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Artificial Intelligence-Based Arabic Language Learning: A Systematic Study of the Development and Challenges of Pedagogical Innovation

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Abstract

The significant growth rate of artificial intelligence (AI) in virtual learning has significantly changed learner-technology interactions, leading to pedagogical, cognitive, and ethical implications in terms of Arabic language learning. The study aims to explore the research trends and implementation difficulties associated with integrating AI in Arabic language learning through a Systematic Literature Review (SLR). The study used a systematic search on Scopus and Google Scholar databases using publications within 2023 to 2025, with 200 publications identified. Through a PRISMA-based literature review, 15 peer-reviewed articles were identified as eligible for synthesis. The review was conducted through a thematic coding framework using Constructivist Theory, Knowledge Creation Theory, and DIKW hierarchy as a theoretical foundation. The study found that AI plays a significant role in improving reading, writing, listening, and speaking skills through adaptive feedback, conversational agents, text generation tools, and speech recognition tools. The patterns identified through this review indicate that there are challenges associated with integrating AI in Arabic language learning, such as limited Arabic linguistic resources, inaccuracies in AI-generated text, morphological, and syntactical errors, readiness, and dependency on AI tools by learners. The review established that AI has significant transformative potential in Arabic language learning with appropriate pedagogy, educator readiness, and appropriate use of technology.
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INTRODUCTION

The last decade has seen many innovations in educational technology and changes throughout educational institutions in the teaching of foreign languages. There is strong evidence from researchers (Holmes et al., 2022; Sa'Idah et al., 2024; Pikhart & Klimova, 2025). These technologies have made it possible for educators to offer students more personalized, more efficient, and higher-quality feedback (Maiyanti et al., 2025; Pradana et al., 2025). As technology has been more widely used in the online learning environment, there have been increasingly complex interactions between humans and technology, with technology acting not just as an auxiliary tool, but also as learning agents that can create new content, to generate automated feedback, and to encourage or discourage learners' pathways of thinking. Such a shift has created important pedagogical, cognitive, and ethical questions. For example, will learners become dependent on technologies? What will be the impact on teachers' authority? Will learners have fewer opportunities to think critically and reflectively when they are taught through the use of

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technology? These issues are similarly present in the teaching of Arabic as a foreign language, which can be classified as both an international means of communication and a language of religion (Arifah et al., 2024). As a result, the implementation of educational technology in the teaching of Arabic must not only provide enhancements for educators but must also completely change how teachers, learners, and digital media interact in culturally complex and culturally-based learning environments.

Arabic language instruction takes place in a variety of settings in Indonesia, ranging from Islamic boarding schools (Madrasah) to the State Institute of Islamic Studies (PTKIN). Arabic's function as a language of religious expression links it to the Qur'an, Hadith, and traditional religious writing (Djuaeni & Usman, 2021; Kamal, 2025; Taufiqurrochman, 2025). Due to reforms in education, an increase in access to these resources has occurred via digital media (Kurniasih et al., 2025). The use of digital media in educational settings will allow for increased ways for students to learn through the use of annotated texts, interactive discussion forums, practice quizzes, and evaluation systems based on Arabic morphology. These resources will enable students to develop their skills with mufradāt, nahwu–sharaf, qirā'ah, kitābah, istimā', and kalām.

Previous research has highlighted the importance of artificial intelligence (AI) in the teaching of the Arabic language. Allaithy and Zaki (2025) in their study on the quality of reading text (qir'ah) produced by five different AI models, namely ChatGPT, Gemini, Copilot, JAIS, and Diffit, found that while there is considerable potential in using AI to produce intermediate reading content in Arabic, the pedagogical quality is variable depending on teacher intervention. In another study on the use of Generative AI by Arabic language teachers in preparing reading content, questions, and plans. Furthermore, Alkaabi et al. (2025) found that there is greater efficiency and diversity in content, but that there are concerns regarding plagiarism and student dependency. In another study that broadened the focus of this issue, Hanandeh et al. (2024) found that there is considerable potential as well as concerns regarding corpus, bias, and implications of using AI within the Arabic linguistic ecosystem.

