AJLLSE GLOBAL RESEARCH NETWORK

AMERICAN Journal of Language, Literacy and Learning in STEM Education
Volume 3, Issue 7, 2025 ISSN (E): 2993-2769

Emerging Intersections in Psycholinguistics, Inclusive Educational Material Design, and Language Education

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Abstract. *This paper explores niche intersections among psycholinguistics, inclusive educational material design, and language education, with the aim of advancing equitable, cognitively-informed pedagogical practices. While each domain has developed independently, their convergence offers fertile ground for innovative research and application. Psycholinguistics provides insights into the cognitive processes underlying language acquisition, comprehension, and production, which can inform the development of more accessible and effective instructional materials. Simultaneously, inclusive material design grounded in Universal Design for Learning (UDL) and culturally responsive pedagogy aims to accommodate diverse learners, including those with disabilities, linguistic minority backgrounds, and neurodivergent profiles. This paper investigates how principles from psycholinguistics can be operationalized in the creation of inclusive language learning materials. Specific attention is given to the processing of syntactic complexity, lexical frequency, and semantic transparency in learners with varied cognitive and linguistic profiles. Furthermore, the paper examines how inclusive materials may reduce cognitive load, enhance working memory utilization, and support deeper semantic encoding in multilingual and neurodiverse classrooms. This study highlights under-researched areas such as the acquisition of inclusive pronouns in second-language learners, the psycholinguistic processing of gender-neutral structures, and the design of language input for learners using augmentative and alternative communication (AAC) systems. Methodological approaches draw from experimental psycholinguistics, discourse analysis, and design-based research in education. By integrating these fields, this paper argues for a model of language education that is both empirically grounded and socially inclusive. The proposed framework has implications for curriculum development, teacher training, and policy-making in multilingual and multicultural educational contexts. Ultimately, the paper advocates for a shift toward pedagogical practices that are not only linguistically effective but also cognitively and ethically responsive to learner diversity.*

Key words: *Psycholinguistics, Inclusive Language Education, Cognitive Processing, Multilingual Learners, Educational Material Design.*

1.0 Introduction

In an increasingly globalized and linguistically diverse world, language education must evolve to address not only the structural and communicative aspects of language learning but also the cognitive, cultural, and accessibility needs of learners. Traditionally, the domains of psycholinguistics, educational material design, and language pedagogy have developed in relative isolation. However,

the convergence of these fields offers novel opportunities to design empirically grounded, inclusive educational practices that reflect the neurocognitive and sociolinguistic realities of contemporary learners. This paper explores the underexamined intersection of psycholinguistic theory, inclusive educational material design, and language education, aiming to identify and analyse niche areas of research that can inform future pedagogical innovations.

The rationale for this research arises from the mounting demand for inclusive, accessible, and culturally responsive language instruction. Language classrooms today are increasingly populated by students who vary not only in linguistic background but also in cognitive profile, learning ability, and cultural orientation. Neurodivergent learners, bilingual students, and individuals from marginalized linguistic communities often experience systemic barriers in traditional language instruction. Many of these barriers are rooted in materials and teaching strategies that do not account for the cognitive mechanisms underlying language processing, such as working memory, attention, semantic integration, and syntactic parsing. The field of psycholinguistics offers tools to analyse and optimize these mechanisms, yet its insights remain underutilized in instructional design and inclusive pedagogy. Moreover, inclusive language education—particularly the use of non-binary pronouns, culturally affirming content, and multilingual resources—requires nuanced understanding of how learners process, acquire, and emotionally engage with language. Questions about how gender-neutral structures are processed by ESL learners, or how cultural familiarity influences memory encoding, remain largely unanswered. Similarly, educational material design often lacks grounding in cognitive load theory, dual coding theory, or schema activation, which are essential for creating materials that support learning without overwhelming cognitive resources.

