

Impact of AI-Based Personalized English Learning on Cognitive Offloading and Formal Curriculum

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Abstract

Drawing on a comprehensive review of empirical studies through pedagogical and SLA theoretical lenses, the study looked into the pedagogical implications of the complex relationship between AI-driven personalization and curricular narrowing in language education. The findings are synthesized into a theoretically grounded framework that explains AI's impact on the breadth and depth of language education, particularly in contexts where English is not used as a native language. While AI promises individualized learning experiences, the study revealed a paradox in which algorithmic standardization and market-driven priorities risk homogenizing language curricula and constraining pedagogical diversity. To address these challenges, the study situated its analysis within an interdisciplinary AI framework for education that emphasizes collaboration among educators, linguists, technologists, and designers. The framework promotes transparency, accountability, cultural and linguistic inclusion, and ethical digital literacy. It is a contribution to developing balanced curricular designs that ensure AI-driven personalized learning platforms support comprehensive, equitable, and culturally responsive educational experiences, rather than narrowing learners' linguistic exposure or limiting critical engagement, while highlighting areas where pedagogical innovation can counterbalance emerging risks.

Keywords: Artificial intelligence (AI), personalized learning, language education, cognitive offloading, curriculum theory

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Introduction

Artificial Intelligence has significant potential for enhancing language learning in both formal and informal contexts. It has turned language education upside down, and this phenomenon is unstoppable. It requires thorough and balanced discussion. Several studies (e.g., Kohnke & Zou, 2025; Pratschke, 2024; Wang & Fan, 2025) tapped into AI-based boundless learning tools. Using these advances in language education represents progression beyond earlier technology-based frameworks, namely Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) (Al-Kadi, 2017; Mohsen et al., 2025; Zhao, 2024). CALL, which emerged in the 1980s (Al-Kadi, 2017), primarily focused on structured computer-based drills and exercises to reinforce language skills through programmed instruction and limited interactive capabilities (Chapelle & Sauro, 2017; Stockwell & Wang, 2025). MALL, driven by advances in mobile technology (Mohsen et al., 2025), provided learners with unprecedented flexibility and on-the-go access to language learning resources (Stockwell & Wang, 2025). By facilitating engagement with the target language in informal extramural contexts (Al-Kadi, 2017), these technologies have redirected scholarly inquiry beyond traditional foreign language classrooms (Rød & Calafato, 2023).

Extensive research has highlighted the benefits of technological advances for personalized language learning in the fast-paced context of the 21st century. Studies in CALL and MALL (e.g., Burston, 2015; Mohsen et al., 2025; Schmidt & Strasser, 2022) showed how these tools promote learner autonomy and provide individualized learning trajectories. More recently, Generative AI (GenAI) has extended these affordances beyond automated instruction, fostering engagement and motivation among language learners through responsive, adaptive interactions (Al-Hoorie & AlShakhori, 2025; Pikhart & Al-Obaydi, 2025).

Hasumi and Chiu (2024), in a bibliometric analysis of technology-enhanced language learning, showed that AI-powered tools enhance vocabulary acquisition, language skill development, and opportunities for authentic language use. Schmidt and Strasser (2022) further found out that AI-driven language learning tools enhance adaptive study plans, provide immediate corrective feedback, and support personalized learning pathways. Large Language Models (LLMs), like ChatGPT and Gemini, enhance these teaching capabilities through dynamic content generation, automated assessment methods, and personalized learning, according to Zhao (2024). Likewise, Zhai and Wibowo (2023) found that GenAI tools provide authentic communicative practice through intelligent tutoring systems and virtual conversation partners. These systems simulate natural language interactions, addressing the ongoing issue of authentic interaction that many traditional classrooms face, as highlighted by Novawan et al. (2024).

It could be argued that the rapid and widespread recognition of LLM models stems from the shortcomings of CALL and MALL (Al-Kadi, 2017; Burston, 2015; Hasumi & Chiu, 2024). GenAI researchers pointed out that LLMs go beyond CALL's and MALL's drilling and practice by generating and manipulating content (Al-Hoorie & AlShakhori, 2025; Kohnke & Zou, 2025; Tan, 2023). Despite these merits, Helm et al. (2023) raised concerns about reduced linguistic and epistemic diversity in AI-assisted content, calling for clearer disclosure policies and greater author accountability. Similarly, Celik et al. (2022), Al-Kadi (2025), and Pikhart and Al-Obaydi (2025) questioned pitfalls beyond plagiarism, cheating, and academic integrity. A major concern is that while language learners now have round-the-clock access to AI resources, there remains a lack of well-developed pedagogical frameworks for mindful integration into curricula. Tan (2023) maintained that such AI-based resources undermine fundamental educational foundations, which emerges as a central consideration for language researchers and educators.

