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ESMERALDAS

ESCUELA DE DERECHO, EDUCACIÓN Y SOCIEDAD

CARRERA DE PEDAGOGÍA DE LOS IDIOMAS NACIONALES Y EXTRANJEROS

RESEARCH REPORT

A DIDACTIC STRATEGY BASED ON NEUROSCIENCE TO IMPROVE ENGLISH LANGUAGE LEARNING

INFORME DE INVESTIGACIÓN:

UNA ESTRATEGIA DIDÁCTICA BASADA EN LA NEUROCIENCIA PARA MEJORAR EL APRENDIZAJE DEL IDIOMA INGLÉS

PREVIO AL TÍTULO ACADÉMICO DE:

LICENCIADO EN PEDAGOGÍA DEL IDIOMA INGLÉS

LÍNEA DE INVESTIGACIÓN:
EDUCACIÓN, COMUNICACIÓN, CULTURA, SOCIEDAD Y VALORES

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COMITÉ EVALUADOR

COMO MIEMBROS DEL COMITÉ EVALUADOR DEL TRABAJO DE INTEGRACIÓN CURRICULAR DE LA PUCE ESMERALDAS, CERTIFICAMOS QUE HEMOS LEÍDO EL TRABAJO ELABORADO POR ARON SALOMÓN RENGIFO POAQUIZA, TITULADO *UNA ESTRATEGIA DIDÁCTICA BASADA EN LA NEUROCIENCIA PARA MEJORAR EL APRENDIZAJE DEL IDIOMA INGLÉS* Y SUGERIMOS SU APROBACIÓN POR CUMPLIR CON LOS REQUISITOS ESTABLECIDOS PARA LA OBTENCIÓN DEL TÍTULO DE LICENCIADO EN PEDAGOGÍA DE LOS IDIOMAS.

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MSc. Marjorie Perlaza Rodríguez	Dr. Haydee Ramírez Lozada, PhD

La aprobación y aceptación final de este trabajo están condicionadas a la entrega, por parte del estudiante, de las copias finales del mismo. Por medio de la presente, certifico que he leído este trabajo elaborado bajo mi dirección y recomiendo que sea aceptado por cumplir con los requisitos exigidos para la obtención del grado correspondiente.

CERTIFICADO DEL DIRECTOR

Yo, Dr. Haydeé Ramírez Lozada, en calidad de directora de este trabajo, certifico haber revisado que el mismo cumple los requisitos de calidad, originalidad y presentación exigibles y que se han incorporado las sugerencias del tribunal al trabajo de grado.

Dr. Haydee Ramírez Lozada, PhD
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DECLARACIÓN DEL AUTOR

Yo, Aron Salomón Rengifo Poaquiza, afirmo que la investigación contenida en el presente informe de investigación es única, auténtica y de carácter personal.

El contenido de este trabajo constituye una responsabilidad legal y académica legítima del autor y de la PUCE Esmeraldas.

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Aron Rengifo Poaquiza

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DEDICATORIA

Dedico el presente trabajo de investigación, en primer lugar, a mis padres, el señor Hernán Rengifo y la señora Gianella Poaquiza, quienes han sido el principal apoyo a lo largo de mi formación académica y personal. Su esfuerzo constante, comprensión y confianza incondicional me brindaron la fortaleza necesaria para superar cada desafío y culminar esta etapa de mi vida profesional.

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Abstract

To improve English language learning, the current research proposed a didactic strategy based on neuroscience. A mixed approach was used, combining qualitative and quantitative methods as part of the methodology. The participants were 35 English teachers from elementary, primary school, high school, and university levels in the province of Esmeraldas. Data were obtained through a Likert scale survey structured into three dimensions, and a semi-structured interview focused on teachers' perceptions and classroom practices. Descriptive statistics were used to analyze the survey data, while thematic analysis was applied to the interview responses. The results showed limited insight into neuroscience principles; nevertheless, teachers reported using intuitive practices such as games, interaction, and feedback, despite their lack of knowledge of neuroscience. These findings enabled the design of a neuroscience-based teaching strategy that promotes long-term English language learning and takes into account both student and teacher needs.