Arabic language technology studies have highlighted the significance of machine learning and natural language processing in analyzing and classifying Arabic texts, thus facilitating the development of computer-based support for various applications related to the Arabic language (Aboalnaser, 2019). Other studies have focused on the application of technology in a specific linguistic element. Duwairi and Abushaqra (2021) developed a text augmentation method based on syntax and morphology, aiming to improve the effectiveness of "nahwu sharaf" exercises, thus demonstrating the potential of artificial intelligence in generating grammatically correct sentences in the Arabic language. At the same time, Asfar et al. (2024) highlighted the role of AI chatbots in the development of "istem'a" (listening) and "kalām" (speaking) skills, thus revealing the increased engagement of students, as well as the risk of relying on AI tools. Recent studies have focused on the role of technology in facilitating language learning, particularly in the application of chatbots as an effective tool for teaching languages. Li et al. (2025) highlighted the role of AI chatbots in facilitating language learning, thus revealing that the effectiveness of AI chatbots in teaching languages can be enhanced by applying the Activity Theory framework, which enables teachers, students, and technology to coordinate their activities more effectively, thus promoting flexibility in teaching and role distribution. At the same time. Meanwhile, Al-Shaboul et al. (2025) highlighted the role of AI in facilitating the development of various tasks related to the Arabic language, such as translation and voice recognition, although certain limitations in terms of linguistic elements were revealed. Other comparative studies have highlighted the role of AI in facilitating the development of various materials, thus promoting greater interaction and improved writing skills (Zubaidi et al., 2025).

Nevertheless, these contributions are not adequately reflected in the current body of research, which remains focused on individual skills or particular tools (Ouali & Garouani, 2024; Snyder, 2019). There is no comprehensive body of research that provides an integrated understanding of the interactional, pedagogical, and epistemological dimensions of artificial intelligence (AI). Thus, there is a lack of understanding of how AI, when examined as a complete system, affects the pedagogy of Arabic language learning in Islamic educational settings. The body of research published so far has focused primarily on examining technical aspects of how AI is performing, such as the precision of classifications or the speed of detecting errors, without looking

at how this type of data may impact pedagogy, the nature of interactions, and how we know things, as is commonly the case in research related to Arabic language learning in Islamic educational settings; this often means that little to no attention is paid to the integration of technology into education and how technology can create a comprehensive system of learning in general.

These emerging trends suggest an overall shift in the learning structure, facilitated by the advancement of technology. In the traditional learning environment, learning has traditionally been structured around a basic paradigm of educator and student, with the educator serving as the central source of information, and the student expected to absorb this information and process it accordingly (Goodwin, 2024). However, this basic two-part structure does not adequately address the needs of the current learning environment. The introduction of artificial intelligence has created an additional dimension of interaction between the educator, the student, and the technology, creating a much more malleable, dynamic, and engaging form of learning, with the AI technology capable of providing immediate feedback, engaging in simulated conversations, and creating individualized learning assignments (Ahmed, 2025). Nevertheless, the educator is still necessary, particularly concerning the linguistic correctness of the AI-generated assignments, as well as the ethical and epistemological implications of the assignments (Bahari et al., 2025; Qiao & Zhao, 2023)

This calls for an improvement in the digital literacy of the teachers, the refinement of the students' ability to critically evaluate, as well as an improvement in the teachers' understanding of the pedagogy of technology. The teacher is not just a facilitator of the learning process; they are expected to employ professional judgment in the authentication of the learning process itself. In this context, the possibility of a triadic relationship between teachers, students, and artificial intelligence offers itself as an innovative model of interaction in the learning of the Arabic language in Indonesia.