This paper argues that without theoretically informed learning design approaches, Generative Artificial Intelligence (GenAI) risks replicating and intensifying the constraints of standardized curricula rather than transcending these limitations to create transformative

learning experiences, raising critical concerns regarding the long-term effects of overreliance on AI in language learning (Kohnke & Zou, 2025; Zhao, 2024). The study presents evidence of how GenAI constrains the breadth, depth, and cultural richness of language curricula, as well as the development of critical thinking (Gerlich, 2025; Sparrow & Flenady, 2025; Wang & Fan, 2025). Learners might believe they are progressing because of the repetition of system-generated lessons, but they risk missing out on varied and meaningful learning opportunities. The main issue is that AI systems tend to target rapid and measurable gains at the expense of preparing students for the variability and unpredictability of real-life language use.

To address these concerns, this study adopts a critical interpretive synthesis approach to examine AI-based personalized learning and its implications for curricula in English language education. The study also attempts to devise an AI framework for education that will promote culturally responsive, pedagogically sound, and socially equitable learning. This initiative considers both the advantages and the challenges of integrating AI into educational contexts. The review draws on literature published between 2020 and 2025, focusing on AI applications in education, language learning theories, curriculum studies, and critical pedagogy. The analysis is grounded in four solid theoretical frameworks: critical pedagogy (Freire, 2020; Giroux, 2021), constructivist learning theory (Piaget & Inhelder, 1969/2008; Wang & Fan, 2025), sociocultural theory (Vygotsky, 1978), and curriculum theory (Pinar, 2019). Even though many of the studies reviewed do not explicitly refer to these frameworks, they are conceptually related to them. Restricting the review to only those that mention these theories could have narrowed the scope of the review and excluded valuable empirical work that implicitly engages with these ideas.

Personalized Language Learning

A major aspect of infusing digital technology into language programs is the principle of learning on the go—anywhere at any time (Al-kadi, 2017; Alm & Watanabe, 2023; Rød & Calafato, 2023). It gave way to what has been termed as personalized language learning, in which learners prioritize their needs and customize their learning based on their learning styles and time (Al-Kadi, 2017). GenAI tools boosted this learning mode even further. Corresponding to the enforced changes, thanks to CALL, MALL, and now GenAI, Zhao (2024) noted that “Western countries such as the United States, the United Kingdom, and Australia have changed their curricula, pedagogy, and staffing requirements and implemented standardized testing to monitor student and school performance, as well as holding schools accountable” (p. 9). Likewise, countries in East Asian such as Japan, Taiwan, South Korea, and Singapore attempt to change their education to be more flexible (Zhao, 2024). In a similar vein, Hasumi and Chiu (2024) proposed that evolving educational systems view GenAI as an essential instrument in modern language education. Commercial platforms like Duolingo and Khan Academy have quickly turned these empirically validated research insights into practical applications. For example, Duolingo incorporates AI to give AI-powered tutoring capabilities and personalized feedback mechanisms that are tailored to each learner's specific needs (Duolingo, 2023).

AI has also transformed intelligent tutoring systems, where sophisticated adaptive learning technologies continuously analyze students' learning patterns and modify curricular elements accordingly, to optimize knowledge acquisition and skill development (Celik et al. 2022). Evaluating these platforms, Wang et al. (2024) showed increased vocabulary acquisition rates, grammatical accuracy, and communicative confidence among regular users, especially those with limited access to traditional language instruction. While these developments create opportunities for personalized language learning, they also raise concerns about possible curriculum narrowing and its impact on overall language acquisition. Personalized learning, under GenAI tools, has turned out to be one of the most innovative teaching approaches in modern language education.

