

Concept of Neuro-Based Strategies for Motivating English as a Second Language (ESL) Struggling Readers

Jamunneswary A/P Veerasingam, Dr. Tajul Rosli Bin Shuib

Faculty of Human Development University Pendidikan Sultan Idris

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Abstract

This research investigates neuro-informed methods of inspiring struggling English as a Second Language (ESL) readers through the integration of findings from cognitive neuroscience into reading. Adopting qualitative research, the research utilises document analysis to analyse peer-reviewed publications, theoretical frameworks, and real-world applications of neuroscience in learning ESL. Key results indicate the importance of multisensory learning, improving motivation through the brain's reward system, and emotional control strategies in enhancing reading competence. Personalised interventions, including adaptive learning technologies and scaffolding approaches, are also highlighted to effectively cater to individual learning requirements. The results imply that incorporating neuroscience into ESL reading instruction can increase student engagement, enhance motivation, and improve literacy achievement. This study offers important insights to teachers who are looking to introduce evidence-based strategies to assist struggling readers, and it calls for ongoing investigation into neuroscience-based approaches to language acquisition and literacy.

Keywords: Neuro-Based Strategies, English as a Second Language (ESL), Struggling Readers, Qualitative research

Introduction

Every adult must be able to read well to succeed in their daily lives, and every child must be able to read well to excel in school. "Neuroscience today sheds indispensable light on how a reader's brain works and what makes it more or less receptive to different teaching methods," according to renowned cognitive scientist Dehaene-Lambertz (2024). For more than a century, educators have been engaged in a contentious discussion over the best ways to teach reading to their pupils. Regrettably, not every student picks up reading quickly; in fact, many find it difficult to develop the abilities necessary to become proficient readers throughout their academic careers (Dehaene-Lambertz, 2024). The majority of educators agree that learning to read is a multi-step process, regardless of the teaching approach used. There are similarities between learning to play an instrument and learning to read. Through practice and instruction, we can acquire reading skills at ever-higher levels. Learning to decode or

sound out words is just the beginning of being proficient in reading. To read fluently, kids must first get acquainted with the letter-sound correlations in reading before learning to employ this method automatically (Fikray & Habil, 2022). "Reading is a complete cognitive process that has five essential components built on brain development and experience," according to Abdolmaleki & Saeedi (2024). According to reading specialists, children acquire and apply five main skill categories as they grow into proficient readers: 1) phonemic awareness, 2) phonics teaching, 3) vocabulary, 4) fluency, and 5) comprehension understanding. The literature consistently identified two fundamental concepts from neurobiology related to learning and reading instruction: Multisensory education works because 1) the brain needs novelty, and 2) skill repetition grows and develops neurons (Abdolmaleki & Saeedi, 2024).

The brain component known as the Reticular Activating System (RAS) is particularly sensitive to novelty and is responsible for the first screening of all sensory information before it reaches the brain. It has significant ramifications for instructors to realise that the RAS will permit new or alternative teaching activities, enabling your pupils to participate in and benefit from them. The requirement for novelty in the RAS will be met by modifications to the classroom, activities, and tactics (Kenol & Hashim, 2022). According to Willis (2024), educators should include novelty in their regular teaching activities to leverage this knowledge about the brain to guide their education (Willis & Blakey, 2024). According to neuroscientists, learning may be effectively communicated via vivid, tangible visuals. Jensen (2024) asserts that 90% of the brain's sensory information comes from visual sources and that the brain has an attentional bias toward high contrast and novelty. What implications does it have for instructors of reading? In their reading and literature classes, teachers should use computers, videos, books, cameras, art materials, visual aids, posters, graphic organisers, and project-based assignments (Jensen, 2024). Thousands of neurons are activated during learning, and these neurons link to form networks of neurons. Neurons transmit dendrites to other neurons when reading skills are mastered, forming deeper brain connections and maybe enhancing myelination. All of the reading components are affected when well-executed skill-building dendrites are repeated. By altering the structure of your kids' brains, regular practice will enhance their phonics, phonemic awareness, vocabulary, fluency, and understanding (McBreen & Savage, 2022).

