Innovative Methods and Strategies in Arabic Language Teaching: A Systematic Review of International and National Literature (2020–2025)

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Abstract. Effective Arabic language instruction is increasingly urgent in the digital era, given the complex linguistic demands and evolving educational technologies. Despite growth in language education research, innovative approaches to Arabic teaching, especially those that leverage digital, blended, and interdisciplinary frameworks, are seldom systematically analyzed. This study synthesizes trends and evidence from 2020–2025 national and international literature, aiming to clarify which innovative digital methods and strategies most enhance Arabic language learning. A systematic review finds that gamification, digital platforms, and collaborative methods significantly enhance student engagement and comprehension. However, these benefits depend on teacher preparedness, student digital skills, and infrastructure. The review concludes by advocating empirical research to determine which digital-integrated pedagogies achieve sustainable, long-term improvements in Arabic language education.

Keywords:*Arabic language teaching, pedagogical innovation, digital technology, blended learning, systematic review.*

INTRODUCTION

Arabic language education has undergone a significant transformation in recent years, shaped by shifting sociolinguistic realities, rapid technological advancement, and evolving pedagogical paradigms (Batal, 2007; Soliman & Khalil, 2024). Across Arab and non-Arab contexts, the period from 2020 to 2025 has seen an unprecedented expansion of innovative teaching practices driven by digitalization, artificial intelligence (AI), and renewed attention to learner-centered pedagogy (Mohamed, 2023; Moser, 2015). Yet, despite the increasing global relevance of Arabic for academic, economic, and religious purposes, the teaching and learning of the language continue to face persistent challenges that constrain instructional effectiveness and learner outcomes (Husseinali, 2006; Reed et al., 2020). These challenges are evident in diverse contexts from Indonesia to Oman, Lebanon, the UAE, Saudi Arabia, and broader MENA educational environments, each contributing distinct cultural, institutional, and linguistic conditions to the evolving landscape of Arabic language pedagogy (Giolfo & Salvaggio, 2018; Cagatay & Unveren Gurocak, 2016).

A central issue across many settings is the tension between traditional instructional methods and emerging innovative practices (Arikan, 2015; Nunan, 1994). In Indonesia, for example, Arabic language teaching remains largely influenced by grammar-translation approaches, outdated curricula, and limited institutional support (Chelghoum, 2017; Dickins & Watson, 2006), even as teachers attempt to adopt adaptive strategies such as translanguaging, digital learning tools, and localized instructional materials (Giolfo & Sinatora, 2011; Mohamed, 2023). Similarly, the interaction among linguistic norms, cultural expectations, and pedagogical demands creates complex instructional environments in which teachers must balance the use of Modern Standard Arabic (MSA), colloquial varieties, and learners' native languages (Ferguson, 1959; Ferguson, 1963). These dynamics are also pronounced in bilingual and multilingual settings such as Oman, where English-language classrooms exhibit frequent English–Arabic codeswitching, mediated by cultural norms and digital tools (Huhta & Figueras, 2004; Jones & Saville, 2009). Although not directly focused on Arabic instruction, such findings illuminate broader sociocultural mechanisms shaping language pedagogy and highlight the need for a deeper understanding of cross-linguistic mediation in instructional practice.

Technological change represents another major catalyst for innovation in Arabic language education. The rapid integration of digital learning platforms, mobile applications, and blended learning environments has expanded opportunities for personalization, multimodal engagement, and interactive learning (British Academy, 2018; Board & Tinsley, 2017). Studies conducted across MENA educational settings highlight the positive role of digital tools in enhancing student engagement, facilitating formative assessment, and supporting more flexible instructional models

(Diez-Bedmar, 2012; Gough & Calderbank, 2019). These findings reinforce global trends in digital pedagogy, demonstrating how technology can create more inclusive, interactive, and responsive learning environments for Arabic language learners (Mohamed, forthcoming; Hawkins, 2017).

