

Integrating Neurolinguistics into EFL Teacher Training in Algeria: A Theoretical Framework for Supporting Dyslexic Learners

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Abstract: This theoretical and conceptual paper examines gaps in EFL teacher training in Algeria regarding the identification and support of learners with dyslexia. Despite advances in neurolinguistics and cognitive neuroscience, teacher education programmes remain insufficiently equipped to address cognitive diversity in foreign language classrooms. Drawing on interdisciplinary research in neurolinguistics, language acquisition, and inclusive education, the study proposes a neurolinguistic framework for EFL teacher training. The framework links neural mechanisms of language processing with teacher education components and classroom practices, emphasising phonological awareness, multisensory instruction, and evidence-based pedagogical strategies. It also highlights the importance of integrating neurolinguistic knowledge into both pre-service and in-service training. The findings suggest that incorporating neurolinguistic perspectives can enhance inclusive teaching practices and improve learning outcomes for dyslexic learners. However, effective implementation requires curriculum reform, sustained professional development, and stronger alignment between research, policy, and classroom practice.

Keywords: *EFL teacher training, neurolinguistics, dyslexia, inclusive education, language acquisition, Algeria, cognitive diversity.*

1. INTRODUCTION

Reading is widely recognised as a fundamental skill for knowledge acquisition, critical thinking, and social participation. In foreign language learning, it plays a central role in vocabulary development, grammatical competence, and overall communicative ability. However, for learners with neurodevelopmental conditions such as dyslexia, reading may become a persistent

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challenge rather than a facilitating tool for learning. These difficulties are often exacerbated by educational systems that rely on traditional instructional approaches and do not adequately account for cognitive diversity.

Dyslexia, affecting approximately 5–10% of the global population, is a neurodevelopmental disorder that interferes with the acquisition and processing of written language (Peterson & Pennington, 2012, pp. 1997-2007). Despite its prevalence, it remains insufficiently understood and inadequately addressed in many educational contexts, including Algeria. Available local evidence highlights the scope of the issue. For example, *Le Quotidiend'Oran* reported that approximately one in ten students may be affected by dyslexia (M. S., 2016, p. 21), while the Algerian Association for the Protection of Dyslexic Children (ALPEDYS) indicated that undiagnosed dyslexia may contribute to nearly 10% of academic failure in Oran (M. S., 2016, p. 21). Similarly, a national initiative identified dyslexia in 826 out of 9,000 cases of academic failure (SN, 2017). At the pedagogical level, Tobbi (2020, pp. 147-161) found that many EFL teachers in Algeria continue to misinterpret dyslexia as laziness or behavioral difficulty rather than as a learning disorder.

Dyslexia is formally classified as a specific learning disability (SLD) (U.S. Department of Education, 2004) and as a developmental learning disorder in the ICD-11 (World Health Organization, 2019). While such classifications are essential for educational support and policy, they are often associated with misconceptions in practice, particularly regarding learners' cognitive abilities. As a largely "hidden" disability, dyslexia is not always immediately observable, which may contribute to misinterpretation and delayed intervention. Consequently, learners may experience reduced academic confidence and engagement when their difficulties are not appropriately recognised.

Although clinical diagnosis requires specialised expertise, the classroom remains a critical context for the early identification of learning difficulties. Teachers, through their sustained interaction with learners, are well positioned to observe patterns of difficulty and provide initial support. A basic understanding of cognitive neuroscience and neurolinguistics can therefore enhance teachers' ability to interpret learning differences and adapt instruction accordingly. However, despite increasing research interest in neurolinguistics and language-related learning disorders, Algerian teacher training programmes remain insufficiently equipped to address these challenges. This gap limits the development of inclusive classroom practices and reduces the effectiveness of EFL instruction for neurodiverse learners.

In light of these issues, the central problem addressed in this article is the lack of integration of neurolinguistic insights into EFL teacher training in Algeria, particularly in relation to supporting learners with dyslexia.

This study is a theoretical and conceptual paper that addresses the following research questions:

- What are the current gaps in Algerian teacher training programmes regarding learning disabilities, and how can awareness and support for neurodiverse learners be improved?
- How can a neurolinguistic framework contribute to enhancing teacher training and inclusive practices for dyslexic learners in Algerian EFL education?
- Accordingly, the objectives of this study are to:
 - examine the limitations of existing EFL teacher training approaches in Algeria with respect to neurodiverse learners;
 - explore insights from neurolinguistics and cognitive neuroscience related to language acquisition and dyslexia;
 - propose a conceptual framework integrating neurolinguistic principles into pre-service and in-service teacher training;
- Outline pedagogical and policy recommendations to support more inclusive EFL classrooms.

Building on the premise that inclusive teaching is a fundamental component of effective educational practice(Gravells, 2017), this article argues that neurolinguistics provides a valuable interdisciplinary foundation for rethinking teacher preparation. Drawing on key domains of neurolinguistics, language representation, processing, and disorders (Friederici, 2017),the study highlights how insights from cognitive neuroscience, linguistics, and education can inform more inclusive pedagogical approaches.

