

Transforming Arabic Language Learning in the Era of Artificial Intelligence: Opportunities and Challenges in Higher Education

تحول تعليم اللغة العربية في عصر الذكاء الاصطناعي: الفرص والتحديات

في التعليم العالي

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Abstract

The rapid development of artificial intelligence (AI) has significantly transformed higher education, including Arabic language learning. This study critically examines the role of AI, particularly large language models, in reshaping learning processes, focusing on pedagogical, cognitive, and epistemological dimensions. Using a qualitative library research approach, this study analyzes recent scholarly works (2020–2025). The findings show that AI enhances access to linguistic input, enables personalized learning, and provides immediate feedback that improves learning efficiency. However, it also introduces challenges such as cognitive dependency, reduced depth of critical thinking, and concerns over knowledge validity, especially in Arabic learning, which is closely linked to Islamic intellectual traditions. The study further reveals that AI is more effective in supporting reading and writing skills than speaking and listening, due to the absence of authentic social interaction. From an epistemological perspective, AI cannot replace the interpretative authority of teachers. This study proposes a hybrid learning model that positions AI as a cognitive support tool rather than a substitute for human instruction, emphasizing the need for balanced integration between technology, pedagogy, and academic integrity.

Keywords: Artificial Intelligence, Arabic, Language Learning

ملخص البحث

يشهد الذكاء الاصطناعي تطورًا متسارعًا أسهم بشكل كبير في إحداث تحولات جوهرية في التعليم العالي، بما في ذلك تعلم اللغة العربية. تهدف هذه الدراسة إلى تحليل دور الذكاء الاصطناعي، لا سيما نماذج اللغة الكبيرة، في إعادة تشكيل عمليات التعلم، مع التركيز على الأبعاد التربوية والمعرفية والإبستمولوجية. وتعتمد الدراسة على منهج نوعي قائم على البحث المكتبي، من خلال تحليل الأدبيات العلمية الحديثة خلال الفترة (٢٠٢٠-٢٠٢٥). تشير النتائج إلى أن الذكاء الاصطناعي يسهم في تعزيز الوصول إلى المدخلات اللغوية، ويدعم التعلم المخصص، ويوفر تغذية راجعة فورية تسهم في تحسين كفاءة التعلم. ومع ذلك، فإنه يطرح أيضًا تحديات، مثل الاعتماد المعرفي، وتراجع عمق التفكير النقدي،



وإشكاليات تتعلق بصحة المعرفة وموثوقيتها، لا سيما في تعلم اللغة العربية المرتبط ارتباطاً وثيقاً بالتراث العلمي الإسلامي. كما تكشف الدراسة أن الذكاء الاصطناعي أكثر فاعلية في دعم مهارتي القراءة والكتابة مقارنة بمهارتي التحدث والاستماع، نظراً لغياب التفاعل الاجتماعي الحقيقي. ومن منظور إبستمولوجي، لا يمكن للذكاء الاصطناعي أن يحل محل السلطة التفسيرية للمعلم. وتقتصر الدراسة نموذجاً تعليمياً هجيناً يضع الذكاء الاصطناعي بوصفه أداة داعمة للعمليات المعرفية، لا بديلاً عن التدريس البشري، مع التأكيد على أهمية تحقيق توازن تكاملي بين التكنولوجيا، والتربية، والنزاهة الأكاديمية.

الكلمات المفتاحية: الذكاء الاصطناعي، اللغة العربية، تعليم اللغة

A. INTRODUCTION

The digital transformation of higher education in the twenty-first century is no longer linear; rather, it is disruptive and exponential in nature. The advancement of artificial intelligence, particularly in the form of large language models (LLMs) such as ChatGPT developed by OpenAI, has fundamentally reshaped the ways in which knowledge is accessed, produced, and validated ¹.

From the perspective of Applied Linguistics, the integration of technology in language learning has evolved from Computer-Assisted Language Learning (CALL) to AI-driven Intelligent CALL (ICALL) ² This shift signifies a paradigmatic transition in which technology is no longer positioned merely as a medium of instruction, but rather as a cognitive partner in the learning process.

Language, in this context, cannot be reduced to a mere system of symbols; rather, it should be understood as a cognitive, social, and cultural construct that develops through interaction ³. Accordingly, the integration of artificial intelligence in language learning extends beyond methodological considerations, reshaping the very epistemological foundations of the learning process itself.

Arabic occupies a distinctive position among foreign languages. In addition to functioning as a means of communication, it also serves as the language of religion and

¹ Enkelejda Kasneci and others, 'ChatGPT for Good? On Opportunities and Challenges of Large Language Models for Education', *Learning and Individual Differences*, 103 (2023), 102274; Wayne Holmes, 'Artificial Intelligence in Education', in *Encyclopedia of Education and Information Technologies* (Springer, 2020), pp. 88–103; Olaf Zawacki-Richter and others, 'Systematic Review of Research on Artificial Intelligence Applications in Higher Education—Where Are the Educators?', *International Journal of Educational Technology in Higher Education*, 16.1 (2019), 39.

² Carol Chapelle and Carol A Chapelle, *Computer Applications in Second Language Acquisition* (Cambridge university press, 2001); Robert Godwin-Jones, 'Emerging Spaces for Language Learning: AI Bots, Ambient Intelligence, and the Metaverse', 2023; Mark Warschauer and Deborah Healey, 'Computers and Language Learning: An Overview', *Language Teaching*, 31.2 (1998), 57–71.