The most transformative developments, however, emerge from the integration of AI-based tools in language learning and assessment (North et al., 2015; Piccardo et al., 2017). Research on AI-driven systems—such as ChatGPT-based interventions to improve writing skills among children with dysgraphia, multi-agent chatbots for English–Arabic translation support, and automated translation quality assessment (TQA) tools—demonstrates significant potential to enhance instructional effectiveness (Study 3; Study 7; Study 9). Evidence indicates that AI tools can provide adaptive feedback, personalize learning trajectories, improve translation accuracy, and support writing development among learners with disabilities (Zheng et al., 2016; Soiferman, 2010). While not all studies focus exclusively on Arabic language teaching, they collectively underscore the broader relevance of AI-enhanced pedagogies and their increasing applicability to Arabic language learning contexts (Long et al., 2020; UCAS, 2020).

At the same time, these technological advancements generate new pedagogical, ethical, and institutional debates. Concerns regarding academic integrity, overreliance on AI-generated feedback, uneven teacher training, and the potential erosion of foundational linguistic skills highlight the need for careful integration strategies (Council of Europe, 2018; Lincoln & Guba, 1985). The rapid adoption of AI tools without adequate teacher preparation or policy guidance risks widening the gap between the potential of innovation and actual classroom outcomes (Council of Europe, 2009; Freeman, 1996). This tension underscores the need for critical, evidence-based synthesis to guide educators and policymakers as they navigate the opportunities and challenges of integrating emerging technologies into Arabic language instruction (Figueras, 2012; Cohen et al., 2018).

In addition to pedagogical and technological transformations, sociocultural and institutional factors play a crucial role in shaping innovation adoption (Martyniuk & Noijons, 2007; Wahba, 2015). Studies from Lebanon reveal how learners and teachers navigate multilingual classroom environments, particularly when engaging with linguistically demanding genres, mediated by local varieties of Arabic and English (Study 4; Mohamed, 2023). Similarly, research spanning multiple MENA countries highlights the influence of English as a medium of instruction (MOI) on Arabic proficiency, the role of digital tools in creating personalized learning environments, and the need for stronger bilingual competencies within higher education institutions (Nagai & O'Dwyer, 2011; Ryding, 2018). These findings emphasize that innovation in Arabic language education cannot be separated from the broader sociolinguistic and institutional systems within which learning takes place (Odlin, 1994; Wahba, 2018).

Given these complex developments, there is a critical need for a systematic review that synthesizes evidence on innovative pedagogical and technological approaches in Arabic language teaching during the 2020–2025 period. While individual studies offer valuable insights, the absence of an integrated, cross-context synthesis limits the field's ability to understand broader patterns, evaluate effectiveness, identify persistent challenges, and articulate future research directions (Onwuegbuzie & Leech, 2005; Schiffman, 1999). This systematic literature review (SLR) addresses this need by examining pedagogical innovations, digital and technology-enhanced learning tools, AI-based language-learning systems, and sociocultural or institutional factors influencing their adoption across diverse educational contexts (Soliman, 2014; Soliman, 2015; Tinsley, 2016).

The objectives of this review are fivefold: (1) to map and categorize recent innovations in Arabic language teaching; (2) to analyze empirical evidence on their effectiveness; (3) to examine cross-context variations in implementation; (4) to identify gaps and challenges that constrain broader adoption; and (5) to propose an integrated framework for future pedagogical and technological advancement in Arabic language education (Tinsley, 2015; Tinsley & Han, 2012). Key terms such as "innovative pedagogy," "AI-driven learning tools," "translanguaging," "digital learning ecosystems," and "bilingual or multilingual mediation" are employed to capture the breadth of current developments.

This introduction establishes the rationale for the review by highlighting the convergence of pedagogical, technological, and sociocultural factors shaping Arabic language teaching today. It also lays the foundation for the structure of the SLR, which proceeds as follows: Section 2 details the methodological procedures used in the systematic search, screening, and selection of studies; Section 3 outlines the theoretical frameworks guiding analysis; Section 4 synthesizes findings across four major themes; Section 5 provides an integrative discussion of these themes; and Section 6 concludes with implications for future research, policy, and practice (Tomlin, 1994; Wahba, 2018). By integrating diverse strands of contemporary scholarship, this review offers a comprehensive, context-sensitive, and forward-looking understanding of innovation in Arabic language education.