This study is particularly relevant for policymakers, curriculum designers, teacher educators, and school administrators seeking to strengthen inclusive education in Algeria. By promoting neurolinguistic awareness in teacher training, the proposed framework aims to support more responsive and equitable EFL instruction that recognises cognitive diversity and reduces the marginalisation of learners with unrecognised learning difficulties.

2. Literature Review

2.1 Neurolinguistics: Definition and Scope

Advances in cognitive neuroscience have significantly expanded our understanding of how the human brain supports complex cognitive processes.

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Within this broader field, neurolinguistics has emerged as a specialised discipline concerned with the neural mechanisms underlying language acquisition, comprehension, and production. As Aitchison(2003) notes, “*neurolinguistics is concerned with the biological and neurological aspects of language, focusing on how the brain encodes, processes, and retrieves linguistic information.*”(Aitchison, 2003, p. 98).

The origins of neurolinguistics can be traced to nineteenth-century neurological discoveries that linked language functions to specific brain regions. One of the earliest breakthroughs came when Paul Broca identified a region in the left frontal lobe associated with speech production after observing patients with severe language impairments following brain damage (Broca, 1861, pp. 330-375). Shortly afterwards, Carl Wernicke(1874)described a complementary language disorder associated with damage to the temporal lobe, in which speech remains fluent but lacks meaningful comprehension. These findings demonstrated that language is supported by specialised yet interconnected brain regions rather than a single, unified “speech centre”, one helping us form words, the other helping us understand them.

During the twentieth century, developments in linguistics and cognitive science further strengthened interest in the biological foundations of language. Chomsky’s theory of universal grammar, which posits an innate capacity for language acquisition, stimulated research into the cognitive architecture underlying linguistic competence(Chomsky, 1965, pp. 24-26).Similarly, Jakobson’s(1941)work on aphasia highlighted the relevance of neurological evidence for linguistic theory. As interdisciplinary collaboration increased, neurolinguistics gradually developed into a distinct research field, reflected in the establishment of specialised journals such as the *Journal of Neurolinguistics*(Whitaker, 1985, pp. 3-12).

Technological advances in the late twentieth century further transformed the field. Neuroimaging techniques such as Positron Emission Tomography (PET) and Functional Magnetic Resonance Imaging (fMRI) enabled researchers to observe brain activity during language tasks and to identify the neural networks involved in linguistic processing(Petersen, Fox, Posner, Mintun, & Raichle, 1988, pp. 585-589). At the same time, research on neuroplasticity demonstrated the brain’s capacity to reorganise its neural connections in response to learning and experience, particularly during childhood(Kolb & Whishaw, 1998, pp. 43-64). These developments expanded the scope of neurolinguistics to include areas such as bilingualism, second language acquisition, and literacy development(Abutalebi & Green, 2007, pp. 242-275).

Importantly, neurolinguistic research has also contributed to a more precise understanding of language-related learning difficulties. Conditions such as dyslexia, once described in general behavioural terms, are now examined through the lens of neural processing differences and atypical patterns of brain activation (Shaywitz & Shaywitz, 2008, pp. 1329-1349). By linking neurological evidence with linguistic analysis, neurolinguistics provides valuable insights into the cognitive mechanisms underlying language learning challenges. These insights have important implications for education, particularly in informing more effective instructional approaches and interventions for learners with language-based learning differences (Bishop, 2014, pp. 381-415).

By examining these findings, we could draw a link between neuroscience and pedagogy, facilitating the transition to the next section, which addresses the relationship between neurolinguistics and dyslexia, emphasising its implications for foreign language acquisition and teacher preparation.

2.2 Neurolinguistics and Dyslexia

Dyslexia, as a language-based learning difficulty, has been extensively examined within neurolinguistic research due to its complex interaction with cognitive, linguistic, and neural processes. It is now widely recognised as a neurodevelopmental disorder with a genetic component, as studies have identified specific genes associated with brain regions involved in language processing (Scerri, et al., 2011, pp. 237-245). The imaging of the brain paints a clear image of this phenomenon in which individuals with dyslexia display distinct patterns of neural activation during reading tasks compared with typical readers. As illustrated in Figure 1, fluent reading relies on the coordinated activity of three principal regions in the left hemisphere: the parieto-temporal region, the occipito-temporal region, and the inferior frontal gyrus (Shaywitz & Shaywitz, 2004, pp. 29-35). These regions form an integrated network that supports different components of the reading process.

