Bridging the Gap: Leveraging Neuroeducation to Enhance Teaching Methodologies

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This paper explores how insights from neuroscience can enhance English language teaching (ELT) in South Korea, addressing the persistent achievement gap in English proficiency despite its mandatory inclusion in the curriculum. It emphasizes the importance of aligning teaching methods with brain development. By understanding cognitive functions such as motivation, attention, practice, and feedback, educators can create positive learning environments that foster language acquisition. The study highlights the brain's plasticity and the need for repeated exposure and production to solidify language skills. Additionally, it discusses how emotions influence learning, with positive experiences enhancing memory and negative ones causing anxiety and avoidance. The paper aims to bridge the gap between neuroscience research and practical classroom applications, offering strategies for effective language teaching that respect the brain's natural learning processes.

Keywords: neuroeducation, ELT, cognitive functions, motivation, attention, practice, feedback, memory enhancement

INTRODUCTION

In today's globalized context, proficiency in English as a second language (L2) is increasingly crucial for success (Choi, 2024). South Korea has mandated English education since the 1980s, yet persistent gaps in achievement indicate shortcomings in current ELT methodologies (Lee & Lee, 2021; Lee et al., 2024; Park & Son, 2022). The country's emphasis on English education, driven by economic imperatives and global competitiveness, has led to mandatory English education from elementary school onward (Kim, 2000; Kwon, 2000). However, disparities

persist, with affluent families exacerbating the "English divide" by investing heavily in private English education, reflecting a perception that the mandatory classroom instruction alone does not suffice to attain desired proficiency levels (Park & Abelmann, 2004).

The South Korean education system and its institutions hold the responsibility of equipping students with the necessary English skills to navigate the demands of a globalized world. This is particularly crucial for high school students on the cusp of adulthood, as they prepare for higher education or careers. Adolescence is a period of significant brain development, during which students may struggle with emotional regulation and behavioral control (Blakemore, 2012). Consequently, the ELT approach must address these specific needs by fostering motivation, providing support, and creating a positive learning environment, while also recognizing that these approaches yield similar advantages regardless of the learner's age (Blakemore, 2012). A negative learning experience can hinder immediate progress and discourage future language acquisition endeavors, leading to anxiety and avoidance of similar experiences. In contrast, a positive learning experience can open doors to successful and enriching language learning opportunities. Insights from neuroscience can inform these educational strategies, emphasizing the importance of understanding brain development to enhance learning outcomes (Sousa, 2016; Tokuhama-Espinosa, 2014).

The human brain is inherently designed for learning, possessing a complex and powerful capacity to master new skills, including an L2 (Ratey, 2008). However, to unlock its full potential, we must respect the brain's natural learning processes and rhythms. In the context of South Korea, this necessitates that English language teachers adapt their methods to align with how the brain acquires language. Understanding how the brain learns is paramount, as neuroscience offers valuable insights into which pedagogical practices should be prioritized and which should be avoided to cultivate a productive learning environment. Teachers wield significant influence over their students' brain development through daily interactions. Thus, it is essential for educators to be aware of this influence and equip themselves with the tools to optimize the brain's potential for language learning (Sousa, 2016). Ultimately, the goal is to create a learning environment that fosters "teaching to the rhythm of the brain" (Edjidjimo, 2022) − an approach that equips students with the tools they need to succeed in English language learning and flourish in other areas of their lives (Ratey, 2008; Sousa, 2016;

Tokuhama-Espinosa, 2014).

Korean society and education have witnessed momentous changes in the past two decades due to the widespread use of English, and consequently, a rapid increase in English language education and an expansion of English-medium instruction in tertiary education (Choi, 2023; Graddol, 2006; Park, 2009). A complex confluence of linguistic, psychosocial, and economic factors has influenced this desire to learn English as a foreign language. Key driving factors include an urgent sense of linguistic and cognitive globalization, English being see as a gateway to increased global status and wealth, and a deep-seated belief that educational credentials related to English language proficiency are essential to future job opportunities (Choi, 2023; Kim, 2020; Park, 2009). In primary, secondary, and tertiary education alike, English language education has become the focal point of curricular revision and pedagogical innovation. This is epitomized by the national Ministry of Education's 2010 announcement of a sweeping ten-year plan to reform English language education at all levels of public schooling (Yi, 2010). A considerable portion of research has centered on primary and secondary English education, partly due to the increasing prevalence of English instruction at these levels (Lee, 2011), but also due to a belief that English learning in childhood and adolescence significantly shapes language attitudes, motivation, and overall L2 proficiency in ways that impact future adult English education and L2 use in the country (Yi, 2009).

