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Transforming Learner Autonomy in Arabic Language Learning Through Artificial Intelligence

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Abstract

The development of Artificial Intelligence (AI) in education has transformed the ways in which students learn Arabic, particularly in the context of fostering learner autonomy. This study aims to explore the role of AI as a facilitator of learning autonomy, identify emerging challenges, and examine pedagogical implications for higher education. The methodology employed is an integrative review, synthesizing recent literature on AI, self-regulated learning, and Arabic language acquisition. Findings indicate that AI can enhance learner autonomy through support for multimodal learning experiences, material personalization, and real-time feedback that promotes student reflection and self-regulation. On the other hand, AI also presents risks such as pseudo-autonomy, epistemological errors, and ethical and academic challenges, which necessitate critical digital literacy and pedagogical oversight. Effective AI integration requires instructors to act as facilitators, ethical guides, and quality controllers of learning processes. This paper concludes that AI holds significant potential to strengthen authentic and responsible learner autonomy, provided it is employed within a reflective, critical, and ethical pedagogical framework. These findings offer important implications for the design of technology-based Arabic language instruction and the development of strategies to reinforce learner autonomy among digital-native students

A. Introduction

In the past decade, the development of Artificial Intelligence (AI) has brought significant changes to higher education practices (Mushthoza et al., 2023). Recent reports indicate a rapid increase in the adoption of AI-driven tools in higher education, particularly generative AI applications such as ChatGPT, adaptive learning systems, and automated feedback platforms, which are increasingly used by students for academic purposes. AI-based technologies, such as natural language processing (NLP), speech recognition, chatbots, automated feedback systems, and generative AI, enable adaptive, personalized, and responsive learning that caters to individual student needs (Hanifah Salsabila et al., 2023). This transformation aligns with the broader trend of educational digitalization, which promotes the integration of technology as an integral component of contemporary pedagogical strategies (Fakih et al., 2025).

In the context of language learning, AI is no longer merely a technical aid but increasingly influences how students access information, process knowledge, and construct understanding autonomously (Mahmudah & Paramita, 2023). In Arabic language education, the utilization of AI has been shown to support the development of istima' (listening), kalam (speaking), qira'ah (reading), and kitabah (writing) skills through interactive features and personalized materials (Faroid et al., 2025). The use of chatbots for conversation practice, text-to-speech tools for pronunciation training, and generative AI for writing exercises exemplifies how technology facilitates more autonomous learning (Khotimah, 2025). Empirical findings reinforce this tendency, as a study conducted among students of the Arabic Language Education Program at Universitas Islam KH. Ruhiat Cipasung shows that most students perceive ChatGPT as helpful due to its ability to provide quick and easy access to information (Muttaqin et al., 2025).

Existing studies on AI in language learning can generally be grouped into three main trends. First, a number of studies focus on the effectiveness of AI in improving language skills through adaptive and interactive technologies. Second, several studies examine students' perceptions and experiences in using AI-based tools for learning. Third, emerging research begins to explore the relationship between AI and learner autonomy, particularly in the context of self-regulated learning. However, these studies are still fragmented and often emphasize practical implementation rather than conceptual integration.

However, despite these potentials, traditional Arabic language instruction remains largely influenced by teacher-centered structural approaches, with an emphasis on the deductive mastery of nahw and sarf rules. The complexity of derivational morphology, the i'rāb system, and the diglossic phenomena between *fuṣḥā* and *'āmmiyyah* demand deep cognitive engagement and systematic learning strategies. In this context, the development of learner autonomy becomes an urgent necessity, enabling students to manage their learning processes independently and reflectively (Satibi et al., 2025). The concept of learner autonomy, as formulated by Henri Holec, emphasizes learners' capacity to take responsibility for their own learning processes (Holec, 1979). David Little extends this notion by highlighting reflective and social responsibility dimensions, while Phil Benson underscores control over learning management, cognitive processes, and learning content (Benson et al., 2016). Consequently, learner autonomy is not

merely the ability to learn without a teacher but encompasses the capacity to plan, monitor, and evaluate the learning process consciously. Furthermore, autonomy refers to a learner's right to make decisions inside the educational system (Putra & Madkur, 2025).