Keywords: Neuroscience, didactic strategy, English language learning.

Resumen

Para mejorar el aprendizaje del idioma inglés, la presente investigación propuso una estrategia didáctica basada en neurociencia. El enfoque mixto fue usado, combinando los métodos cualitativo y cuantitativo, como parte de la metodología. Los participantes fueron 35 profesores de inglés de los niveles de primaria, secundaria, bachillerato, y universidad de la provincia de Esmeraldas. Los datos fueron obtenidos a través de una encuesta con escala de Likert conformada por tres dimensiones, y una entrevista semi estructurada enfocada tanto en las percepciones de los profesores como en las prácticas de aula. Las estadísticas descriptivas fueron usadas para analizar los datos de la encuesta, mientras que un análisis temático fue aplicado para las respuestas de la entrevista. Los resultados mostraron un conocimiento limitado de los principios de la neurociencia. Sin embargo, los profesores afirmaron utilizar prácticas intuitivas como juegos, interacción entre pares, y retroalimentación. Estos hallazgos permitieron diseñar una estrategia de enseñanza basada en la neurociencia que promueve el aprendizaje del inglés a largo plazo y tiene en cuenta las necesidades tanto de los alumnos como de los profesores.

Palabras clave: Neurociencia, estrategia didáctica, aprendizaje del idioma inglés

Introduction

Learning has been a subject of study for decades. The hypothesis of how humans learn has been addressed by experts throughout time. Notably, learning is a complex cognitive process, involving attention, memory, and emotions. It is especially true when learning a language such as English. Although English plays a fundamental role in the academic context, some students face barriers to learning it. This is not merely related to a lack of content, but to how the learning process is carried out in the classroom. Nowadays, contributions from neuroscience have helped to comprehend the learning processes and how the brain learns (Dubinsky & Hamid, 2024; Pradeep et al., 2024)

Thus, educational practices should promote neuroscience-based teaching that considers how the brain processes information. Caine and Caine (1991) emphasize that "by providing a stimulating classroom environment, teachers can help to satisfy the brain's enormous hunger for discovery and challenge" (p. 66). Nonetheless, it is currently seen that within educational practices, there is a deficiency of approaches that align with how the brain learns and its functions. Unfamiliarity could lead to limited opportunities for lifelong learning. Taking this issue into account, the following research question arises: What strategy based on neuroscience could be effective to improve English language learning?

This research seeks to improve English language teaching. This will be achieved by designing an innovative strategy that responds to students' cognitive needs and helps teachers strengthen their classroom practices. In order to address this study, it is necessary to set goals. That is why the main objective of this research is to design a didactic strategy based on neuroscience principles to improve English language learning. To fulfill the main aim, the following specific objectives are established: to analyze fundamental neuroscience principles and theories related to how the brain

processes and stores information in language learning; to examine teachers' perceptions and attitudes toward the application of neuroscience principles in English teaching; and to identify pedagogical and methodological components that connect neuroscience-based knowledge with effective English language learning practices.

Neuroscience in Education

Neuroscience is a discipline that combines knowledge from other areas, for instance medicine, biology, and chemistry to explain how the human brain works (Nezih, 2006). Besides, it helps to understand how learning originates highlighting important aspects such as cognition, emotions, and behavior. Regarding the educational field, motivation, attention, and memory are core process that facilitates to comprehend how learning is acquired and then applied (Chang et al., 2021).

Core Neuroscientific Principles Related to Learning Processes

There are fundamental principles within neuroscience. They lead to understanding more broadly, how the brain works. One of them is neuroplasticity. It refers to the brain's ability to adapt through reorganization. In addition, it allows neural connections to become stronger in response to experience, which shows that learning is a process of change and adaptability (Gazerani, 2025). Attention and motivation are also essential components when it comes to learning. On the one hand, attention allows the brain to select relevant information (Lindsay, 2020). On the other hand, motivation plays a fundamental role in maintaining commitment and persistence in a task (Gopalan et al., 2017; Ryan & Deci, 2020) Similarly, attention is one of the most important components for all cognitive processes and helps to promote memory consolidation.

