

Exploring Neuroeducation-Based strategies for English Language acquisition in adult virtual classrooms

Exploración de estrategias basadas en la neuroeducación para la adquisición del Inglés en aulas virtuales para adultos

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Abstract

This study explores the role of Neuroeducation-Based strategies in supporting English language acquisition among adult learners in virtual classrooms. Through a review of academic literature published between 2020 and 2025, the analysis identifies key brain-based principles that enhance attention, memory, emotional stability, and meaningful engagement in online learning environments. The findings show that strategies such as spaced practice, structured routines, reduced cognitive load, multisensory activities, and emotionally supportive interactions significantly improve retention and promote more effective language use. Evidence also highlights that virtual instruction becomes more successful when teachers design tasks that activate multiple neural pathways and encourage motivation through timely feedback, collaboration, and purposeful practice. Overall, the study concludes that integrating neuroeducation principles into virtual English instruction offers a scientifically grounded and human-centered approach that strengthens adult learners' progress, autonomy, and long-term language development.

**Keywords:** Neuroeducation, adult learning, virtual classrooms, English acquisition, brain-based strategies, cognitive engagement, emotional regulation, online education.

Resumen

Este estudio explora el papel de las estrategias basadas en la neuroeducación para apoyar la adquisición del inglés en estudiantes adultos en aulas virtuales. Mediante una revisión de la literatura académica publicada entre 2020 y 2025, el análisis identifica principios clave basados en el cerebro que mejoran la atención, la memoria, la estabilidad emocional y la participación significativa en entornos de aprendizaje en línea. Los hallazgos muestran que estrategias como la práctica espaciada, las rutinas estructuradas, la reducción de la carga cognitiva, las actividades multisensoriales y las interacciones de apoyo emocional mejoran significativamente la retención y promueven un uso más efectivo del idioma. La evidencia también destaca que la instrucción virtual es más exitosa cuando los docentes diseñan tareas que activan múltiples vías neuronales y fomentan la motivación mediante retroalimentación oportuna, colaboración y práctica con propósito. En general, el estudio concluye que la integración de los principios de la neuroeducación en la instrucción virtual de inglés ofrece un enfoque con base científica y centrado en el ser humano que fortalece el progreso, la autonomía y el desarrollo lingüístico a largo plazo de los estudiantes adultos.

**Palabras clave:** Neuroeducación, aprendizaje de adultos, aulas virtuales, adquisición del inglés, estrategias basadas en el cerebro, participación cognitiva, regulación emocional, educación en línea.

## Introduction

Neuroeducation has transformed the way learning is understood because it links everyday experiences with the brain processes that make skills possible. It shows that attention, emotion, and repetition directly shape how people absorb new information, which is especially relevant for adults who often balance learning with complex routines. As researchers such as Letelier (2020) and Moscoso (2023) explain, the brain continues adapting throughout life, meaning that progress depends on the quality and frequency of practice rather than age. This perspective encourages teachers to design activities that feel meaningful and manageable, supporting learners to understand how their habits, moods, and expectations influence their progress.

Even though neuroeducation offers strong evidence about how adults learn, virtual English programs rarely apply its principles consistently. Many online courses still focus on delivering content rather than building motivation, regulating cognitive load, or creating emotionally engaging experiences. Research on brain-based learning, including work by Navarro et al. (2025) and Figueroa & Farnun (2020), shows that the brain responds better to tasks that involve active engagement and emotional balance, yet these elements are often missing in digital English lessons. As a result, the benefits of neuroeducation remain disconnected from adult English acquisition in virtual settings.

Adults learning English online often face difficulties such as distractions, low motivation, and limited interaction, all of which reduce their chances of staying engaged over time. Studies on virtual learning suggest that digital platforms can increase cognitive overload when tasks are not well paced or when feedback arrives too late to be useful (Suparman et al., 2023). In addition, adults manage emotional factors like frustration or self-doubt more intensely when learning languages online, particularly because they juggle study with demanding personal schedules. These challenges slow progress and

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highlight the need for strategies that consider how adults think, feel, and manage their time.