According to Arani (2024), it provides customized learning pathways tailored to individual student needs, learning styles, and differential progress rates. Reviewing some adaptive systems, Naznin et al. (2025) and Schmidt and Strasser (2022) claimed that they apply algorithms in the analysis of students' different performances. By doing so, they engage students with precisely targeted instructional content and detailed feedback. Wang et al. (2024) argued that this enhances both cognitive engagement and measurable learning outcomes among diverse student groups. In other words, it is the adaptive learning algorithms within these systems that allow pinpointing specific knowledge gaps and misunderstandings, hence adjusting the instruction to make learning experiences more effective and cognitively optimized learning experiences.

In second language learning research, AI-powered dialogue systems provide strong evidence for improving interaction skills among university students studying English (Zhai & Wibowo, 2023), especially in contexts where English is not the native language, including virtual spaces where digital communication occurs (Al-Kadi, 2025). These chatbots and platforms are effective in improving various aspects of language learning beyond interaction, including vocabulary acquisition, grammar practice, and communicative competence (Pikhart & Al-Obaydi, 2025).

Similarly, Wah (2025) reviewed evidence from twenty-six recent empirical and theoretical studies exploring the transformative potential of AI in personalizing foreign language learning. The review found that AI-driven systems can effectively tailor instruction to meet individual learner needs, enhancing vocabulary retention, grammatical accuracy, authentic conversational practice, motivation, engagement, and emotional regulation. However, the review identified a significant limitation, as most AI-based systems do not adequately incorporate linguistic and cultural contexts and often overlook sociolinguistic variation, all of which are essential for achieving authentic language learning outcomes.

Curricular Narrowing

Beyond content limitations, structural and pedagogical concerns arise (Kohnke & Zou, 2025). Critical pedagogy, as described by Freire (2020) and further developed by Giroux (2021), emphasizes the critical inquiry and transformative dialogue over reducing educational experiences to simple knowledge transfer. This is a key perspective that raises important questions about the extent to which AI-driven personalized learning can support the dialogical and problem-posing education that Freire saw as crucial to authentic learning. In this context, the traditional transmission model of education is viewed as an inadequate means for promoting true intellectual development and forming critical consciousness. There is, therefore, a risk that AI-based personalization could inadvertently perpetuate this shortcoming.

The key aspect of Freire's and Giroux's theoretical framework lies in transformative dialogue that raises consciousness, empowers learners, and encourages students to take a critical attitude toward complex sociocultural issues through language. However, as Crompton et al. (2024) indicated, adaptive language learning systems powered by AI focus primarily on short-term efficiency in basic skill acquisition at the expense of more exploratory and reflective tasks that are seen as essential for deeper cognitive involvement and intercultural understanding. Thus, it is likely that learners in such algorithm-driven learning environments may experience intellectual stagnation, less critical thinking, and lowered cultural awareness due to limited exposure to diverse language settings and culturally rich materials. This raises important questions about whether AI-driven personalized learning contributes to curricular narrowing by prioritizing efficiency and standardized skill acquisition over the dialogic, exploratory, and culturally rich experiences central to critical pedagogy.

The concern of curricular narrowing can also be examined through Piaget's constructivist lens. Piaget emphasized that meaningful learning results from cognitive challenges and

exploratory interactions. However, these essential elements may be limited by AI-driven, repetitive content rather than being supported by productive cognitive struggle (Piaget & Inhelder, 1969/2008). From this standpoint, effective language acquisition requires rich opportunities for cognitive disequilibrium and active meaning-making. Yet, such opportunities may be restricted in AI learning paths designed to reduce frustration and prioritize measurable outcomes. According to Piaget and Inhelder (1969/2008), deeper language competence develops through engaging with unfamiliar structures, unexpected contexts, and new communicative situations, rather than through repetitive practice of familiar materials. Although AI-driven personalized language learning platforms can efficiently tailor content to learners' skill levels, they may reduce chances for cognitive conflict by routinely presenting material suited to current abilities and preferences (Pikhart & Al-Obaydi, 2025). The focus on comfort clashes with constructivist principles, which value growth through cognitive challenges and difficulties inherent in real learning experiences. Similarly, Krashen (1992) argued that 'comprehensible input' is essential for language learning. Krashen stated that the input should contain elements the learner is close to mastering but has not yet acquired. In other words, L2 input must exceed the learner's current competence for progress to occur, which opposes the goal of minimizing cognitive challenge.