³ Lev Semenovich Vygotsky and Michael Cole, *Mind in Society: Development of Higher Psychological Processes* (Harvard university press, 1978); James P Lantolf, *Sociocultural Theory and Second Language Learning* (Oxford university press, 2000), LXXVIII.

the primary medium for engaging with classical Islamic texts⁴. Consequently, learning Arabic requires not only linguistic competence but also interpretive validity and depth of understanding.

However, a growing body of research indicates that Arabic language learning in Indonesia continues to face a range of structural challenges, including limited access to authentic input, the absence of a sustained language environment, and the dominance of traditional, memorization-oriented methods (Al-Jarf, 2020; Hidayat, 2021; Rosyidi, 2020). Such conditions stand in contrast to the principle of comprehensible input proposed by Stephen Krashen (1985) and the interaction hypothesis advanced by Michael Long (1996), both of which emphasize the centrality of meaningful input and interaction in language acquisition.

The emergence of artificial intelligence offers promising avenues to address these challenges through the provision of abundant linguistic input, personalized learning pathways, and immediate feedback⁵. Nevertheless, recent scholarship also highlights significant risks, including cognitive offloading, superficial learning, and the erosion of academic authority⁶.

Furthermore, within the context of Arabic, more complex epistemological concerns emerge, particularly with regard to the validity of interpretation, the authority of knowledge, and the absence of the concept of *sanad* within AI systems. Accordingly, the integration of artificial intelligence in Arabic language learning should not be understood merely as a technological development, but rather as a multidimensional transformation encompassing pedagogical, cognitive, and epistemological dimensions.

This study contributes to the field by proposing a hybrid epistemic model that integrates artificial intelligence within Arabic language learning, bridging data-driven systems with the tradition of knowledge validation rooted in *sanad*. By combining pedagogical, cognitive, and epistemological perspectives, this study offers a comprehensive framework that extends beyond purely technological approaches and provides a foundation for future research.

B. RESEARCH METHODS

This study employed a systematic qualitative literature review approach to examine the integration of artificial intelligence (AI) in Arabic language learning in higher education. The study focused specifically on pedagogical transformation, cognitive implications, and epistemological challenges within the field of Arabic Applied Linguistics. To strengthen analytical rigor and research transparency, the study adopted

⁴ J Mark Halstead, 'Islamic Values: A Distinctive Framework for Moral Education?', *Journal of Moral Education*, 36.3 (2007), 283–96; Kees Versteegh, *Arabic Language* (Edinburgh University Press, 2014).

⁵ Ahmed Tlili and others, 'What If the Devil Is My Guardian Angel: ChatGPT as a Case Study of Using Chatbots in Education', *Smart Learning Environments*, 10.1 (2023), 15; Zawacki-Richter and others; Versteegh.

⁶ Emily M Bender and others, 'On the Dangers of Stochastic Parrots Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency', in *ACM Conferences*, 2021; Neil Selwyn, *Should Robots Replace Teachers?: AI and the Future of Education* (John Wiley & Sons, 2019).



selected procedures from systematic review methodology and thematic qualitative analysis⁷⁸.

The study aimed to synthesize and critically interpret recent scholarly discussions related to AI-assisted Arabic language learning, particularly following the rapid development of generative AI technologies such as ChatGPT. Rather than producing statistical generalization, this research emphasized conceptual interpretation, thematic synthesis, and theoretical integration. Data were collected from several international academic databases, including Scopus, Web of Science, ScienceDirect, and ERIC. These databases were selected because they provide peer-reviewed international publications in educational technology, applied linguistics, and language learning research.

The literature search focused on publications from 2020–2025 in order to capture recent developments in AI-driven education and large language models. Several keywords and keyword combinations were used during the search process, including: AI in language learning, ChatGPT in education, Arabic language learning and AI, AI-assisted Arabic learning, Intelligent CALL, and Arabic Applied Linguistics and technology.

The initial search identified 214 publications. After duplicate removal and preliminary relevance screening, 96 studies remained for further evaluation. Following full-text eligibility assessment based on the inclusion and exclusion criteria, 42 articles were selected as the primary corpus for analysis. The inclusion criteria consisted of peer-reviewed journal articles; studies published between 2020–2025; articles indexed in Scopus, Web of Science, or reputable international databases; publications written in English or Arabic; studies related to AI, language learning, Arabic learning, or applied linguistics; and studies discussing pedagogical, cognitive, or epistemological dimensions of AI integration.

The exclusion criteria included conference abstracts, unpublished manuscripts, non-peer-reviewed publications, studies unrelated to education or language learning, technical studies without pedagogical implications, and studies lacking substantial analytical discussion. The selected studies consisted of empirical research articles, conceptual papers, and review studies discussing AI in education, language learning, Arabic acquisition, maharah development, Arabic textual interpretation, and AI-assisted learning environments.

Data collection employed documentation techniques through systematic extraction of concepts, findings, arguments, and theoretical perspectives from the selected literature. The data were then analyzed using thematic analysis following Braun and Clarke (2006). The analytical process involved four stages: open coding, categorization, thematic grouping, and interpretative synthesis.

In the open coding stage, recurring concepts and analytical patterns were identified from the literature. Examples of initial codes included personalized learning, instant feedback, cognitive dependency, surface learning, epistemic authority, Arabic textual interpretation, and nahwu-sharaf simplification. These codes were subsequently grouped into broader analytical categories and synthesized into major themes.