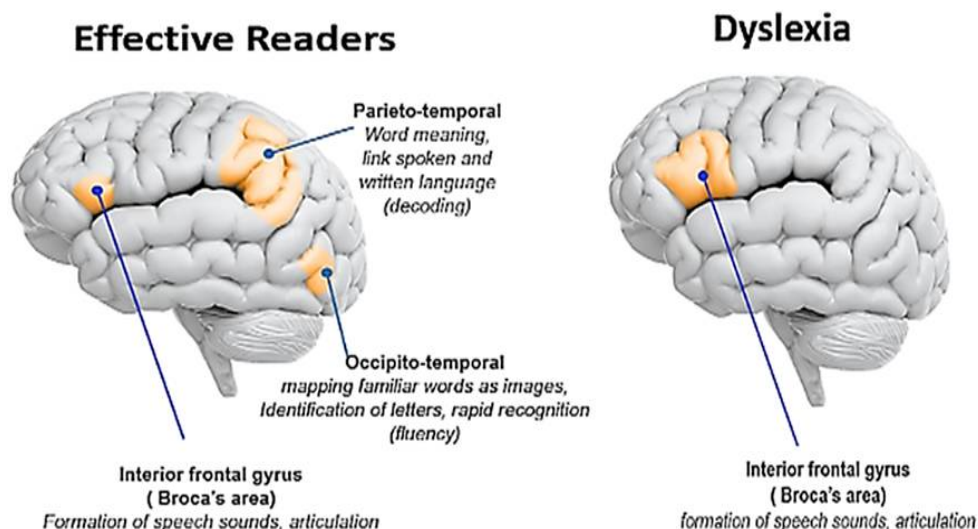


Figure 1: The Neural Signature for Dyslexia. Adapted from (Shaywitz & Shaywitz, 2004, pp. 29-35)

As shown in this figure, distinct brain activity patterns are present in individuals with dyslexia, often referred to as their “neural signature”. In proficient readers, the parieto-temporal region plays a central role in phonological processing and the decoding of written language. The occipito-temporal region, often referred to as the Visual Word Form Area (VWFA), enables the rapid recognition of familiar words and contributes to reading fluency. The inferior frontal gyrus, commonly associated with Broca’s area, is involved in speech production and articulation. The efficient coordination of these regions allows for automatic and fluent reading. (Pugh, et al., 2000, pp. 51-56).

In contrast, individuals with dyslexia typically exhibit reduced activation in the occipito-temporal and parieto-temporal regions, alongside increased activation in the inferior frontal gyrus (Shaywitz & Shaywitz, 2008, pp. 1329-1349). This pattern is often interpreted as a compensatory mechanism, whereby readers rely more heavily on effortful, language-production-related processes rather than automatic word recognition. In addition, dyslexic readers may engage alternative neural pathways, including regions in the right hemisphere, relying more on contextual and semantic cues to interpret written text (Shaywitz & Shaywitz, 2005, pp. 1301–1309).

These differences in neural processing help explain common characteristics associated with dyslexia, including slow reading speed, difficulties in decoding unfamiliar words, and reduced reading fluency. Importantly, such variations do not reflect deficits in intelligence or motivation but rather indicate alternative patterns of language processing. From a neurolinguistic perspective, dyslexia can

therefore be understood as a difference in how the brain processes written language rather than a lack of cognitive ability.

Understanding this neurological foundation provides a useful starting point for looking at how dyslexia plays out in educational settings, particularly in the context of learning foreign languages and shaping instructional strategies in EFL classrooms.

2.3 Dyslexia in the Algerian EFL Context

In Algeria, English is becoming increasingly important in academic, professional, and international domains, particularly in higher education and digital environments (Seidlhofer, 2008, pp. 85–102). Although French keeps monopolising as the primary foreign language owing to Algeria’s colonial past, recent educational reforms have introduced English at the primary level and expanded its use in university programmes, especially in scientific and medical fields (AP, 2022); (Middle East Monitor, 2022); (Fanverse, 2023).

Despite its growing importance, English presents significant challenges for Algerian learners. Its irregular orthography and inconsistent sound–letter correspondence often lead students to rely on phonological patterns from Arabic or French, resulting in mispronunciations and comprehension difficulties (Boudjella, 2021). These challenges are further intensified for dyslexic learners, as differences between the three languages complicate decoding and vocabulary acquisition (Toumi, 2019, pp. 112–129). From a neurolinguistic perspective, this multilingual context adds an additional layer of complexity, as learners must navigate competing phonological and orthographic systems.

2.3.1 Cognitive and Linguistic Challenges

Dyslexic learners in Algerian EFL classrooms face a range of persistent difficulties, all of which are underpinned by core cognitive deficits related to phonological awareness, working memory, and processing speed.

A major difficulty arises from the irregular nature of English orthography. Unlike Arabic, which has a relatively transparent sound–letter correspondence, English contains inconsistent spelling patterns and unclear grapheme–phoneme relationships. For example, words such as *though*, *cough*, and *enough* share similar orthographic patterns but differ significantly in pronunciation. For learners who rely heavily on phonological decoding, such inconsistencies increase cognitive load and make reading less predictable (Kormos, 2017). This issue worsens when learners transfer phonological patterns from Arabic or French, leading to confusion and reduced reading fluency (Boudjella, 2021).

Closely related to this issue is difficulty in phoneme–grapheme mapping, a

core characteristic of dyslexia that affects the ability to associate sounds with written symbols (Eissa, 2010, pp. 345–361). In English, a single phoneme may correspond to multiple graphemes, for instance, the /f/ sound can appear as *f* in *fish*, *ph* in *phone*, or *gh* in *cough*. This variability increases processing demands and slows the development of decoding skills. Consequently, dyslexic learners often expend considerable cognitive effort on basic reading processes, leaving fewer resources available for comprehension and higher-level language tasks (Boudjella, 2021).