A further rationale stems from the limitations of prevailing research methodologies. Much of the existing literature is constrained to laboratory settings or monolingual populations, and fails to capture how language is processed and learned in authentic, multimodal, and socially diverse classrooms. Emerging methods such as mobile eye-tracking, ERP/fNIRS neuroimaging, and sentiment analysis offer new possibilities for assessing how learners interact with inclusive language content in real time. By incorporating these approaches, researchers can better understand the intersection of cognitive function, linguistic form, and pedagogical context.Given these gaps, this paper seeks to map out niche, interdisciplinary research directions that address the cognitive and affective dimensions of language learning, especially for underserved or underrepresented populations. It argues that effective language education in the 21st century must be grounded in psycholinguistic evidence while being ethically and culturally inclusive. By integrating theory, practice, and innovative research methods, this study aims to lay a foundation for a more equitable, cognitively sound, and empirically informed approach to language instruction.

2.0 Research in Psycholinguistics and Inclusivity

Recent advances in psycholinguistics have begun to address individual differences in language processing, yet significant gaps remain in understanding how inclusive linguistic structures are cognitively processed by neurodivergent populations. For example, examining the cognitive processing of gender-neutral and culturally inclusive language among individuals with autism, ADHD, or dyslexia can offer insight into how executive function, attention, and processing speed interact with non-standard linguistic forms. Likewise, the impact of bilingualism on executive functioning in children with learning disabilities represents a relatively untapped intersection, merging research on cognitive reserve and dual language exposure with atypical developmental trajectories. Further, real-time syntactic processing comparisons between heritage speakers and L2 learners can illuminate how implicit grammatical knowledge differs based on early versus late exposure, using psycholinguistic tools such as eye-tracking and event-related potentials (ERP). In the multilingual classroom context, neurocognitive markers of code-switching, measured via EEG or fMRI, can help identify the neural correlates of language control, inhibition, and switching costs, particularly among younger or lower-proficiency speakers. Lastly, the effect of lexical diversity in educational input on vocabulary acquisition in low socioeconomic status (SES) learners highlights the psycholinguistic importance of input frequency, type-token ratio, and contextual richness, especially in under-resourced educational settings. Together, these topics address critical but

underexplored aspects of language processing, emphasizing the need for inclusive and ecologically valid psycholinguistic research that considers both cognitive variability and sociolinguistic context.

Table-1. Niche areas in psycholinguistics and inclusivity

Topic	Novelty Justification
Cognitive Processing of Inclusive Language Structures in Neurodivergent Learners	Limited research exists on how neurodivergent learners process non-binary or culturally inclusive language, despite increasing use in educational and social contexts.
Impact of Bilingualism on Executive Functions in Children with Learning Disabilities	While bilingualism and executive functions are widely studied, their interaction in populations with specific learning disabilities remains largely unexplored.
Real-Time Syntactic Processing in Heritage Speakers vs. L2 Learners	Eye-tracking and ERP studies rarely compare these two learner types directly, missing distinctions in implicit syntactic knowledge and processing efficiency.
Neurocognitive Markers of Code-Switching in Multilingual Classrooms	Few studies use neuroimaging to examine code-switching in real-world, classroom-based multilingual settings, especially in young learners.
Effects of Lexical Diversity in Classroom Input on Vocabulary Acquisition in Low SES Populations	There is a gap in psycholinguistic studies that measure how lexical input characteristics specifically affect vocabulary growth in socioeconomically disadvantaged learners.