The analysis produced three major themes: pedagogical transformation, cognitive implications, and epistemological challenges. To improve analytical transparency, the

⁷ Hannah Snyder, 'Literature Review as a Research Methodology: An Overview and Guidelines', *Journal of Business Research*, 104 (2019), 333–39.

⁸ Virginia Braun and Victoria Clarke, 'Using Thematic Analysis in Psychology', *Qualitative Research in Psychology*, 3.2 (2006), 77–101.

selected studies were synthesized comparatively based on research focus, findings, and limitations.

This model emphasizes that AI should function as a cognitive support tool rather than a replacement for teachers. The framework highlights the importance of balancing

Figure 1. PRISMA-Style Literature Selection Process



Figure 2. Multi-Layer Epistemic Model for AI Integration in Arabic Language Learning



technological efficiency, pedagogical depth, social interaction, and epistemic validation within Arabic language learning.

This study does not seek statistical generalization. Instead, it aims to construct a deeper conceptual understanding of how AI reshapes Arabic language learning from pedagogical, cognitive, and epistemological perspectives. The study also seeks to contribute theoretically to Arabic Applied Linguistics by integrating AI discourse with language acquisition, Arabic textuality, and knowledge validation traditions.

C. FINDING AND DISCUSSION

The transformation of language learning in the era of artificial intelligence cannot be understood merely as the adoption of new technologies; rather, it represents a structural shift within the knowledge ecosystem. Based on a thematic analysis of recent literature, the integration of AI in Arabic language learning reconfigures the relationship between technology, cognition, and epistemology. In this context, AI functions not only as a pedagogical tool, but also as an agent that mediates the processes of knowledge production and legitimation⁹.

The findings indicate that this transformation unfolds across three primary dimensions: (1) the reconstruction of learning paradigms, (2) the redefinition of cognitive processes, and (3) epistemological disruption. These three dimensions interact dynamically, giving rise to new configurations in the practice of Arabic language learning within higher education.

Reconstructing the Paradigm of Language Learning in the Age of AI: From Constructivism to Post-Human Learning

The advancement of artificial intelligence has not only shifted language learning paradigms at the methodological level, but has also intervened in the ontological and epistemological structures of the learning process itself. In traditional paradigms, learning was understood as a hierarchical process of knowledge transmission. Within a constructivist framework, however, learning is redefined as an active process of meaning-

⁹ Holmes; Kasneci and others.



making through social interaction ¹⁰. The emergence of generative AI now signals a further transformation that extends beyond constructivism, giving rise to what may be described as a post-human learning paradigm, in which learning is no longer exclusively human-centered but occurs within hybrid cognitive ecosystems involving both human and non-human entities.

In this context, language learning can no longer be reduced to interaction between teacher and student. Instead, it becomes part of a distributed cognition system, where knowledge is dispersed and processed across networks linking humans and machines ¹¹. Artificial intelligence functions not merely as a supporting tool, but as an epistemic agent that actively mediates the production, distribution, and even the legitimation of linguistic knowledge. This marks a shift from learning as acquisition toward learning as co-construction within human-machine networks.

From a sociocultural perspective, the concept of the Zone of Proximal Development (ZPD) proposed by Lev Vygotsky (1978) has traditionally positioned the “more capable other” as a human agent who provides scaffolding. In the age of AI, however, this role undergoes a significant redefinition. Artificial intelligence is capable of providing scaffolding that is immediate, adaptive, scalable, and continuously available. This development raises a fundamental question: can AI genuinely be regarded as a “more capable other,” or does it merely function as a pseudo-other that simulates such capacity?

A critical perspective is offered by ¹², who characterize large language models as “stochastic parrots.” According to this view, such systems do not truly understand language, but instead generate outputs by predicting word sequences based on probabilistic distributions. This critique suggests that interaction with AI may produce what can be described as an epistemic illusion, a condition in which learners perceive themselves as understanding, while in reality they are only reproducing linguistic patterns without achieving deep conceptual comprehension.

Within the framework of connectivism ¹³, knowledge is no longer confined to the individual but is distributed across networks. Artificial intelligence intensifies this logic by functioning as a central node within knowledge systems. However, a critical issue emerges when such a node lacks internal mechanisms of epistemic validation. AI possesses neither consciousness, nor scholarly authority, nor epistemic accountability. Consequently, when AI is used as a learning resource, a shift occurs from validated knowledge toward probabilistic knowledge.

In the context of Arabic language learning, the implications of this shift are considerably more complex. Arabic is not merely a linguistic system, but also an epistemological medium within the Islamic intellectual tradition, grounded in concepts such as *sanad*, scholarly authority, and the validity of knowledge transmission. The integration of AI into Arabic language learning thus generates a tension between two distinct epistemological systems: a traditional epistemology grounded in chains of transmission and scholarly authority, and a digital epistemology grounded in data and probability.

This tension gives rise to ontological and epistemological challenges that are not typically encountered in the learning of other languages. If left unexamined, AI may shift

¹⁰ Vygotsky and Cole.

¹¹ George Siemens, ‘Elearnspace. Connectivism: A Learning Theory for the Digital Age’, *Elearnspace. Org*, 2004, 14–16; Holmes.

¹² Bender and others.

¹³ Siemens.

scholarly authority away from verified sources toward systems that lack epistemic legitimacy. In this sense, AI is not merely a pedagogical tool, but an actor with the potential to disrupt established structures of knowledge authority.