The purpose of this study is to explain the ways in which neuroscience can inform language teaching and use this information to the benefit of ELT professionals, particularly those in South Korea. Both an understanding of how the brain works in regards to language learning and the practical applications for the classroom are vital to bridging the current gap between research and practice in Korea. Drawing on the authors' own research experience in Korea, this study will first reflect on the ways in which a deeper understanding of language learning from a neuroscience perspective can be used to inform teachers, as research suggests that currently there is very little understanding of second language acquisition (SLA) among English as a second language (ESL) teachers (Gray, 2021; Richter, 2022; Shin et al., 2021; Whitehead, 2022). This research is unique in that it does not merely identify the gap between research and practice in Korea but makes concerted efforts to bridge it with useful and practical information for ESL teachers in

Korea.

It also explores the contributions of neuroscience to education, examining the brain's learning processes and identifying key aspects to consider for effective language acquisition. Furthermore, it analyzes L2 learning from a neuroscientific perspective, highlighting the brain regions involved in language processing and memory mechanisms. The article, thus, seeks to understand the implications of current SLA research on explicit and implicit knowledge in designing English tasks, and how these insights can enhance learning transfer. Based on these findings, the article will explore neuroscience-based strategies for effective language teaching and provide a practical guide for incorporating these strategies into typical English language classrooms in South Korea.

NEUROSCIENCE AND LANGUAGE LEARNING

Neuroscience is the study of the different parts of the brain and the nervous system, and how they operate and interact with each other to direct the psychological and behavioral aspects of an individual (Kemmerer, 2022). Stemming from individual differences in language learning and bilingualism and the discussion of the age factor, neuroscience is at the core of the issue of language acquisition (Aamodt et al., 2020; Luk et al., 2020). Recent advancements in neurotechnology have enabled researchers to directly observe brain function during learning. These breakthroughs have fueled the field of "educational neuroscience," also known as "neuroeducation" or "mind, brain, and education science" (e.g., Kim & Han, 2018). This emerging field explores how neuroscientific findings can inform and optimize educational practices (Han & Park, 2020), as it aims to translate knowledge about the brain's learning processes into practical applications for educators (Knowland & Thomas, 2014).

Research suggests that the brain possesses remarkable plasticity, meaning its structure and function can adapt throughout life based on environmental interactions (Chang, 2014). While it is true that this plasticity is more evident among younger learners, it remains present as learners get older as well (Knowland & Thomas, 2014). Educational neuroscience seeks to identify learning environments that promote optimal brain function, fostering effective learning. This translates into improved learning outcomes by equipping educators and students with

tools and strategies to enhance the learning process (Edjidjimo, 2022). The field goes beyond purely cognitive functions, also considering factors like physical activity, sleep, stress, and nutrition. However, this article will focus on those elements over which the teacher has direct control.

Neuroeducation is an inherently interdisciplinary approach, drawing upon neuroscience, pedagogy, and psychology (Cho & Kim, 2019; Doukakis & Alexopoulos, 2020). Education has traditionally benefited from psychological insights. However, Lee et al. (2018) highlight that while psychology focuses on observable behavior, neuroscience delves deeper, examining the "brain mechanisms underlying behavior" (p. 2). Neuroscience offers a unique window into the mind, allowing us to observe the brain and nervous system at work through brain imaging and other techniques. This direct observation informs educators about brain states conducive to optimal learning, fostering a holistic understanding of the brain–learning connection (Sousa, 2017). Educational neuroscience can investigate all internal and external factors influencing learning, exploring how to cultivate a healthy brain, optimize its function, and address learning disabilities (Pasquinelli, 2015). A healthy, well-functioning brain forms the foundation for successful learning. Neuroeducation equips educators with a deeper understanding of student needs, particularly those with learning disabilities (Howard-Jones, 2014).

Language acquisition, including learning a foreign language, is a fundamental neurobiological process. Accordingly, before delving into English language learning specifically, this section will explore key aspects of brain-based learning, identifying elements that English language teachers can cultivate to support their students' learning journeys, independent of their age or current level of proficiency.