A fundamental aspect that is rarely taken into account in contemporary education is the role of emotions. They are another crucial factor in learning. According to Pekrun (2014), emotions help shape students' willingness to learn. Along the same lines, Hascher (2010) emphasized that emotions have a considerable impact on self-regulation and well-being. It should be noted that learning can be enhanced by multisensory information. It is the integration of visual, auditory, and kinesthetic stimuli. These promote deeper processing and more solid mental representations (Mayer, 2002). Moreover, Immordino and Damasio (2007) argue that sensory experiences linked to emotions activate more lasting neural networks. Besides, consolidation allows information learned in the moment to become stable in the long term through repetition, emotional relevance, and time (Mcgaugh, 2000; Rasch & Born, 2013).

Theories

To break down neuroscience, it is necessary to delve into some key theories. The theory of Brain Based Learning supports the understanding that teaching must respect and follow the biological rhythm of the brain. An overwhelmed brain cannot consolidate information meaningfully, notwithstanding an engaged, motivated, interested brain can do it (Bonomo, 2017). The Cognitive Learning Theory emerges as an aid to understanding mental processes such as perception and memory, which helps to grasp how complex learning is (Yilmaz, 2011).

It is important to recognize, that interaction has become an essential aspect of learning. According to Yusof (2021), based on Vygotsky’s sociocultural theory emphasizes that the brain needs to interact when it is in the process of learning. This activates paramount brain processes that help internalize knowledge.

Background

There are fundamental studies that show neuroscience has successfully contributed to English Learning. Sham (2019), considering important principles of neuroscience and reducing cognitive load, achieved better linguistic engagement and recall. Similarly, Madua et al. (2022) found that sensory techniques applied in the classroom led to more active participation in class.

Quesada and Peña (2025) demonstrated that through the application of neuroscience-based teaching, students improved their linguistic competence and fluency. In addition, a study conducted by Abdelwahab (2024) showed that English language learning was improved by means of neuroscientific principles such as repetition, multisensory learning, and feedback. Besides, Wedlock and Wilson (2024) reported that the use of breaks during lessons contributes significantly to better cognitive activation and optimal memory consolidation.

Furthermore, other studies, such as those by Hosny (2021) and Morocho et al. (2025), highlight that the application of neuroscience-based principles to learning facilitates brain activation, contributing to linguistic comprehension and communicative fluency. In addition, Cueva (2024) and Fernández (2025) showed an increase in student motivation, attention, and participation through the application of multisensory strategies and neurodidactic activities. Complementarily, Pantusín and Jama (2025) suggest that the connection between cognitive processes and emotional experiences proposed by methodologies based on neuroscientific principles favors prolonged learning.

Methodology

The research was conducted in the province of Esmeraldas. The participants were 35 English teachers from primary, secondary, high school, and university levels. The study followed a mixed approach that combines qualitative and quantitative methods. It is crucial to mention that the documentary review played a fundamental role. This was done with the aim of obtaining evidence and scientific support for the study.

The data were collected using a survey consisting of three dimensions with five Likert scale items per dimension. The arithmetic mean and descriptive statistics were used to analyze the survey data in the Excel program. Besides, it was distributed digitally along with a voluntary participation consent form. On the other hand, a semi-structured interview was conducted to obtain more specific and nuanced perspectives. This was examined through thematic analysis. The interview was also subject to permissions authorized by the participants.