According to Shurovi et al. (2025), incorporating brain-based learning methodologies into ESL programs produces several positive outcomes. There will be some practice activities in class. These useful internet resources for mentally challenging activities will be recommended to you. Research has shown that greater learning occurs when the tongue and the intellect cooperate (Shurovi et al., 2025). Many facets of language are caused by the activation of various brain regions. Lexicon (word recall), phonology (hearing), spelling (visual perception), grammar (syntax), and pragmatics (social language usage) are some of these. Additionally, Kenol & Hashim (2022) contended that we need to take into account the biological foundations of language to improve our comprehension of the differences between human and non-human brains. Language is a combination of spoken and nonverbal communication, the brain areas that control cognitive processes, and the cognitive processes of perception, memory, and reasoning. Teachers and students may both find inspiration in a classroom. By expanding on their prior knowledge to acquire new, pertinent material, students in brain-based programs demonstrated their unique abilities (Kenol & Hashim, 2022). The brain-based

learning process has been revitalised by these classroom changes, and students are now gaining a greater variety of skills. Youngsters comprehend the structure of the thinking process as well as how thought contributes to learning. In cognitively friendly classrooms, the training method is divided into three primary phases: "alerting," "coordinated immersion," and "active therapy" (or problem-solving). The aforementioned restrictive surroundings, the course book, the instructors' final attitudes, and the initial practice of "learning with packing" have all traditionally hindered predictable training in Pakistan. Spoken language is distinguished from written language by paralinguistic and prosodic features. Voice tone, pace, loudness, gestures, proper pronunciation, intonation, emphasis, rhythm, and pauses are among these, according to Kernagaran & Abdullah (2022). Compared to written language, spoken language is less ordered and logical. Speech may be succinct and direct, in contrast to writing, which is more organised and cohesive. According to Sana and Fenesi (2013), a person's ability to communicate is influenced by their grammatical, discourse, sociocultural, and strategic competencies. Simple repetition, replacement, and slot substitution exercises that only target a limited number of language structures, according to Bell (2018), simply strain students' short-term memory and do not improve their communication skills. According to Pardede (2019), students will become more comfortable public speakers and foster an environment conducive to language learning if they are encouraged to engage in communicative activities that enhance the relationship between the teacher and students as well as between the students themselves (Barreto, 2022). Students may develop their public speaking confidence by engaging in activities including role-playing, dramatisation, problem-solving, free discussion, task-based learning, a jigsaw puzzle, games, group and pair work, and oral reading. To make better selections about what to educate their pupils, modern educators would study more about the brain. Due to the many obstacles they encounter in the classroom, brain-based learning (BBL) has assisted pupils in meeting their unique needs. "Brain-based education" refers to instruction that takes into account our present knowledge of how the brain functions. Brain-focused educational approaches are growing in popularity around the globe. According to Fikray & Habil (2022), improving teaching and learning environments via the use of brain-based techniques is crucial, and accelerating learning is a major goal. Students may be motivated to apply their learning strengths via the use of manipulatives, active learning, field excursions, guest speakers, and real-world projects (Habil & Fikray, 2022).

In the case of ESL struggling readers, motivation to read undertakes the task of fostering important literacy skills development because it affects the reader's level of engagement, sustained effort, and overall achievement (Schellings, 2014). By strategically incorporating emotional and multisensory components as well as real-world context, neuro-based strategies foster, along with reducing anxiety, ESL learners are likely to better engage in reading tasks, develop motivation, build confidence, and adopt a more favourable perception towards reading, which in turn, improves their reading proficiency.