3.0 Niche areas of research in inclusive materials

Building upon psycholinguistic insights into language processing, the development of inclusive educational materials presents a promising yet underdeveloped area of interdisciplinary research. While cognitive science has informed instructional design broadly, its integration into inclusive material design particularly for linguistically and neurologically diverse populations remains limited. For example, designing psycholinguistically-informed Augmentative and Alternative Communication (AAC) systems for multilingual children addresses a crucial intersection of cognitive processing, language development, and accessibility. This area is especially novel as most AAC research assumes monolingual frameworks, ignoring the distinct processing demands of multilingual users. Similarly, visual language accessibility in educational materials for Deaf and Hard-of-Hearing (DHH) students necessitates psycholinguistic understanding of cross-modal syntactic and semantic translation, a field still in its infancy given the complexity of language transfer across sensory modalities. Furthermore, the application of Universal Design for Learning (UDL) principles in creating inclusive language materials can benefit significantly from psycholinguistic theories of comprehension, such as cognitive load theory and working memory limitations. This approach ensures that materials are not only physically accessible but also cognitively optimized for diverse learner profiles. Finally, research into textual cohesion and cognitive load in multilingual educational materials can illuminate how visual and linguistic design elements impact reading comprehension, retention, and learning efficiency, particularly in students navigating multiple languages. These topics push the boundaries of traditional material design by grounding educational inclusivity in empirical cognitive science and language processing research.

Table 2. Justification of Novelty for Inclusive Material Design Research Topics

Topic	Novelty Justification
Designing Psycholinguistically-Informed AAC Systems for Multilingual Children	Most AAC tools are developed with monolingual norms; few address multilingual

	code-switching, syntax, or cross-linguistic lexical access in AAC contexts.
Visual Language Accessibility in Educational Materials for Deaf and Hard-of-Hearing Students	Existing materials often lack linguistic nuance; limited psycholinguistic research on how DHH students process syntactic complexity across modalities.
Designing Inclusive Language Materials Using UDL Principles	UDL is often applied in general education but rarely integrated with psycholinguistic models of memory, comprehension, or semantic encoding.
Textual Cohesion and Cognitive Load in Multilingual Educational Materials	Research is scarce on how visual and syntactic cohesion affects language processing in learners managing multiple linguistic systems simultaneously.

4.0 Language Education-Focused Topics

Contemporary language education increasingly recognizes the need for pedagogical models that are both inclusive and grounded in cognitive science. However, there remain niche yet critical areas where psycholinguistic principles can enrich instructional efficacy and learner equity. One such area involves the comparative effectiveness of implicit versus explicit instruction of inclusive pronouns in EFL/ESL contexts, which probes how different learning modalities influence syntactic acquisition and long-term retention especially in culturally diverse classrooms. Relatedly, the role of culturally responsive language teaching on working memory engagement addresses how affective alignment and cultural salience modulate cognitive load and attentional resources during language learning. These questions point to an urgent need for models that integrate sociocultural relevance with psycholinguistic processing. Furthermore, cross-linguistic influence in learning gendered languages by speakers of gender-neutral L1s remains an understudied phenomenon, particularly as global educational systems embrace inclusive linguistic forms. This line of inquiry examines conceptual restructuring, grammatical gender acquisition, and learner resistance to forms that conflict with native cognitive-linguistic schemas. Additionally, the influence of phonological working memory on reading comprehension in multilingual learners' sheds light on a foundational psycholinguistic constraint that can disproportionately affect academic performance in diverse classrooms. Finally, the emotional valence of educational language and its impact on semantic retention presents a novel lens into how emotionally charged input (positive or negative) affects encoding, consolidation, and recall topic that bridges psycholinguistics with affective neuroscience. Together, these topics underscore the value of integrating cognitive science with inclusive and contextually relevant language education strategies.

Table 3. Justification of Novelty for Language Education-Focused Topics

Topic	Novelty Justification
Implicit vs. Explicit Instruction of Inclusive Pronouns in EFL/ESL Contexts	Few studies have examined how inclusive grammatical structures are differentially acquired through implicit vs. explicit methods, despite growing curricular emphasis on inclusivity.
Effectiveness of Culturally Responsive Language Teaching on Working Memory Engagement	There is minimal empirical work linking cultural relevance in materials to working memory dynamics and attentional regulation during language learning.
Cross-Linguistic Influence in Learning Gendered Languages by Speakers of Gender-Neutral L1s	Conceptual and syntactic restructuring in this specific direction (neutral-to-gendered) remains under-theorized, particularly in relation to inclusive language education.