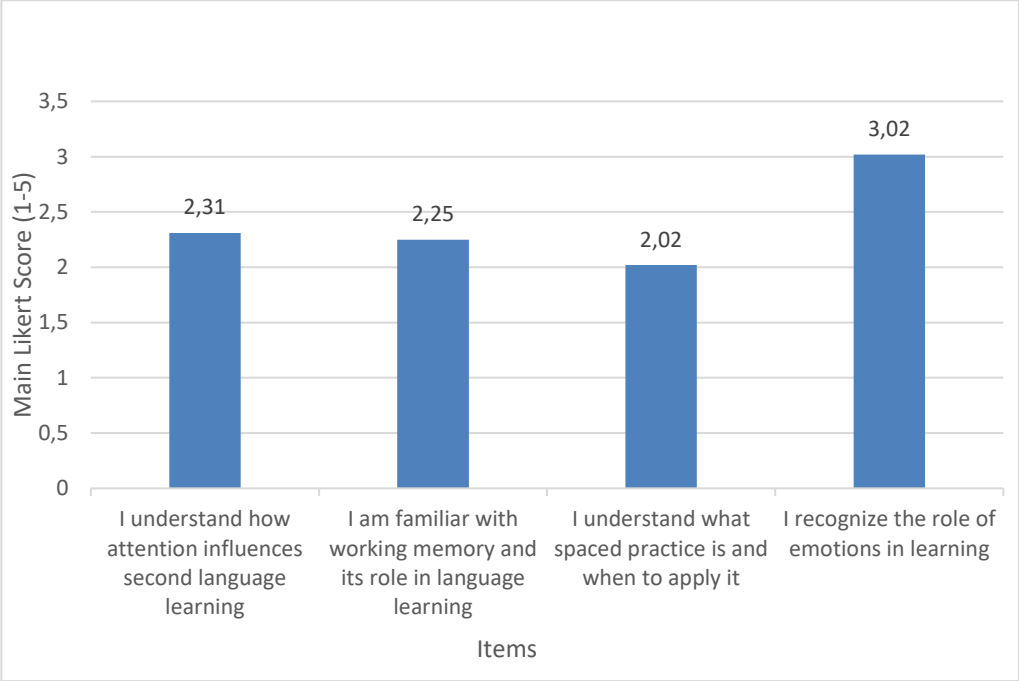
Results

The research findings are presented in this section. They are derived from the analysis of the data obtained. The following results allow to comprehend, how the English language teaching process is currently being approached. Regarding dimension one, Understanding Neuroscience Principles, the results show the distribution of responses to four items. The highest average score is linked to the role of emotions in learning with a score of 3.02. The remaining items have lower scores, including understanding how attention influences second language learning with a total of 2.31, familiarity with working memory and its role in language learning with 2.25, and

knowledge of spaced practice and its application with a mean of 2.02.

Figure 1

Dimension 1- Understanding Neuroscience Principles

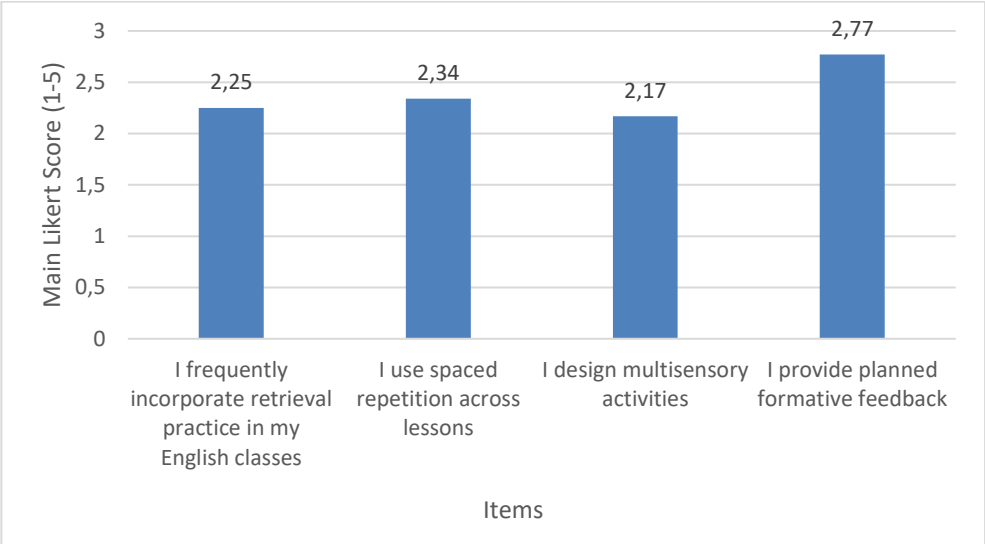


Note. The responses were obtained through the survey using a Likert scale to identify the participating teachers' knowledge of neuroscience.