The focus of this article, therefore, is to study and examine brain-based strategies which can enhance the motivation of struggling English as a Second Language (ESL) readers, utilising the findings from cognitive neuroscience and educational psychology. It seeks to determine how instructional principles based on the brain, including neuroplasticity, multisensory learning, and emotional control, can promote greater reading motivation and understanding among ESL readers. Moreover, the article attempts to narrow the distance between theoretical

neuroscience and classroom practice, offering teachers research-based strategies to create a supportive and engaging learning environment. By recognising the neurological basis of reading challenges, this research aims to inform more effective intervention approaches that equip ESL students with confidence, motivation, and competence in reading.

Literature Review

The alphabet itself is 3800 years old, and reading is a comparatively new cultural invention. From a neuroscience perspective, reading is the process by which the brain develops connections between thousands of neurons via practice (Kernagaran & Abdullah, 2022). The parts of the brain responsible for speech, hearing, vision, and face and location recognition have been discovered by neuroscientists. The visual word form is an area of the brain that lies between the parts that allow us to identify faces and the parts that allow us to recognise locations. Similar to the main auditory region or the motor cortex found in all of our brains (McBreen & Savage, 2022), Dehaene (2024) states that "an amazing recent discovery shows that there is a specific cortical area for written words". The left occipital-temporal region of the brain has been referred to as the "brain's letterbox" or the visual word form area by Dehaene-Lambertz (2024) and others. According to neuroscientists, reading entails the fusion of two systems: our speech and facial and object recognition systems (Dehaene-Lambertz, 2024). Dehaene-Lambertz (2024) states that "learning to read involves connecting two sets of brain regions that are already present in infancy; the language circuit and the object recognition system". According to Dehaene-Lambertz (2024), brain activity in the left occipital temporal area (Brain's Letter Box) extracts the visual word form and follows activation in the occipital or visual processing part of the brain when a student reads a word. According to neuroscientists, as we learn to read, the brain saves words in the visual word form region as pictures after we sound them out several times. According to Dehaene, reading causes parts of the brain that were hardwired for visual identification to be hijacked. Primates have to be able to recognise faces and locations instantly to stay safe and improve their chances of surviving. This would explain the evolutionary and genetic programming of these extremely skilled recognition abilities (Morgan, 2019).

Effective phonics programs assist instructors in methodically teaching kids how to associate letters and sounds, split words into sounds, and mix sounds to produce words (Okkinga et al., 2018). An explicit phonetic method for teaching decoding is supported by recent brain research. Using magnetic resonance imaging equipment, Sally Shaywitz, a neuroscientist and paediatric professor at Yale University School of Medicine, has investigated the brain processes behind reading. According to Nordin et al. (2023), learning to utilise spoken language is a naturally evolved talent, but reading is not (Nordin et al., 2023). More than six hundred reading studies were meta-analysed by Adams (1990). The Adams study had two main conclusions: (1) reading performance increased when phonics was explicitly taught, and (2) phonics teaching had to be provided as part of a well-rounded curriculum. Despite being made up of two primary methods, the phonetic style of education has been used to define a broad variety of techniques: (1) the analytic or implicit method, and (2) the synthetic or explicit way. Letter-sound correspondences are taught separately in explicit phonics approaches, which require pupils to mix the component sounds to enunciate whole words. According to (Van Steensel et al., 2023) "In explicit phonics instruction, the sounds associated with letters are identified in isolation and then 'mixed' together to form words".