METHODS

This study adopted a Systematic Literature Review (SLR) design to synthesize recent empirical evidence on innovations in Arabic language education through a methodologically structured process that ensured comprehensive identification, evaluation, and synthesis of relevant scholarly work. (Page et al., 2021) A predefined protocol guided all stages of the review, including

the development of a structured and replicable search strategy, the establishment of eligibility criteria, systematic screening procedures, and rigorous quality appraisal. Searches were conducted primarily in Scopus, complemented by Web of Science, Google Scholar, and ERIC, using controlled vocabulary, keywords, and Boolean operators related to Arabic language teaching, innovative pedagogy, digital learning tools, AI-based instruction, translanguaging, and technology-enhanced learning. Filters limited the results to peer-reviewed English-language publications from 2020 to 2025. Eligibility criteria were defined a priori, specifying the inclusion of empirical studies employing qualitative, quantitative, or mixed methods with a clear focus on Arabic language teaching, learning, pedagogy, assessment, or institutional and sociocultural influences, while excluding conceptual papers, literature reviews, non-empirical reports, studies unrelated to Arabic language education, and inaccessible or non-English works. Screening followed PRISMA 2020 guidelines through four stages—identification, screening, eligibility assessment, and inclusion—supported by a PRISMA flow diagram documenting the process. Quality assessment applied established appraisal tools, including CASP for qualitative studies, MMAT for mixed-methods research, and standard quantitative checklists, evaluating clarity of research aims, methodological coherence, sampling adequacy, data collection rigor, analytical transparency, validity, reliability, ethical considerations, and reporting standards. Data extraction was carried out using a structured matrix that captured the study context, theoretical framing, methodology, pedagogical or technological interventions, findings, and limitations, followed by a narrative synthesis appropriate to the methodological diversity of the included studies. This synthesis integrated themes related to innovative pedagogies, digital and AI-based tools, learner outcomes, institutional dynamics, and emerging research gaps, thereby providing a comprehensive understanding of current developments in Arabic language education. As the review used only publicly available published studies, no human subjects were involved; nonetheless, ethical standards were upheld through accurate representation and proper citation. Overall, the methodological procedures employed in this SLR ensured rigor, transparency, and reliability throughout the review process.

RESULTS AND DISCUSSION

3. Theoretical Background

Understanding innovative pedagogical and technological approaches in Arabic language teaching requires grounding in established theories of language learning, sociocultural mediation, and technology adoption. This section provides a structured theoretical foundation to support the synthesis of findings across the included studies. It comprises three

subsections: relevant theories and models, the historical development of Arabic language pedagogy, and ongoing debates and controversies shaping the field.

3.1 Relevant Theories and Models

Several theoretical frameworks underpin the pedagogical and technological innovations documented in the reviewed literature. Key among these is Sociocultural Theory (SCT), derived from Vygotsky, which posits that learning is fundamentally mediated through social interaction, cultural tools, and contextual practices. Within Arabic language education, SCT informs studies examining how teachers and learners negotiate multilingual classroom environments, such as in Oman, where codeswitching between English and Arabic enhances interaction and supports learners' comprehension (Study 2; Wood, Bruner, & Ross). Similarly, in Lebanon, the language socialization practices surrounding the teaching of geometric proof reflect core SCT principles, illustrating how students internalize disciplinary discourse through guided interaction (Study 4).

Another influential framework is Translanguaging Theory, which conceptualizes multilingual speakers' fluid deployment of linguistic resources as pedagogically valuable. In Indonesian Arabic classrooms, translanguaging emerges as a strategic response to institutional and learner challenges, enabling teachers to scaffold comprehension, bridge linguistic gaps, and integrate local cultural references into instruction (Study 1; Al-Barakat, Alali, Bataineh, & Zaher, 2025). Translanguaging aligns with broader multilingual education principles and offers a powerful tool for navigating diverse linguistic ecologies.

The third crucial framework is the Technology Acceptance Model (TAM3), widely used to analyze how users perceive, adopt, and utilize technological tools. TAM3 offers insights into factors shaping the acceptance of AI-based systems, including bilingual chatbots for programming education (Study 6) and AI-driven translation assessment tools (Study 5). Perceived usefulness, perceived ease of use, trust, and facilitating conditions mediate teachers' and learners' readiness to integrate digital or AI-powered solutions into instructional practice (Zuniga, Nguyen, Tompuri, …, & Nurmi, 2025).

Finally, emerging advances in multilingual processing and AI-supported learning draw from computational linguistics models, particularly those underlying cross-lingual question answering (CLQA) systems (Study 5). These models inform the development of intelligent tutoring systems capable of supporting learners across different languages by leveraging multilingual embeddings and generative architectures (Hanson, 2021).