The urgency of this issue becomes increasingly relevant when linked to the characteristics of Generation Z students. This generation has grown up as digital natives, accustomed to instant access to information, high interactivity, and algorithms that tailor content to their preferences (Khattak et al., 2025). Studies indicate that Generation Z's learning motivation is influenced by flexibility, the use of interactive technology, and rapid feedback (Baizuri Z, 2025). However, the digital native myth warrants critical scrutiny, as frequent technology use does not necessarily correspond to the ability to process information deeply (Kirschner & De Bruyckere, 2017).

From a self-regulation perspective, learner autonomy is closely associated with metacognition. Barry Zimmerman explains that self-regulated learning encompasses three main phases: forethought (planning), performance (execution), and self-reflection (Zimmerman & Schunk, 1989). John Flavell emphasizes the importance of awareness and control over one's own thinking processes as the core of metacognition (Flavell, 1979). In Arabic language learning, students' ability to recognize grammatical errors, evaluate learning strategies, and reflect on the development of their competencies serves as a key indicator of authentic learner autonomy. AI has the potential to act as a cognitive partner that supports reflection and decision-making in learning. Through material personalization, interactive feedback, and learning progress analysis, AI can enhance students' metacognitive awareness and learning strategies (Goyal, 2025). However, this optimism is not without risks. Ethical challenges, such as data bias, information inaccuracies (hallucinations), and the tendency to use AI instantly without critical reflection, are particularly concerning for Generation Z students (Chairunnisa & Amaniar, 2025). Overreliance on AI may lead to cognitive outsourcing, wherein the responsibility for thinking is transferred to technological systems.

Given this context, a fundamental question arises: does AI integration truly strengthen learner autonomy, or does it instead produce a form of pseudo-autonomy? Autonomy derived merely from technological access may result in pseudo-autonomy, where students appear independent because they can complete tasks without instructor guidance but remain cognitively dependent on AI outputs without adequate metacognitive reflection. Conversely, when AI is employed as a tool for reflection and self-regulation, it has the potential to foster authentic learner autonomy.

Thus, a significant research gap exists at the intersection of AI, metacognition, and learner autonomy in the context of Arabic language learning for Generation Z students. Although various studies have examined AI integration in Arabic language education (Fitri, 2025). most focus on technology implementation or user perceptions rather than conceptual analyses of how AI mediates learners' self-regulation processes. This study offers a conceptual analysis of AI as a metacognitive mediator in Arabic language learning, highlighting how AI not only supports learning activities but also shapes the quality of students' self-regulation and the development of authentic learner autonomy.This article aims to develop a

conceptual analysis of AI's role as a metacognitive mediator in higher education Arabic language learning. AI is positioned not merely as a technical tool but as a system that can influence students' planning, monitoring, and self-evaluation processes. The discussion is directed toward demonstrating how AI functions as a bridge between technological support and learners' cognitive regulation, and how the quality of this mediation determines the trajectory of learner autonomy, whether authentic or pseudo.

B. Method

This study employs an integrative literature review (Torraco, 2016). to synthesize empirical and theoretical research in order to construct a conceptual framework on AI-mediated learner autonomy. The literature search was conducted systematically between January and March 2026 across multiple databases, including Google Scholar, DOAJ, Garuda, Crossref, and SINTA-indexed journals. The search used keywords such as "Artificial Intelligence in language learning," "AI in Arabic language learning," "learner autonomy," and "Generation Z and digital learning." The initial search identified 119 publications, of which 32 duplicates were removed, leaving 87 records for screening. Titles and abstracts were then reviewed based on predefined inclusion and exclusion criteria, resulting in 61 articles deemed potentially relevant. Full-text screening was subsequently conducted, leading to a final selection of 28 articles included in the review. The inclusion criteria comprised (1) peer-reviewed journal articles, (2) studies published between 2023 and 2026, (3) research focusing on AI applications in language learning and/or learner autonomy, and (4) articles written in English or Indonesian. Studies were excluded if they were opinion pieces, non-academic publications, lacked clear methodological description, or did not directly address the intersection of AI and learner autonomy.