In their gold standard research study, Shurovi et al. (2025) discovered that between 86% and 98% of children reported vocabularies that mirrored their parents. Additionally, they discovered that children from working-class homes had a vocabulary of 749 words by the age of three, whereas children from professional families had a documented vocabulary of 1,116 words (Shurovi et al., 2025). Youngsters from working homes are at a disadvantage while learning to read because of the disparity in vocabulary between youngsters entering schools. Nonetheless, children may close the current language gap by expanding their vocabulary with the aid of enhanced early childhood programs. By providing background information, reading aloud from works of literature, and encouraging their children to appreciate reading, proficient instructors may help their students' vocabulary grow (Ramalingam et al., 2022). Dehaene-Lambertz (2024) reminds us that "especially when he comes from an underprivileged background where English is a second language, a child must learn the morphology of English prefixes, suffixes, and roots of words". According to Van Steensel et al. (2017), literate persons have a three-tiered vocabulary. Sight words, nouns, verbs, and adjectives like book, girl, and baby comprise Tier 1 words. Coincidence, masterpiece, diligent, and generous are examples of Tier 1 words. To get the most vocabulary advantage, Beck suggests that instructors focus on teaching Tier 1 terms. Tier 3 words are domain-specific and utilised throughout instruction in that core area (Morgan, 2019). Now let's focus on reading fluency and examine various brain-compatible techniques for increasing fluency. "Fluent readers can decode, recognise, and comprehend the meaning of text at the same time, so their networks fire effectively and efficiently," claim Willis & Blakey (2024). The progressive release of responsibility model is a well-recognised approach among reading specialists for fostering fluency in reading. The instructor demonstrates how to read a paragraph fluently in step one of this approach (Abdolmaleki & Saeedi, 2024). Students hear the proper pronunciation and emotion of this text at this period. Step two involves the instructor and students reading the text together. When students are chorally reading without the instructor present, step three comes next. Students practice the text before reading it on their own in step four (Kenol & Hashim, 2022).

The majority of educators agree that comprehension is the ultimate aim of reading. Students' working memory is freed up for the job of understanding the text after they have learned the alphabetic principle, decode words proficiently, and read fluently. Pupils who have extensive knowledge of a variety of topics and the world contribute their existing knowledge to the reading process. Teachers who model comprehension techniques demonstrate to their pupils how to deconstruct texts to get meaning (Unrau et al., 2018). Students' neural circuitry is strengthened when they successfully execute comprehension skills after seeing their teachers display them. We should employ a variety of tales to teach reading comprehension, since we know that the brain requires novelty (Ramalingam et al., 2022).

Methodology

Study Design

This research utilises a qualitative research approach to investigate Neuro-based techniques of encouraging struggling English as a Second Language (ESL) readers. A qualitative research method is adequate since it enables an in-depth discovery of how the principles of neuroscience can be applied to ESL reading. This research has been structured as a document analysis, examining available literature, educational models, and case studies that incorporate successful Neuro-based approaches in language learning. Document analysis

allows for the determination of dominant themes, theoretical orientations, and practical applications that teachers can leverage to improve reading motivation among ESL students. Through a systematic literature review, this study seeks to provide an extensive overview of how neuroscience-based approaches can assist struggling ESL readers.

Sample

The study does not involve human subjects but instead investigates a purposive sample of scholarly literature and teaching materials on neuro-based methods in language learning and teaching in ESL reading. The sources employed are peer-reviewed journal articles, books written by language learning and neuroscience experts, curriculum guides by schools, and educational organisation reports. To ensure relevance, only papers published within the last ten years are considered, with emphasis placed on studies that address cognitive neuroscience, reading motivation, and language acquisition in ESL settings. The criteria for selection emphasise sources providing empirical evidence, theoretical frameworks, and practical implementation of neuro-based methods of teaching reading. This ensures that the study is informed by current developments and evidence-based practice.