For this reason, reconstructing language learning paradigms in the age of AI requires moving beyond a purely technological perspective and engaging with the philosophy of knowledge itself. AI should not be positioned as a substitute for human agency, but rather as an epistemic instrument that remains under human control as the primary subject of learning. In other words, language learning in the age of AI must be developed within a framework of controlled post-human learning, in which human-machine interaction is governed by rigorous cognitive, pedagogical, and epistemological principles.

The primary contribution of this reconstructed paradigm lies in its reframing of AI, not as a mere instructional aid, but as an entity that compels a redefinition of the nature of learning, knowledge, and scholarly authority. The central challenge, therefore, is not simply how to use AI, but how to regulate its epistemological implications so that it does not erode intellectual depth and the integrity of knowledge, particularly within the domain of Arabic language learning.

AI as Linguistic Input Infrastructure: Between Quantity, Quality, and Linguistic Illusion

In second language acquisition theory, input constitutes a fundamental element and a primary precondition for language acquisition. Through the Comprehensible Input Hypothesis, ¹⁴ argues that learners acquire language only when they are exposed to input that is slightly beyond their current level of competence ($i+1$). In this regard, the emergence of artificial intelligence introduces a radical transformation in the ecology of linguistic input by providing access to input that is virtually unlimited, adaptive, and instantaneous ¹⁵.

Artificial intelligence enables learners to access a wide range of linguistic input, from basic structures to complex discourse, while dynamically adjusting levels of difficulty according to individual needs. Theoretically, this creates highly favorable conditions within Krashen's framework, as learners can continuously operate within the $i+1$ zone without being constrained by the limitations of physical learning environments. In the context of Arabic language learning in Indonesia, where exposure to authentic language input remains relatively limited, AI has the potential to function as a simulator of linguistic environments, compensating for the scarcity of natural input.

Nevertheless, the dominance of AI in providing linguistic input introduces challenges that extend beyond issues of accuracy. ¹⁶ demonstrate that AI-generated output is not grounded in semantic understanding, but rather in statistical prediction, thereby creating the risk of producing hallucinated knowledge. In this sense, the input generated by AI is not only prone to error but may also give rise to what can be described as pseudo-input, input that appears valid on the surface yet lacks semantic depth and epistemic validity.

From the perspective of the Noticing Hypothesis ¹⁷, language acquisition depends not only on exposure to input but also on learners' conscious awareness of specific

¹⁴ Stephen D Krashen, 'The Input Hypothesis: Issues and Implications', (*No Title*), 1985.

¹⁵ Godwin-Jones; Tlili and others.

¹⁶ Bender and others.

¹⁷ Richard W Schmidt, 'The Role of Consciousness in Second Language Learning1', *Applied Linguistics*, 11.2 (1990), 129–58.



linguistic forms. Although AI can provide large quantities of input, it does not inherently guarantee the occurrence of noticing. On the contrary, the ease of access to abundant input may encourage passive consumption, with limited cognitive engagement.

Furthermore, within the framework of the Output Hypothesis¹⁸, language production plays a crucial role in acquisition, as it enables learners to recognize the limits of their competence. An overreliance on AI as a source of input may disrupt the balance between input and output, leading to a learning process that is predominantly receptive rather than productive.

Another issue lies in the tendency of AI systems to optimize output for readability and communicative clarity rather than linguistic complexity. This often results in excessive simplification, which may hinder the development of advanced proficiency, particularly in engaging with classical Arabic texts characterized by complex syntactic structures, semantic ambiguity, and rich rhetorical nuance.

From a more critical standpoint, this phenomenon may be understood as an illusion of linguistic richness, a condition in which learners perceive themselves as being exposed to rich linguistic input, whereas in reality they are engaging with language that has been simplified and standardized by algorithmic processes. Consequently, a high quantity of input does not necessarily correlate with the quality of language acquisition.

For this reason, AI as an infrastructure for linguistic input must be positioned with caution within pedagogical frameworks. It should not be treated as an authoritative primary source, but rather as a secondary resource that requires validation, curation, and mediation by educators. In the context of Arabic language learning, this becomes particularly critical, as linguistic inaccuracies affect not only communication but also the interpretation of religious texts with profound epistemological implications.

Accordingly, the integration of AI in the provision of linguistic input should not focus solely on increasing quantity, but must be accompanied by mechanisms for quality control and pedagogical strategies that ensure deep cognitive processing. Without such measures, AI risks not only transforming how languages are learned, but also redefining what is meant by “understanding” a language itself.

Transforming Interaction: Redefining Negotiation of Meaning in the Age of AI

Within the framework of the Interaction Hypothesis, language acquisition is understood as the outcome of negotiation of meaning occurring in communicative interaction, where learners actively modify, clarify, and adjust their utterances to achieve mutual understanding¹⁹. This process enables the restructuring of interlanguage systems through feedback mechanisms and attention to linguistic form. However, the development of artificial intelligence has significantly reshaped this interactional landscape by introducing forms of engagement that are no longer exclusively human.

Artificial intelligence gives rise to what may be characterized as asymmetrical interaction, namely interaction between humans and systems that lack social awareness and communicative experience. In this context, learners engage with entities capable of producing linguistically complex output, yet devoid of communicative intentionality in

¹⁸ Merrill Swain, ‘Communicative Competence: Some Roles of Comprehensible Input and Comprehensible Output in Its Development’, *Input in Second Language Acquisition*, 15 (1985), 165–79.

¹⁹ Michael Long, ‘The Role of the Linguistic Environment in Second Language Acquisition’, *Handbook of Second Language Acquisition*, 1996.

the human sense²⁰. This marks a shift from socially grounded interaction toward interaction centered on information processing.