To bridge the research gap that has been identified, the current study is a Systematic Literature Review (SLR) that is expected to provide a clearer, integrated picture of the developments that are taking place. The study's contribution is the attempt to establish the link between innovation in the linguistic tools that utilize artificial intelligence and the broader educational reforms, as well as the emphasis on the teachers, the ethical dimension, and the educational context.

This study also conceptualizes the integration of AI as part of the larger pedagogical change that affects teaching methodologies, the role of the educator, and the students' learning experience itself, as opposed to the more technological integration of the tool itself. The theoretical framework of this study is informed by the following three pillars: Constructivist Theory (Piaget & Inhelder, 1969; Vygotsky, 1978) which discusses the construction of knowledge through the students' experiences with the tool; Knowledge Creation Theory (Nonaka & Takeuchi, 1995) which discusses the conversion of tacit knowledge to explicit knowledge and its role in the integration of AI in the study; and the DIKW framework by Rowley (2007) which discusses the conversion of data or information to knowledge and wisdom and its role in the integration of AI in the study. By using these theories as the framework of the study, the integration of AI in the learning of the Arabic language is not only viewed as technological innovation but also as a pedagogical strategy that meets the needs of the Arabic language curriculum itself.

METHOD

This current study is classified as a systematic literature review (SLR), based primarily on a review using descriptive qualitative methodology as outlined by Petticrew & Roberts, (2008) and Snyder, (2019). The rationale for employing Systematic Literature Review (SLR) methodology has proven to be methodologically compelling since it generates a sound, consolidated response to the research questions through an analysis of development trajectories and challenges associated with the application of artificial intelligence (AI) to Arabic language teaching, and how pedagogical practice is influenced by technology within Islamic higher educational institutions. Based on this focus, the research questions are formulated as follows:

- RQ1: What are the developments and directions of research related to the application of AI in Arabic language learning in the context of Islamic education?

- RQ2: What are the pedagogical, technological, and contextual challenges that arise in the application of AI for Arabic language learning?
- RQ3: How does AI-based innovation contribute to pedagogical transformation and improve the quality of Arabic language learning in the digital age?

The search strategy for the literature search involved searching scholarly databases such as Scopus and Google Scholar. In addition, international policy documents were also included in the search strategy. The search strategy included the use of the following search terms: ("Arabic language learning" OR "Arabic grammar" OR "Arabic NLP") AND ("Artificial Intelligence" OR "AI" OR "machine learning" OR "chatbot") AND ("grammar correction" OR "education" OR "text processing"). To ensure that the most recent trends in the use of Artificial Intelligence in Arabic language learning are included in the search results, the search period is limited to 2023-2025. Initially, the search results and data were processed using Publish or Perish (PoP) software. This software is used to retrieve bibliometric data such as citation count and impact factors.

The search results are exported in .RIS format and later processed using Zotero. Later, the search results were analyzed using VOS viewer. VOS viewer is used to create visualizations such as keyword co-occurrences, thematic trends, and patterns of scientific collaboration. In addition, thematic analysis and tabulation were done using Microsoft Excel. This allows for the categorization of the search results.

The selection of articles followed the guidelines set by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which is divided into four consecutive steps: identification, screening, eligibility, and inclusion. In the identification phase, 200 articles were identified through the specified sources. Of these, 80 were excluded before screening because of duplication (n=35), incomplete information in terms of abstract/metadata (n=18), non-English/Indonesian publications (n=12), and lack of relevance to the educational context (n=15), leaving 120 articles to be screened. In the screening phase, 75 articles were excluded because they did not specifically focus on Arabic language learning (n=28), did not specifically focus on AI application in education (n=31), and were not relevant to the themes after perusing the abstracts (n=16), leaving 45 articles that were eligible according to the criteria. In the eligibility phase, 30 articles were excluded because they were technically oriented toward NLP without pedagogical relevance (n=14), did not include the Islamic educational context (n=9), and were not available in full text (n=7), leaving 15 studies that met all criteria. The definitions of the inclusion and exclusion criteria in terms of thematic relevance, research design, publication quality, language accessibility, and pedagogical orientation toward AI are all systematically presented in Table 1, which serves as a type of analytical filter that is consistently used in all steps in screening and determining eligibility.