Similarly, the results for dimension two, Teachers' Perceptions and Attitudes, indicate that the highest average score corresponds to providing planned formative feedback with a total of 2.77. However, the items with the lowest values are the use of spaced repetition across the lessons with 2.34, the frequent incorporation of retrieval practice in English classes with 2.25, and the design of multisensory activities with an average of 2.17.

Figure 2

Dimension 2 – Teachers' Perceptions and Attitudes

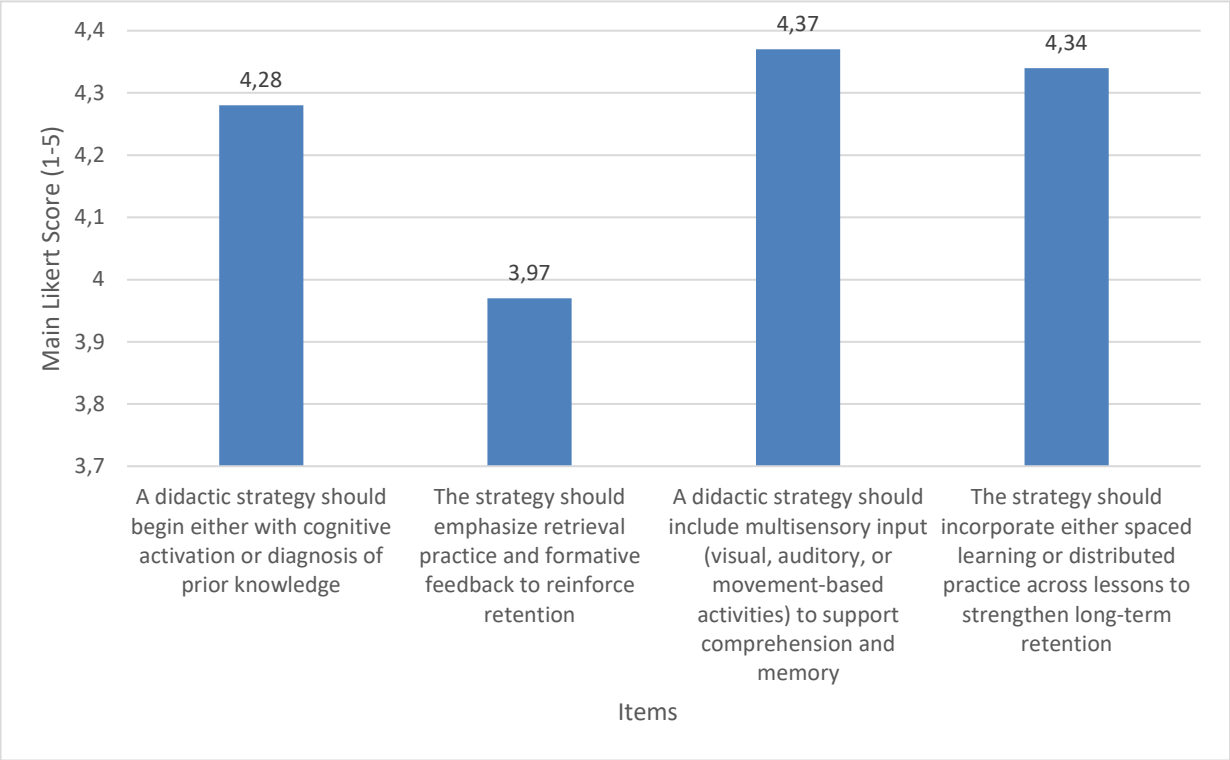


Note. The data show the recurring instructional perceptions and attitudes used by the participating teachers.