Motivation: The Spark for Learning

Motivation is a crucial factor influencing learning success, particularly in language acquisition. It serves as the driving force for students to engage in challenging tasks, persist through difficulties, and ultimately achieve fluency in a new language (Oxford & Shearin, 1994). Understanding the neurobiological underpinnings of motivation can provide valuable insights for language educators.

Research in neuroeducation suggests that the frontal lobe plays a central role in motivation (Passingham, 1995). This region integrates

various cognitive functions, including planning, decision-making, and goal-setting. Repeated positive experiences trigger the release of dopamine, a neurotransmitter associated with reward and pleasure, in the brain's reward system (Gold et al., 2014). This dopamine release reinforces the behavior and increases motivation to repeat the action in anticipation of the positive outcome (Zangemeister et al., 2016). There are two main types of motivation identified in the language learning literature: approach motivation and avoidance motivation (e.g., Elliot, 2013; Lee et al., 2018). Approach motivation is the desire to engage in a task due to the anticipated positive outcomes, such as gaining fluency or obtaining good grades. The expectation of a positive experience can trigger dopamine release, further fueling motivation (Elliot, 2013). Avoidance motivation, conversely, arises from the desire to avoid negative experiences such as failing a test or disappointing teachers. The amygdala, a region associated with processing emotions like fear, plays a significant role in avoidance motivation (LeDoux, 1996). If past language learning experiences were negative or associated with anxiety, the amygdala may trigger avoidance behavior, discouraging further engagement.

Understanding these neuroeducational concepts can guide English language teachers in fostering student motivation. Creating positive learning environments that emphasize fun and successful experiences can trigger dopamine release and enhance approach motivation (Asher, 1999). Providing constructive feedback focused on progress and improvement, rather than solely on errors, can further reinforce positive learning experiences. Clearly outlining learning objectives relevant to students' lives demonstrates the value of learning and fosters intrinsic motivation (Deci & Ryan, 2000). Finally, encouraging students to reflect on their learning goals and desired outcomes can help them discover their intrinsic motivation for language acquisition.

Attention: The Gateway to Effective Learning

Attention is a crucial cognitive process that underpins successful language learning. It allows learners to selectively focus on relevant language stimuli, such as auditory input, spoken words, and grammatical structures, while filtering out distractions (e.g., background noise, irrelevant conversations; Nation & Waring, 2019). In essence, attention acts as a neural gatekeeper, prioritizing information essential for language

acquisition (Doukakis et al., 2022). Brain regions involved in attention, such as the parietal, temporal, and frontal lobes (Cabeza & Nyberg, 2000), work in tandem with areas responsible for processing auditory input, a critical skill for SLA (Lee et al., 2018).

Several internal and external factors influence learners' attention in the foreign language classroom. Internal factors include learners' individual goals and motivation. External factors encompass elements such as classroom lighting, the teacher's teaching style, vocal delivery (intonation), and background noise (Lee et al., 2018). Research suggests several effective strategies that language teachers can utilize to capture and maintain learner attention during instruction.

Effective language learning hinges not just on content delivery but also on how we engage the learner's mind and emotions. Short breaks throughout a lesson can prevent information overload and allow refocusing, while also regulating emotions for better learning (Simpson, 2011). Presenting information in clear, concise chunks (Nation, 2008) and using a well-structured approach further reduces cognitive load. Curiosity is key to maintaining attention, and introducing new language in surprising ways or incorporating authentic materials like videos can spark this (Ellis, 2018). Engaging multiple senses through visuals, sounds, and even kinesthetic activities can enhance learner engagement (Lee et al., 2018). Finally, when dealing with challenging sounds, especially in differentiating between similar ones in an L2 (like /l/ and /r/ for Korean-speaking learners of English), initial exaggeration can help solidify the distinction, gradually reducing the emphasis as learners form new sound categories (McCandliss et al., 2002). By incorporating these strategies, educators can create a dynamic and emotionally charged learning environment that optimizes language acquisition.

Among the previously mentioned techniques that language instructors could employ, repetition with variation is one of the most important ones. The following section focuses on this specific point in more detail.

Practice: Making Learning Stick

While motivation fuels the engine of language acquisition and attention makes sure students get the information needed to learn, practice and repetition provide the essential mileage needed to reach fluency. Research consistently highlights the critical role of repeated exposure and production in solidifying language skills (e.g., Long, 1981;

Schmidt, 1990).