The ability of AI to simulate conversation enables forms of interaction that resemble real communication, including the provision of immediate linguistic feedback. From an interactionist perspective, such feedback may facilitate language development, particularly when learners notice discrepancies between their own production and target forms²¹. Nevertheless, AI-mediated interaction remains fundamentally limited, as it does not incorporate the social dimension that lies at the core of human communication.

According to Leo Van Lier²², language learning does not occur solely through exposure to input, but through engagement in rich ecological contexts in which language is embedded within social and cultural environments. From this perspective, interaction with AI tends to be decontextualized, thereby potentially reducing the depth of language learning experiences.

Furthermore, Merrill Swain²³ emphasizes that meaningful interaction involves collaborative dialogue, a process through which learners jointly construct understanding through authentic negotiation of meaning. In AI-based interaction, such dialogue is not fully realized, as AI does not genuinely collaborate but merely generates responses based on learned linguistic patterns.

From a pragmatic standpoint, Gabriele Kasper and Kenneth R. Rose²⁴ demonstrate that communicative competence entails an understanding of social norms, implicature, and cultural context. These dimensions cannot be fully represented in AI interaction, which tends to produce language in neutral and standardized forms.

Accordingly, while AI enhances the frequency and accessibility of linguistic interaction, the quality of such interaction remains fundamentally different from that of human interaction. AI-mediated interaction is largely instrumental and task-oriented, whereas human interaction is relational and contextually embedded.

In this light, the transformation of interaction in language learning should not be viewed as a replacement of human interaction, but rather as a reconfiguration of its function. AI can serve as a facilitator of initial practice, providing a space for linguistic experimentation without social pressure. However, it must be integrated with human interaction to ensure social meaningfulness and pragmatic depth. Consequently, negotiation of meaning in the age of AI should be redefined as a hybrid process that combines computational and social interaction in a complementary manner.

Personalized Learning: Between Efficiency and Dependency

One of the key contributions of artificial intelligence to learning lies in its ability to provide personalized learning experiences. Through continuous data processing, AI-based systems are able to identify patterns in learners' abilities, errors, and learning needs, and subsequently adjust instructional materials and forms of practice in a dynamic manner. Within this framework, learning no longer proceeds in a uniform way, but shifts

²⁰ Diane Larsen-Freeman and Marti Anderson, *Techniques and Principles in Language Teaching 3rd Edition* (Oxford university press, 2013).

²¹ Rod Ellis, *Understanding Second Language Acquisition 2nd Edition* (Oxford university press, 2015).

²² Leo van Lier, *The Ecology and Semiotics of Language Learning: A Sociocultural Perspective* (Springer, 2004).

²³ Merrill Swain, 'The Output Hypothesis: Theory and Research', in *Handbook of Research in Second Language Teaching and Learning* (Routledge, 2005), pp. 471–83.

²⁴ Gabriele Kasper and Kenneth R Rose, 'Pragmatic Development in a Second Language.', *Language Learning*, 2002.



toward a more responsive approach that accommodates individual differences among learners.

²⁵ note that the development of adaptive learning systems enhances efficiency by aligning instructional content with each learner's level of cognitive readiness. In the context of Arabic language learning, this is particularly significant given the diversity of students' backgrounds, including differences in vocabulary mastery, grammatical competence, and prior learning experience. In this regard, AI can play a bridging role by providing more flexible and targeted learning pathways.

Nevertheless, such efficiency is not without its challenges. The excessive use of AI may foster a growing dependency in the learning process. ²⁶ demonstrate that high levels of technological reliance can weaken learners' capacity for self-managed learning. Learners may become inclined to wait for system-generated guidance, rather than actively planning, monitoring, and evaluating their own learning processes.

Over time, this condition may affect the depth of learning, particularly in the context of language acquisition, which requires sustained practice and continuous reflection. As control over learning shifts from the individual to the system, metacognitive abilities that should otherwise develop may instead deteriorate.

For this reason, AI-driven personalization must be positioned proportionally within instructional design. Technology should function as a support that enhances the learning process, rather than replacing the active role of the learner. In this context, instructors remain essential in guiding the use of AI, ensuring that it not only improves efficiency but also preserves learner autonomy and the depth of critical engagement in Arabic language learning.

Cognitive Dimension: Cognitive Offloading and the Erosion of Depth in Thinking

One of the increasingly prominent concerns in the use of artificial intelligence in education is the phenomenon of *cognitive offloading*, referring to the tendency of individuals to delegate part of their cognitive processes to technological systems. In learning contexts, this occurs when learners rely on AI to generate answers, construct sentences, or complete tasks without engaging in sufficient cognitive processing. As a result, the mental engagement that should constitute the core of the learning process is significantly diminished.

From a theoretical standpoint, meaningful learning requires active engagement in processing information, connecting concepts, and reflecting on acquired understanding. ²⁷ emphasizes that effective learning depends on deep cognitive processing rather than passive reception of information. Within this framework, uncontrolled use of AI risks shifting learning from deep learning to surface learning, where learners focus on outcomes without adequately understanding the underlying processes.

Recent studies further indicate that the ease of access to intelligent technologies can reduce the cognitive effort required to complete tasks. ²⁸ found that when individuals are aware that information can be easily retrieved through technology, they tend to exert less effort to remember and understand it. This phenomenon, commonly referred to as the

²⁵ Zawacki-Richter and others.

