal of Education and Teaching Learning (JETL), 6*(1), 106-117. http://dx.doi.org/10.51178/jetl.v6i1.1793

Quevedo, S., & Huamani, L. (2024). English teaching and learning strategies used in early childhood education students. *Revista Interdisciplinaria de Humanidades, Educación, Ciencia y Tecnología, X*(18), 184-198.

Raihan, M., & Hua, K. (2020). Multisensory Learning Approach: Impacts on Phonological Awareness among Young ESL Learners in a Rural Setting. *Universal Journal of Educational Research, 8*(12), 6692-6705. http://dx.doi.org/10.13189/ujer.2020.081234

Rustan, N., Cahyono, B., & Junaid, R. (2023). Teachers' perspectives on technology-based learning for the kindergarten students. *Journal of Education and Learning (EduLearn), 17*(3), 374-381.

Sousa, D. A. (2011). *How the brain learns*. Corwin Press.

Sumihatul, S. (2017). The Implementation of TPR (Total Physical Response) Method in Teaching English for Early Childhood. *Advances in Social Science, Education and Humanities Research (ASSEHR),* 58, 421-427. https://doi.org/10.2991/icece-16.2017.74

Vovk, O., Zenya, L., & Brovarska, I. (2022). Neuropedagogy: A concept of brain compatible teaching a foreign language. *Bulletin of Bohdan Khmelnytsky National University of Cherkasy,* (2), 1-10. https://doi.org/10.31651/2524-2660-2022-2-64-73

Yunita, W., Zaim, M., Syarif, H., & Zainil, Y. (2022). The Effectiveness of Project-Based Learning through Vlog to Improve Pre-Schoolers' Vocabulary Mastery. *Journal Pendidikan Anak Usia Dini, 6*(5), 4661-4668. https://doi.org/10.31004/obsesi.v6i5.2232

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