Language acquisition relies on the formation of new neural networks (pathways) in the brain. Repetition serves as a critical mechanism for strengthening these networks, facilitating the retrieval and application of vocabulary, grammar structures, and pronunciation patterns (Decoo, 2011; Ullman, 2001). This process is similar to how long-term memories are consolidated through repeated activation (Scoville & Milner, 2000), which aligns with the concept of spaced repetition. Research has consistently shown that spaced or distributed practice, where a task is practiced at random intervals with other intervening tasks, leads to long-term retention compared to regular blocked practice, where all learning occurs in a single session (Kantak et al., 2010; Lee & Simon, 2004; Shea & Kohl, 1991). Spaced practice may be beneficial because it forces learners to actively retrieve information, leading to stronger memory formation (Ho et al., 2010).

Language instructors could make use to different strategies to make practice and repetition engaging and effective, as they are crucial for learning, but monotonous drills can lead to disengagement. To ensure effective and engaging practice, teachers can employ a variety of strategies, which includes, among others, incorporating a mix of activities (e.g., drills, games, role-plays) that cater to different learning styles (Fredricks et al., 2019). Another strategy would be providing scaffolding, which could be implemented by providing initial support and gradually increasing complexity as students gain proficiency (Tai et al., 2021). Meaningful contexts that resonate with students' interests and lives can be integrated into practice activities to enhance engagement (Bai, 2018), as feedback and correction focused on progress and improvement are essential for skill refinement (Hattie & Timperley, 2007). Finally, integrating technologies such as spaced repetition apps and interactive exercises can provide additional and engaging practice opportunities (Tabibian et al., 2019).

By incorporating these strategies, language classrooms can become dynamic environments where practice and repetition feel less like a chore and more like a journey towards improved fluency.

Feedback: The Bridge to Mastery

Similar to motivation, attention or practice, feedback plays a crucial role in language learning success. It acts as a compass, guiding learners

towards improvement by providing targeted information about their performance. Research on SLA has shed light on how the brain optimizes learning through feedback. Studies with adult learners highlight the concept of plasticity, the brain's ability to adapt and form new neural connections throughout life (McCandliss et al., 2002). Learning new speech sounds, like the English distinction between /r/ and /l/ for Korean speakers, requires the brain to develop new perceptual categories. When learners receive feedback with perceptual exaggerations, emphasizing the differences between sounds, followed by a gradual reduction in exaggeration, the brain can establish new categories for these sounds (see McCandliss et al., 2002). This demonstrates the brain's capacity to learn with targeted feedback.

Further research by Tricomi et al. (2006) explored the connection between feedback, reward, and learning. Their study found that learners showed improved performance when receiving feedback on their speech production tasks. Interestingly, brain activity patterns were similar when learners received either feedback or reward. This suggests that learners are more likely to engage with learning stimuli they previously performed well on, especially when accompanied by feedback or reward (Tricomi et al., 2006).

Effective feedback acts as a compass, guiding learners on their language learning journey. To maximize its impact, teachers can employ several strategies. First, feedback should focus on progress and improvement (Hattie & Timperley, 2007). Highlighting areas for growth while acknowledging achievements reinforces positive learning experiences and motivates continued effort, as described in the previous section. Second, feedback should be targeted and specific to the task at hand (Sadler, 1989). Focusing on correctable errors provides students with clear learning goals to work towards. Third, incorporating a variety of feedback delivery methods, such as written, oral, and peer feedback, caters to different learning styles and keeps the process engaging (Bhat, & Bhat, 2019). Finally, encouraging self-assessment fosters self-awareness and a sense of ownership over learning (Wiliam, 2010).

These findings offer valuable insights for language instructors. By employing these strategies and understanding the neurobiological underpinnings of effective feedback, teachers can create an optimal environment for successful language acquisition, while helping learners optimize their brain's plasticity for language acquisition.

The Emotional Roller Coaster: How Emotions Fuel Learning

Similar to motivation, attention, or feedback, emotions play a significant role in capturing and maintaining attention during the process of learning a new language. However, it is crucial to avoid cultivating counterproductive emotions such as anxiety, which can hinder progress (Lee et al., 2018).