The data analysis followed a structured qualitative synthesis process. First, each selected article was systematically coded using thematic analysis, with the unit of analysis focusing on key findings and discussions reported in each study. Open coding was applied to identify recurring concepts related to AI functions, learner autonomy, and metacognitive processes, allowing categories to emerge inductively from the data. These initial codes were then grouped into broader themes such as AI as facilitator, personalization, metacognitive mediation, and emerging challenges (e.g., pseudo-autonomy and ethical concerns). In the second stage, axial coding was used to examine relationships among these themes, particularly in mapping how AI supports the phases of self-regulated learning (planning, monitoring, and evaluation). Finally, a conceptual synthesis was conducted to integrate these patterns into a coherent analytical framework, positioning AI as a mediating system that shapes learners' cognitive regulation rather than merely functioning as a technical tool. To enhance the robustness of the analysis, findings were continuously compared across studies to identify converging patterns, inconsistencies, and gaps, resulting in a conceptual model that distinguishes between authentic learner autonomy and pseudo-autonomy.

C. Findings and Discussion

Reconceptualizing Learner Autonomy in the Era of Artificial Intelligence

Based on the synthesis of the reviewed studies, learner autonomy in the context of Artificial Intelligence (AI) is no longer conceptualized solely as an internal

capacity of learners but as a mediated process shaped by continuous interaction with digital systems. Across the literature, three consistent patterns emerge: (1) a shift from internal control to AI-mediated regulation, (2) the increasing role of metacognitive processes within self-regulated learning, and (3) the emergence of risks such as pseudo-autonomy, where apparent independence masks underlying dependency on Artificial Intelligence systems.

The development of Artificial Intelligence (AI) has brought fundamental changes to how learning is understood and implemented, particularly in language education (Utari et al., 2024). Learner autonomy, traditionally defined as learners' ability to take responsibility for their learning goals, strategies, and evaluation, must now be reconceptualized within a more complex digital framework. Henri Holec emphasizes autonomy as internal control over learning decisions (Holec, 1979); however, in AI-supported environments, this control becomes partially mediated by algorithmic systems that provide recommendations, feedback, and generated content.

This shift is further reinforced by perspectives that frame autonomy as control over learning management, cognitive processes, and content selection. In Arabic language learning, characterized by the complexity of sarf, nahw, and diglossia, this expanded notion of autonomy becomes particularly significant for enabling learners to internalize linguistic structures through sustained and self-directed engagement.

To illustrate how these conceptual shifts are reflected in empirical research, Table 1 presents a representative synthesis of selected studies that reflect the major themes identified across the reviewed literature. These studies were chosen to illustrate variation in research focus, context, and findings, highlighting their focus, context, key findings, and thematic contributions. This mapping serves to make explicit the patterns identified across the literature and provides a concrete basis for subsequent analysis.

Table 1. Synthesis of Empirical Studies on AI Integration in Arabic Language Learning and Learner Autonomy

Author	Focus	Context	Key Findings	Theme
Fahmi & Adhimah (2024)	AI content design	Education	Increased motivation & engagement	Personalization
Khotimah (2025)	ChatGPT & writing	Higher education	Improved grammar & vocabulary	AI as facilitator
Nielam Liesmanda Moenir (2025)	TalkPal speaking	School	Increased speaking fluency	Skill development
Al-Farizi et al. (2025)	AI listening tools	School	Improved listening comprehension	Multimodal learning
Murdani et al. (2025)	ChatGPT & student interest	Higher education	High interest in translation, writing, reading	Engagement & usability
Ramdhani &	AI &	Higher	High autonomy,	Autonomy

Hakiman (2025)	learner autonomy level	education	strong in access & strategy use	development & digital readiness
Azizah et al. (2025)	AI tools, autonomy, motivation & creativity	Higher education	Learning partner; increases autonomy, creativity, and motivation;	Autonomy, creativity & ethics
Humairoh et al. (2026)	ChatGPT pedagogy	Higher education	Supports feedback & co-writing	Metacognitive mediation