²⁶ Debby R E Cotton, Peter A Cotton, and J Reuben Shipway, 'Chatting and Cheating: Ensuring Academic Integrity in the Era of ChatGPT', *Innovations in Education and Teaching International*, 61.2 (2024), 228–39.

²⁷ Richard E Mayer, 'Multimedia Learning', in *Psychology of Learning and Motivation* (Elsevier, 2002), xli, 85–139.

²⁸ Betsy Sparrow, Jenny Liu, and Daniel M Wegner, 'Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips', *Science*, 333.6043 (2011), 776–78.

Google effect, demonstrates that technology not only influences how people learn but also how knowledge is managed.

In the context of Arabic language learning, these implications become even more complex. Arabic requires not only vocabulary acquisition but also a deep understanding of grammatical structures, semantic relationships, and context-dependent usage, often embedded in textual and rhetorical traditions. When learners rely excessively on AI for translation or analysis, there is a risk that they may fail to grasp the underlying linguistic structures. This, in turn, may hinder the development of analytical and reflective linguistic competence.

Moreover, excessive reliance on AI may weaken metacognitive abilities, namely the capacity to plan, monitor, and evaluate one's own learning processes. According to ²⁹, effective learning often involves what they term *desirable difficulties*, challenges that encourage deeper thinking and strengthen long-term retention. If AI removes too many of these productive difficulties, learning may become faster but less meaningful.

For this reason, the integration of AI into language learning must be designed with care, ensuring that it does not replace cognitive processes but rather supports them. The use of AI should be directed toward enhancing higher-order thinking, such as analysis, reflection, and evaluation, rather than merely providing immediate answers. When implemented appropriately, AI can serve as a tool that enriches the learning process without compromising the depth of thinking that forms the foundation of language mastery.

Epistemological Disruption: Between Data and *Sanad*

The most critical dimension in the integration of artificial intelligence into Arabic language learning lies in the epistemological domain, namely how knowledge is produced, validated, and transmitted. Within the Islamic scholarly tradition, the validity of knowledge is determined not only by its content but also by the clarity of its sources and the chain of transmission known as *sanad*. Scholarly authority is established through a continuous and traceable transmission from teacher to student, ensuring both the authenticity and integrity of the knowledge conveyed ³⁰.

In contrast, artificial intelligence operates within a data-driven epistemological framework, in which knowledge is generated through statistical processing of large corpora without explicit mechanisms of authority or source validation. Such systems do not distinguish between epistemically sound and problematic knowledge; rather, they optimize outputs based on the most probable linguistic patterns. As noted by ³¹ language models do not possess an understanding of meaning or truth, but merely predict likely sequences of words.

The tension between *sanad*-based epistemology and data-driven epistemology becomes particularly pronounced in the context of Arabic language learning, especially when engaging with Islamic texts rich in interpretive nuance, historical context, and scholarly authority. The use of AI without an adequate validation framework risks oversimplification of meaning, excessive generalization, and even distortion of complex

²⁹ Elizabeth L Bjork and Robert A Bjork, 'Making Things Hard on Yourself, but in a Good Way: Creating Desirable Difficulties to Enhance Learning', *Psychology and the Real World: Essays Illustrating Fundamental Contributions to Society*, 2.59–68 (2011), 56–64.

³⁰ M M Azami, *Studies in Hadith Methodology and Literature* (American Trust Publications, 1978) <<https://books.google.co.id/books?id=qblMCwAAQBAJ>>; Jonathan A C Brown, *Hadith: Muhammad's Legacy in the Medieval and Modern World* (Simon and Schuster, 2017).

³¹ Bender and others.



concepts. In this regard, the epistemological risk extends beyond linguistic inaccuracies to encompass misunderstandings of the substance of knowledge itself.

From a broader philosophical perspective, AI represents a shift from authority-based epistemology toward probability-based epistemology.³² argues that in the digital information age, knowledge is increasingly produced through large-scale data processing, often neglecting the dimensions of context and authority. By contrast, within the Islamic intellectual tradition, as articulated by³³, knowledge is inseparable from *adab*, authority, and scholarly responsibility.

Accordingly, the integration of AI into Arabic language learning cannot be approached as a neutral process; it requires a clearly articulated epistemological framework. AI should be positioned as an instrument that facilitates access to and exploration of knowledge, rather than as an authoritative source that replaces the role of teachers and established scholarly traditions. In this context, the role of instructors becomes increasingly vital as validators, curators, and guarantors of the legitimacy of knowledge employed in the learning process.

Therefore, the epistemological disruption introduced by AI should not be viewed solely as a threat to be resisted, but as a challenge that calls for a reconstruction of how knowledge is understood. An integrative approach is needed to bridge traditional and digital epistemologies, enabling the effective use of technology without undermining the foundational principles that underpin Arabic language learning.

Curriculum Integration: Toward a Hybrid Epistemic Model

The integration of artificial intelligence into the Arabic language learning curriculum requires systematic and reflective design, rather than the mere pragmatic adoption of technology. A blended learning approach provides the most relevant framework, as it enables the convergence of human-centered pedagogical interaction and the efficiency of digital technology within an integrated learning ecosystem³⁴.

Within this framework, AI can function as a provider of linguistic input that enriches language exposure, as a facilitator of practice that supports autonomous and repeated learning, and as a tool for formative assessment that delivers rapid and adaptive feedback. These functions allow the learning process to become more flexible and responsive to individual needs, while maintaining a structured and goal-oriented instructional design.