A growing concern in recent scholarship is cognitive offloading—the tendency of learners to delegate essential cognitive processes to AI tools (Gerlich, 2025). This phenomenon is significant because it reduces opportunities for students to engage in critical thinking and, over time, may erode cognitive autonomy. Gerlich (2025) found that overreliance on AI tools amplifies cognitive offloading, which in turn diminishes learners' higher-order thinking skills. Beyond individual cognition, this trend has systemic implications for curriculum design. When students depend heavily on AI, educators may simplify tasks or prioritize test-oriented content, limiting open-ended learning and reducing exposure to challenging activities. With the passage of time, such adjustments can narrow the curriculum, restrict both its breadth and depth and reinforce patterns of cognitive offloading. Therefore, students encounter fewer opportunities for meaningful, intellectually demanding experiences that foster independent thought.

In terms of curriculum, the Curriculum Theory stresses diversity and interconnectedness for inclusive language education. Pinar's (2019) comprehensive theoretical framework provides critical insights for understanding AI-driven language education. To Pinar (2019), curriculum involves cultural engagement, interdisciplinary content integration, critical discourse analysis, and technical language proficiency. From this theoretical perspective, it begs the question whether AI instructional systems with their inherent focus on quantifiable outcomes and measurable performance metrics can cope with the comprehensive language curriculum, which understands language not only as a technical ability but also as a cultural practice and a medium for critical thought. Going further from Pinar's vision of curriculum, broader educational goals extend beyond technical proficiency to encompass critical reflection, cultural awareness, empathic understanding, and interpretative sophistication. Personalized AI-based learning from this perspective may reduce the exposure of learners to cognitively and culturally enriching materials that are indispensable for the development of holistic language competence. Language acquisition risks becoming procedural rather than contextualized. Without careful curricular weighing and active intervention of educators in cooperation with technological systems, AI-driven personalization may narrow learners' educational experiences to focus on easily measurable linguistic skills (Bognár et al., 2024). This setting may insufficiently prepare them for acting in diverse global contexts in which language serves as a complex cultural tool rather than just a communication code (Pikhart & Al-Obaydi, 2025).

Similarly, the sociocultural theory (Vygotsky, 1978) also highlights the importance of authentic social interaction, cultural contextual factors, and collaborative learning in comprehensive language acquisition. It highlights the aspects that customized AI tools may overlook despite their technological sophistication. Language learning, from a socio-theoretical

perspective, is deeply situated in complex social contexts and culturally mediated processes that algorithm-driven systems might find hard to replicate or facilitate. Vygotsky's concept of the "Zone of Proximal Development" draws on the need for responsive human support in learning, which AI systems can simulate but not fully embody (Cai et al., 2025). Vygotsky argued that the process of mediation combines language and thought, connecting the external social world with internal cognitive processes. This challenges Cartesian views that separate mind and body into distinct entities. The theory showed that true linguistic development occurs through dynamic social interactions, collaborative meaning-making, and cultural mediation that cannot be entirely reproduced through individualized technological interactions.

Bognár et al. (2024) argued that AI-driven personalized learning largely optimizes autonomous learning pathways and the completion of individual tasks, which may unintentionally isolate learners from the vital social dimensions of language acquisition. This alienation can further reduce opportunities for authentic peer-to-peer interaction, collaborative problem-solving, and gaining insight into diverse cultural perspectives (Zhao, 2024). This may hinder the development of socio-pragmatic skills, cultural literacy, and communicative flexibility—competencies essential for navigating global communication and handling complex, authentic language tasks in real-world contexts. At the center of this debate is whether AI-mediated personalized learning, despite its efficiency benefits, comes at the expense of the social dimensions of language that give communication its meaning. The result may be technically proficient but socially limited language users who are unprepared for authentic, multicultural communication contexts. This shift changes education into a commercial transaction in which the delivery of skills in an effective way is more important than a deeper engagement with the cultural, political, and social dimensions of language. From a critical theoretical standpoint, this commodification undermines the emancipatory and transformative potential of education by constraining learners to superficial contact that prioritizes readily measurable outcomes over deeper reflective and culturally complex engagements necessary for profound language learning. Confining learners in such a way, it neglects the development of students' communicative competence and critical thinking (Sparrow & Flenady, 2025).