Working memory deficits further compound these challenges. Verbal working memory is the ability to temporarily store and manipulate language information, especially important for tasks like understanding sentence structures, remembering new vocabulary, and applying grammar rules. (Gathercole & Baddeley, 1993). When this capacity is limited, even routine language tasks, such as forming questions or selecting appropriate verb forms, can become difficult, particularly in instructional contexts that rely heavily on memorisation and rule-based learning.

For many dyslexic learners, reading and writing remain as one of the toughest hurdles. Their reading is often slow and effortful, full of stops and starts, and peppered with mistakes that make it hard to fully grasp what the text is saying. Rather than recognising a word at a glance, they tend to break it down letter by letter, which disrupts fluency and makes comprehension even harder. Dyslexic writing as well can appear untidy or inconsistent: letters may be reversed, like mixing up “b” with “d” or “p” with “q”, while other times letters or even whole words go missing. Sentences may lack structure, making it difficult for their ideas to flow smoothly onto the page. As Reid (2016) confirms, these struggles are not a matter of carelessness but rather stem from weaknesses in working memory and phonological encoding, both of which are essential for shaping and expressing coherent written thoughts.

Perhaps one of the deepest and most systemic barriers dyslexic learners face in Algerian EFL classrooms is the simple fact that Many educators receive little to no formal training in recognising or supporting learning disabilities, which often results in the use of uniform teaching methods that do not account for cognitive diversity. Consequently, dyslexic learners may be misinterpreted as inattentive or underperforming. This kind of misjudgement can be deeply damaging as it chips away at a learner’s self-esteem and leaves them feeling excluded, even invisible, in the very classroom where they are supposed to grow. Over time, it can lead to withdrawal, silence, and a loss of motivation, not because the student lacks potential, but because the environment fails to see it.

Despite these obstacles, emerging evidence suggests that appropriately structured foreign language learning can improve metalinguistic awareness and cross-linguistic transfer in dyslexic learners (Kormos & Smith, 2012). With structured intervention and adaptive instruction, dyslexic learners can, in fact, succeed in EFL contexts.

2.4 Neuroplasticity and Teacher Training in Dyslexia Awareness

The concept of brain plasticity is the brain's capacity to remodel and create new neural connections in response to learning and experiences. Considered a game changer in the field of cognitive neuroscience, it offers a robust platform for intervention, notably in the literacy development of dyslexic learners.

Research demonstrates that evidence-based approaches, such as the Orton–Gillingham method, which emphasises phonological awareness, multisensory engagement, and structured instruction, can strengthen the brain's reading network, particularly within the left hemisphere, including the visual word form area (Hynd, Edmonds, & Pribyl, 2004); (Shaywitz & Shaywitz, 2008). Meta-analytical evidence further confirms that systematic phonics-based instruction leads to significant improvements in reading outcomes, especially when implemented early and consistently (Galuschka, Ise, Krick, & Schulte-Körne, 2014). These findings indicate that, although dyslexia is associated with atypical neural processing, appropriate instruction can lead to measurable cognitive and behavioural improvements. However, this promise only becomes reality if teachers are prepared to act on it. Within this context, research makes it clear that when educators understand the neurocognitive underpinnings of dyslexia and apply targeted strategies; they are not just supporting students in the classroom, they are literally helping to reshape how the brain processes reading (Washburn, Joshi, & Binks-Cantrell, 2011, pp. 165–183); (Moats, 2009, pp. 22-31)

As Rose (2009) aptly stated: *«Every teacher should be a teacher of literacy,»* (Rose, 2009). That statement rings even truer when we remember that every classroom includes neurological diversity. Preparing teachers to meet that reality is not just good practice, it is the foundation of inclusive education.

2.5 EFL Teacher Training in Algeria: Frameworks and Approaches

To examine the current state of EFL teacher training in Algeria, it is useful to consider international models of teacher education, which provide a structured basis for analysis.

Contemporary perspectives conceptualise teacher education as a continuous process integrating theoretical knowledge, practical experience, and ongoing professional learning (OECD, 2019). According to Richards and Farrell (2005),

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teacher training prepares educators through the development of instructional strategies, classroom management skills, and reflective practices necessary for addressing diverse learner needs. Beyond technical skill-building, it also supports the exploration of innovative pedagogical approaches and adaptation to evolving classroom contexts(Feiman-Nemser, 2001, pp. 1013-1055).