In this sense, the purpose of this article is to systematize recent literature to identify and organize a set of Neuroeducation-Based strategies that can improve adult learning in virtual English classrooms. Rather than simply summarizing studies, this work connects ideas from different authors to create practical guidance for educators. By combining evidence on attention, emotion, repetition, and cognitive load, the study seeks to offer strategies that make learning in virtual settings more meaningful, manageable, and motivating for adults.

Understanding how the brain learns is essential for teaching in virtual environments. Pinzón and Moreno (2020) explain that the adult brain remains plastic and strengthens neural pathways through repeated practice, making constant exposure to English key for long-term progress. Castro and Cevallos (2021) add that new and emotionally engaging experiences lead to durable neural changes, which supports the use of short but frequent lessons that involve listening and speaking. Learning improves when students make mistakes and receive feedback, reinforcing the idea that trial and error is a core mechanism rather than a flaw (Campuzano et al., 2021). These insights support the idea that learning may be more effective when it is aligned with the brain's natural tendency to build routines, seek meaning, and adapt gradually.

Across many areas of education, neuroeducation has been proven as an effective approach for increasing engagement, improving attention, and creating deeper learning experiences (Moscoso, 2023, Navarro et al., 2025). Multisensory activities improve retention and emotional involvement while emotional balance, persistence, and meaningful challenges also strengthen learning (Moscoso, 2023). Programs that combine feedback, reflection, and repeated exposure tend to produce stronger

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outcomes because they align with how the brain organizes information and forms long-term memory.

In language acquisition, neuroeducation highlights the importance of repetition, context, and active engagement. Several recent studies emphasize that repeated and meaningful exposure helps learners internalize patterns, especially when language becomes part of daily routines and authentic interactions (Navarro et al., 2025). Multisensory tasks combining listening, speaking, participation, and interaction not only activate several neural pathways but also make language learning more memorable and emotionally engaging (Castro and Cevallos, 2021). Research on learning through mistakes further shows that vocabulary games, communicative practice, and interactive tasks facilitate more natural acquisition than memorization alone (Campuzano et al., 2021). These insights demonstrate that neuroeducation aligns naturally with how people learn a second language.

Additionally, adults benefit greatly from neuroeducational approaches because their learning depends heavily on habits, personal goals, and emotional regulation. Recent research shows that daily routines and consistent exposure reinforce neural pathways, supporting the idea that repetition is essential for long-term progress in adult learners (Letelier, 2020). Persistence and deliberate practice also play a central role, particularly in autonomous learning environments such as virtual classrooms, where adults must regulate motivation independently (Campuzano et al., 2021). Studies on adult neuroplasticity confirm that adults continue forming new neural connections when learning experiences are meaningful and emotionally positive (Pinzón and Moreno, 2020). This explains why adult learners respond best to practical, relevant lessons connected to real-life experiences.

Virtual learning environments benefit greatly from neuroeducation because they depend on attention control, emotional balance, and appropriate management of

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cognitive load. Current research indicates that adults learn more effectively when digital tasks reduce unnecessary mental effort and follow a clear, organized progression (Suparman et al., 2023). Interactive dynamics, timely feedback, and short learning sequences maintain engagement and prevent cognitive fatigue in online settings (Campuzano et al., 2021). Emotional connection and social interaction, also emphasized in neuroeducational approaches, play a critical role in sustaining adult learners' motivation in virtual environments where isolation can easily reduce participation and persistence.

Neuroeducation-Based strategies can strongly enhance the virtual English learning experience for adults. By aligning teaching practices with how the brain learns through repetition, meaningful routines, emotional engagement, and clear structure, educators can create virtual environments that feel more motivating and human. This approach not only strengthens adult learners' confidence but also supports long-term progress. For these reasons, integrating neuroeducation into virtual English teaching offers a promising path to more effective and supportive learning experiences.