Emotions are not simply subjective experiences; they have a profound impact on the brain and learning processes. Research suggests that emotional information activates several brain areas, including the amygdala, the orbital prefrontal cortex, and the dorsolateral prefrontal cortex (frontal lobe), areas associated with memory and emotion (Slotnick, 2017). The processing of emotional data strengthens long-term memory for language content due to the synergy between the amygdala and the hippocampus (Lee et al., 2018; Slotnick, 2017). The amygdala, an area associated with processing emotions like fear, actually enhances the encoding and consolidation of emotionally charged language information within the hippocampus (Lee et al., 2018; Slotnick, 2017).

The learning environment and content can be significantly impacted by emotional stimuli. Learners' feelings towards the learning experience are important. Positive emotions, such as enjoyment and accomplishment while learning a foreign language, trigger the release of endorphins, which can create a pleasurable and successful learning experience (Sousa, 2016). Conversely, negative emotions like stress can trigger the release of cortisol, which leads to a defensive "fight-or-flight" response that can hinder language learning (Lee et al., 2018; Sousa, 2016). Emotions can also be reflected in the learning content itself. Students are more likely to remember language content associated with positive emotions (Sousa, 2016).

One way for language teachers to manage student emotions is to begin by managing their own. Students often learn through imitation, which is linked to the concept of mirror neurons (Bueno, 2021). Mirror neurons fire when individuals execute an action and when they observe another person doing it. Mirror neurons are not only a learning mechanism but also a way to infer emotions, intentions, and feelings of others (Bueno, 2021). Considering that language learners often experience feelings of vulnerability and lack confidence, it is important for teachers to have positive intentions, believe in their students, and manage their own emotions in a way that fosters positive emotions in

students, ultimately enhancing the language learning experience.

These findings highlight the crucial role of emotions in L2 learning. By understanding how emotions influence the brain, instructors can create environments that foster positive emotions like motivation and confidence. This, in turn, can optimize learners' brain plasticity and enhance language acquisition.

Encoding to Retrieval: The Memory Journey

Understanding the memory systems that support language acquisition is crucial for effective English language teaching (Ullman, 2001). The declarative-procedural model (DPM) proposed by Ullman (2001) provides a framework for understanding the neural basis of language, emphasizing the distinction between two types of memory: declarative memory and procedural memory. This model has significant implications for language education, as it helps educators understand how different aspects of language are learned and processed in the brain. The two memory systems work together to enable learners to acquire both the factual knowledge and the practical skills needed for proficiency and are briefly explained in Table 1.

TABLE 1. Overview of the Two Memory Systems

	Declarative Memory (Knowing "What")	Procedural Memory (Knowing "How")
Focus	Facts and events related to language learning.	Acquiring motor and cognitive skills for language use.
Brain Regions	Primarily associated with the medial temporal lobes (including the hippocampus) and parts of the prefrontal cortex.	Primarily associated with frontal/basal-ganglia circuits, including the caudate nucleus, putamen, and motor areas of the cortex.
Language Learning	Involved in the learning and retrieval of vocabulary (lexicon) and explicit language knowledge.	Involved in the learning and application of grammar and syntax (rules of language).
Learning Rate	Can be rapid, with new information potentially retained after a single exposure.	Gradual but leads to strong retention, similar to how one doesn't forget how to ride a bike.
Development	Strengthens during childhood and stabilizes in adolescence, potentially declining later.	Younger children tend to rely more on procedural memory compared to older learners.

| Characteristics | • Conscious recall.
 • Flexibility in use (knowledge can be applied in various contexts).
 • Rapid acquisition (learning can happen quickly). | • Unconscious recall.
 • Automatization of skills (actions become automatic with practice).
 • Gradual acquisition (learning occurs through repeated practice). |

Note. Table made by the author based on Poeppel and Hickok (2004), Rasch and Born (2009), and Ullman (2001).

While Table 1 provides us with an overview on how the two memory systems are structured and work, Table 2 provides more detailed information on how the previous information is directly linked with language acquisition (extracted and reorganized by the author from Ullman, 2001).