Table 1. Article Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion
The article discusses the relationship between AI and Arabic language learning (including the context of Islamic education).	The article is not relevant to the theme of AI and Arabic language learning.
Articles in the form of empirical research, systematic reviews, or literature reviews.	Opinion pieces, editorials, or articles that have not undergone peer review.
Published in indexed journals (Scopus, Google Scholar, or DOAJ) during the period 2024–2025	Published before 2023 or not available in full text.
Available in English or Indonesian and fully accessible.	Articles in other languages or that cannot be accessed in full.
Positioning AI as an intervention in the context of Arabic language learning.	Pure technical studies on NLP or machine learning without pedagogical relevance.

In the inclusion phase, we selected 15 articles for qualitative synthesis. These were chosen as they directly explored the integration of AI in Arabic language learning, were empirical or systematic reviews, published in an indexed journal, and were fully accessible. Figure 1 illustrates the selection process in detail.

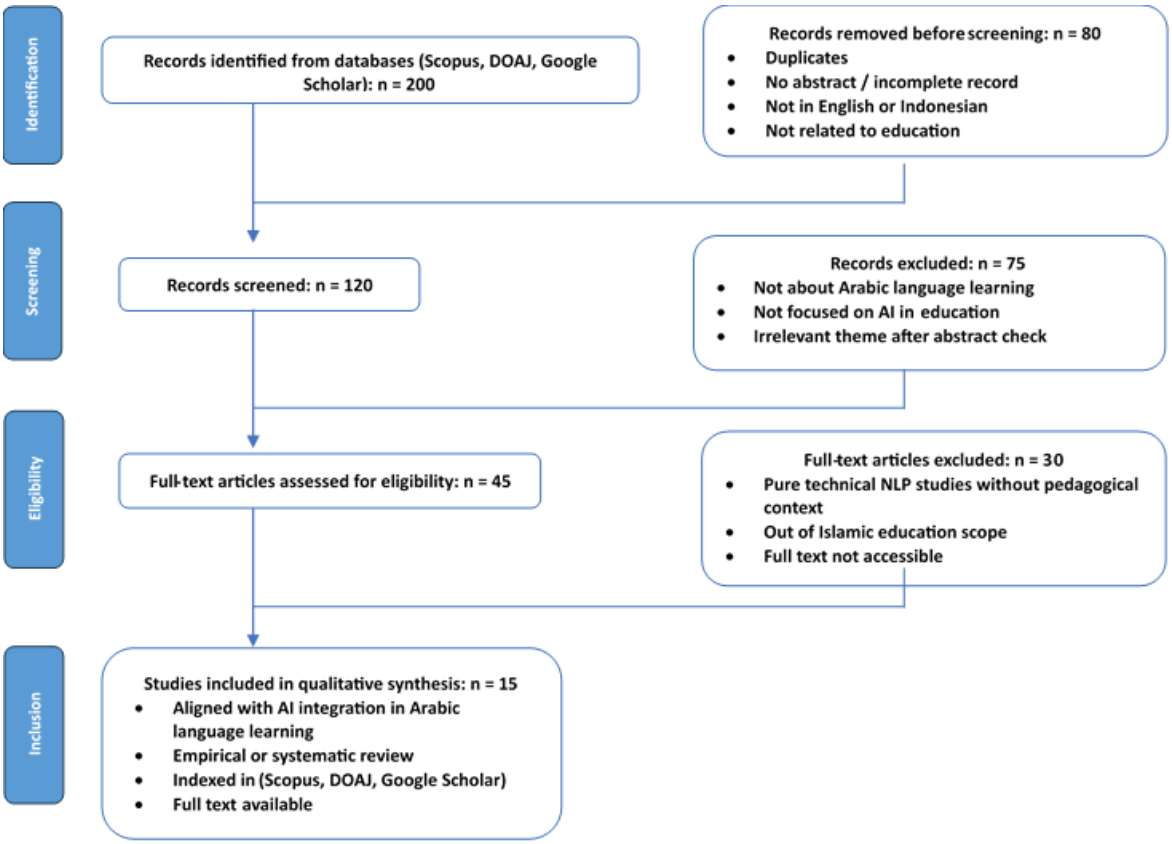

Figure 1. Prisma Flow Chart

The analysis of data was performed using thematic methods based on the thematic analysis process, which is divided into four parts: 1) Familiarising oneself with the data by reading all the selected articles thoroughly to understand the key concepts, context, and trends around themes in the data set; 2) Initial coding by highlighting all themes related to the research question, including the role of AI in teaching and learning the four language skills of the Arabic language, the role of the teacher in using AI, and any ethical issues related to the use of technology; 3) Theme grouping by creating themes using the codes created during initial coding; grouping codes into themes such as pedagogical innovations, ethical and technological challenges, and the relationship between AI and Islamic principles in education; and 4) Theme interpretation by synthesising the findings of the analysis with the theory used to explain the relationship between AI, self-directed learning and pedagogical transformation in Arabic language education.

