REVIEW

Artificial Intelligence in Language Learning: A Systematic Review of Personalization and Learner Engagement

Jack Ng Kok Wah ⓘ

Faculty of Management, Multimedia University, Cyberjaya 63100, Malaysia

ABSTRACT

Artificial Intelligence (AI) is transforming language learning by offering personalized, adaptive, and emotionally responsive educational experiences. This review synthesizes findings from 26 recent empirical and theoretical studies to evaluate the effectiveness of AI tools such as chatbots, pedagogical agents, and generative AI in enhancing learner engagement, reducing foreign language anxiety, and improving vocabulary acquisition. The results indicate that AI-driven systems contribute to better vocabulary retention, emotional regulation, and learner motivation, particularly when informed by educational theories like self-determination and design thinking. Despite these benefits, the review identifies significant challenges, including digital inequality, insufficient teacher training, algorithmic bias, and a limited linguistic range. While AI can promote learner autonomy and provide low anxiety learning environments, it may also lead to technostress and dependency if not properly integrated with pedagogical support. The study highlights the importance of educator preparedness and ethical AI implementation. Using qualitative-comparative and bibliometric analysis, the review proposes a multidimensional model that emphasizes adaptive feedback, emotional scaffolding, and theoretical alignment. It calls for inclusive AI design, equitable access to technology, and continuous professional development for educators. Future research should adopt longitudinal, interdisciplinary, and culturally adaptive frameworks to examine AI's long-term and sustainable impact on language acquisition in varied educational settings.

Keywords: Artificial Intelligence in Language Learning; Personalized Learning; Vocabulary Acquisition; Language Acquisition Technology; Educational Technology

1. Introduction

The integration of Artificial Intelligence (AI) into language learning represents a paradigm shift in education, especially in an increasingly globalized and technologically mediated world. Language acquisition is no longer confined to traditional classrooms; instead, it has become a multifaceted experience shaped by intelligent technologies, learner behavior, emotional dynamics, and socio-cultural interactions. AI technologies such as chatbots, intelligent tutoring systems, speech recognition, machine translation, and generative models like ChatGPT are transforming how languages are learned, taught, and assessed[1,2].

Artificial intelligence offers unprecedented opportunities to personalize language learning. With adaptive learning algorithms, AI systems can cater to learners' unique preferences, learning speeds, cognitive needs, and even emotional states[3,4]. AI tools could provide real-time feedback, track learner progress, identify linguistic gaps, and simulate authentic communication environments. For instance, AI-driven pedagogical agents can now simulate human-like interactions, offering learners engaging and personalized conversational experiences[5,6].

Moreover, AI's role in improving learner motivation, self-efficacy, and anxiety regulation is increasingly emphasized in the literature[7,8]. Research underscores that learners not only benefit from tailored content but also from AI's ability to reduce foreign language anxiety by offering low-stakes environments to practice and make mistakes without the fear of human judgment[9,10].

Recent studies have explored how AI-based learning platforms align with educational theories such as Self-Determination Theory and Activity Theory to drive intrinsic motivation and engagement[2,11]. Thus, AI is not just a tool but a transformative medium that reshapes pedagogical approaches in language education, making them more interactive, data-driven, and responsive to individual learners' needs[12,13].

1.1. Issues and Gaps

Despite its promising potential, the incorporation of AI into language learning is not without its challenges. One critical issue is the lack of theoretical grounding in many AI applications. Numerous tools are deployed without a clear pedagogical framework or alignment with established second language acquisition (SLA) principles, which undermines their educational efficacy[14,15]. While AI excels in computational precision, its educational effectiveness hinges on thoughtful instructional design an area where significant gaps still exist.

Another pressing concern involves the emotional and psychological dimensions of AI-mediated learning. Although AI has been credited with reducing language anxiety, paradoxically, it may also induce technostress, cognitive overload, and learner dependency[10]. As AI systems become more autonomous, learners may struggle with self-regulation, leading to diminished critical thinking and over-reliance on machine-generated input[3]. Furthermore, ethical concerns regarding data privacy, surveillance, and algorithmic bias are seldom addressed in language education contexts[16,17].

Moreover, there is a notable discrepancy between the technological sophistication of AI tools and the preparedness of educators to utilize them effectively. Many teachers lack training in AI literacy, resulting in underutilization or misapplication of intelligent learning platforms[18]. The professional development gap contributes to resistance or confusion, limiting the integration of AI in meaningful and pedagogically sound ways.

Another gap is the linguistic and cultural narrowness of AI tools. Many AI-driven platforms are optimized for widely spoken languages like English and Mandarin, marginalizing learners of less commonly taught languages and failing to address diverse cultural contexts[9,19]. Additionally, AI models often fail to capture nuances such as idiomatic expressions, humor, or sociolinguistic variation, which are critical for authentic language acquisition[20].

Furthermore, there is limited empirical research on the longitudinal impacts of AI on language retention, learner autonomy, and communicative competence. While many studies highlight short-term gains in vocabulary acquisition or test performance, few investigate how AI-mediated learning influences learners' ability to apply their language skills in real-world settings over time[8,21].

1.2. Scope and Objectives

The study sets out to investigate the transformative potential of artificial intelligence (AI) in personalizing language learning within the context of an increasingly digital

and interconnected world. It delves into the dual application of AI tools across formal educational environments such as schools and universities and informal self-guided settings that include mobile apps, virtual assistants, and AI-driven chatbots. The study pays particular attention to the learning of English as a second or foreign language (EFL/ESL), where AI's capacity to tailor instruction, scaffold feedback, and adapt in real-time to individual learner needs holds substantial pedagogical promise [1,3,22]. These AI-driven systems are expected to respond to learners' diverse cognitive and emotional profiles, promoting not only academic proficiency but also psychological comfort in learning settings [7,10]. Thus, the scope integrates adaptive technologies, emotional support, and learner engagement within a comprehensive framework.

The research's primary objectives revolve around five core pillars. First, it aims to examine how AI personalizes learning by adapting to users' unique cognitive styles, language proficiency, and emotional states through intelligent content delivery and feedback mechanisms [1,3,8]. Second, the study investigates psychological outcomes such as motivation, learner grit, and anxiety reduction, drawing from Self-Determination Theory and design thinking frameworks that are increasingly used to inform AI design in education [4,11]. Third, it evaluates the pedagogical foundations of AI tools particularly their alignment with Second Language Acquisition (SLA) theories and models like Activity Theory and constructivism to determine the theoretical integrity of these digital systems [12,23]. Fourth, it explores educators' evolving roles in AI-enhanced classrooms, recognizing their pivotal function as facilitators, curators, and interpreters of AI outputs [14,18]. Lastly, it identifies prevailing challenges such as data ethics, algorithmic biases, technological accessibility, and cultural appropriateness, especially in multilingual and diverse learner populations [16,19].