The OECD Teacher Education Pathway model conceptualises teacher preparation as a structured progression encompassing entry into Initial Teacher Education (ITE), completion of training, transition into the profession, and early career development(Roberts-Hull, Jensen, & Cooper, 2015). This model highlights the importance of both pre-service preparation and in-service professional support, including induction and mentoring, as integral components of teacher development. As presented in the followingfigure :

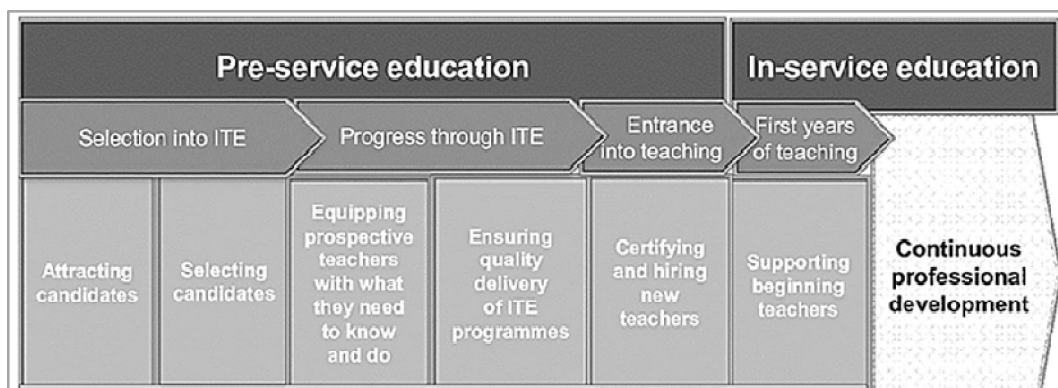


Figure 2: Teacher Education Pathway Model (Roberts-Hull, Jensen, & Cooper, 2015)

The model presented in Figure 2 provides an analytical framework for situating the proposed neurolinguistic approach within teacher education. It conceptualises training as a multi-stage process, supporting the integration of neurolinguistic knowledge across all phases. At the pre-service level, this involves introducing key concepts related to language processing and dyslexia, while early-career stages require mentoring and guided practice to translate theory into classroom application. In-service training further enables ongoing professional development aligned with advances in cognitive neuroscience. The model therefore highlights key stages at which neurolinguistic principles can be embedded to support inclusive EFL practices.

This framework is particularly relevant for examining EFL teacher training, as it highlights the transition from academic preparation to classroom practice. However, its application in the Algerian context remains limited, particularly in preparing teachers to address cognitive diversity, including dyslexia. The following section therefore examines the structure of EFL teacher training in

Algeria and identifies key gaps in both pre-service and in-service provision.

2.5.1 EFL Teacher Training in Algeria: Current Gaps and Needs

In Algeria, EFL teacher training is institutionally structured and primarily supervised by the Ministry of National Education (MNE) and the Ministry of Higher Education and Scientific Research. The preparation of future English teachers is largely carried out in Écoles Normales Supérieures (ENS) and university English departments. These institutions serve as the cornerstone for building the linguistic and pedagogical foundations required for teaching. The system is organised into two main stages: pre-service and in-service training, which together are intended to support the gradual development of professional competence.

2.5.1.1 Pre-Service Training

Pre-service teacher education typically spans three to five years and combines theoretical instruction with practical training, leading to a qualification that enables teaching at primary, middle, or secondary levels. At ENS and university departments, programmes focus on developing linguistic, pedagogical, and cultural competencies (Siam, & Rebouh, 2023, pp. 55-70). These are complemented by classroom-based internships designed to bridge theory and practice (Haddad, 2024, pp. 88-102).

Despite this structured design, research indicates a persistent gap in professional readiness. In particular, these programmes remain insufficiently responsive to the realities of multilingual and cognitively diverse classrooms (Siam, & Rebouh, 2023, pp. 55-70); (Messaour & Khadraoui, 2022, pp. 112-124). While trainees acquire substantial theoretical knowledge in areas such as phonetics, syntax, morphology, psycho-pedagogy, and teaching methodology, many report feeling unprepared when confronted with learners who experience difficulties beyond language proficiency (Fekih, 2019, p. 8). These teachers often lack the training to recognise the signs of such conditions, let alone apply differentiated instruction strategies tailored to those needs. This not only shows a significant limitation in the context depth of the given courses, but also reflects a disconnection between theory and practice, which ultimately limits teachers' capacity to address cognitive diversity in the classroom effectively (Goswami, 2008); (Gillon, 2018).

This gap is further reinforced by institutional constraints related to infrastructure and expertise. Teacher education programmes in Algeria rarely provide access to specialised facilities dedicated to language and cognition, such as psycholinguistics laboratories, phonetics labs, or experimental research environments. In contrast, universities such as Lancaster University host well-

equipped linguistics departments with eye-tracking laboratories, phonetics and speech analysis facilities, and experimental psycholinguistics units that support empirical research on language processing and acquisition. Such environments play a key role in linking theoretical knowledge with scientific inquiry and pedagogical application. In the Algerian context, the absence of similar infrastructure limits opportunities for pre-service teachers to develop a deeper understanding of the cognitive mechanisms underlying language learning. This issue is compounded by the limited presence of academic specialists in areas such as neurolinguistics, cognitive linguistics, and language-related learning disorders within teacher training institutions. Consequently, teacher education remains largely theoretical and linguistically oriented, with limited exposure to interdisciplinary perspectives that could inform inclusive and evidence-based teaching practices.