This analysis is grounded in three fundamental conceptual frameworks. Firstly, the Constructivist Theory (Piaget & Inhelder, 1969; Vygotsky, 1978), which positions Artificial Intelligence as a scaffolding within the interactive learning environment, Knowledge Creation Theory as postulated (Nonaka & Takeuchi, 1995), offers an understanding of the conversion of knowledge from tacit to explicit, or vice versa, in human-technology interactions. Finally, (Rowley, 2007), a framework that offers an understanding of the application of created knowledge in a manner that is "meaningful" and "wisdom-oriented."

RESULTS AND DISCUSSION

The Development and Direction of AI Research in Arabic Language Learning

To illustrate the dynamic nature of research topics, keyword visualization is an important aspect in identifying the areas of focus for the field and the direction in which research is being conducted (Snyder, 2019; Petticrew & Roberts, 2008). Figure 2 shows the network visualization of keyword co-occurrence using VOSviewer, describing the relationship between keywords and key themes for research on the development of artificial intelligence for Arabic language learning.

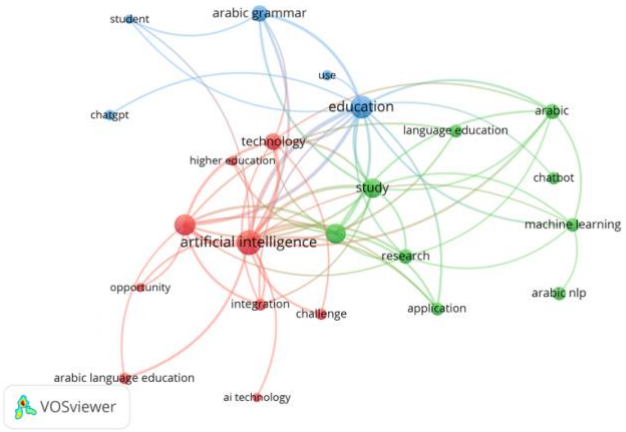

Figure 2. VOS-Viewer Display for Type of Analysis Network Visualization

From the visual pattern of the keyword frequencies in Figure 2, three main clusters are identified, each suggesting a different path that AI research is taking with respect to learning Arabic. The red cluster revolves around themes such as artificial intelligence, technology, and integration, indicating that there is significant interest in using AI as well as in the challenges that lie ahead in using AI in higher learning institutions. The green cluster revolves around themes such as Arabic, Chatbot, machine learning, and Arabic NLP, suggesting that there is significant momentum building around using AI-based applications and tools to teach Arabic. The blue cluster revolves around themes such as using AI in teaching, as indicated by words such as education, Arabic grammar, and students, suggesting that the future of AI in Arabic learning is integrated with technology and linguistics, as is currently being seen with AI-based language learning (Bahari et al., 2025; Li et al., 2025).