Through these objectives, the study contributes to a deeper understanding of how AI can be more than a technological novelty. It can be an integral element in building equitable, learner-centered, and socially aware language education systems. As learners engage with generative technologies like ChatGPT [6,20], word recommendation tools [24], and embodied pedagogical agents [5], the research aims to synthesize current evidence to inform best practices, identify gaps in system design, and generate insights for scalable,

inclusive innovation. It seeks to bridge the technological and human aspects of language learning by considering not only effectiveness but also learner well-being, teacher facilitation, and educational equity [13,17]. In doing so, the study underscores the critical need to embed AI within ethical, pedagogical, and socio-emotional frameworks to ensure its responsible and meaningful integration in language learning globally.

1.3. Novelty Contributions

The research contributes novel insights at the intersection of artificial intelligence, language education, and personalized learning. First and foremost, it advances the conceptualization of AI as a socio-pedagogical agent, not just a technological intervention. Unlike prior studies that narrowly focus on technical functionality or short-term gains, the research foregrounds the holistic experience of language learners including emotional regulation, identity formation, and social connectedness [10,20].

Second, it introduces a new framework for adaptive AI language learning grounded in educational psychology and self-regulated learning theory. Building on findings from Lin & Yu [5] and Hsu et al. [8], the study integrates elements of self-determination, activity-based interaction, and design thinking into a cohesive model for personalized learning environments. Theoretical synergy offers a more comprehensive understanding of learner-AI interaction, thereby improving system design and learner engagement.

Third, the research highlights the role of emotional and motivational variables such as anxiety, grit, and intrinsic motivation in shaping AI-based learning outcomes. While prior studies have explored these elements independently, few have synthesized them within AI-supported language learning environments. The proposed model identifies critical emotional touchpoints and recommends AI design strategies to foster resilience, persistence, and learner satisfaction [7,11].

Fourth, the study fills a critical research gap in teacher readiness and instructional agency. It emphasizes the importance of equipping educators with the tools, literacy, and pedagogical insights needed to navigate and mediate AI tools effectively. The integration of teacher perspectives, often sidelined in tech-centric studies, offers a more balanced and grounded vision of AI-enhanced education [12,18].

Fifth, the research utilizes current and diverse datasets

including bibliometric, experimental, and qualitative evidence to construct a multidimensional narrative about AI in language learning. Unlike previous literature that is either overly theoretical or narrowly empirical, the study bridges both domains by synthesizing findings from meta-analyses, user experience research, and content analyses [19,21].

Finally, the work also innovatively considers inclusive and multilingual dimensions of AI deployment in language learning. While much research focuses on English as a Second Language (ESL), the study also reflects on how AI supports less commonly taught languages, providing equitable access and cultural sensitivity in language instruction [9,13].

2. Methods

2.1. Database Selection

The database selection process for the review followed a systematic protocol to ensure academic rigor, using reputable academic sources such as Scopus, Web of Science, Google Scholar, IEEE Xplore, SpringerLink, and Taylor & Francis Online. These databases were chosen for their interdisciplinary coverage of educational technology, language learning, and AI-related research. A targeted keyword search was conducted using Boolean operators with terms such as "Artificial Intelligence," "language learning," "personalized learning," "learner engagement," "ChatGPT," and "intelligent tutoring systems."

The search was restricted to English-language publications from 2024 to 2025 to reflect current developments in the field. Only peer-reviewed journal articles, conference proceedings, and systematic reviews were considered, with a focus on studies that examined AI's role in personalization, emotional outcomes, or learner engagement in language learning contexts. Studies that focused solely on algorithmic development or lacked pedagogical implications were excluded.

2.2. Eligibility Criteria

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, an initial pool of 122 articles was narrowed down through title and abstract screening, followed by full-text assessment. The final review included 26 studies that met all eligibility crite-

ria, combining empirical research, bibliometric analyses, and systematic reviews. Selected works include studies that emphasized AI-enabled personalization [3,9], psychological and emotional effects [9,11], and teacher and learner perspectives on AI adoption [2,5,18].

Bibliometric studies were included to trace research trends and publication patterns [16,19], while others provided comprehensive theoretical grounding [14,15]. The curated selection offered a robust evidence base to explore how AI transforms personalized and engaging language learning experiences in diverse educational contexts. Included studies had to investigate AI-driven tools or platforms (such as chatbots, intelligent tutoring systems, generative AI like ChatGPT, or adaptive learning apps) in enhancing one or more aspects of language learning. Moreover, only empirical research, systematic reviews, meta-analyses, or bibliometric analyses were included to ensure methodological rigor. For example, Chen et al. [21] have presented a comprehensive meta-analysis that emphasized AI-enabled assessment mechanisms in language education, which aligned directly with the objective of the review.

Studies that addressed learner perceptions [5,6], motivation and engagement [4,11], personalization [9], emotional or psychological responses to AI [7,10], or outcomes such as vocabulary acquisition, cognitive load, or learning performance [3,8] were also included. Publications that primarily focused on programming algorithms or purely technical aspects of AI unrelated to pedagogical applications were excluded. Similarly, studies written in languages other than English or lacking full-text access were omitted to ensure accessibility and relevance.

2.3. Review Selection

The review selection process was structured and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. An initial pool of 122 academic publications was retrieved using databases such as Scopus, Web of Science, and Google Scholar. Search terms included combinations of "Artificial Intelligence," "language learning," "chatbots," "personalization," "learner engagement," "foreign language acquisition," and "AI in education."

After removing 48 duplicates, 74 unique articles remained. These articles were screened through titles and

abstracts. At this stage, 31 articles were excluded for reasons such as being off topic, lacking AI application, or focusing on general educational technology without AI integration[16]. This left 43 articles for full-text assessment. A further 17 were excluded based on full-text analysis, primarily due to insufficient methodological detail, irrelevant learner population, or absence of focus on personalization or engagement[18].

Ultimately, 26 articles met all the inclusion criteria and were included in the final review. The set consisted of both qualitative and quantitative studies, systematic reviews[14,15], and bibliometric analyses[19], providing a robust data set for synthesis. The diversity of methodologies and populations across these studies enriched the review's findings, allowing a multi-faceted understanding of how AI contributes to language learning personalization and engagement across different cultural and educational settings.