As Messaour and Khadraoui (2022) point out, enhancing the professionalisation of teacher training requires not only a restructuring of content with novelty but also a shift towards problem-based learning and practical engagement with classroom realities. (pp. 112-124)

2.5.1.2 In-Service Training

Following initial training, most university graduates are required to pass a national competitive examination in order to enter the teaching profession, while ENS graduates are directly recruited. This examination includes subjects such as Arabic, general culture, information and communication technologies (ICT), and a subject-specific test. Newly recruited teachers then complete a probationary year accompanied by additional training covering areas such as educational psychology, didactics, educational media, professional ethics, and school legislation.

However, it is noteworthy that neither the content of the exams nor the training modules take special education into account. Moreover, these theoretical subjects are largely reiterations of topics already studied at university. Although in-service teacher training is designed to support ongoing professional development through workshops, seminars, training days, and online modules, in practice, these opportunities rarely reflect up-to-date research or modern educational approaches. We often overlook key concepts like inclusive pedagogy, differentiated instruction, or neuroscience-informed strategies. As a result, many teachers find themselves trapped into facing different types of learners with varied cognitive capacities. Learning disorders such as dyslexia would be mistaken for laziness, lack of intelligence or a simple learning difficulty, leading to more

complicated outcomes. Another recurring concern adding to this dilemma is the predominance of theoretical content over practical application. Teachers need more opportunities to practise learnt material and receive feedback, emphasising the importance of hands-on experience in professional development. A more particularly troubling aspect of this is that Algeria lacks the systematic integration of speech and language therapists (SLTs). SLTs can play a pivotal role by offering individual or small-group interventions and advising teachers on effective classroom strategies. Collaborating with SLTs during training would allow EFL teacher trainees to cultivate inclusive, neurolinguistically informed teaching practices. This would not only enhance their ability to support diverse cognitive profiles but also help them identify cases requiring specialist intervention.

Establishing such interdisciplinary collaboration and aligning training with contemporary research are therefore a key step toward achieving inclusive education in line with international best practices.

2.6 Gaps in Current Approaches for Supporting Dyslexic Learners

Following the Teacher Education Pathway Model, both pre-service and in-service are included in the Algerian teacher educational system. However, despite these frameworks, significant gaps exist in parts of the training:

- Many EFL teachers and schools are not trained to identify or manage specific learning disabilities (SLDs) such as dyslexia. As confirmed by the National Recognition Information Centre for the United Kingdom (UK NARIC) on their *assessment of International Teacher Training (ITT) Systems*. in Algeria: “specific training on SEN is not a feature of the core ITT system.” (2012, p. 15)
- While Algeria has signed international agreements promoting inclusive education (e.g., UNESCO Salamanca Statement) (UNESCO, 1994); (UNICEF, 2021), implementation remains limited, with schools often lacking the necessary resources, specialised staff, and institutional support.
- Theoretical instruction does not fully correspond with the actual issues in classrooms, leaving many novice teachers unprepared for the cognitive diversity they encounter.
- Recruitment examinations and evaluation criteria do not assess teachers’ knowledge of SLDs or their ability to apply inclusive and differentiated teaching methods.
- In-service training remains largely theoretical and repetitive, with limited integration of current research or innovative pedagogical

approaches.

- The absence of systematic collaboration with speech and language therapists (SLTs) limits both early identification and targeted support for learners with language-based difficulties.
- Neurolinguistic principles and recent advances in brain-based learning are not built into the curriculum, limiting instructors' understanding of variances in language acquisition.
- New teachers rarely receive structured mentorship or hands-on guidance, which makes the transition from initial training to confident professional practice even harder.

3 A Neurolinguistic Framework for EFL Teacher Training

Given that there are plenty of complicated issues that cannot be solved solely through pedagogical models alone, the neurolinguistics approach brings the neuroscientific based research observations in educational settings, providing new viable options for addressing longstanding educational issues. This approach is particularly useful for addressing the challenges faced by dyslexic learners, but can also benefit any learner with a language proficiency, as it emphasizes brain-based learning strategies and multisensory phonological interventions that align with cognitive and neural mechanisms involved in language acquisition.

From this angle, pre-service and in-service teachers' training programs ought to include:

3.1 Pre-Service Teacher Training

3.1.1 Foundations of Neurolinguistics in Language Learning:

Effective support for dyslexic learners requires a foundational understanding of how the brain processes language. Pre-service training should therefore introduce core neurolinguistic concepts, including:

- **Basic neurolinguistic principles:** Understanding the role of neural networks in language acquisition and the cognitive mechanisms underlying dyslexia.
- **Brain plasticity and second-language learning:** examining the brain's adaptation to novel linguistic frameworks and the distinct approaches of dyslexic learners to L2 processing.
- **The role of working memory and executive functions:** understanding how cognitive factors affect reading and writing skills in dyslexic students (Goldstein,, Naglieri, & DeVries, 2015, pp. 141–170).

3.1.2 Identification and Assessment of Dyslexia:

Teachers require the ability to recognise early indicators of dyslexia, particularly in foreign language contexts where difficulties may be misinterpreted. This training component should focus on:

- **Early warning signs of dyslexia in EFL learners**, such as persistent spelling errors, difficulty with phoneme-grapheme mapping, and slow reading fluency.
- **Assessment tools for diagnosing dyslexia**: Introducing teachers to standardised dyslexia screening tests, such as the Dyslexia Early Screening Test (DEST) and Comprehensive Test of Phonological Processing (CTOPP) (Wagner , Torgesen , Rashotte, & Pearson, 2013).
- **Observational techniques**: Training teachers to recognise behavioural indicators of dyslexia, such as reading avoidance or inconsistent spelling patterns (Reid , 2016, p. 40).