Aside from the network structure, the overlay visualization in Figure 3 illustrates the evolution of research themes over time, indicating the usage of keywords in particular periods.

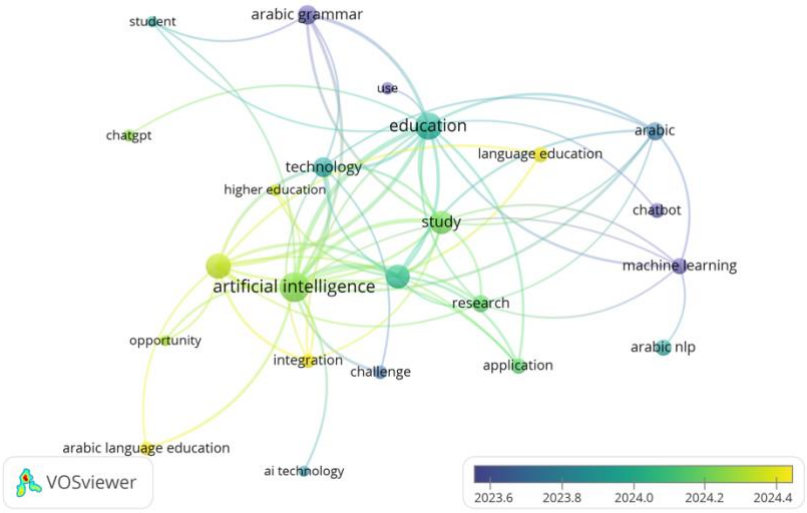

Figure 3. VOS-Viewer Display for Type of Analysis Overlay Visualization

The trend map in Figure 3 shows this shift in research focus. The map starts with more traditional linguistic research and moves into research focused on the application of artificial intelligence tools in education. The words highlighted in yellow, 'Artificial Intelligence,' 'Technology,' and 'Integration,' show the newest research topics, indicating an increased interest in integrating AI into higher education and Arabic language education. The words highlighted in blue, 'Machine Learning,' 'Chatbot,' and 'Arabic Grammar,' show more traditional research topics, focusing on technical and grammatical aspects. Overall, the map reveals the changing direction of the research towards a more contextualized and application-oriented orientation, in which AI

technologies are increasingly being used to improve Arabic language learning and raise the quality of teaching in the digital age.

To further expound the major research direction revealed by the bibliometric mapping, the thematic synthesis of the selected studies is presented in Table 2, which highlights the major themes, key areas of concern, and findings with regard to AI-based Arabic language teaching.

Table 2. Thematic Synthesis of Research on Artificial Intelligence (AI)-Based Arabic Language Learning