In contrast, dimension three presents mean Likert scores for items related to stages and methodological components in English language teaching. The results demonstrate consistently high mean values across all items. The highest score belongs to the inclusion of multisensory input with a mean of 4.37. Additionally, the integration of spaced practice has 4.34. Cognitive activation or diagnosis of prior knowledge also shows a high mean score of 4.28, while retrieval practice and formative feedback present slightly lower values of 3.97.

Figure 3

Dimension 3 – Stages and Methodological Components

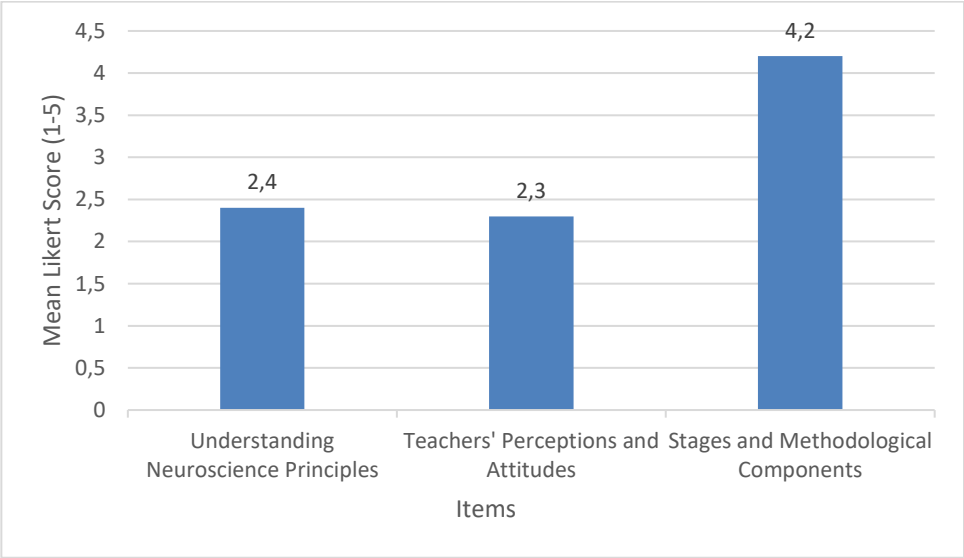


Note. The results were carefully examined to find common patterns related to methodological planning and its implementation in the classroom.

In overall terms, this figure represents mean scores obtained in the three dimensions. The results show higher mean values for the dimension related to stages and methodological components 4.24. Nevertheless, lower mean scores are observed for understanding neuroscience principles 2.40 and teachers' perceptions and attitudes with a mean of 2.38. These values synthesize the distribution of responses across dimensions.

Figure 4

Overall Results by Research Dimensions



Note. The general data for all dimensions are presented.

Interview Results

A semi-structured interview was conducted based on two analytical dimensions: teachers' perceptions of learning processes and classroom practices aligned with student participation. The interview results show detailed descriptions of the teachers' responses. On the one hand, in the first dimension, teachers mentioned that they use games, songs, group work, and movement-based activities to maintain students' attention and promote participation. Teachers also emphasized that varying activities per class help to avoid monotony and maintain interest throughout most of the class.

Furthermore, teachers identified student engagement through observable behaviors such as active participation, responsiveness to instructions, eye contact, and enthusiasm during activities. Conversely, teachers pointed out that the lack of engagement is seen through signs such as distraction, silence, lack of interaction, and reduced participation, which are often linked to fatigue and external factors affecting the student. Regarding the dimension related to classroom practices, teachers reported that they regularly connect new content through questions and contextualized examples related to their reality. Moreover, they mentioned that the use of repetition and context-based practice helps improve both attention and retention in English classes.