It is therefore obvious that a theoretical tension exists between the efficiency-oriented, algorithmic nature of AI and the inherently messy, non-linear nature of authentic language acquisition. This tension becomes particularly pronounced through curriculum theory lens. Each of the different theoretical frameworks explored throughout this paper provides valuable insight into understanding the tension created between the AI-driven personalization of learning and the potential for curricular narrowing in language education. These frameworks provide critical vantage points through which one might begin to consider ways in which AI systems may simultaneously expand and constrain the possibilities of language learning.

Salient Theoretical Concerns

This section reviews key empirical studies that show how theoretical tensions appear in actual educational practice, providing curricular implications. To begin with, Lee and Lee (2024) provided strong evidence of the differential impact of AI on language learning outcomes. Their meta-analysis of AI-guided language learning studies showed significant overall effectiveness. The authors found that AI systems have significantly stronger effects on vocabulary acquisition and grammatical accuracy than on communicative competence or cultural understanding. This implies that current AI implementations may prioritize readily measurable language components while offering comparatively limited support for the more complex communicative and cultural dimensions of language learning. Moreover, Zhai and Wibowo (2023) found that while these systems effectively support certain aspects of interactional competence, there are still significant gaps. The authors noted a lack of focus on debate, problem-solving, humor, empathy, and cultural

elements in existing AI systems. From theoretical perspective, these elements are regarded as essential for holistic language development. These findings reinforce the concern that AI systems may inadvertently prioritize measurable language components while overlooking the nuanced, cultural, and creative dimensions of language learning.

Novawan et al. (2024) explored how AI-driven personalization influences curricular breadth, showing how English language teachers integrate AI-based tools into their instructional practices. The study showed that while AI improves material development, assessment efficiency, and individualized feedback, it also raises significant concerns about the potential depersonalization of the learning experience and reduced meaningful human interaction. Although teacher participants valued AI's contributions to material development and assessment, they expressed concerns about depersonalization and the loss of human interaction. Teachers pointed out that AI has significant limitations in addressing cultural context and pragmatic skills. This supports arguments from sociocultural perspectives about the need for authentic social interaction in language learning. Teachers expressed support for hybrid models that balance AI-driven instruction with human-led learning to maintain a broad curriculum.

Likewise, Mananay (2024) provided further insights into how English language teachers perceive curricular issues. The survey of 100 teachers revealed significant concerns about finding AI tools that integrate smoothly into their existing curriculum in a way that enhances learning outcomes and remains consistent with pedagogical objectives. This highlights the risk that such technologies could control instructional design, limit pedagogical flexibility, and narrow the overall scope of the curriculum. As one teacher stated in the qualitative portion of the study: "It is difficult to find AI tools that fit seamlessly into our existing curriculum" (p. 375). This highlights the risk that AI integration may constrain curriculum design and implementation if it is not aligned with established educational goals. In a related context, Song et al. (2023) showed how technological affordances can influence and shape curricular priorities. Song et al. found that VR language learning environments successfully create immersive contexts that enhance engagement and retention. However, these environments need significant simplification of cultural and pragmatic elements to prevent cognitive overload. This finding supports concerns that the limitations technology may lead to simplified language scenarios, which prioritize engagement over comprehensive language development, demonstrating how medium constraints can influence curricular decisions.

In addition, Tan (2023) provided empirical evidence of this tension, describing AI tools like ChatGPT as a double-edged sword in education. Tan documented two concerning trends: widespread academic integrity issues, with 89 percent of surveyed college students using ChatGPT for assignments, and the risk of overreliance on these tools. The study noted that AI's impacts vary across educational levels, showing more significant disruption in higher education, where traditional methods of knowledge transmission are particularly vulnerable to replacement. Coppin (2025) showed that AI-powered tools can provide personalized learning experiences that raise student engagement and improve performance. Simultaneously, the study warned that overreliance on AI in education may lead to curricular narrowing, restricting holistic and interdisciplinary learning opportunities for students.

Taken together, these findings confirm theoretical concerns about the impact of AI integration on education and support arguments that AI, especially GenAI, although offering benefits for personalized learning, can emphasize some dimensions over others, specifically those related to cultural, creative, and critical dimensions in favor of language learning aspects that are easily measurable. This empirical evidence underlines the necessity of intentional design approaches that address potential curricular narrowing and supports theoretical propositions that AI integration requires balancing technological affordances with comprehensive educational objectives.