Main Theme	Researcher & Year	Research Focus	Findings and Implications
Pedagogical Innovation and the Effectiveness of Arabic Language Learning	(Ahmed, 2025; Borham et al., 2024; Imaduddin & Bahruddin, 2025; Mulyanto et al., 2024; Sa'Idah et al., 2024; Shalihah et al., 2025; Sismat et al., 2025)	Assessing the effectiveness of AI (ChatGPT, Tashkeel Chatbot, TTS, and conversation simulation) in improving Arabic language learning outcomes.	AI improves learning outcomes, motivation, and self-directed learning. Adaptive feedback features strengthen students' linguistic abilities and self-reflection. Teachers act as facilitators, not centers of knowledge.
Development of Arabic Linguistic Technology	(Allaithy & Zaki, 2025; Kurniasih et al., 2025; Ouali & Garouani, 2024)	Evaluation of the quality of NLP and AI-based Arabic translation systems.	Morphological and syntactic errors were found in the AI-generated text. A hybrid model based on rule-based and machine learning needs to be developed so that AI is more sensitive to variations in Arabic dialects.
Institutional Challenges and AI Ecosystem Readiness in Islamic Education	(Adawiyah, 2025; Hanandeh et al., 2024)	Researching barriers to AI adoption in Islamic universities.	The main obstacles include digital infrastructure, AI literacy, and institutional policies. The main recommendations are to improve lecturer training and provide an AI learning policy framework at PTKIN.
Pedagogical Transformation and Interactive Learning Design	(Al Rajab et al., 2023; Asfar et al., 2024; Zubaidi et al., 2025; Shalihah et al., 2025; Sismat et al., 2025)	Examining the paradigm shift from traditional teaching to AI-integrated learning models.	AI promotes adaptive, contextual, and collaborative learning. The Human–AI Collaboration model increases student productivity and learning accuracy. Smart Book AR fosters an engaging multisensory learning experience.
Ethical Dimensions and Spiritual Values in Islamic Education	(Asfar et al., 2024; Hanandeh et al., 2024; Zubaidi et al., 2025)	Examining the moral and epistemological implications of using AI in Islamic education.	AI needs to be directed towards strengthening wisdom and ethics, not just technological efficiency. The integration of AI should support tazkiyah al-nafs (self-purification) and tafakkur (scientific reflection) in Arabic language learning.

The synthesis of the fifteen selected studies (2023–2025) by cross-study revealed that there are 3 primary research orientations found: (1) effectiveness of teaching about AI and innovation, (2) language and technology refinement associated with the use of AI, and (3) context related to institution or ethical perspective (refer to Table 2).

The majority of studies found that the pedagogical effectiveness of AI in teaching was an area of convergence. There is evidence based on empirical data that shows improvement in student engagement, grammar, pronunciation, and the ability to direct their own learning as a result of using AI. For Example, Sa'Idah et al. (2024), through partial least squares structural equation modeling (PLS SEM), found that artificial intelligence (AI) significantly increases student engagement and learning outcomes. Lecturer training is seen to amplify this impact. Ahmed (2025) found that there is a significant improvement in students' proficiency in nahwu sharaf through the use of artificial intelligence in correcting grammatical errors. The study found that there is an increase of thirty percent on average. In a similar study, Mulyanto et al. (2024) found that natural language processing (NLP), as embodied by text-to-speech, improves listening and speaking skills. The study by Borham et al. (2024) on conversation simulations using artificial intelligence found that this improves speaking fluency. Imaduddin and Bahruddin (2025), through an experimental study, found that adaptive feedback and gamification features on platforms such as Busuu, AlifBee, and Arabits significantly improve proficiency in all four skills. These studies see artificial intelligence as a facilitator of adaptive learning that increases learner independence rather than replacing lecturers.

The second set of studies, albeit limited in numbers, points to the challenges that are faced by artificial intelligence in mastering Arabic. The studies by Allaithy and Zaki (2025), Kurniasih et al. (2025), and Ouali and Garouani (2024) all point to similar problems with morphological, syntactic, and dialectal consistency in artificial intelligence-generated texts. The studies point to a common issue that, despite the pedagogical use of artificial intelligence, there is a problem with Arabic linguistic structure.

Thirdly, institutional readiness and ethical framing also come into view as an evolving and somewhat less explored area. Adawiyah (2025) and Hanandeh et al. (2024) point to infrastructural constraints, limited AI literacy among lecturers, and the absence of comprehensive institutional policy frameworks within Islamic higher education. Complementing this, Asfar et al. (2024) and Zubaidi et al. (2025) also touch upon the ethical and epistemological aspects, emphasizing that the effectiveness of technology should not be allowed to override the learning paradigms of reflection and values.