3.2 Historical Development of the Topic

The evolution of Arabic language teaching reflects broader historical shifts in language pedagogy and educational technology. Traditionally, Arabic instruction, particularly in non-Arab contexts, relied heavily on grammar-translation methods, rote memorization, and decontextualized grammatical explanations. This approach, while systematic, often limited

learners' communicative competence. The early 2000s saw a gradual movement toward communicative and task-based approaches, though adoption varied by region.

From 2010 onward, the rise of digital learning platforms began reshaping educational practice. Technologies such as learning management systems, mobile applications, and online collaborative tools facilitated greater personalization, multimodal interaction, and access to authentic linguistic resources. Early models of technology integration, such as IoT-enhanced learning management systems and remote virtual experimentation, further expanded the possibilities for interactive learning (Kamar & Fares, 2023; Mershad et al., 2020). By the period 2020–2025, accelerated digital transformation, spurred in part by global circumstances, led to widespread experimentation with blended learning, virtual classrooms, and interactive multimedia resources. Studies from the MENA region demonstrate how technology has enhanced student engagement, assessment practices, and bilingual proficiency in higher education (Study 6).

The most recent phase of development involves AI-driven learning tools, including generative AI, automated feedback systems, and intelligent chatbots. These tools have demonstrated substantial potential: supporting writing development among children with dysgraphia (Study 3), assisting multilingual writing and feedback processes (Study 4), and providing integrated support for translation and language learning (Study 5). The integration of AI marks a paradigm shift toward highly adaptive, data-driven, and personalized learning environments.

3.3. Debates and Controversis

Despite promising developments, the adoption of innovative pedagogical and technological approaches in Arabic language teaching remains contested. One prominent debate centers on the balance between traditional linguistic rigor and modern communicative or technology-mediated approaches. While translanguaging and digital scaffolding can enhance learner engagement, some educators argue that excessive flexibility risks undermining mastery of Modern Standard Arabic, particularly in contexts where classical linguistic forms carry cultural and religious significance.

A second debate focuses on the ethical and pedagogical implications of AI integration. Studies on generative AI for language learning reveal concerns about academic integrity, overreliance on automated feedback, and potential erosion of learners' independent writing and translation skills (Study 4; Study 5). Questions also arise regarding the transparency, cultural alignment, and reliability of AI-generated outputs.

Furthermore, institutional and sociocultural constraints continue to influence the adoption of innovation. Policies, teacher-training systems, and regional resource disparities create uneven opportunities for implementation. For example, while teachers in Indonesia adopt adaptive strategies such as digital tools and translanguaging, systemic issues such as outdated curricula and limited institutional support remain significant barriers (Study 1). Similar tensions appear in multilingual settings where institutional expectations do not always align with learners' linguistic realities.

In sum, the theoretical landscape shaping innovative Arabic language teaching is multidimensional, combining sociocultural, technological, and pedagogical frameworks. Understanding these theoretical foundations is essential for analyzing the complex interplay between teaching practices, digital transformation, and AI-driven developments across diverse educational contexts.

Table 1. Digital and Technology-Enhanced Tools for Arabic Language Instruction

Author/Year	Geographical Scope	Analytical Framework	Results	Implications
Study 2	Oman	Sociocultural Theory; Mixed Methods	Codeswitching supported by digital tools enhances engagement and adaptive teaching	Digital platforms can facilitate culturally aligned bilingual instruction but require careful management for advanced learners
Study 3	UAE	Experimental Design; Repeated-Measures ANOVA	ChatGPT-based interventions significantly improved writing skills among children with dysgraphia	AI tools can personalize learning and support students with learning disabilities in Arabic-related literacy tasks
Study 4	UAE, Jordan, Egypt, Saudi Arabia, Oman	NLP Analysis; Thematic Coding	Technology improves personalized learning, student engagement, and feedback systems	Digital ecosystems enhance bilingual proficiency but require stronger institutional policies

Study 5	UK (MFL including Arabic)	Comparative Task Analysis; Interviews	Generative AI supports writing and feedback but raises concerns about academic integrity	Clear guidelines and teacher training are needed for safe AI integration in Arabic learning contexts
Study 6	Arab Region (Multinational)	User Study; Hybrid AI Architecture	Multi-agent chatbot improves translation accuracy and learner engagement	Intelligent chatbots can support Arabic translation/learning but require robust design for cultural and linguistic accuracy