Influence of Phonological Working Memory on Reading Comprehension in Multilingual Learners	While the role of working memory in reading is known, its effects across languages and orthographies in multilingual learners are less explored.
Emotional Valence of Educational Language and Its Impact on Semantic Retention	Affective priming and its influence on semantic memory in educational language contexts is a novel interdisciplinary frontier combining psycholinguistics and emotion research.

5.0 Psycholinguistic Foundations for Inclusive Language Education

The intersection of psycholinguistics and language education provides critical insights into how learners process, store, and retrieve language in classroom contexts. Several niche yet emerging areas including inclusive grammar instruction, culturally responsive pedagogy, and emotion-cognition interactions can be interpreted through established cognitive and linguistic theories. This review discusses five key research areas within inclusive language education and maps them onto relevant theoretical models: Working Memory Theory, Dual Coding Theory, Schema Theory, Cross-Linguistic Transfer, and Affective Neuroscience Models. First, implicit versus explicit instruction of inclusive pronouns in EFL/ESL learners may invoke different cognitive pathways associated with declarative and procedural memory (Paradis, 2009). Implicit learning, linked to procedural memory, is sensitive to input frequency and salience, while explicit instruction relies on conscious rule learning and declarative encoding. This aligns with working memory theory, which posits that explicit instruction imposes greater cognitive load, potentially overwhelming learners with limited processing resources (Baddeley, 2012). Second, the effectiveness of culturally responsive language teaching can be examined through schema theory, which emphasizes the role of prior knowledge and cultural scripts in comprehension and retention (Anderson et al., 2001). When learners encounter culturally familiar material, cognitive integration becomes more efficient, reducing extraneous cognitive load and enhancing semantic retention (Gay, 2010). The cross-linguistic influence in learning gendered languages by speakers of gender-neutral L1s illustrates the role of conceptual transfer and restructuring. Learners must form novel gender schemas that may conflict with existing L1 grammar process shown to involve increased attentional control and metalinguistic awareness (Jarvis & Pavlenko, 2008). Studies suggest that L1 structures deeply influence L2 acquisition trajectories, particularly for morphosyntactic features not present in the learner's native language (Montrul, 2011). Phonological working memory's role in reading comprehension among multilingual learners is grounded in working memory theory. Research shows that phonological loop capacity directly predicts L2 reading success and is especially critical for learners navigating orthographic variation and inconsistent grapheme-phoneme correspondence (Service & Kohonen, 1995). This highlights the need for instruction that scaffolds decoding and retention without overburdening short-term memory. Lastly, the emotional valence of educational language and its impact on semantic retention can be interpreted using models from affective neuroscience and dual coding theory. Emotionally charged language (positive or negative) tends to be more memorable due to heightened amygdala activation and deeper semantic encoding (Kensinger & Schacter, 2006). Dual coding theory further posits that emotionally evocative content benefits from multimodal reinforcement visual and verbal which supports richer memory traces (Paivio, 1991).Together, these frameworks offer a robust foundation for designing inclusive and cognitively optimized language instruction. Psycholinguistically-informed education must address not only the structural features of language but also learners' cultural, emotional, and neurocognitive contexts.