Beyond empirical data, and in line with these concerns, resolutions from the 10th Education International World Congress recognized that the shift toward digitalizing knowledge and adapting curricula for digital use might result in curriculum narrowing and a decline in quality. Further, it was noted that overreliance on AI could potentially weaken the cognitive, socio-emotional, and motor skills of learners (Education International, 2024). UNESCO (2023) raised similar concerns, warning that GenAI systems in education could reduce the variety of learning experiences and limit student autonomy. In a similar vein, Hasa (2023) argued that AI integration, as reflected in OECD perspectives, may inadvertently narrow the curriculum by emphasizing workforce skills over broader educational objectives. Later, UNESCO (2025) cautioned that excessive reliance on AI could influence cognition, motivation, and memory retention, possibly affecting curriculum implementation by disrupting the sequence of learning objectives and hindering the attainment of educational goals.

Figure (1) shows the sequential impact of AI-driven language learning, beginning with *Increased Cognitive Offloading (ICO)* and its influence on how learners engage with more complex tasks. This shift can, in turn, contribute to a reduction in curricular breadth and depth. Moreover, current AI systems still have significant technological limitations, which may further reinforce curriculum narrowing in language education.

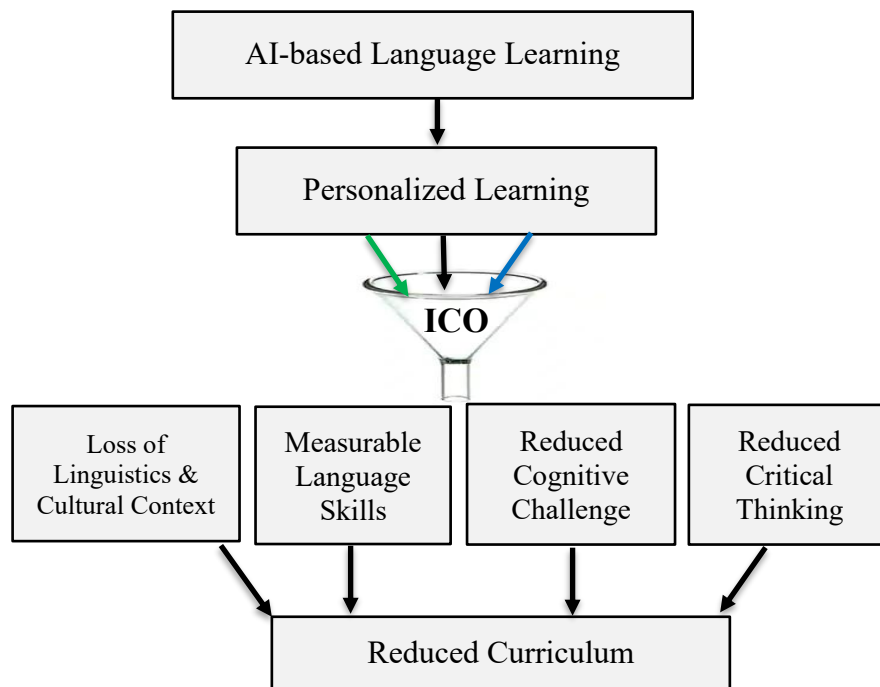


Figure 1. Flowchart of Long-term Pedagogical Impact of AI-Driven Language Learning on Curriculum Breadth and Depth

Schmidt and Strasser (2022) and Ruano-Borbalan (2025) pointed out that most AI-based language learning programs follow rigid, fixed instructional sequences instead of truly diverse learning paths that cater to personal interests and emerging needs. This technological limitation constrains curricular diversity, as the system can only adjust within its pre-programmed parameters and knowledge base. Virtual reality applications in language learning offer a different set of possibilities and challenges. Thorne et al. (2021) reported a positive impact of using VR in

out-of-school “rewilding” contexts, promoting authentic engagement and exploratory learning. However, when VR is integrated into classroom instruction, Cognitive Load Theory (Sweller, 1988) becomes particularly relevant, as without careful instructional design, learners may experience cognitive overload, which can undermine language acquisition. Song et al. (2023) warned that many of the language scenarios created in VR contexts need simplification. It risks producing linguistically and culturally impoverished experiences compared to authentic communicative contexts, which in turn limits curricular innovation. Although VR can enhance motivation and immersion, it often falls short of providing comprehensive language development opportunities afforded by real-world interaction.