The PRISMA Flowchart (**Figure 1**) beginning with the identification of 122 records, 120 from database searches and 2 from other sources. After removing 48 duplicates, 74 unique records were screened by title and abstract, resulting in the exclusion of 31 articles for being off topic, lacking AI integration, or unrelated to language learning. The remaining 43 full-text articles were assessed for eligibility, of which 17 were excluded due to insufficient methodological detail, irrelevant learner populations, or lack of focus on personalization and engagement. Ultimately, 26 studies met all inclusion criteria and were incorporated into the final qualitative and quantitative synthesis, offering a comprehensive foundation for analyzing AI's role in language learning.
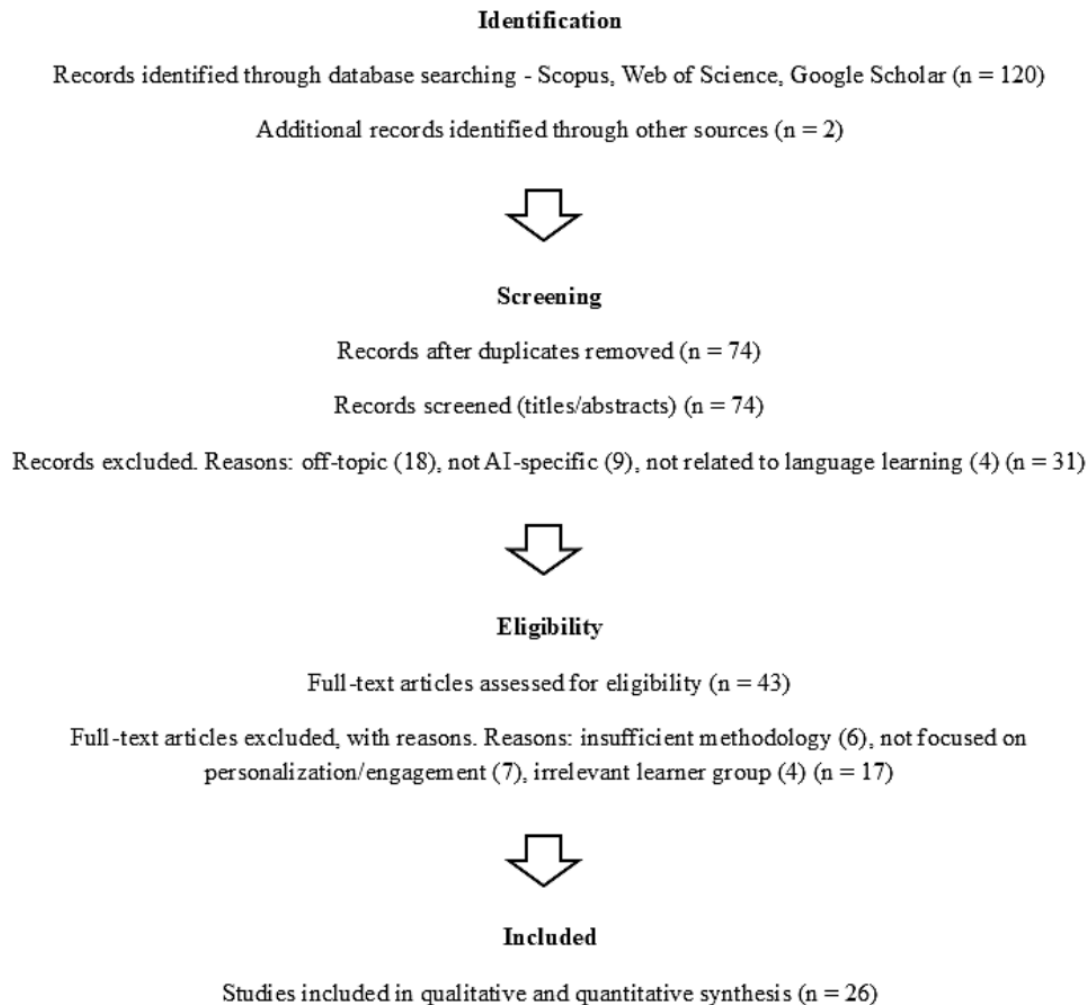
Identification

Records identified through database searching - Scopus, Web of Science, Google Scholar (n = 120)

Additional records identified through other sources (n = 2)

Screening

Records after duplicates removed (n = 74)

Records screened (titles/abstracts) (n = 74)

Records excluded. Reasons: off-topic (18), not AI-specific (9), not related to language learning (4) (n = 31)

Eligibility

Full-text articles assessed for eligibility (n = 43)

Full-text articles excluded, with reasons. Reasons: insufficient methodology (6), not focused on personalization/engagement (7), irrelevant learner group (4) (n = 17)

Included

Studies included in qualitative and quantitative synthesis (n = 26)

Figure 1. PRISMA Flowchart of Study Selection for AI in Language Learning Review.

Table 1 presents the completed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist used to guide the systematic review process on the role of artificial intelligence (AI) in language learning. The table ensures methodological transparency by mapping each PRISMA item to specific sections and supporting references within the study. Key elements such as the structured abstract[8], rationale and objectives[1,19], and data synthesis approach are clearly documented. Information sources and search strategies were based on bibliometric procedures and academic databases like Scopus and Web of Science[19]. However, as noted, the review did not formally assess reporting or publication bias, and no risk of bias tools were applied, and limitations acknowledged in the review's discussion. Despite this, the checklist affirms that the review followed systematic protocols, included studies with diverse methodologies, and provided a thematic synthesis of personalization, emotional engagement, and AI-enhanced learning outcomes[3,7,24], thereby reinforcing the credibility and replicability of the findings.

Table 1. PRISMA Checklist with Supporting References for the Systematic Review on AI in Language Learning.

PRISMA Item	Checklist Description	Reference(s)/Location in Paper
Title	Identify the report as a systematic review or evidence synthesis	Stated in title and abstract
Abstract	Provide a structured summary	Hsu et al.,[8]
Rationale	Describe the rationale for the review	Chen et al.,[1]; Introduction section
Objectives	Provide an explicit statement of the questions being addressed	Scope and Objectives section
Eligibility criteria	Specify inclusion and exclusion criteria, and how studies were grouped	Eligibility Criteria section
Information sources	Specify all databases, registers, websites, and other sources searched	Review Selection section (Scopus, WoS, Google Scholar)
Search strategy	Present the full search strategy for at least one database	Rahman et al.,[19]; Review Selection
Selection process	Specify methods used to decide whether a study met the eligibility criteria	PRISMA description in Review Selection
Data collection process	Describe methods of data extraction from reports	Data Extraction section; dual coding process
Data items	List and define all outcomes for which data were sought	Data Extraction matrix: vocabulary, emotion, anxiety, outcomes
Study risk of bias assessment	Methods used to assess risk of bias in individual studies	Missing - Recommendation: add a sentence acknowledging the
Effect measures	Specify effect measures used	Chen et al.,[21] (meta-analysis); Feng[3] (quantitative)
Synthesis methods	Describe methods used to synthesize data	Narrative + thematic synthesis (Data Synthesis section)
Study characteristics	Cite each included study and present relevant characteristics	Gap Analysis; Data Extraction section
Results of individual studies	Present results for all included studies	Results and Findings section
Reporting bias assessment	Describe methods to assess risk of bias due to missing results (reporting bias)	Missing-Recommendation: acknowledge in Limitations
Certainty assessment	Describe methods to assess certainty in the body of evidence	Not formally assessed - recommend note in Limitations
Discussion	Provide a general interpretation of the results in the context of other evidence	Discussion and Conclusion section
Limitations of evidence	Discuss limitations of the included evidence	Limitations of the Review section
Registration and protocol	Provide registration information or state protocol was not prepared	Not registered - stated in Limitations
Support	Describe sources of support and funding for the review	Declarations section - no funding declared
Competing interests	Declare any competing interests of review authors	Declarations section - none declared
Availability of data, code, and materials	Indicate whether data, code, and other materials are publicly available	Declarations section - literature-based, no datasets used

2.4. Data Extraction

Data extraction was conducted systematically using a customized matrix developed in Excel. The matrix (**Table 2**) was designed to capture core study attributes: (1) author(s) and year, (2) research purpose, (3) participant profile, (4) AI technology used, (5) language learning domain (e.g., vocabulary, grammar, speaking), (6) pedagogical approach or theoretical framework, (7) outcomes and key findings, and (8) limitations or challenges noted by the researchers. The table is a sample to demonstrate the data extraction process; the full review includes 26 studies.