### **Methods and Materials**

The present study follows a qualitative descriptive documentary design which is the most appropriate approach because the purpose of the research is to gather, compare, and interpret recent scientific literature related to neuroeducation and adult virtual English learning. This design allows the researcher to examine how different authors describe cognitive, emotional, and methodological processes and to identify patterns that help explain why certain strategies are more effective than others. Since the study does not seek to measure variables experimentally but instead aims to organize and understand what current literature demonstrates, this approach provides the clarity and depth required for a systematic interpretation.

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The information used for this analysis comes from published academic sources instead of human participants. These sources include peer-reviewed journal articles, scientific reports, books, doctoral theses and master's dissertations published between 2020 and 2025 as this range reflects the most recent advances in neuroeducation and virtual language learning. The inclusion criteria focused on documents that:

- Discuss neuroeducation or brain-based learning.
- Analyze adult education or virtual English learning.
- Present empirical or theoretical contributions relevant to the topic.

Sources that were outdated, lacked academic rigor, or did not address adult learning were excluded. The review incorporated 48 journal articles, 9 books, 6 doctoral dissertations, and 11 master's theses, providing a broad and reliable base of evidence.

Data collection consisted of searching academic databases and institutional repositories using keywords such as neuroeducation, adult learning, virtual English instruction, and cognitive strategies. Once the sources were identified, they were organized in a digital archive and grouped according to common themes such as attention, cognitive load, emotional regulation, and feedback practices. This organization made it possible to compare ideas across authors and determine how each concept contributes to the understanding of adult learning in virtual environments. The process did not follow phases or stages; instead, sources were reviewed and classified continuously.

Data analysis was conducted through thematic analysis, which makes it possible to identify repeated concepts, relationships, and patterns within the selected literature. The coding process involved labeling key ideas and organizing them into broader thematic categories, which helped synthesize the evidence into coherent strategies for virtual English instruction. To strengthen accuracy, digital tools such as Atlas.ti were

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used to support the coding and categorization of information, ensuring that themes were derived systematically from the materials reviewed. This method allowed the researcher to interpret the literature in an organized, transparent, and academically rigorous way.

### **Analysis of results**

#### Key principles for creating effective online learning environments for adults

The analysis of the reviewed literature reveals that adult learners benefit most when virtual English instruction is designed around emotional stability, clear structure, active engagement, and manageable cognitive load. Several authors emphasize that predictable routines, supportive environments, and meaningful tasks help adults maintain attention and regulate motivation, which is essential in digital learning spaces (Hosny, 2025). Studies also highlight that adults engage more effectively when they understand the purpose of each activity and how it connects to real-life situations, reinforcing the value of structured and goal-oriented virtual lessons (Juarez y Bardales, 2023).

Emotional balance appears as a foundational element in adult learning research shows that stress and uncertainty interfere with information processing, whereas calm learning environments improve concentration and memory (Córdova et al., 2023). These findings underscore the need for emotional support mechanisms in virtual spaces, such as clear instructions, low-pressure activities, and empathetic communication.

Overall, the literature consistently demonstrates that adult learners thrive in online environments that are organized, emotionally safe, cognitively clear, and socially engaging (Gómez y García, 2024). This set of conditions forms the basis for instructional approaches informed by how the brain supports learning in virtual English contexts.

#### Emotional Regulation

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From a brain-based perspective, emotional regulation plays a central role in adult learning, as affective states directly influence attention, memory, and engagement in virtual environments. The reviewed literature shows that adults learn more effectively when instructional settings promote emotional stability, reduce anxiety, and normalize mistakes as part of the learning process. Emotional balance allows learners to focus, process information more efficiently, and remain motivated throughout online instruction (Chung, 2022).

Studies consistently indicate that supportive feedback, low-pressure activities, and meaningful interaction contribute to emotional readiness. When learners feel emotionally safe, they are more willing to participate, persist in challenging tasks, and sustain attention over time. These findings suggest that emotional regulation is an essential dimension when designing instruction that aligns with how the brain responds to learning experiences (James y Disabilities, 2023).