The ethical issues related to using AI in language education create significant complications to the personalization narrative that often comes with these technologies. Another major ethical concern is the unequal access to resources, which can weaken the supposed benefits of AI-supported language education. Walter (2024) pointed out that the benefits of using AI in education are not shared fairly across society. There are clear gaps in access to advanced AI tools among different socioeconomic groups, geographical regions, and educational institutions. Walter (2024) noted that the digital divide shows up not only in physical access but also in differences in AI knowledge and the ability to critically engage with AI tools. Such skills are increasingly seen as vital for effective use of AI in education. These multiple inequalities in access and abilities raise important questions about whether AI-driven personalization may worsen, rather than improve, existing educational disparities in language learning opportunities.

This technological digital divide raises the alarming possibility of a two-tiered language education system. In this scenario, advanced personalization and learning opportunities would be available only to privileged learners, potentially widening rather than narrowing achievement gaps. Degni (2025) elaborated on this divide, noting that technological disparities extend far beyond simple hardware access to encompass significant differences in digital infrastructure, technical support, and institutional capacity for effective AI implementation.

Moreover, this digital divide in education increases educational inequality, reinforcing disparities among students from various social and economic backgrounds, including those from rural areas and learners with disabilities. It also contradicts the principle of equal access to education for all (George, 2023; Pedro et al., 2019; UNESCO, 2025). This divide may further weaken learners’ motivation and engagement, as students without adequate access to AI resources may feel disadvantaged compared to peers with better digital support. At the same time, it highlights the necessity of providing equal access to digital infrastructure and skills development for both teachers and students to ensure effective and fair integration of AI into language education (UNESCO, 2025; Wahdini et al., 2025). UNESCO (2025) stressed that reaching this goal needs a shift in pedagogical beliefs to encourage meaningful and inclusive digital integration into education. Acknowledging these risks, UNESCO created a guidance document to help plan appropriate regulations, policies, and training programs. The guidance seeks to ensure that GenAI in education serves as a tool that truly empowers learners, teachers, and researchers, grounded in a human-centered approach that upholds “human agency, inclusion, equity, gender equality, cultural and linguistic diversity” (UNESCO, 2023, p. 7).

The changing role of educators within AI-enhanced language learning environments introduces a complex landscape of opportunities and challenges for maintaining curricular diversity and effectiveness (Kohnke & Zou, 2025). Novawan et al. (2024) called for a carefully balanced hybrid teaching model that combines AI-driven instruction with teacher-led learning experiences to preserve curricular breadth while leveraging technological benefits (Al-Kadi, 2025). The findings indicate that maintaining the essential human aspects of language education—such as cultural understanding, empathetic communication, and spontaneous

linguistic creativity—is vital for meaningful and comprehensive language learning. In practice, this necessitates intentional pedagogical design rather than the wholesale adoption of technology.

AI Framework for Education

As pointed out earlier, the integration of AI into education offers significant opportunities, yet poses challenges in terms of pedagogy, cognitive growth, language, technology, ethics, and culture (Jaramillo & Chiappe, 2024; Jia, 2025; OECD, 2023; UNESCO, 2025). These challenges suggest that collaboration across different fields is needed to create meaningful AI systems for education that consider learners' cultural, cognitive, and linguistic diversity (Coppin, 2025). Such cooperation should include experts from various disciplines, educators, technology developers, and entrepreneurs to ensure that AI applications follow solid pedagogical principles and lead to transformative educational practices (OECD, 2023; Novawan et al., 2024; Ruano-Borbalan, 2025). UNESCO (2025) called for an interdisciplinary and human rights-based approach to integrating AI in education that supports transparency and accountability, protects linguistic and cultural diversity, fosters ethical and critical digital literacy, and ensures equity across all educational contexts. Similarly, Magrill and Magrill (2024) emphasized the need for ethical, interdisciplinary frameworks for AI integration and cooperation between academia and industry to enhance the educational benefits of AI while addressing potential risks. In line with these perspectives, George (2023) argued that technology can enhance education only when its implementation aligns with pedagogical goals and the curriculum, guided by clear learning objectives and supported by responsive teaching to enhance learning outcomes.