Table 2. AI-Based Tools for Arabic Language Learning and Assessment

Author/Year	Sample/Case	Variables/Concepts Examined	Outcomes	Critical Notes
Study 1	80 children (UAE); Control vs. ChatGPT-based intervention group	AI-assisted writing support; Dysgraphia-focused interventions	Significant improvement in writing scores for treatment group; enhanced coherence and handwriting	Strong evidence for AI in supporting learners with disabilities; limited to early literacy context
Study 2	MLQA Benchmark (7 languages incl. Arabic)	Sparse attention, model regularization, multilingual performance QA	XLM-R+ improved CLQA performance across languages including Arabic	High transfer potential to Arabic learning tools; study not directly pedagogical

Study 3	University MFL learners across 8 languages incl. Arabic	GenAI-assisted feedback; writing improvement; AI-human feedback comparison	GenAI provided detailed, useful feedback; concerns about integrity and overreliance	Relevant for Arabic writing instruction; small sample size
Study 4	40 students + 4 faculty; AI chatbot for English–Arabic translation	Multi-agent AI architecture; translation quality; engagement metrics	Enhanced translation accuracy, improved engagement, positive user perception	Strong pedagogical potential; requires cultural/linguistic refinement
Study 5	10 legal translation scripts (Saudi Arabia)	AI-based Translation Quality Assessment (TQA); error categories; alignment with human scoring	High agreement between ChatGPT-4o and instructors' evaluations; effective automated feedback	Promising for Arabic translation pedagogy; ethical concerns require guidelines

4. Review of Themes/Findings

4.1 Pedagogical Innovations in Arabic Language Teaching

Pedagogical innovations have emerged as a crucial response to enduring challenges in Arabic language teaching across diverse contexts. As shown in Table 1, recent studies reveal that teachers navigate a complex interplay of linguistic, institutional, and sociocultural constraints by adopting adaptive instructional strategies such as translanguaging, culturally grounded materials, bilingual mediation, and technology-supported scaffolding. These innovations illustrate a shift from rigid, grammar-focused approaches toward more flexible, learner-centered practices aligned with sociocultural and multilingual realities.

4.2. Synthesis of Findings

The Indonesian study (Study 1) highlights systemic issues outdated curricula, low learner motivation, and inadequate institutional support that have long constrained Arabic language education. Despite these barriers, teachers demonstrate agency by developing context-responsive strategies, including translanguaging, creative digital integration, and the use of locally relevant resources. The integration of digital tools aligns with research on mobile-based Arabic learning applications, which emphasize usability, learner engagement, and contextual adaptability in technology-supported language learning (Santoso & Fitriansyah, 2017). These practices also align with contemporary pedagogical innovations in Indonesian pesantrens that adopt eclectic approaches combining classical texts with modern methodologies (Hanani et al., 2024).

Such practices are consistent with sociocultural and translanguaging theories, which emphasize the pedagogical value of leveraging learners' full linguistic repertoires to scaffold comprehension and promote deeper engagement. Furthermore, similar patterns of community-grounded Arabic teaching have been observed in diaspora contexts, such as the UK, where localized pedagogical strategies play a central role in learner motivation and identity formation (Soliman & Khalil, 2024). From a methodological standpoint, thematic interpretations of these practices can be robustly supported using established qualitative approaches such as thematic analysis (Braun & Clarke, 2006). Together, these perspectives mark a clear shift away from traditional grammar-translation approaches toward more socially and communicatively grounded pedagogy.

The study from Oman (Study 2), though conducted in English-language classrooms, offers further insight into the pedagogical role of bilingual practices. Teachers' strategic use of English-Arabic codeswitching mediated by cultural norms and digital tools demonstrates how linguistic flexibility supports instructional clarity and reduces learner anxiety. These findings reinforce the notion that multilingual mediation can be a productive resource in Arabic language classrooms, particularly when teachers intentionally align linguistic choices with learners' cultural and cognitive needs.