Table 1

Summary of Teachers' Interview Responses by Dimensions

Dimension	Theme	Description of Teachers' Responses
Perceptions of Learning Processes.	Activities that promote attention.	They promote attention by means of games, songs, collaborative work, and movement-based activities.
	Indicators of engagement.	Professors observe engagement through active participation, eye contact, enthusiasm, and student interaction.
	Indicators of disengagement.	Disengagement was associated with silence, distraction, lack of participation, and inattentive behavior.
Classroom Practices (Implicit Neuroscience Behaviors)	Activation of prior knowledge.	Teachers reported using brainstorming, questioning, and images.
	Introduction of new content.	Teachers described starting with familiar concepts before introducing new material.
	Strategies supporting attention.	Short tasks, movement and interactive material are used by them to sustain attention.
	Strategies supporting attention and retention.	Professors highlighted repetition, practice through multiple activities, and contextualized examples.

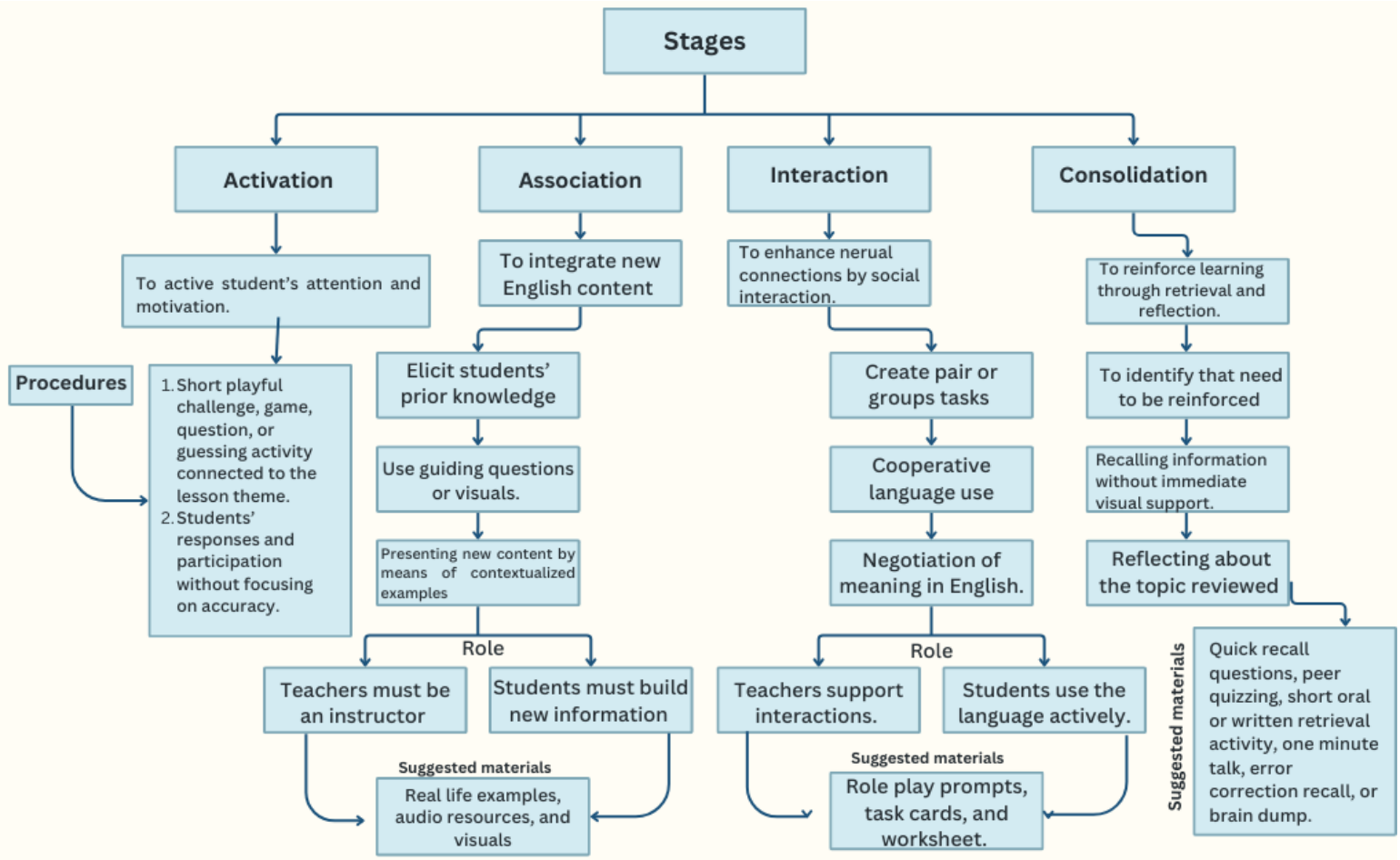
Note. This table presents the qualitative categorization of teachers' perceptions and classroom practices related to learning processes and implicit neuroscience-based behaviors.