Together, these findings suggest that emotional regulation represents a central dimension of effective adult learning in virtual English instruction.

### Cognitive Load

The analysis highlights cognitive load as a critical factor influencing adult learning in virtual environments. Research shows that when tasks are overly complex, poorly structured, or presented with excessive information, learners experience mental overload that interferes with comprehension and retention. From a brain-based learning perspective, managing cognitive demands allows learners to allocate mental resources more effectively (Zhao, 2023).

Clear instructions, concise content, and logically sequenced activities support information processing and reduce unnecessary mental effort. The literature demonstrates that instructional clarity and simplicity facilitate deeper understanding and

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longer retention, particularly in online contexts where distractions are frequent. These results reinforce the importance of designing learning experiences that respect the brain's limited processing capacity (Moscoso , 2023).

The evidence confirms that cognitive simplicity paired with purposeful, concise activities is essential for designing effective online English instruction informed by an understanding of how the brain processes and organizes information.

#### Memory Consolidation and Spaced Learning

Findings consistently emphasize the role of repetition and spaced exposure in strengthening learning outcomes. Research shows that adults retain language structures more effectively when learning is distributed over time through short, frequent practice sessions rather than intensive instruction. This approach supports the formation of stable neural connections that contribute to long-term memory (Navarro et al., 2025).

The literature indicates that micro-learning activities, regular review, and opportunities to revisit content in different contexts enhance retention and transfer of knowledge (Castro y Cevallos, 2021). Error-based practice combined with feedback further supports consolidation by allowing learners to adjust and reinforce understanding. These patterns align with how the brain consolidates information through repeated and meaningful exposure (Matea, 2025).

These findings demonstrate that structured repetition and spaced exposure represent fundamental learning practices that align with how memory consolidation occurs in the brain.

#### Active Participation and Interaction

Active participation emerges as a key condition for effective adult learning in virtual English classrooms. The reviewed studies show that learners benefit from tasks

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that involve speaking, collaboration, and problem-solving, as these activities stimulate multiple cognitive processes simultaneously. Engagement increases when learners actively use language rather than passively receive information (Rodríguez et al., 2025).

Interaction also contributes to emotional stability and sustained motivation. Collaborative activities reduce feelings of isolation and promote a sense of belonging, which supports attention and persistence. These findings suggest that participation-centered instruction enhances learning by engaging both cognitive and emotional processes associated with effective knowledge construction (Hosny, 2025).

Overall, active participation supports both cognitive engagement and emotional resilience two essential dimensions for successful online language acquisition.

#### Motivation, Autonomy, and Self-Regulation

The literature highlights motivation and self-regulation as fundamental elements in adult virtual learning. Adults demonstrate higher engagement when learning tasks are relevant, achievable, and connected to personal or professional goals. From a brain-based perspective, motivation is reinforced when learners experience progress and emotional satisfaction (Fadhilah et al., 2025).

Strategies such as goal-setting, self-monitoring, and reflective practice support autonomy and help learners regulate their learning behaviors. The findings indicate that when adults take an active role in organizing their learning, they develop greater persistence and control over their progress. These results underscore the importance of fostering self-regulation to support sustainable learning outcomes (Sánchez y Quesada, 2025).

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## Discussion

The results of this review offer a clear picture of the conditions that support adult English learning in virtual environments taken together, the findings show that learning improves when instruction is grounded in neuroeducation principles such as emotional regulation, cognitive clarity, spaced repetition, meaningful interaction, and structured routines. These patterns highlight the importance of designing online English courses that respect how adults process information, manage emotions, and maintain motivation over time.