Building on these perspectives, the proposed AI Framework for Education (Figure 2) responds directly to the issue of ATV and curricular narrowing effects associated with AI-driven language learning. By situating AI within a broader interdisciplinary dialogue that integrate insights from linguistics, psychology, pedagogy, computer science, and cultural studies, the framework seeks to mitigate curricular reduction and promote balanced, inclusive, and adaptive learning environments that sustain curricular breadth and depth.

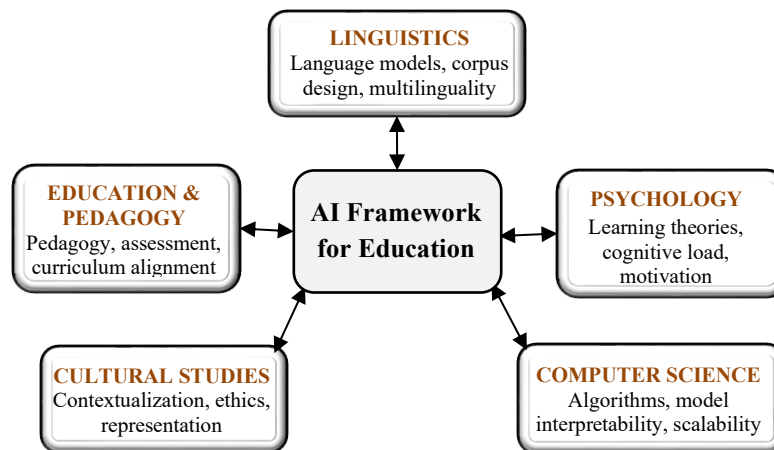


Figure 2. An Interdisciplinary AI Framework for Education

The diagram illustrates how AI for Education should interact with five key disciplines to develop AI systems that are pedagogically sound, culturally sensitive, and learner-adaptive. At the center of this model is the AI framework for education, which maintains a dynamic, bidirectional relationship with linguistics, psychology, education and pedagogy, computer science, and cultural studies. In the model, linguistics informs AI through its contributions to language models, corpus design, multilinguality, and speech recognition. In turn, AI generates empirical data on

language use and learning patterns, which can help refine both theoretical and applied approaches in linguistics. Psychology offers insights into learning theories, cognitive load, motivation, developmental stages, and emotional processes that support adaptive learning design, whereas AI supplies behavioral data and learning analytics that refine psychological theories of language learning and motivation. Education and pedagogy guide AI through principles of instructional design, curriculum alignment, assessment strategies, and teacher support, whereas AI enhances education by enabling evidence-based teaching, personalized learning, and innovative pedagogical approaches. Computer science underpins AI with algorithms, machine learning models, data processing, model interpretability, scalability, and system architecture; meanwhile, challenges and insights emerging from the implementation of AI in education inform the development of new computational methods and tools. Cultural studies ensure that AI systems remain contextually relevant, ethically grounded, and culturally responsive, while AI provides insights into digital inclusion, educational equity, and cross-cultural learning interactions. Together, these disciplines and AI form a continuous, reciprocal exchange of knowledge and innovation. It creates a holistic, responsive framework for advancing education through AI.

Conclusion

This study points out the hidden risks of personalized AI-driven learning. It suggests an AI framework for education and provides areas for more research which surfaced from this critical analysis of existing literature. Synthesizing the existing literature rather than generating empirical data limits the ability to make clear causal claims. Although this approach integrates diverse perspectives, it does not provide direct evidence of how AI-driven personalization affects curricular outcomes in practice. The analysis is primarily focused on formal educational settings and does not consider the impact of AI on informal or self-directed language learning. The reliance on English-language scholarship may also exclude important insights from regions with differing technological trajectories and educational priorities. Future research may address these limitations through empirical and interdisciplinary studies that encompass a broader range of educational environments, cultural contexts, and emerging AI technologies. Longitudinal and mixed-methods studies that combine outcome assessments with discourse analysis and classroom observation can provide deeper insights into the educational impact of AI. Future research should investigate algorithmic strategies that encourage curriculum diversity, user interfaces that boost learner agency, and participatory design processes involving educators, learners, and developers. Policy-focused research on ethical frameworks and fair implementation is equally important to ensure AI enhances rather than limits language education.

Disclosure Statement

I (the author of this paper) hereby declare that research ethics and citation principles have been considered in all stages of this paper. I take full responsibility for the content of the paper in case of a dispute. I confirm that the manuscript was created by the author and not an AI tool or a large Language Model (LLM).

Conflict of interest:

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