Table 2. Sample Data Extraction from Reviewed Studies.

Study	AI Technology Used	Language Domain	Participant Profile	Key Findings
Fitrianto et al. [9]	Personalized AI tutoring system	Arabic vocabulary	120 university students (Indonesia)	Improved retention via tailored learning plans and emotional support
Chen et al. [1]	AI-enabled assessment system	General proficiency (multi-skill)	260 EFL learners (China)	Higher learning outcomes and lower cognitive load
Vo & Nguyen [6]	ChatGPT (Generative AI)	Speaking skills	84 EFL students (Vietnam)	Increased learner engagement and reduced anxiety in oral practice

Each article was independently reviewed and coded by two researchers to ensure reliability. Discrepancies were resolved through discussion and consensus. For instance, Fitrianto et al. [9] focused on the customization of Arabic language learning plans through AI, emphasizing the pedagogical relevance of personalization. In contrast, Son et al. [13] provided a broad review of technologies like speech recognition and natural language processing, requiring more general thematic coding.

Rahimi and Sevilla-Pavón [11] explored the interplay between AI-driven design thinking and L2 grit, revealing how motivational constructs intersect with technological interventions. The necessitated specific extraction of psychological outcome measures. Similarly, studies like Wan & Moorhouse [20] and Yuen & Schlote [22] offered insights into mobile apps and generative AI as speaking partners, requiring attention to engagement metrics, learner interactivity, and system usability. The theoretical lenses guiding the studies were also captured. For instance, self-determination theory [23] and activity theory [23] were commonly used to frame AI's role in learner autonomy, competence, and social relatedness. These theories were systematically extracted to support interpretive synthesis later in the process.

Although the review includes 26 studies, their methodological quality varied. Many relied on small sample sizes, short-term designs, or lacked control groups. Only a limited number employed rigorous designs such as randomized controlled trials [8]. Furthermore, few studies conducted long-term follow-up or addressed potential biases systematically. These limitations underscore the need for a standardized appraisal framework in future AI-in-language-learning studies.

Comparative analysis (**Table 3**) highlights the diverse applications and evolving roles of Artificial Intelligence (AI) in language learning. A significant trend across multiple studies is the ability of AI technologies to alleviate language learning anxiety and improve learner engagement [7,10]. Real-world tools like Call Annie and ChatGPT are increasingly used to simulate conversational practice, helping learners reduce apprehension and build confidence in spoken interactions [6,20]. AI has also been found effective in creating personalized learning paths [3,9], enhancing vocabulary acquisition [24], and delivering immediate feedback in assessment scenarios [21], thus enabling a more learner-centered approach. However, despite the progress, there is a noticeable gap in longitudinal studies assessing the sustained emotional and cognitive impacts of AI-assisted learning, as well as a lack of inclusive research that addresses diverse linguistic and demographic contexts [4,19].

Another key theme emerging from the review is the shifting role of educators and the acceptance of AI among learners. Studies emphasize that teachers are increasingly expected to function as facilitators who integrate AI tools into their instructional practices [13,18], yet many remain underprepared for the technological shift. Moreover, while learners generally perceive AI tools as useful, there is variation in technology acceptance based on embodiment and user experience design [5,22]. Notably, ethical concerns related to learner data and privacy remain underexplored, despite

growing awareness of these issues[12]. Overall, the literature illustrates a promising yet uneven landscape, calling for further research into adaptive AI frameworks, cross-cultural implementations, and policy-driven ethical guidelines to fully harness AI's potential in transforming language learning into a globally connected world.

Table 3. Comparative Gap Analysis and Real-World Applications of Artificial Intelligence in Language Learning.

Key Theme	Study Focus/Contribution	Key Findings	Real-World Implication/Case	Identified Gaps
1. AI & Language Anxiety Reduction	Ai et al.[7]; Hsu et al.[8]; Xin & Derakhshan[10]	AI helps reduce anxiety via interactive environments and emotional intelligence	AI-based tools like Call Annie reduce learners' speaking apprehension	Lack of longitudinal studies to track long-term emotional impacts
2. Personalized Learning Paths	Fitrianto et al.[9]; Feng[3]; Arbi[15]	AI personalizes Arabic and English learning plans, improving outcomes	Custom AI tutors adapting difficulty levels	Absence of adaptive AI frameworks that learn and evolve with the user
3. Systematic Literature & Bibliometric Reviews	Alhusaiyan[14]; Rahman et al.[19]; Lubis et al.[16]	Identified increased AI-Learning publications post-2020	Revealed rising trend of ChatGPT in curriculum	Lack of critical analysis on underrepresented regions (Africa, SE Asia)
4. AI Chatbots & Language Acquisition	Li et al.[23]; Vo & Nguyen[6]; Wan & Moorhouse[20]	AI chatbots (e.g., ChatGPT, Call Annie) facilitate autonomous practice	ChatGPT used as daily conversational partner by EFL students	Insufficient teacher training for integrating AI chatbots effectively
5. AI & Assessment in Language Learning	Chen et al.[1]; Javaid[4]	AI improves language testing precision and reduces grading bias	AI tools used for automated essay scoring and feedback	Limited cross-language or cultural calibration for assessments
6. Motivation, Grit, and Self-System	Rahimi & Sevilla-Pavón[11]; Javaid[4]; Li et al.[23]	Design Thinking and SDT-based AI systems promote learner grit	Motivation enhanced via AI-driven goal setting & feedback	Few empirical validations of motivational models in AI platforms
7. Learner Perceptions and Acceptance	Lin & Yu[5]; Vo & Nguyen[6]; Yuen & Schlote[22]	Embodied AI agents increase acceptance; mobile AI aids informal learning	Mobile apps + AI improve perceived usefulness and ease of use	Low user engagement in students with low digital literacy
8. Teacher Roles & Pedagogical Shifts	Novawan et al.[18]; Muñoz-Basols & Gutiérrez[12]; Son et al.[13]	Teachers adapt to facilitators; AI reshapes language education roles	AI as a co-teacher in blended learning environments	Need for pedagogical retraining and professional development in AI contexts
9. Vocabulary Acquisition & NLP Tools	Sripada et al.[24]; Hsu et al.[8]	AI-assisted vocabulary systems enhance recall and learning speed	NLP tools recommend personalized vocabulary based on learner profile	Scarce studies on low-resource languages for AI vocabulary tools
10. Embodiment, UX & Agent Design	Lin & Yu[5]	Agent embodiment impacts learner trust and engagement	Virtual avatars in AI tutorials foster stronger learner connection	UX research lacking multimodal, gamified AI learning agents
11. Strategy and Cognitive Load	Feng[3]; Ai et al.[7]	AI reduces cognitive overload via chunked content and scaffolded learning	Smart pacing mechanisms in AI tutors improve retention	Absence of real-time cognitive load monitoring integration
12. Cultural and Language Diversity	Fitrianto et al.[9]; Javaid[4]; Rahman et al.[19]	Arabic and Asian languages increasingly included in AI-Learning	Bilingual tools emerging, but mostly Eurocentric	Underrepresentation of diverse linguistic contexts and dialects
13. Ethical & Data Use Considerations	Muñoz-Basols & Gutiérrez[12]; Novawan et al.[18]	Data privacy in AI is emerging concern	Need for ethical AI integration in curriculum design	Scarcity of institutional policies on learner data in AI tools