3.1.3 Multisensory and Phonological Interventions:

One of the most effective ways to teach dyslexic learners is through Multisensory Structured Language Education (MSLE), which involves integrating visual, auditory, kinaesthetic, and tactile elements (Birsh & Carreker, 2018, p. 21). In this case, teachers who are proficient in English and sensitive to phonological patterns are better positioned to implement multisensory and phonics-based strategies. This should include:

- **Phonological awareness training**: Teaching explicit phonics instruction using approaches such as the Orton-Gillingham Method.
- **Multisensory techniques**: Research shows that multisensory phonological interventions significantly improve literacy outcomes for dyslexic EFL learners (Schneider & Crombie, 2012, p. 110). These include ways such as tactile learning (e.g., tracing words in sand or using textured letters), auditory reinforcement (e.g., reading aloud with speech-to-text tools), or visual aids (e.g., color-coded morphemes to enhance comprehension).
- **Structured literacy instruction**: Implementing sequential and cumulative teaching methods that reinforce decoding and spelling skills.

3.1.4 Inclusive Classroom Strategies:

Creating a dyslexia-friendly classroom requires adaptable teaching strategies that foster inclusivity and engagement. Training should focus on:

- **Differentiated instruction**: Adjusting teaching strategies to meet individual needs, such as offering extra time on assessments or providing simplified reading materials.

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- **Assistive technology for dyslexic learners:**Including speech-to-text tools, audiobooks, and dyslexia-friendly fonts.
- **Scaffolded writing exercises:** Using sentence starters, graphic organisers, and guided composition activities to support dyslexic learners in writing (Graham, MacArthur, & Hebert, 2018).
- **Addressing Cross-Linguistic Differences:** Since the severity of dyslexia is influenced by the orthographic depth of a language, teachers must understand how students' first languages interact with their English learning experiences.

3.2 In-Service Teacher Training:

3.2.1 Teacher Competencies and Professional Development:

Taking care of individuals with dyslexia cannot be left to chance, it requires teachers to feel confident, well-prepared, and supported in their practice. For this reason, in-service training should aim to:

- Create specialist training paths: provide specialised training pathways, including certification or continuing professional development (CPD) in neurolinguistics and dyslexia.
- Promote collaboration across disciplines: No single field holds all the answers. Linguists, neuroscientists, speech therapists and educators should collaborate, sharing research and expertise to design teaching strategies that are both evidence-based and realistic for everyday classroom use.
- Encourage reflective practice through case studies, action research, and peer mentoring (Schneider & Crombie, 2012, p. 10).
- Set up networks for teachers who work with dyslexic students: When teachers have to deal with dyslexia in their classrooms, they often feel alone. Establishing professional communities for the exchange of experiences, ideas, and resources can offer both practical assistance and a sense of solidarity and collective purpose (Rello & Ballesteros, 2015, pp. 1-8).

4. Policy Recommendations for EFL Teacher Education

Improving support for dyslexic learners cannot rest on teachers alone. Valuable changes only happen if there is top-down support. The integration of neurolinguistic insights into EFL teacher training depends on coordinated action at the policy level, linking curriculum reform, teacher development, and research initiatives. Policymakers ought to set clear, actionable objectives such as:

- Courses on learning disabilities, cognitive linguistics, and inclusive

teaching should be part of every programme at ENS and universities. This way, new teachers would enter the classroom already equipped with an understanding of learning differences and how to respond to them.

- Expanding professional development options is also necessary for educators. They could refresh their knowledge and gain self-assurance in helping students from varied backgrounds through regularly scheduled, publicly financed training and workshops in neurolinguistics and EFL pedagogy, alongside collaboration with speech and language therapists.
- Funding action research in schools could show how neurolinguistic approaches actually work in Algerian classrooms and help adapt methods to the local context. As well as, creating PhD programs in cognitive neuroscience and forming international research partnerships would allow Algeria to build its own expertise rather than depend on outside models.
- Strengthen infrastructure by investing in specialised research facilities, such as neurolinguistics or cognitive science laboratories with properly trained staff, which can potentially mark a significant milestone. With adequate government funding, international collaboration, and specialised faculty training, these labs would place Algeria at the forefront of applied research in education and language learning. More importantly, they would show a genuine national commitment to building an education system where every learner has a fair chance.