The reviewed studies reveal several consistent patterns regarding the role of AI in supporting learner autonomy. First, AI is widely positioned as a facilitator of language skill development, particularly in writing, speaking, and listening, as reflected in studies on ChatGPT, TalkPal, and AI listening tools. These tools contribute to improving grammar accuracy (Hadi & Qohar, 2024), speaking fluency (Sari et al., 2025), and listening comprehension (Garba & Hassan, 2024) through interactive (Hadi & Qohar, 2024) and multimodal features. Second, AI also enhances learners' engagement and motivation, (Almelhes, 2025) as indicated by studies highlighting increased interest in translation, writing, and reading activities, as well as the role of usability and accessibility in shaping positive learning experiences (Naqrash et al., 2025). Third, several studies emphasize the role of AI in fostering learner autonomy and digital readiness, particularly in enabling students to independently access learning resources, select strategies, and regulate their learning processes. This is further strengthened by findings that position AI not only as a tool but as a learning partner that supports creativity, confidence, and flexible learning. However, these benefits are accompanied by emerging concerns related to ethical use, overreliance, and the need for critical digital literacy.

Within this framework, AI can be understood as a mediating system within the self-regulated learning process that supports learners' metacognitive regulation rather than merely providing information. Learners interact with AI not only to access content but also to plan learning activities, monitor progress through feedback, and evaluate their performance. Drawing on the self-regulated learning model, these functions correspond to the three phases of self-regulation: planning, monitoring, and evaluation, which are consistently supported across the reviewed studies through personalization, real-time feedback, and learning analytics.

Overall, the synthesis suggests that learner autonomy in the AI era is increasingly characterized as regulated and mediated autonomy, in which independence is restructured through continuous interaction with intelligent systems. Importantly, the findings also highlight that AI's role extends beyond technical facilitation toward cognitive, metacognitive, and motivational mediation, while simultaneously introducing challenges related to dependency, ethics, and reflective engagement. Therefore, AI should be understood not only as a technological tool but as a mediating system within structured self-regulation processes, whose effectiveness depends on learners' ability to engage critically with feedback, maintain reflective awareness, and exercise strategic control over their learning.

AI as a Facilitator of Practicum Learner Autonomy

The second major theme emerging from the literature concerns the role of AI as a facilitator of learner autonomy in practice. The synthesis reveals three dominant patterns: (1) multimodal learning support, (2) adaptive personalization, and (3) real-time feedback mechanisms. These patterns collectively illustrate how AI moves beyond a supporting tool to become an active system that shapes learners' engagement with language skills and learning strategies within self-regulated learning processes.

From this perspective, AI-mediated learner autonomy can be understood as a form of situated and process-oriented autonomy, where learners continuously interact with AI systems to regulate their learning in real time. Rather than operating independently of external support, learners engage in a dynamic cycle of planning, monitoring, and evaluation that is scaffolded by AI-generated feedback, adaptive content, and interactive features. In this sense, AI functions not only as a facilitator, but as a cognitive and metacognitive mediator that extends learners' capacity to make informed decisions, reflect on their performance, and adjust their learning strategies accordingly.

To make these patterns more transparent, the following table presents a structured synthesis of how AI functions across different language skills and phases of self-regulated learning (SRL):

Table 2. Synthesis of AI Functions in Supporting Learner Autonomy in Arabic Language Learning

Aspect	AI Function	Learning Skill	SRL Phase	Key Contribution	Theme
Multimodal Learning	Audio-based input (native-like pronunciation)	Istima' (listening)	Monitoring	Improves listening accuracy and phonetic recognition	Multimodal facilitation
Interactive Simulation	Speech recognition & conversation practice	Kalam (speaking)	Monitoring	Enhances fluency, pronunciation, and real-time correction	Skill development
Text Analysis	Vocabulary and structure analysis	Qira'ah (reading)	Monitoring	Accelerates comprehension and linguistic awareness	Cognitive support
Automated Feedback	Grammar and writing correction	Kitabah (writing)	Evaluation	Supports reflection and revision of written texts	Metacognitive mediation
Personalize	Adaptive	All skills	Planning	Aligns	Personaliza

d Learning	content and material selection			learning with learner proficiency and goals	tion
Feedback System	Real-time feedback & error detection	All skills	Monitoring & Evaluation	Enables continuous self-assessment and improvement	Self-regulation support
Learning Analytics	Progress tracking and performance review	All skills	Evaluation	Facilitates reflective learning and planning next steps	Reflective learning
Multimodal Integration	Combination of audio, visual, and interactive features	All skills	All phases	Increases engagement and sustained motivation	Engagement enhancement
Instructor Mediation	Guidance in interpreting AI outputs	All skills	All phases	Prevents dependency and strengthens critical thinking	Pedagogical mediation