However, such integration must not displace the central role of the instructor. In Arabic language learning, instructors retain authority as epistemological validators who ensure the accuracy of meaning, the validity of interpretation, and the alignment of instructional content with established scholarly traditions.³⁵ emphasize that the integration of AI in education must simultaneously consider pedagogical, ethical, and epistemological dimensions, ensuring that technological advancement enhances efficiency without compromising scholarly integrity.

Accordingly, AI-based curriculum integration should be directed toward the development of a hybrid epistemic model, in which technology is positioned as a

³² Luciano Floridi, *The Philosophy of Information* (OUP Oxford, 2013).

³³ Syed Muhammad Naquib Al-Attas, *Prolegomena to the Metaphysics of Islam* (Penerbit UTM Press, 2014).

³⁴ Charles R Graham, 'Emerging Practice and Research in Blended Learning', in *Handbook of Distance Education* (Routledge, 2013), pp. 333–50; D Randy Garrison and Norman D Vaughan, *Blended Learning in Higher Education: Framework, Principles, and Guidelines* (John Wiley & Sons, 2008).

³⁵ Zawacki-Richter and others.

supportive instrument, while epistemic authority remains grounded within a verified academic framework. This approach enables a balanced synthesis between digital innovation and intellectual depth in Arabic language learning.

Conceptual Model: Multi-Layer AI Integration in Arabic Language Learning

Based on a synthesis of the findings, the integration of artificial intelligence in Arabic language learning cannot be understood as a singular, purely technical process, but rather as a layered system involving the interaction of technology, pedagogy, cognition, and epistemology. Accordingly, a conceptual model grounded in multi-layer integration can be proposed, positioning AI within a structured and controlled framework.

At the first layer, technology functions as an infrastructure that provides access to learning resources, generates linguistic input, and facilitates system-based interaction. In this context, AI serves as a medium that expands learning possibilities, rather than as an end in itself.

The second layer concerns pedagogy, encompassing instructional design, teaching strategies, and evaluation mechanisms. At this stage, AI is utilized to enrich linguistic input, support interactive practice, and provide adaptive formative feedback. However, its effectiveness depends largely on how it is integrated within a well-designed pedagogical framework³⁶.

The third layer relates to the cognitive dimension, namely how learners process, comprehend, and internalize language. Here, the role of AI must be directed toward supporting active cognitive engagement rather than replacing it. Meaningful learning continues to depend on deep thinking, reflection, and the construction of meaning by learners themselves³⁷.

The fourth layer represents the epistemological dimension, which constitutes the foundational basis of Arabic language learning. At this level, the validity of knowledge, the credibility of sources, and scholarly authority become primary considerations. AI lacks mechanisms of *sanad* or scholarly authority, and therefore requires validation by human agents, particularly instructors, as guardians of epistemic integrity³⁸.

This model demonstrates that AI integration must be carried out in a layered and balanced manner. When any one of these layers is neglected, the learning process risks distortion, whether in the form of pedagogical reduction, cognitive weakness, or epistemological crisis. Thus, the multi-layer approach functions not only as a conceptual framework but also as a normative principle for designing AI-enhanced Arabic language learning that preserves both intellectual depth and epistemic validity.

Theoretical Implications: Redefining Language Learning

The findings of this study indicate that language learning can no longer be understood as a linear process progressing incrementally from input to output. Rather, it should be conceptualized as a complex system involving dynamic interactions among human agents, technological systems, and social contexts. Within this framework, language learning shifts from an individual acquisition model toward a distributed cognitive ecosystem, in which learning occurs through reciprocal relationships between learners and multiple sources of knowledge, including artificial intelligence.

This transformation implies the need to redefine fundamental concepts in second language acquisition. Interaction is no longer confined to human-to-human relationships,

³⁶ Zawacki-Richter and others; Graham.

³⁷ Richard E Mayer, *Multimedia Learning*, 2nd edn (Cambridge: Cambridge University Press, 2009) <<https://doi.org/DOI: 10.1017/CBO9780511811678>>.

³⁸ Azami; Floridi.



but also encompasses engagement with digital systems capable of mediating the learning process. Knowledge is not constructed solely through direct experience, but also through representations and simulations generated by technology. From this perspective, language learning becomes an adaptive, non-linear, and context-sensitive process.

Furthermore, these findings challenge the traditional distinction between tool and agent in learning. Technologies that were previously positioned as mere instructional media now function as integral components of the cognitive system, shaping how learners think about and understand language. This aligns with the view that learning in the digital age is inseparable from the networks of information that structure how individuals access and construct knowledge ³⁹.

Accordingly, the theoretical implications of integrating AI into language learning extend beyond the introduction of a new variable in the learning process. They point instead to a paradigm shift that requires a broader conceptual framework. Language learning must be understood as a complex, open, and distributed system that simultaneously integrates cognitive, social, and technological dimensions.

Practical Implications: Policy Design and Pedagogy

The integration of artificial intelligence in Arabic language learning calls for practical responses at the institutional level, particularly in the formulation of policy and pedagogical design. The use of AI cannot be left entirely to individual practice; rather, it must be governed by a clear institutional framework to ensure that its implementation remains purposeful, ethical, and aligned with educational objectives.

At the policy level, institutions need to establish comprehensive guidelines for AI usage that address limitations, ethical considerations, and academic responsibility. Such policies are essential to ensure that technology functions as a supportive learning tool rather than as a substitute for cognitive processes or a means of undermining academic integrity. They should also anticipate potential misuse, particularly in relation to assignments, assessment, and the production of academic work.