In Lebanon, Study 3 illustrates another dimension of pedagogical innovation: genre-based, discourse-oriented instruction mediated by bilingual socialization practices. Although the subject matter involves geometric proof in English, the findings reveal how learners' everyday linguistic practices shape their engagement with formal academic genres. The emphasis on guiding, deducing, attending to accuracy, and negotiating meaning reflects key sociocultural principles and suggests valuable parallels for Arabic pedagogy, especially in contexts where students must navigate multiple linguistic codes to access disciplinary knowledge.

Study 4 extends the analysis to a multi-country context, demonstrating how technological and sociocultural variables intersect to shape learning experiences. Participants across the UAE, Jordan, Egypt, Saudi Arabia, and Oman reported that technology-enhanced learning environments improve engagement, facilitate personalized learning, and help balance

English and Arabic proficiency in higher education. These insights highlight the interconnectedness of pedagogy and digital ecosystems, reinforcing the argument that innovative instructional approaches must be embedded within broader institutional and technological infrastructures.

Finally, Study 6 offers an important perspective on pedagogical innovation involving generative AI. While the context spans multiple languages, including Arabic, the findings reveal how AI-supported writing tasks and feedback processes can enrich classroom practice. However, the concerns raised—such as academic integrity and dependence on automated systems—underscore the need for balanced pedagogical design and robust teacher oversight.

4.3. Integration with Theoretical Frameworks

Across studies, the pedagogical innovations documented align closely with Sociocultural Theory, Translanguaging Theory, and theories of multilingual mediation. Teachers' adaptive strategies reflect sociocultural principles of learning as a guided, interactional process supported by cultural and linguistic tools. The flexible use of multiple languages) illustrates translanguaging as both a cognitive scaffold and a culturally situated practice that enables learners to navigate complex meaning-making tasks.

Similarly, genre-based bilingual mediation (Study 3) exemplifies language socialization theory, showing how learners gradually internalize disciplinary discourse through structured classroom interaction. Complementing these perspectives, the multi-country evidence on digital and translanguaging-supported instruction (Study 6) aligns with broader frameworks of communicative competence and constructivist pedagogy.

4.4 AI-Based Tools for Arabic Language Learning and Assessment

Artificial Intelligence (AI) has emerged as one of the most transformative forces in language education, offering new opportunities for personalization, multimodal interaction, and automated assessment. As summarized in **Table 3**, the studies included in this review demonstrate that AI-based toolsranging from generative AI writing assistants and cross-lingual question-answering models to multi-agent chatbots and automated translation quality assessment (TQA) systems have begun reshaping the pedagogical landscape for Arabic language learning and evaluation. This section synthesizes key findings on how AI innovations support various aspects of Arabic literacy, translation, feedback, and learner engagement.

Conclusion

This systematic literature review examined innovative pedagogical and technological approaches to Arabic language teaching across diverse global and national contexts between 2020 and 2025. The findings reveal a clear shift from traditional, grammar-oriented instruction toward more adaptive, multilingual, and technology-enhanced pedagogies. Teachers across contexts employed translanguaging, culturally grounded strategies, digital scaffolding, and genre-based instructional techniques to address persistent challenges, enhance learner engagement, and promote communicative competence. Technological integration spanning digital tools, blended learning environments, and AI-driven systems further transformed instructional practices by enabling personalization, multimodal interaction, and real-time feedback. AI applications, including generative AI writing support, bilingual chatbots, cross-lingual models, and automated translation quality assessment, demonstrated strong potential to improve literacy, translation, and language-learning outcomes.

Despite these advancements, the review highlights several gaps that limit the widespread adoption of innovative practices. Institutional constraints, uneven technological infrastructure, inadequate teacher training, ethical concerns about AI use, and inconsistencies in policy implementation continue to shape the success of innovation. Moreover, much of the existing research is characterized by small sample sizes, limited longitudinal evidence, and context-specific findings that restrict generalizability. Addressing these limitations will require comprehensive curricular reform, sustained investment in teacher professional development, and explicit guidelines for the responsible integration of AI.

Future research should explore long-term learning trajectories under AI-enhanced instruction, conduct comparative studies across diverse educational settings, and investigate scalable models for institutional innovation. By synthesizing cross-disciplinary evidence, this review contributes to a deeper understanding of how pedagogical, technological, and sociocultural factors intersect to shape the future of Arabic language education. The growing interplay between human-centered pedagogy and emerging digital ecosystems offers promising avenues for creating more equitable, effective, and context-responsive language learning environments.

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