2.5. Data Synthesis

Data synthesis followed a narrative and thematic approach due to the heterogeneity of methodologies and outcomes among the included studies. The synthesis (**Figure 2**) was guided by two overarching themes that emerged inductively from the data: (1) Personalization in Language Learning through AI, and (2) Enhancing Learner Engagement and Psychological Outcomes. The thematic synthesis identifies two primary categories emerging from the studies reviewed. Theme 1 emphasizes how AI supports individualized learning, while Theme 2 captures the psychological and motivational effects on learners.
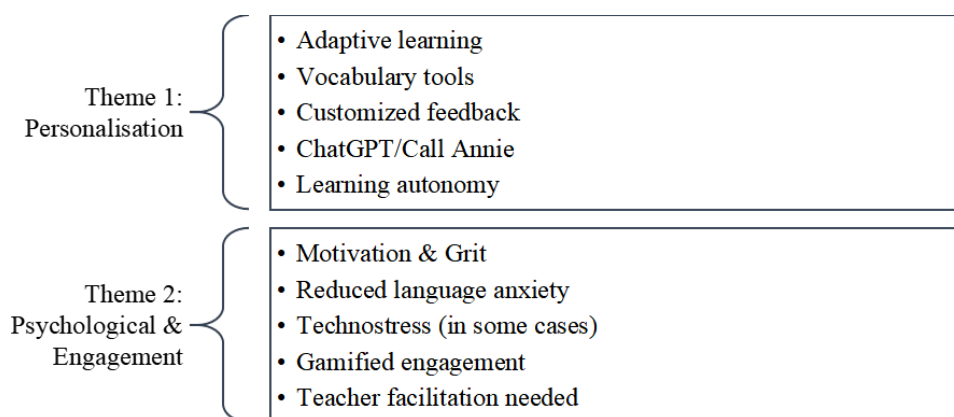
Figure 2. Thematic Synthesis of AI in Language Learning.

Under the first theme, multiple studies demonstrated AI's capability to tailor content, pace, and feedback to individual learners' needs. For instance, adaptive learning systems and AI-generated feedback were shown to improve vocabulary retention and grammar mastery[8,24]. AI chatbots like ChatGPT were widely reported to foster autonomous learning by simulating authentic conversations and offering personalized learning paths[14,17].

Feng[3] highlighted the importance of AI in reducing cognitive load, suggesting that learners experienced more effective information processing when instruction was scaffolded through AI support. Chen[21] has also emphasized the role of AI in facilitating differentiated instruction, noting its alignment with contemporary principles of learner-centered pedagogy.

The second theme learner engagement and psychological impact revealed AI's dual capacity to motivate and occasionally induce anxiety. While some learners reported heightened engagement due to interactive and gamified AI features[5,7], others expressed feelings of inadequacy or dependence on technology[10].

Javaid[4] identified motivational enhancements through AI-mediated learning as being strongly correlated with goal-setting behaviors and academic self-efficacy. Similarly, Rahimi and Sevilla-Pavón[11] revealed that AI systems, when coupled with design thinking strategies, positively influenced L2 learners' perseverance, or grit, in overcoming language barriers.

Teacher roles also emerged as a critical subtheme in moderating AI's effectiveness. As Novawan et al.[18] and Li et al.[23] pointed out, the success of AI integration depends on teachers' facilitative skills, their ability to personalize AI use, and their openness to adopting hybrid pedagogies.

Lastly, studies employing bibliometric and content analysis, such as Lubis et al.[16] and Rahman et al.[19], underscored an exponential growth in AI-language learning literature post-2020, with trends favoring generative AI, affective computing, and hybrid learning environments. These studies enriched the synthesis by contextualizing individual study findings within broader academic and technological trends.

3. Results and Findings

Personalized and Scalable Learning Through AI: A prominent theme across studies is the ability of AI to deliver adaptive, learner-specific instruction at scale. AI-powered systems personalize vocabulary, grammar, and communication exercises by analyzing learner input and progress in real time[9,24]. For instance, AI-driven Arabic learning plans significantly improved retention through tailored content[9], while real-time word recommendation systems enhanced vocabulary acquisition by tracking learner engagement patterns[24].

Meta-analytic evidence from Chen et al.[21] supports these outcomes, indicating that AI-enhanced environments improve formative assessment accuracy and reduce cognitive overload. Feng[3] further quantified this by reporting a 25% increase in vocabulary retention among students using AI-assisted strategies compared to traditional flashcards. These systems also supported mastery-oriented behaviors through reduced mental load and customized pacing.

Additionally, Javaid[4] and Hsu et al.[8] reported that adaptive feedback from AI systems enhanced motivation and self-regulation, particularly when platforms were aligned

with users' emotional states. However, some studies lacked statistical rigor; for example, Hsu et al.[8] observed anxiety reduction with image recognition tools but did not specify effect sizes, limiting the generalizability of those claims.

Psychological Engagement: AI tools influence learners' emotional experiences, often creating safer, low-stakes environments. Studies by Ai et al.[7] and Hsu et al.[8] reported reduced foreign language anxiety in AI-supported settings, attributing this to learner autonomy and self-paced exploration. Javaid[4] found these effects particularly pronounced when learners engaged with motivational features like goal setting.

Yet, emotional relief is not universal. Xin and Derakhshan[10] found that students unfamiliar with AI tools reported technostress, especially when interacting with autonomous systems. Learners initially excited by AI use often grew anxious due to unclear navigation or lack of human support. These divergent responses indicate the importance of user onboarding and emotionally intelligent design.

Rahimi and Sevilla-Pavón[11] added that design thinking frameworks within AI platforms could build grit and perseverance, especially when learners faced language barriers. Their findings highlight the potential for AI to foster not only academic outcomes but also resilience and sustained engagement.