In addition, strengthening instructors' capacity is equally critical. Educators must be equipped with a solid understanding of how AI systems function, their pedagogical potential, and the associated risks. In this way, instructors are positioned not merely as users of technology, but as facilitators capable of integrating AI critically into the learning process. Continuous professional development is therefore essential, enabling educators to adapt to the rapid transformations of the digital educational landscape.

At the same time, assessment systems must undergo significant adjustment. Evaluation should no longer focus solely on final outcomes, but must also account for cognitive processes, originality of work, and the depth of learner engagement. This approach is crucial for maintaining academic integrity in an environment where AI tools are readily accessible. Accordingly, there is a need for innovation in assessment design, emphasizing more authentic forms such as process-based tasks, reflective assignments, and critical analysis.

Thus, the practical implications of AI integration extend beyond technological considerations, requiring transformation in policy, educator competence, and assessment systems. These elements must operate in synergy to ensure that the use of AI genuinely enhances the quality of learning rather than weakening its academic foundations.

³⁹ Siemens; Larsen-Freeman and Anderson.



Critical Synthesis: The Dialectics of AI in Arabic Language Learning

The emergence of artificial intelligence in Arabic language learning gives rise to a dialectical dynamic that cannot be reduced to a simple narrative of progress or threat. On the one hand, AI expands access to learning resources, enriches linguistic input, and enhances efficiency through personalization and immediate feedback. In this sense, technology contributes to the expansion of learning spaces that were previously constrained by environmental factors, time, and resource availability.

On the other hand, the integration of AI entails significant consequences, particularly in the cognitive and epistemological domains. Dependence on technology may diminish deep cognitive engagement, while the absence of scholarly validation mechanisms within AI systems introduces the risk of semantic distortion, especially in Arabic language learning, which is closely tied to textual traditions and scholarly authority. Thus, AI not only transforms how learning occurs, but also has the potential to reshape how knowledge itself is understood and recognized.

Within this framework, the relationship between AI and Arabic language learning should be understood as a dialectical interplay between two poles: innovation and tradition. Innovation offers efficiency and accessibility, while tradition safeguards depth, validity, and epistemic integrity. The tension between these poles is not something to be avoided, but rather to be managed constructively.

Accordingly, the appropriate response is neither uncritical acceptance nor outright rejection of AI, but a form of critical integration that situates technology within a coherent scholarly framework. In this position, AI functions as a tool that expands the possibilities of learning, while human agents remain the primary subjects who guide, interpret, and validate knowledge. Through such a balance, Arabic language learning can evolve adaptively without compromising its intellectual and epistemological foundations.

The present study contributes theoretically by redefining language learning as a hybrid human-AI cognitive system and by introducing the concept of a multi-layer epistemic integration model in Arabic language learning.

D. CONCLUSIONS

This study demonstrates that the integration of artificial intelligence in Arabic language learning constitutes a fundamental transformation that extends beyond technology into pedagogical, cognitive, and epistemological domains. AI expands access to linguistic input, enables personalized learning, and introduces new forms of interaction, offering solutions to long-standing structural limitations in Arabic language education. However, these advantages are accompanied by critical risks. Excessive reliance on AI may lead to cognitive offloading and superficial learning, while the absence of epistemic validation mechanisms raises concerns about the authenticity and authority of knowledge, particularly within the tradition of sanad in Arabic scholarship.

To address this complexity, the study proposes a hybrid epistemic model that positions AI as a supportive tool within a multi-layer framework, while maintaining the central role of educators as epistemic authorities. Therefore, the integration of AI should be approached through critical alignment, ensuring a balance between technological innovation and the preservation of intellectual depth and academic integrity.

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Author Contributions Statement

Author 1 contributed to the conceptualization and design of the study, the development of the theoretical framework, and the collection of relevant primary and secondary data related to Arabic language learning in the era of artificial intelligence. The first author also played a leading role in the analysis and interpretation of data, particularly in examining the opportunities and challenges of integrating artificial intelligence in higher education, and drafted the initial version of the manuscript.

Author 2 contributed to the refinement of the research methodology, as well as the linguistic and theoretical analysis. The second author was also responsible for the critical revision of the manuscript to enhance its academic rigor, coherence, and clarity, and participated in validating the findings and strengthening the discussion of the study.

Both authors collaboratively reviewed, edited, and approved the final version of the manuscript and take full responsibility for the accuracy and integrity of the work.

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Data Availability Statement

The data used in this study consist of secondary sources derived from published scholarly literature. This research is a conceptual qualitative inquiry based on library research, incorporating selected elements of a systematic literature review. The materials analyzed include peer-reviewed journal articles and academic publications obtained from reputable databases such as Scopus, Web of Science, and ScienceDirect, covering the period 2020–2025.

All data supporting the findings of this study are publicly available through these academic databases and published sources. No primary data or new datasets were generated during the course of this research.

Declaration of Interest Statement

The authors declare that there are no financial or non-financial conflicts of interest that could be perceived to influence the design of the study, the analysis or interpretation of the data, or the preparation of the manuscript. The authors received no funding from any organization that could give rise to a conflict of interest.

AI Use Statement

During the preparation of this manuscript, the authors used **ChatGPT (OpenAI)** solely for language editing, including improvements in grammar, clarity, and readability. The authors reviewed and edited the content and take full responsibility for the accuracy, originality, and integrity of the work.

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