Instrument and Data Collection

The main data-collection tool of this research is a systematic model of document analysis. The model consists of identification, classification, and integration of information from academic literature sources to attain a comprehensive overview of neuro-informed ESL reading instruction practices. Data collection presumes many important processes. An initial search is carried out for the online databases of Google Scholar, PubMed, ERIC, and ResearchGate on the keywords "neuroscience in ESL reading," "brain-based strategies for struggling readers," and "motivation in language learning." An inclusion and exclusion criterion is subsequently applied to find only peer-reviewed and empirically grounded sources relevant to the area. Articles and publications are included on the grounds of relevance to the topic, publication within the last ten years, and theoretical or empirical contribution to neuro-based reading methods. Older material, anecdotal, and unscientific quality are removed to maintain the validity and reliability of the research. Once the relevant sources are identified, the major findings, theories, and strategies of the chosen literature are extracted and categorised into themes like multisensory learning, neuroplasticity, emotional regulation, and motivation strategies. Extracted data is then synthesised to create a meaningful analysis of how neuro-based strategies can be utilised to motivate ESL struggling readers.

Data Analysis

The data is analysed through a thematic analysis method, which entails identifying, analysing, and reporting the patterns in the literature. Thematic analysis is selected due to its flexibility and ability to condense qualitative data from various sources. The analysis process is made up of several steps. To begin with, all the gathered literature is read multiple times to acquire a thorough grasp of the major concepts and themes. This familiarisation procedure permits the recognition of repeated ideas and patterns. Secondly, pertinent information is coded and placed under thematic headings like cognitive neuroscience in reading, motivation in ESL learning, and classroom practice strategies. These themes assist in the organisation of the data and in bringing to light significant interconnections between the principles of neuroscience and effective ESL reading strategies. The identification of patterns and interrelations within the data is the next step. Interrelationships among various studies,

theoretical models, and instructional applications are explored to determine ongoing trends and optimal practices. Last, the resultant themes are analysed within the realm of ESL education and how teachers can realistically integrate neuro-based interventions to assist struggling readers. Findings are explained relative to previous research, emphasising similarities, variations, and gaps in research requiring future exploration.

Ethical Considerations

Since this study relies on the analysis of documents and not on human participants, there are no immediate ethical considerations involving informed consent or confidentiality among participants. However, rigorous practices of ethical research are observed in that proper citing of all the sources, preventing plagiarism, and maintaining the integrity of the research process are adhered to. Reputable and peer-reviewed sources alone are employed for the assurance of the validity and reliability of findings. Data analysis and collection are also made with transparency to ascertain that the process of research can be replicated and is well documented by other scholars. The research also maintains the standards of academic integrity by evaluating sources critically as well as the avoidance of bias in the data selection and interpretation.

This qualitative study employs document analysis to investigate the use of neuro-based strategies to motivate struggling ESL readers. By thorough reading of scholarly sources and instructional content, this research aims to present teachers with evidence-based methods aligning with cognitive neuroscience principles. The use of thematic analysis facilitates the most essential findings to be correctly categorized and interpreted, contributing to the overall understanding of how the application of neuroscience can be used to enhance motivation in reading in ESL students. The study underscores the importance of incorporating neuroscience-based strategies into ESL teaching, targeting strategies such as multisensory learning, neuroplasticity, and emotional involvement in a bid to develop reading proficiency. Through bridging the gap between neuroscientific findings and teaching practice, this study contributes meaningfully to inform the development of more effective and more engaging ESL reading interventions. Future research can explore more the application of these strategies to multicultural educational settings with their long-term impacts on ESL students' reading competence and motivation.

Discussion

The results of the present research show the immense influence of neuroscience-based interventions to enhance the motivation of ESL struggling readers. Neuroscience has taught us much about the nature of brain activity in language use and how interventions can influence the outcome of learning. One of the most substantial issues that has emerged in the literature is the use of multisensory learning for ESL reading. Research has demonstrated that the stimulation of more than one sense, like visual, auditory, and kinesthetic modes, promotes neural integration and thus increases retention and understanding (Barreto, 2022). This aligns with neuroplasticity theories, in which it is postulated that the brain has an incredible ability to adapt to change and reorganise itself upon repeated presentation of stimuli. With multisensory methodologies integrated, educators can build a stimulating learning environment suited for varying styles and cognitive competencies. Another important discovery is the contribution of motivation to ESL reading acquisition. Motivation has a strong association with the reward system of the brain, specifically the stimulation of

dopamine pathways. It has been found that students who feel positive reinforcement and accomplishment are more inclined to read. Gamification, positive reinforcement, and setting goals are all neuroscience-based methodologies that can boost motivation, too, by making it a fun, rewarding experience of reading. The teacher can easily adopt these by using interactive storylines, electronic reading platforms, and peer work activities that convey feelings of competence and social presence (Dehaene-Lambertz, 2024).