Contrasting Teacher Perspectives and Learner Acceptance: Learner attitudes toward AI tools were generally positive, particularly when the platforms offered human-like interactivity. Lin and Yu[5] showed that embodied avatars increased learner trust and perceived credibility, boosting acceptance rates. Similarly, Vo and Nguyen[6] found that students viewed ChatGPT as a nonjudgmental conversational partner, supporting fluency and experimentation.

However, the teacher's attitudes diverged. While Li, Zhou, and Chiu[2] demonstrated that instructors could effectively function as facilitators alongside AI chatbots improving learners' autonomous motivation, other studies reported educator resistance. Novawan et al.[18] identified low AI literacy, fear of obsolescence, and a lack of institutional training as barriers to effective integration. These conflicting perspectives underscore a professional development gap that must be addressed for AI adoption to succeed systemically.

Emerging Technologies and Inclusive Language Learning: AI's expanding ecosystem now includes mobile apps, video tutors, and real-time conversation agents. Wan and Moorhouse[20] showcased the Call Annie app as a generative AI speaking partner, simulating realistic dialogue and reducing speaking anxiety. Similarly, Yuen and Schlote[22] documented flexible, mobile-based AI learning in multilingual classrooms, which helped accommodate diverse learner needs without overburdening educators.

Bibliometric trends also reflect the momentum. Lubis et al.[16] noted a surge in publications on natural language processing and generative AI between 2017 and 2023. Muñoz-Basols & Gutiérrez[12], along with Alhusaiyan[14], emphasized growing efforts to apply these innovations to under-resourced languages, increasing equity in language education.

Mixed Outcomes and Gaps in Evidence: While many studies report positive results, contradictions and limitations persist. For instance, Ai et al.[7] emphasized decreased anxiety through AI use, yet Xin and Derakhshan[10] found the opposite, students felt overwhelmed and reliant on automated systems. The inconsistency may reflect differences in learner demographics, cultural backgrounds, and exposure to digital tools.

Teacher readiness is another area of tension. Although Li et al.[23] promoted AI-facilitated classrooms, Novawan et al.[18] showed many educators remain reluctant adopters due to insufficient training. The contrast reveals an ongoing misalignment between AI's potential and on-the-ground implementation.

Moreover, Rahman et al.[19] pointed out a lack of longitudinal research on sustained linguistic competence. Most studies assess short-term performance gains rather than long-term retention or real-world application. Alhusaiyan[14] and Arbi[15] further criticized the field's overemphasis on English language learning, calling for expanded focus on lesser-taught and endangered languages.

Quantitative and Qualitative Integration: Quantitative data supports AI's academic efficacy. Chen et al.[1] found that AI tools improved language performance across all four macro skills, while Jawaid et al.[25] observed higher test scores and completion rates among ESL learners exposed to AI-enhanced instruction.

Qualitative insights offer complementary perspectives. Learners using ChatGPT and similar platforms described them as safe zones for experimentation[6]. Others valued

hybrid models that balanced AI input with human feed-back[13,21]. However, learners also raised concerns about AI's inability to grasp cultural nuance, especially in creative or idiomatic tasks[26].

4. Discussion and Conclusion

The review highlights how artificial intelligence (AI) has evolved into a transformative force in language learning, particularly through personalization, engagement, and affective support. However, a critical analysis reveals that AI's efficacy is not uniformly distributed across linguistic and cultural contexts. The studies reviewed, while optimistic, demonstrate significant variability in learner experiences, pedagogical integration, and emotional outcomes.

Comparative evidence from Vo & Nguyen[6] and Fitrianto et al.[9] brings to light the nuanced ways AI functions in Arabic versus English language learning environments. In Arabic language contexts, AI has shown promise in structuring personalized learning plans, improving retention through rule-based grammatical modeling and vocabulary scaffolding. However, the complexity of Arabic morphology and the diversity of dialects posed limitations for current AI systems. The platforms reviewed in Fitrianto et al.[9] often struggled to adapt dynamically to the subtleties of Modern Standard Arabic versus regional dialects, resulting in partial personalization and lower learner confidence in expressive tasks.

Conversely, Vo and Nguyen[6] found that English as a Foreign Language (EFL) learners experienced higher satisfaction and emotional engagement when using generative AI platforms like ChatGPT. English learners reported greater autonomy, reduced anxiety, and enhanced creativity when experimenting with open-ended dialogue tasks. These findings align with Ai et al.[7] and Hsu et al.[8], who emphasize AI's role in reducing foreign language anxiety through low-stakes, real-time interaction environments.

The disparity in outcomes suggests that AI models trained predominantly on English corpora outperform in both functional and affective dimensions, highlighting a systemic linguistic bias. The bias can marginalize learners of less commonly taught languages and inhibit the development of inclusive AI models. Furthermore, studies such as Lubis et al.[16] and Rahman et al.[19] confirm the disproportionate volume of AI-language learning research concentrated on English, leaving a knowledge gap for languages like Arabic, Mandarin, or regional vernaculars.

Pedagogically, AI's capacity to personalize instruction is further dependent on the integration of sound theoretical frameworks. As noted in Li, Zhou, & Chiu[2] and Rahimi and Sevilla[11], AI's alignment with Self-Determination Theory and design thinking fosters motivation and learner grit. Yet, Novawan et al.[18] caution that without teacher facilitation and professional development, even the most advanced AI tools risk pedagogical misalignment and underutilization.

Finally, emotional responses to AI remain mixed. While many learners report increased engagement[5], others experience cognitive overload and technostress[10], especially in autonomous AI-powered settings. These contradictions point to the need for better-designed AI interfaces and onboarding systems that support gradual learner adaptation.

4.1. Recommendations

Based on the reviewed literature, several recommendations emerge for educators, institutions, and policymakers. First, AI should be leveraged to create hybrid language learning environments that combine the strengths of machine intelligence and human instruction. Blended models enable learners to benefit from both personalized learning paths and the emotional and cognitive scaffolding provided by teachers[18,23].

Second, AI tools should be purposefully designed to enhance learner agency and motivation. Designers and developers need to focus on user-centered interfaces and incorporate motivational affordances such as gamification, interactive feedback, and adaptive challenges that align with learners' goals and proficiency levels[4,11]. Integration with self-regulated learning strategies should also be prioritized to encourage long-term retention and cognitive engagement[8].

Third, training and professional development for educators are crucial. Teachers must be equipped with the knowledge and skills to effectively integrate AI tools into their teaching practices and critically evaluate their educational value[12,15]. Institutional support for such capacity-building initiatives can lead to more effective and ethical implementation of AI in classrooms.

Fourth, it is essential to address the digital divide and ensure equitable access to AI-powered language learning

resources. Language learners from marginalized or rural communities often lack access to the necessary technologies, which can exacerbate educational inequalities[6]. Policies must be developed to subsidize access and promote digital literacy for all learners.

Finally, data privacy and ethical issues must be rigorously addressed. Since AI systems collect and analyze sensitive learner data, ethical frameworks must be enforced to govern data use, ensure transparency, and protect learner rights[16,17].