Didactic Strategy

The results obtained from the survey and the interview revealed crucial aspects related to teachers' perceptions, classroom practices, and methodological components linked with neuroscience principles. These findings have shown the necessity to create a feasible instructional proposal. Thus, a didactic strategy has been designed. It integrates neuroscience-based principles to enhance English language learning in a practical and context sensitive manner.

Figure 5

AAIC Neuro-Connect Strategy



Note. This diagram summarizes the AAIC didactic strategy, which integrates neuroscience principles.

Discussion

The results of this research show, that teachers do value student participation and motivation, but there is a contrast as the survey results revealed that teachers do not fully incorporate neuroscience principles into their English classes. These results coincide with those of Sham (2019), who mentions that teachers recognize the importance of attention and motivation, but they are unaware of strategies that help reduce cognitive load and promote long-term memory. Similarly, Madua (2022) concluded in his study that when teachers do not apply sensory techniques, student participation is reduced. This is reflected in the low scores obtained in the dimension with neuroscience principles.

Additionally, this coincides with the findings of Cueva (2024), who indicates that through neuroscience-based strategies, motivation, attention, and participation can be improved significantly, even if they are applied intuitively. Also, the results of this research are consistent with those obtained by Bonomo (2017), who proposed that teaching should be aligned with the natural rhythm of the brain. Through the creation of the teaching strategy in this study, this gap could be bridged, as it promotes processes of cognitive activation, interaction, and consolidation. In addition, this study aligns with Vygotsky sociocultural theory, which emphasizes the fundamental role of social interaction in cognitive development. Drawing on this perspective, Yusof (2021) highlights that learning occurs more effectively through guided interaction and collaborative engagement. This principle was reflected in one of the pillar phases proposed by the AAIC Neuro Connect Strategy.

Moreover, recognition of emotions was a crucial component of research. The results showed that teachers do recognize that emotions are a key factor in fostering a

positive and highly participatory classroom environment. This is consistent with Pekrun (2014), who explained that emotions directly influence attention and academic engagement. By the same token, Hascher (2010) demonstrated that creating emotionally safe spaces significantly promotes sustained learning and self-regulation. That is why one of the phases proposed in the didactic strategy prioritizes not only mental, but also emotional activation with the sole purpose of ensuring the consolidation of learning.

Conclusions

As a result of this study, it was possible to propose a didactic strategy based on neuroscience aimed to improve English language learning. The pedagogical needs identified were addressed through the design of the strategy. It should be noted that the phases of the strategy were adapted to the way in which the brain learns, taking into account fundamental aspects such as emotions, attention, and motivation.

Furthermore, it was confirmed that English language is influenced by complex mental processes such as attention, neuroplasticity, memory, and multisensory information. Therefore, this study demonstrated that learning is not a passive process, but rather an adaptable and changeable one.

Although the participants' knowledge of neuroscience was limited, the results showed that teachers do have a positive perception of strategies that promote student motivation, interaction, and participation. Many of them use games to stimulate students' motivation. In addition, they promote interaction and activities that keep students attentive and actively involved. These findings indicate that professors already have elements that can be reinforced using the strategy proposed in this research, which can be taken as an example.

The identification of methodological and pedagogical components revealed that

English language learning can be improved through the integration of neuroscience. Some of the core components were mental activation, interaction, feedback, and consolidation. Through these components, the author was able to develop the stages of the teaching strategy, which ensured the success of a good strategy based on the principles of neuroscience.

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