TABLE 2. Declarative/Procedural Memories and Language Acquisition

Memory Type	Function in Language Acquisition	Learning Process	Factors That Enhance
Declarative Memory (Lexical)	Stores individual words, irregular forms, idioms, and proverbs.	Learned consciously through explicit teaching, memorization, and attention to detail.	* Explicit teaching * Slower feedback * Spaced presentation * Retrieval practice
Declarative Memory (Rule-Based)	Can learn some grammatical rules and patterns treated as chunks.	Learning can be slower and less efficient. May lead to reliance on rote memorization for complex grammar.	* Slower feedback * Spaced presentation * Retrieval practice for retention
Procedural Memory	Automates grammar, morphology, and phonology. Used for handling sequences and categories in language.	Learning happens implicitly through exposure, practice, and not necessarily requiring conscious attention to the rules.	* Not requiring explicit teaching * Faster feedback * Exposure through immersion or task-based learning * Increasing complexity

Recent research in language acquisition has provided new insights into the roles of declarative and procedural memory systems in learning a second language, building on the foundations of Ullman's (2001)

declarative–procedural model. This model posits that the declarative memory system, which is responsible for learning and storing factual knowledge, is crucial for vocabulary acquisition, while the procedural memory system, which underlies the learning of motor and cognitive skills, is essential for mastering grammar and syntax. Studies have shown that effective language instruction can benefit from leveraging both memory systems. For instance, Pascual et al. (2022) found that explicit vocabulary teaching methods that engage the declarative memory system significantly enhance learners' retention and recall of new words. Similarly, Morgan-Short et al. (2014) demonstrated that immersive, practice-based grammar instruction that stimulates the procedural memory system leads to more fluent and automatic use of syntactic structures. These findings suggest that a balanced approach, integrating both declarative and procedural learning strategies, can optimize the effectiveness of English language teaching. By incorporating activities that promote explicit knowledge acquisition alongside those that encourage procedural practice, educators can better align their teaching methods with the cognitive processes involved in language learning, potentially improving learner outcomes (Morgan-Short et al., 2014; Pascual et al., 2022).

The following section will discuss practical tools for English teachers to facilitate this dual approach, fostering both explicit knowledge and implicit learning in their students, while still taking into account all the other factors discussed thus far.

ENHANCING ENGLISH LEARNING THROUGH NEUROSCIENCE

While the field of educational neuroscience is still developing, we are gaining valuable insights into how the brain acquires language across different age groups. These principles can inform language learning strategies for people of all ages as well as provide language instructors with the resources needed to create a more successful learning environment within their classrooms. Additionally, educational goals and learner experiences vary globally, requiring adaptable approaches. Here are some key principles based on current research, applicable to language learning across one's lifespan:

1. If the goal is to learn a language, rather than just gaining certain

proficiency, practice is the key. Achieving fluency, not just basic proficiency, requires consistent effort. Language learning at any age, like childhood education, demands long-term commitment from both learners and educators. This applies not only within the classroom walls but also in getting students to continue practicing the language outside of the classroom.

2. Intrinsic motivation and focused attention are crucial for successful learning at any age. These not only help with retention but also reduce dropout rates. Feedback on performance is equally important, especially for older learners. For example, promoting curiosity can be fostered by taking into account students' interests, their emotions, using humor, reducing stress, or avoiding authoritarian manners. Using games, stories, or linking the content to students' interests or daily lives could be good options to foster their motivation.

3. Engaging with a live instructor and actively interacting with learning materials may be more beneficial for individuals than passive learning methods. That is, while AI can serve as a useful tool in language instruction, it cannot yet replace the role of human language instructors. This can be true for learners of all ages, though the specific methods may differ. While younger learners would benefit for a learning environment involving lots of movement and stimuli, an older learner would benefit more from a quiet place with lots of chances for active participation in the classroom.

4. While some teachers think that, when teaching English (or any other language for that matter), the most important aspect is to provide students with plenty of input, the order of instruction should be taken into careful consideration. Focusing on foundational skills, like attention control or phonemic awareness (sound–letter relationships), lays the groundwork for more advanced language acquisition. This reduces learning variability and improves overall outcomes, making it possible to have more balanced students (in terms of their proficiency level) within a given classroom. This, in turn, would lead to more motivated students, more opportunities for equal participation in the classroom, and more proficient students.

5. When learning new distinctions in language (e.g., verb conjugations or how to pronounce a particularly challenging minimal pair (e.g.,

/r/ vs. /l/ by Korean-speaking learners of English), initial materials should exaggerate the relevant features. Combining this with spaced repetition, where learners revisit information at unpredictable intervals, optimizes learning. One common mistake that many instructors make when planning their classes is to leave some time at the beginning of class to practice what was learned in the previous lesson. While repetition is crucial for language learning and consolidation, doing so at unpredictable intervals would be of greater benefit for our students.