The proposed neurolinguistic framework and its policy implications can be synthesised as follows:

Table 1:

Integrated Neurolinguistic Framework for EFL Teacher Training

Integrating Neurolinguistics into EFL Teacher Training in Algeria: A Theoretical Framework for Supporting Dyslexic Learners

Neurolinguistic Principle	Training Component	Classroom Practice	Policy Implication
Language processing and neural mechanisms	Foundations of neurolinguistics	Improved understanding of learner difficulties	Integration into teacher education curricula
Phonological deficits in dyslexia	Identification and assessment training	Early detection and targeted support	Inclusion of SEN training in programmes
Neuroplasticity	Multisensory and structured instruction	Phonics-based and adaptive teaching	Support for evidence-based interventions
Cognitive factors (e.g., working memory)	Teacher awareness and training	Adaptation of tasks and materials	Development of inclusive teaching guidelines
Brain-based learning	Continuous professional development	Differentiated and inclusive practices	Investment in training, research, and collaboration

5. Discussion

While a neurolinguistic framework in EFL teacher training holds considerable promise, its adoption is constrained by systemic, pedagogical, and socio-cultural challenges. These include insufficient government support, weak collaboration across sectors, large class sizes, time pressures, the stigma surrounding neurodevelopmental disorders, and institutional inertia often linked to bureaucracy or a lack of awareness of neurolinguistics' value. For this reason, reform should be understood as a gradual and iterative process rather than a one-time solution.

Overcoming these obstacles calls for coordinated action from multiple levels. This means reforming curricula, providing sustained professional development, strengthening cooperation between education and health sectors, and securing greater governmental investment in inclusive, research-driven practices. We know that educational reform is by nature complex and should be guided by a coherent, context-sensitive strategy, which is why a dynamic training system must be informed by "feedback loops"(Snyder, 2013); in other words, as illustrated in figure 3, it is the continuous interactions among stakeholders that evaluate and inform teaching and learning practices. Within this cycle, a neurolinguistic approach can act as the connecting thread, ensuring that policy is grounded in cognitive science (providing the vision, resources, and institutional backing), training teachers with brain-based strategies (translating this vision into professional competencies), and classroom realities feed back into refining neurolinguistically informed practice by testing and refining the methods, generating evidence that loops back to inform and improve policy.

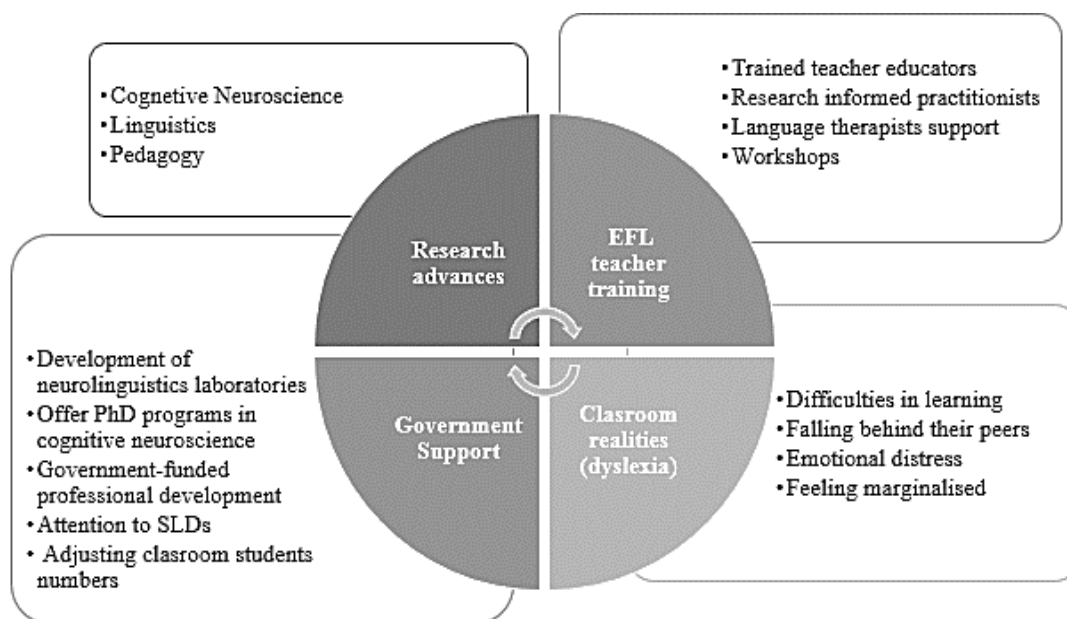


Figure 3: A Neurolinguistics Approach in EFL Teachers' Training (Dib Imene)

6. Conclusion

As a final analysis, this article has outlined a theoretical framework for integrating neurolinguistics into EFL teacher training, while highlighting systemic, pedagogical, and socio-cultural barriers that must be addressed. The points raised are presented as theoretical suggestions, indicating possible directions for policy and practice, though they still require careful implementation, piloting, and field-based research before adoption in real educational contexts. While the framework holds strong potential for addressing cognitive diversity, especially in supporting learners with dyslexia, progress is hindered by limited governmental support, insufficient collaboration across sectors, and a lack of practice-oriented teacher preparation. Moving forward, curriculum reform, evidence-based professional development, and partnerships with specialists such as speech and language therapists are highly recommended. More than a set of classroom strategies, a neurolinguistic approach offers a bridge between research and practice, aligning Algeria with international standards of inclusive education. Its success, however, rests on the collective commitment of policymakers, educators, researchers, and institutions to maintain a dynamic feedback loop, adapt to new insights, and prioritise equity in learning.

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