As shown in Table 2, AI functions are distributed across all language skills and closely aligned with the phases of self-regulated learning. This indicates that AI does not operate in a fragmented manner but rather supports a continuous and integrated cycle of self-regulation, encompassing planning, monitoring, and evaluation.

In Arabic language learning, AI facilitates AI-mediated autonomy by enabling students to control their learning pace (Daflizar, 2023), select appropriate materials, and receive immediate feedback across istima', kalam, qira'ah, and kitabah. Studies consistently report that speech recognition supports pronunciation accuracy (H. L. M. Mohideen, 2024), automated feedback enhances writing quality, and text analysis tools improve reading comprehension through interactive and adaptive learning environments.

These functions align with the SRL framework. AI supports planning through goal-setting and material selection, monitoring through error detection and interactive feedback, and evaluation through performance analysis and revision processes. A consistent trend across studies is the integration of multimodal elements (audio, visual, and interactive features), which enhances motivation and sustained engagement while also supporting metacognitive awareness.

These findings suggest that AI extends learner autonomy beyond mere flexibility of access toward a more structured form of self-regulation. However, this

facilitative role is not inherently transformative; its effectiveness largely depends on how learners actively engage with feedback, reflection, and strategic control. In this sense, autonomy is not simply enabled by the presence of technology, but is shaped by the depth of learners' metacognitive involvement. This becomes particularly significant when considering the potential challenges and risks, where insufficient reflection may lead to superficial or pseudo-autonomy.

Challenges of AI in Supporting Learner Autonomy

The third major theme emerging from the literature concerns the challenges of AI integration in supporting learner autonomy. The synthesis reveals three dominant categories: (1) cognitive challenges related to pseudo-autonomy, (2) epistemological challenges concerning accuracy and validity, and (3) ethical and academic challenges. These categories consistently appear across studies and indicate that AI-supported autonomy is not without significant limitations. To clarify these patterns, the following table summarizes the key challenges identified in the reviewed literature:

Table 3. Synthesis of Challenges in AI-Supported Learner Autonomy

Challenge Type	Key Issue	Description	Impact on Learner Autonomy	Theme
Cognitive	Pseudo-autonomy	Superficial independence with reliance on AI outputs	Weak critical thinking and shallow learning	Cognitive limitation
Cognitive	Reduced resilience	Low tolerance for effort and complexity	Decreased persistence in learning	Learning behavior
Epistemological	Inaccuracy (hallucination)	AI generates plausible but incorrect information	Risk of misconception in language learning	Knowledge validity
Epistemological	Lack of authority	AI lacks scholarly reliability	Weak verification practices	Digital literacy
Ethical	Plagiarism risk	AI-generated texts used without reflection	Academic integrity issues	Ethical concern
Ethical	Overreliance	Dependence on AI for task completion	Reduced cognitive engagement	Academic behavior

As shown in Table 3, the challenges are not isolated but interconnected, influencing both cognitive processes and learning behavior. Cognitive challenges are primarily reflected in the emergence of pseudo-autonomy, where learners appear independent but remain dependent on AI-generated outputs (AlSajri, 2023). In Arabic language learning, this is often evident in writing (kitābah), where

students generate texts without understanding underlying grammatical structures, resulting in shallow internalization.

Epistemological challenges arise from the nature of AI systems, particularly large language models, which generate responses based on probabilistic patterns rather than verified knowledge. Studies consistently report the occurrence of inaccurate or misleading outputs, especially in linguistically sensitive areas such as harakat, iʻrāb, and lexical choice. Without adequate evaluative skills, learners risk internalizing incorrect information.