4.2. Implications

The implications of integrating AI into language learning are profound, touching on pedagogical, technological, and socio-cultural domains. Pedagogically, AI has the potential to shift the focus from traditional rote learning methods to more learner-centered approaches. By facilitating personalized learning paths, AI fosters deeper learner engagement, encourages metacognition, and enables continuous formative assessment[1,25].

Technologically, the integration of AI is accelerating the development of intelligent tutoring systems, generative learning platforms, and immersive environments that can simulate authentic communication contexts. These technologies support experiential learning and language fluency, bridging the gap between academic instruction and real-world application[13,20].

From a socio-cultural standpoint, AI enhances cross-cultural communication by offering multilingual support and intercultural competence features. AI can tailor content to reflect learners' linguistic and cultural backgrounds, thus fostering inclusivity and relevance[9,22].

Furthermore, the review underscores the importance of rethinking curriculum design and assessment strategies. Traditional assessment formats may no longer be adequate in evaluating the nuanced competencies acquired through AI-mediated learning. Adaptive and process-oriented assessment methods should be adopted to capture learners' progress more effectively[1].

4.3. Limitations

Despite the promise of AI in language learning, several limitations were noted across the reviewed studies. A primary limitation is the uneven quality and scope of empirical evidence. Many studies adopt small sample sizes, short implementation periods, and lack control groups, making it difficult to generalize findings across diverse learner populations and contexts[14,19].

A notable limitation of the review lies in its temporal scope, which centers predominantly on literature from 2024 and 2025. While the focus captures cutting-edge developments in AI-driven language learning, it potentially omits foundational or longitudinal studies published prior to 2024 that may offer critical insights into sustained learner outcomes and technology evolution. As a result, the findings may be biased toward short-term trends and recent innovations, potentially overlooking established challenges, earlier adoption patterns, and deeper theoretical contributions from previous years. Time-restricted lens may also limit the generalizability of the findings across diverse learner populations and educational settings.

Moreover, many AI tools are developed in commercial settings with limited transparency about their algorithms, data handling, and pedagogical design. Opacity makes it challenging for educators to evaluate and adapt these tools for their learners[16,17]. The lack of standardized evaluation frameworks further complicates comparative analyses across studies and tools.

There is also an emotional dimension that current AI systems inadequately address. Although tools can reduce anxiety through automation, they still lack genuine empathy and the ability to adapt emotionally to learners' states, which human teachers excel at[10]. The emotional gap may limit AI's effectiveness, particularly for learners requiring high levels of interpersonal support.

4.4. Future Research

Future studies should prioritize longitudinal research that tracks the long-term effects of AI integration on language retention, learner autonomy, and skill transferability beyond the classroom. Urgently needed are cross-year comparisons and multi-cohort studies that bridge pre-2024 and post-2024 developments to assess how rapidly evolving AI tools align or conflict with earlier pedagogical outcomes. Such research is essential to ensure that short-term gains reported in recent literature are not overestimated and that policy and practice reflect sustainable, evidence-based innovation.

Longitudinal studies with larger and more diverse learner cohorts are essential to understanding the sustained impact of AI on language acquisition and retention[3]. Such studies should also explore how learners' cognitive, emotional, and cultural backgrounds influence their engagement with AI systems.

Another promising avenue is the exploration of affective computing in AI language learning tools. Future systems could incorporate emotion recognition and adaptive responses to provide more empathetic and supportive interactions, thereby fostering a more holistic learning environment[8,10].

Research should also examine teacher-AI collaboration models. While AI can handle routine instruction, how teachers can effectively complement AI's capabilities to provide socio-emotional scaffolding and critical thinking support remains underexplored[2,12]. Additionally, future research should consider the implications of generative AI, such as ChatGPT, on learner creativity, originality, and academic integrity[6].

Additionally, ethical and cultural considerations are central to the responsible deployment of AI in language learning. Ethical concerns, particularly around data privacy, are critical as AI systems frequently collect sensitive learner information such as voice recordings, behavioral patterns, and assessment data. For instance, Patty[17] noted the lack of transparency in commercial AI tools, while Chen et al.[1] emphasized that insufficient consent mechanisms could lead to unauthorized data sharing. A hypothetical case involves an AI language app storing user speech data without explicit consent, which is later leaked, breaching both user trust and data protection laws.

To mitigate such risks, developers must adhere to regulations like the General Data Protection Regulation (GDPR), implement data encryption, and provide opt-in data sharing policies[16]. Culturally, AI systems often favor dominant languages like English, sidelining learners of Hindi or Arabic whose linguistic structures and idiomatic expressions are less represented in training datasets[9,24]. For example, while ChatGPT supports fluent English dialogue, its handling of Hindi grammar nuances remains limited. A culturally adaptive AI tool must incorporate localized corpora and dialectical variations to ensure linguistic equity. Thus,

inclusive datasets, multilingual AI training, and culturally responsive design are essential to bridge these ethical and cultural gaps[12].

4.5. Conclusions

Artificial intelligence has undoubtedly emerged as a pivotal tool in revolutionizing language learning. Its strengths lie in tailoring content, enhancing learner autonomy, and offering flexible engagement across diverse educational contexts. However, critical insights from the review suggest that AI's current benefits are more pronounced for English language learners than for speakers of structurally complex and under-resourced languages such as Arabic. Moving forward, educators and policymakers must go beyond abstract enthusiasm and ensure concrete, context-sensitive integration of AI. Educators should pilot AI tools in 2026 curricula with clear guidelines on personalization, data ethics, and learner emotional support. Institutions must also prioritize AI literacy programs for teachers, enabling them to evaluate, adapt, and co-design AI-enhanced instruction effectively.

Furthermore, developers must invest in linguistically diverse training datasets and build AI systems capable of handling morphologically rich, dialectally diverse languages. This includes expanding beyond generative text to include speech recognition and multimodal learning systems for underrepresented languages. AI is not a one-size-fits-all solution, it is a complex, evolving technology that must be localized, contextualized, and humanized. When paired with strong pedagogy and equity-driven policy, AI has the potential to make language learning more inclusive, engaging, and effective for all learners regardless of the language they speak.

Funding

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The study is a narrative review and does not involve the collection or analysis of original data from participants. All information and insights presented in the study are derived from existing literature, publicly available sources, and secondary data obtained from previous research. As such, no new datasets were generated or analyzed during the study.

Conflicts of Interest

I, as the sole author and the corresponding author of the article, declare that I have no competing financial or personal interests that could have influenced the work reported. The review article was conducted independently, with no external influences, funding, or affiliations that could have impacted the findings or interpretations presented.