For teachers, these results represent a call to rethink traditional approaches to virtual instruction the evidence shows that adults learn more effectively when lessons are emotionally safe, cognitively manageable, and clearly structured. Therefore, teachers should intentionally create predictable routines, provide timely and supportive feedback, and design tasks that reduce unnecessary mental load. Incorporating short, purposeful activities and repeated exposure to key language elements can help adults develop stronger neural connections and sustain attention. Likewise, prioritizing interactive dynamics rather than relying on passive listening encourages deeper engagement and builds confidence in practical terms, these results invite teachers to design online classes that are more intentional, more empathetic, and more aligned with how adults learn best.

The implications also extend to adult learners themselves understanding how the brain learns can empower students to take greater control of their progress. Strategies such as spaced practice, goal-setting, self-monitoring, and emotional regulation become more effective when learners understand their purpose. The findings suggest that adults benefit from adopting consistent study habits, minimizing digital distractions, and embracing mistakes as part of the learning process by developing these self-regulation skills, learners can become more autonomous and resilient in virtual environments.

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Institutional authorities and curriculum developers also play a crucial role in the application of these results to create effective online programs, institutions must provide teachers with adequate training in Neuroeducation-Based strategies, as well as technological tools that support clear instruction, interaction, and emotional connection. Curricula should incorporate structured routines, opportunities for reflection, and space for micro-learning practices. The findings highlight the need for policies that prioritize student well-being, cognitive organization, and accessible digital design by integrating these principles into institutional planning, authorities can ensure that virtual English programs respond to the cognitive and emotional realities of adult learners.

Finally, the results open relevant pathways for future research scholars may use the findings of this review as a foundation to investigate how Neuroeducation-Based strategies operate in real online classrooms, measuring their impact on language development, motivation, and long-term retention. Researchers could also explore how specific variables such as age, occupation, digital literacy, or prior language experience shape adults' responses to these strategies. There is also room to examine how institutional support, socio-emotional factors, and technological innovations interact with neuroeducational practices by encouraging continued empirical work in these areas, this study invites the scientific community to expand the evidence base and contribute to more effective online education for adults.

### **Conclusion**

The findings of this review demonstrate that neuroeducation provides a solid and meaningful framework for strengthening adult English learning in virtual environments across the analyzed literature, a consistent pattern emerges: adults learn more effectively when instructional practices align with how the brain organizes information, regulates emotions, and builds long-term memory. Elements such as emotional balance,

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structured routines, cognitive clarity, and intentional repetition are not complementary additions but essential components for supporting sustained learning.

One of the central conclusions of this study is that emotional regulation plays a decisive role in adult language acquisition virtual environments often increase stress and uncertainty, and these affective factors directly influence motivation, attention, and retention. When instructors incorporate strategies that promote emotional safety such as timely feedback, predictable lesson structures, and opportunities for supportive interaction adult learners engage with greater confidence and persistence.

Another key conclusion is that reducing cognitive load and presenting information in clear, organized sequences significantly improves comprehension in online settings the literature shows that adults process information more efficiently when tasks are concise, purposeful, and free from unnecessary visual or textual distractions. These conditions allow learners to sustain attention and develop more stable learning habits.

Additionally, the review confirms that repetition, spaced practice, and micro-learning routines are highly effective for consolidating vocabulary, pronunciation, and communicative skills. Adults benefit from short, frequent exposures that align with the brain's natural consolidation cycles virtual platforms offer ideal conditions for implementing these strategies, making language learning more flexible and manageable.

Active participation also emerges as a fundamental element for meaningful language development adults progress when they interact, collaborate, and apply English in communicative tasks that connect with real-life goals. Interactive and socially engaging activities stimulate multiple cognitive processes and reinforce learners' sense of relevance and purpose.

Overall, the evidence suggests that integrating Neuroeducation-Based strategies is not only beneficial but necessary for creating effective and humanized virtual English

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instruction for adults. These strategies support learners' cognitive, emotional, and motivational needs while fostering greater autonomy and long-term progress. The conclusions of this review reinforce the importance of designing online learning environments that are structured, empathetic, and grounded in scientific understanding of how adults learn implementing these principles can lead to virtual English programs that are more engaging, more efficient, and more responsive to the realities of adult learners.

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