Moreover, emotional regulation plays a key role in reading fluency for ESL students. Stress and tension may compromise brain processes, compromising comprehension and memorisation. Neuroscience indicates that mindful meditation practices, relaxation training, and SEL programs will reverse stress and anxiety and lay the groundwork for effective learning environments. Instructors may incorporate these in the form of modelling self-awareness, advocating a mindset shift, and embracing classroom cultures that encourage performative tension reduction. The studies also highlight the importance of evidence-based and targeted interventions with cognitive neuroscience (Jensen, 2024). Cognitive individualised reading programs, considering the cognitive strengths and weaknesses of each student, can significantly improve literacy attainment. Adaptive learning systems, individualised feedback, and scaffolding methods can help struggling ESL readers learn at their own pace, with the strengthening of neural circuits involved in language learning. In general, this study highly favours the importance of integrating neuroscience-informed approaches to ESL reading instruction to promote improved learning opportunities for struggling readers (McBreen & Savage, 2022). The study indicates that an integrated approach that incorporates multisensory instruction, motivation, emotional control, and tailored interventions can establish a strong and fair learning environment. Longitudinal studies that measure the long-term effects of such approaches in various learning environments need to be studied further by future research.

Conclusion

The results of this research highlight the importance of neuroscience-informed approaches to enhancing motivation and reading capacity in struggling ESL students. By incorporating knowledge from cognitive neuroscience, teachers can create more efficient and motivating reading interventions that are specifically designed for the learner. The research highlights the importance of multisensory learning, which uses visual, auditory, and kinesthetic stimuli to activate cognitive processing and memory. This practice is supported by neuroplasticity theory, which underscores the brain's malleability and ability for long-term reading ability with recurrent and substantial exposure to various learning stimuli. The study also specifies the key interconnection between motivation and the brain reward system, specifically the triggering of the dopamine pathways. Pupils who receive positive reinforcement and feelings of accomplishment will most likely be motivated and consistent in reading practice. Neuroscience-based interventions like gamification, goal-setting, and interactive learning can promote motivation, rendering reading an enjoyable and rewarding experience. ESL instructors can make instruction more engaging and student-centred by implementing these strategies in the classroom.

Another key aspect of learning achievement is emotional regulation. Stress and anxiety can severely disrupt language acquisition and cognitive processes. According to the research, social-emotional learning (SEL) programs, mindfulness-based activities, and relaxation

training reduce these problems and promote a supportive and confident learning environment. Reading motivation and achievement of students may also be increased by establishing low-anxiety reading environments, developing a growth mindset, and developing peer support. In addition, targeted treatments derived from cognitive neuroscience concepts could improve literacy levels. Instructors can respond to diverse learning needs by incorporating differentiated instruction, scaffolding approaches, and learning adaptability software. This helps poor readers obtain the assistance required to enhance reading skills. Through improved brain linkage and embedding of language learning capacities, these chosen strategies create superior learning experiences. In summary, the current research offers significant insight into how neuroscience-based methods may assist struggling ESL readers. Educators can make a more effective and supportive learning environment by incorporating motivation-building, emotional self-regulation, multisensory education, and customised instruction. The study states that there is significant potential for enhancing student motivation and reading achievement through the incorporation of neuroscience in ESL reading instruction. To enhance best practices and extend the application of neuroscience in language learning, subsequent research should investigate the long-term impact of these strategies in other learning environments.

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