6.0 Novel Research Methods and Their Uniqueness

As the intersection of psycholinguistics, inclusive material design, and language education continues to expand, traditional methodologies such as surveys, grammar tests, and observational techniques often fail to capture the nuanced cognitive, linguistic, and emotional processes involved. This necessitates a shift toward more multimodal, neurocognitive, and ecologically valid research methodologies that can uncover subtle individual differences and processing mechanisms in diverse

learner populations. While eye-tracking has traditionally been used in laboratory psycholinguistics to examine reading and parsing behaviours, mobile eye-tracking now allows researchers to track real-time visual attention during authentic learning tasks. This method is particularly powerful for evaluating how learners with ADHD, dyslexia, or low working memory capacity engage with inclusive or visually complex educational materials (Holmqvist et al., 2017). Its ecological validity makes it ideal for analysing the usability and accessibility of inclusive material design in naturalistic environments. Event-related potentials (ERP) and functional near-infrared spectroscopy (fNIRS) offer non-invasive ways to study real-time language processing and executive functions, especially in populations often excluded from neurocognitive research such as bilingual learners with disabilities. These methods enable fine-grained analysis of semantic integration, code-switching, and inhibitory control across languages (Friederici, 2011).

Design-Based Research (DBR) bridges theory and practice by iteratively designing, implementing, and refining instructional interventions in real classrooms. This method is especially suited to inclusive language education, where researcher-teacher collaboration is essential to create materials grounded in both cognitive science and sociocultural relevance (The Design-Based Research Collective, 2003). With the rise of NLP tools, sentiment analysis and semantic vector modelling (e.g., using BERT or Word2Vec) can evaluate emotional valence and conceptual depth in learner-produced texts. This is particularly novel in the context of inclusive language instruction, where affective tone and semantic choices may reflect deeper Combining video, text, gesture, and speech, multimodal discourse analysis (MMDA) can assess how students interpret and respond to inclusive, culturally embedded content. MMDA is uniquely equipped to capture how meaning is constructed through layered semiotic resources vital for learners navigating multiple cultural or linguistic codes (Jewitt, 2014).

Table 4. Novel methods

Research Method	Domain of Application	Unique Contribution
Mobile Eye-Tracking	Inclusive material design; attention in ADHD, dyslexia, ESL learners	Captures real-time visual attention in authentic learning environments
ERP / fNIRS Neuroimaging	Code-switching; semantic integration; bilingual and neurodivergent learners	Reveals temporal dynamics of language processing in diverse linguistic profiles
Design-Based Research (DBR)	Classroom-based inclusive pedagogy; UDL-informed interventions	Facilitates iterative, practice-integrated testing of inclusive instructional strategies
Sentiment & Semantic Analysis	Affective and inclusive language in student writing	Enables quantification of emotional tone and conceptual richness in learner output
Multimodal Discourse Analysis	Interpretation of inclusive texts and media; classroom interactions	Examines how learners use multiple semiotic modes (text, gesture, visuals) to make meaning

7.0 Conclusion and Scope for Future Research

This paper has highlighted the critical yet underexplored intersections between psycholinguistics, inclusive material design, and language education. By integrating cognitive theories such as working memory theory, schema theory, and dual coding theory with inclusive pedagogical frameworks, we underscore the necessity of designing educational materials and instructional strategies that are both linguistically and cognitively responsive to learner diversity. Novel methodologies such as mobile eye-tracking, ERP/fNIRS neuroimaging, and sentiment analysis offer promising tools for empirically grounding this integration. However, current research remains limited in scope, often focusing on monolingual or neurotypical populations and failing to adequately address how inclusive linguistic structures are processed and retained across varied cognitive profiles and sociolinguistic

backgrounds. Future research should expand to include longitudinal and ecologically valid designs that assess how learners interact with inclusive language forms over time, particularly in multilingual, neurodivergent, and low-resource settings. There is also a need for cross-disciplinary collaboration between psycholinguists, educators, instructional designers, and computer scientists to co-develop adaptive educational technologies, including AI-driven tutors and accessible AAC systems, grounded in psycholinguistic evidence. Moreover, integrating affective and socio-emotional variables into language acquisition research such as emotional valence, identity alignment, and cultural relevance will deepen our understanding of learner engagement and semantic retention. Ultimately, future inquiry must move toward a more inclusive, empirically grounded, and ethically aware model of language education that reflects the cognitive and cultural realities of today's diverse classrooms.

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