Ethical challenges further complicate this landscape. The ability of AI to generate complete academic texts introduces risks related to plagiarism and academic misconduct. The reviewed studies indicate that such risks are closely linked to patterns of overreliance, where learners prioritize efficiency over cognitive engagement.

These findings suggest that learner autonomy in AI-supported environments is inherently fragile and highly dependent on learners' metacognitive and evaluative capacities. Without critical reflection, the use of AI may shift autonomy toward dependency rather than independence.

Pedagogical Implications

Building on these findings, the literature also identifies several pedagogical implications that emerge as responses to both the opportunities and challenges of AI integration. The synthesis highlights four major directions: (1) multimodal learning design, (2) adaptive personalization, (3) strengthening digital literacy, and (4) transformation of instructional roles.These implications can be summarized as follows:

Table 4. Synthesis of Pedagogical Implications of AI Integration

Aspect	Pedagogical Strategy	Description	Contribution to Autonomy	Theme
Multimodal Learning	Integrated audio-visual tasks	Combines multiple learning channels	Enhances engagement and comprehension	Learning design
Personalization	Adaptive content	Aligns materials with learner needs	Supports self-directed learning	Individualization
Digital Literacy	Critical evaluation skills	Verification of AI outputs	Strengthens reflective autonomy	Metacognition
Instructor Role	Facilitator & guide	Supports reflection and strategy use	Prevents dependency	Pedagogical mediation

As illustrated in Table 4, pedagogical responses focus on balancing technological affordances with cognitive and reflective engagement. A consistent pattern across studies is the emphasis on multimodal learning, where the integration of audio, visual, and interactive elements enhances both motivation and sustained engagement.

At the same time, personalization emerges as a key feature that enables learners to align learning materials with their individual needs and proficiency levels. However, the literature indicates that personalization alone is insufficient without

metacognitive support. This is why digital literacy—particularly the ability to evaluate and verify AI outputs—becomes a central component of learner autonomy.

Building on this, another significant finding concerns the transformation of the instructor's role. Rather than functioning as the sole source of knowledge, instructors act as facilitators who guide reflection, support strategic learning, and monitor the quality of students' engagement with AI.

To operationalize these pedagogical implications, several practical strategies can be implemented in classroom settings. For instance, instructors can design structured AI-assisted tasks that require students not only to generate responses using AI tools but also to critically evaluate, revise, and justify those outputs. Reflective prompts, guided questioning, and comparison activities between AI-generated and student-generated responses can further strengthen learner's metacognitive engagement. In addition, integrating explicit instruction on digital literacy, such as identifying inaccuracies, bias, and limitations in AI outputs, can help learners develop more critical and responsible use of technology. In this way, AI is positioned not merely as a tool for efficiency, but as a means of supporting deeper cognitive engagement and reflective autonomy.

Taken together, these findings indicate that effective AI integration requires a structured and reflective pedagogical framework. Autonomy is not automatically produced by access to technology but must be cultivated through guided interaction, critical evaluation, and sustained metacognitive engagement.

Overall, the synthesis of findings demonstrates that AI simultaneously expands and problematizes learner autonomy. While it enables flexible, personalized, and self-regulated learning, it also introduces risks that may undermine deep cognitive engagement. Therefore, the development of authentic learner autonomy depends not only on technological access but on the quality of learners' interaction with AI within a reflective and pedagogically guided environment.

D. Conclusion

Based on the discussion, Artificial Intelligence (AI) has transformed Arabic language learning from an instructor-centered approach into a more flexible, student-centered process that supports learner autonomy. Through adaptive and multimodal features, AI enables students to plan, monitor, and evaluate their learning while practicing language skills in a more personalized and reflective manner, positioning AI as both a learning tool and a cognitive partner. However, its use also presents cognitive, epistemological, and ethical challenges, such as pseudo-autonomy, issues of accuracy, and risks to academic integrity, which require strong digital literacy and critical awareness. Consequently, the role of instructors shifts toward facilitating ethical and reflective AI use within structured pedagogical frameworks. Overall, AI can effectively enhance authentic learner autonomy when used not merely for instant answers, but as a medium for critical reflection, responsible learning, and sustained academic development.

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