References

[1] Chen, A., Zhang, Y., Jia, J., et al., 2025. A systematic review and meta-analysis of AI-enabled assessment in language learning: Design, implementation, and effectiveness. Journal of Computer Assisted Learning. 41(1), e13064. DOI: https://doi.org/10.1111/jcal.13064

[2] Li, Y., Zhou, X., Chiu, T.K., 2025. Systematics review on artificial intelligence chatbots and ChatGPT for language learning and research from self-determination theory (SDT): what are the roles of teachers? Interactive Learning Environments. 33(3), 1850–1864. DOI: https://doi.org/10.1080/10494820.2024.2400090

[3] Feng, L., 2025. Investigating the effects of artificial intelligence-assisted language learning strategies on cognitive load and learning outcomes: A comparative study. Journal of Educational Computing Research. 62(8), 1961–1994. DOI: https://doi.org/10.1177/07356331241268349

[4] Javaid, Z.K., 2024. A systematic review on cognitive and motivational impact on English language learning through artificial intelligence. International Journal of Literature, Linguistics and Translation Studies. 4(1). DOI: https://doi.org/10.37605/ijllts.v4i1.4

[5] Lin, Y., Yu, Z., 2025. Learner perceptions of artificial intelligence-generated pedagogical agents in language learning videos: Embodiment effects on technology acceptance. International Journal of Human–Computer Interaction. 41(2), 1606–1627. DOI: https://doi.org/10.1080/10447318.2024.2359222

[6] Vo, A., Nguyen, H., 2024. Generative artificial intelligence and ChatGPT in language learning: EFL students' perceptions of technology acceptance. Journal of University Teaching and Learning Practice. 21(6), 199–218. DOI: https://doi.org/10.53761/fr1rkj58

[7] Ai, Y., Hu, Y., Zhao, W., 2025. Interactive learning: harnessing technology to alleviate foreign language anxiety in foreign literature education. Interactive Learning Environments. 33(3), 2440–2459. DOI: https://doi.org/10.1080/10494820.2024.2409990

[8] Hsu, T.C., Chang, C., Jen, T.H., 2024. Artificial intelligence image recognition using self-regulation learning strategies: effects on vocabulary acquisition, learning anxiety, and learning behaviours of English language learners. Interactive Learning Environments. 32(6), 3060–3078. DOI: https://doi.org/10.1080/10494820.2023.2165508

[9] Fitrianto, I., Setyawan, C.E., Saleh, M., 2024. Utilizing artificial intelligence for personalized Arabic language learning plans. International Journal of Post Axial: Futuristic Teaching and Learning. 2(1), 132–142.

[10] Xin, Z., Derakhshan, A., 2025. From excitement to anxiety: Exploring English as a foreign language learners' emotional experiences in the artificial intelligence-powered classrooms. European Journal of Education. 60(1), e12845. DOI: https://doi.org/10.1111/ejed.12845

[11] Rahimi, A.R., Sevilla-Pavón, A., 2025. The role of design thinking skills in artificial-intelligence language learning (DEAILL) in shaping language learners' L2 grit: the mediator and moderator role of artificial intelligence L2 motivational self-system. Computer Assisted Language Learning. 1–49. DOI: https://doi.org/10.1080/09588221.2025.2477710

[12] Muñoz-Basols, J., Gutiérrez, M.F., 2025. Opportunities for artificial intelligence (AI) in language teaching and learning. In: Technology-Mediated Language Teaching: From Social Justice to Artificial Intelligence. Channel View Publications, Ltd.: Bristol, UK. DOI: https://doi.org/10.21832/9781800419889-017

[13] Son, J.B., Ružić, N.K., Philpott, A., 2025. Artificial intelligence technologies and applications for language learning and teaching. Journal of China Computer-Assisted Language Learning. 5(1), 94–112. DOI: https://doi.org/10.1515/jccall-2023-0015

[14] Alhusaiyan, E., 2025. A systematic review of current trends in artificial intelligence in foreign language learning. Saudi Journal of Language Studies. 5(1). DOI: https://doi.org/10.1108/SJLS-07-2024-0039

[15] Arbi, A.P., 2024. Optimizing the use of artificial intelligence in English language learning: A literature review. Gudang Jurnal Multidisiplin Ilmu. 2(2), 25–30. DOI: https://doi.org/10.59435/gjmi.v2i2.278

[16] Lubis, A.H., Samsudin, D., Triarisanti, R., et al., 2024.

A bibliometric mapping analysis of publications on the utilization of artificial intelligence technology in language learning. Journal of Advanced Research in Applied Sciences and Engineering Technology. 38(1), 156–176. DOI: https://doi.org/10.37934/araset.38.1.1 56176

[17] Patty, J., 2024. The use of AI in language learning: what you need to know. Jurnal Review Pendidikan dan Pengajaran (JRPP). 7(1), 642–654. DOI: https://doi.org/10.31004/jrpp.v7i1.24609

[18] Novawan, A., Walker, S.A., Ikeda, O., 2024. The new face of technology-enhanced language learning (TELL) with artificial intelligence (AI): Teacher perspectives, practices, and challenges. Journal of English in Academic and Professional Communication. 10(1), 1–18. DOI: https://doi.org/10.25047/jeapco.v10i1.4565

[19] Rahman, A., Raj, A., Tomy, P., et al., 2024. A comprehensive bibliometric and content analysis of artificial intelligence in language learning: tracing between the years 2017 and 2023. Artificial Intelligence Review. 57(4), 107. DOI: https://doi.org/10.1007/s10462-023-10643-9

[20] Wan, Y., Moorhouse, B.L., 2024. Using Call Annie as a generative artificial intelligence speaking partner for language learners. RELC Journal. 56(2). DOI: https://doi.org/10.1177/00336882231224813

[21] Chen, Y., 2024. Enhancing language acquisition: The role of AI in facilitating effective language learning. In Proceedings of the 2024 3rd International Conference on Humanities, Wisdom Education and Service Management (HWESM 2024); pp. 593–600. DOI: https://doi.org/10.2991/978-2-38476-253-8_71

[22] Yuen, C.L., Schlote, N., 2024. Learner experiences of mobile apps and artificial intelligence to support additional language learning in education. Journal of Educational Technology Systems. 52(4). DOI: https://doi.org/10.1177/00472395241238693

[23] Li, Y., Zhou, X., Yin, H.B., et al., 2025. Design language learning with artificial intelligence (AI) chatbots based on activity theory from a systematic review. Smart Learning Environments. 12(1), 24. DOI: https://doi.org/10.1186/s40561-025-00379-0

[24] Sripada, P.N., Kanagarajan, A., Subha, S., 2025. AI-driven pedagogical word recommendation systems transforming English as a second language vocabulary learning effectiveness. In Proceedings of the 2025 International Conference on Machine Learning and Autonomous Systems (ICMLAS); pp. 1012–1017. DOI: https://doi.org/10.1109/ICMLAS64557.2025.1096788 4

[25] Jawaid, A., Batool, M., Arshad, W., et al., 2025. AI and English language learning outcomes. Contemporary Journal of Social Science Review. 3(1), 927–935. DOI: https://doi.org/10.12345/k8s7ja78

[26] Kutsyk, B.M., Nykyporets, S.S., 2024. The impact of artificial intelligence (AI) on language learning [Doctoral thesis]. BHTУ: Vinnytsia, Ukraine. DOI: https://doi.org/10.13140/RG.2.2.30485.33767