6. Related to the idea that spaced repetition is useful is the fact that quality and quantity of sleep is necessary for memory consolidation, regardless of age. This applies to procedural memory (learned skills) and declarative memory (factual knowledge) involved in language learning, which will be further discussed in the next paragraphs. Moreover, noise and distraction reduction is essential, particularly in busy learning environments. However, this may be challenging in most classroom settings with large groups of students. Utilizing diverse learning materials across different sensory channels can further mitigate distractions.

The key takeaway for educators is that language learning is possible at any stage of life. However, recognizing both the strengths and limitations of the brain at different ages is essential when designing effective learning programs. Let us not forget that, for a successful learning process, both procedural and declarative memory should be at play. Next, this article proposes some ideas on how language instructors could create specific activities targeting each type of memory system. The following are some activities that may be used to, explicitly, target procedural memory (which directly relates with language skills):

1. Grammar Games: Turn grammar drills into interactive games. For example, create a board game where players must answer questions using the correct verb tense to move their piece. This makes practicing grammar rules more engaging and strengthens the procedural memory for those rules.

2. Role-Playing Activities: Design role-playing scenarios that require students to use specific language structures in conversation. This provides opportunities for repeated use and practice of those structures, solidifying them in procedural memory.

3. Shadowing: In shadowing exercises, students listen to native speakers and repeat what they hear immediately. This helps them internalize pronunciation patterns and speaking rhythms, improving their procedural memory for spoken language.

The following are some activities that may be used to, explicitly, target declarative memory (which directly relates to vocabulary acquisition and the learning of facts):

1. Flashcards with a Twist: Instead of just showing a word and its definition, use flashcards with pictures, synonyms, antonyms, or short sentences demonstrating the word's usage. This creates additional connections in the brain and strengthens memory retrieval.
2. Mind Maps: Encourage students to create mind maps associating new vocabulary with related words, concepts, or pictures. This visual representation aids recall and helps integrate new vocabulary into existing knowledge structures.
3. Storytelling Activities: Have students create stories using newly learned vocabulary words. This encourages them to think about the meaning and usage of these words in context, solidifying them in declarative memory.

And finally, the following are some ideas for activities that combine strategies targeting both procedural and declarative memories:

1. Spaced Repetition Apps: Utilize spaced repetition apps for both grammar drills and vocabulary flashcards. These apps present information at increasingly spaced intervals, optimizing memory consolidation for both procedural and declarative knowledge.
2. Interactive Dialogues: Design interactive dialogues with built-in spaced repetition. These dialogues can introduce new vocabulary and grammar structures, and then revisit them at set intervals, reinforcing both procedural and declarative memory.

In short, all the recommendations discussed so far in this article could be briefly summarized as shown in Table 3.

TABLE 3. Neuroscience Principles to Consider in the Teaching–Learning Process

Principles	Strategies
Motivation	Provide positive and constructive feedback. Highlight the importance and relevance of the material. Set clear and achievable learning objectives.
Attention	Introduce novel and engaging stimuli. Employ multisensory teaching techniques. Deliver information concisely and clearly. Incorporate regular breaks.
Emotions	Integrate emotional engagement in lessons. Create a supportive and safe learning environment. Minimize excessive stress.
Memory	Offer regular feedback. Implement spaced learning techniques. Use diverse instructional methods. Encourage practice and repetition.

By incorporating these types of activities and keeping in mind the different aspects that have been found to lead to successful language acquisition through neuroscience, educators can create a more well-rounded learning experience that caters to engaged language learners, targeting both procedural and declarative aspects of language acquisition. This can lead to deeper understanding, improved fluency, and better long-term retention for learners of all ages.

CONCLUSIONS

Understanding developments in neuroscience is crucial for language acquisition, particularly for instructors striving to bridge the English proficiency gap in countries such as South Korea. Neuroscience provides insights into how the brain processes and retains new information, highlighting the importance of aligning teaching methods with natural cognitive functions. This includes, for instance, recognizing the best mechanisms to get students into the right learning mode, while implementing strategies that enhance memory retention and emotional regulation. By utilizing neuroscience-based approaches, such as incorporating multisensory learning and providing positive feedback,

instructors can create more effective and motivating learning environments. This understanding can lead to tailored educational practices that support the brain's natural learning rhythms, ultimately improving language acquisition outcomes and addressing the persistent challenges in South Korean ELT. Emphasizing neuroscience in educational strategies not only optimizes student engagement and performance but also equips teachers with the tools to foster long-term language proficiency.

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