Overall, as one can see by analyzing the studies as presented above, there is a clear pattern in the development of research on AI-driven Arabic language learning: from tech experimentation to pedagogical validation, and then to institutionalization/ethics. While most studies report on the positive aspects of teaching, there are not as many studies on system readiness/epistemology, highlighting a gap in tech innovation vs. actual change.

Pedagogical, Technological, and Contextual Challenges in Implementing AI in Arabic Language Learning

While the benefits of artificial intelligence in learning the Arabic language are often cited, an analysis of different studies reveals that there are significant limitations in the language and technology. In different studies on the use of artificial intelligence in learning the Arabic language, two issues have been raised: the complexity of the language and the scarcity of quality data in artificial intelligence. In one study on the use of artificial intelligence in generating Arabic text, grammatical and syntactical issues were found to be significant (Allaithy & Zaki, 2025). Similar issues can also be seen in the general analysis of the development of Arabic chatbots, which points out the issues of dialects and the lack of datasets as the major problems in the accurate processing of the language (Ouali & Garouani, 2024). The findings suggest that the development of AI technology in the Arabic language learning process should be hybrid in nature.

Apart from the technological limits, the readiness of the institution is highlighted as an overarching challenge, as many studies have shown. The overall consensus of these studies is that the success of AI in Arabic language education depends not only on the level of technological advancement but also on the readiness of the institution. The challenges that have been

consistently identified in the implementation of artificial intelligence in Islamic higher education institutions include the lack of digital infrastructure, the lack of AI literacy, and the lack of strategic policy frameworks (Adawiyah, 2025). Complementing this perspective, Hanandeh et al. (2024) The main challenge lies in human resource development and collaboration on an interdisciplinary basis, not on a purely technological basis. These findings suggest that the integration of AI in the learning of the Arabic language calls for simultaneous advancement in technology refinement, institutional preparedness, and educator expertise.

Pedagogical Transformation and Interactive Learning Design: AI-based Arabic language learning

Some of the studies referred to in the article were not only chosen with regard to their focus on the technical aspects, but they were also chosen with regard to the emphasis they place on the underlying paradigm shift in learning. In the study by Asfar et al. (2024) he shift that AI-based learning of the Arabic language has brought about from the traditional teacher-centered approach to a learner-centered approach is discussed, with AI playing the role of scaffolding, i.e., an enabler of the learner's construction of knowledge independently (Vygotsky, 1978; Piaget & Inhelder, 1969).

The research by Shalihah et al. (2025) confirms these findings as it reveals the effectiveness of chatbots in improving students' reading skills, or maharah qirā'ah, through an experiment that combined both quantitative and qualitative methods. The study found that the group that benefited from the chatbot learning experience had an improved level of understanding and reading speed compared to the traditional learning group or the control group. It appears that the chatbot acts as an interactive learning tool that assists in the development of Arabic literacy.

Similarly, research by Sismat et al. (2025) sheds light on the role of ChatGPT as an auxiliary tool for the learning needs of non-Arabic speakers. By employing a qualitative methodology using focus groups (FGD), this research demonstrates how the tool may be used to help produce paraphrases, translations, and/or sentence structures. Additionally, this study identifies the need for some sort of ethical foundation for using the tool, especially with respect to potential risks of creating dependency and/or morphological errors.

Meanwhile, research by Zubaidi et al. (2025) conducted research that suggests a three-dimensional model of human and artificial intelligence working together to teach writing skills (maharah kitābah). According to their study, AI will automate corrections to help learners' writing. The educator acts as a validator of the learner's corrected product and a conceptual guide. The results of the study showed that learners improved their writing skills by 12% and reflected more on their language errors.

Another important finding comes from Al Rajab et al. (2023). They developed an augmented reality (AR) AI "Smart Book" for young learners in Palestine. The Smart Book used augmented reality to allow learners to interact with 3D characters and enhanced how well they retained what they learned through a visually stimulating learning environment. Therefore, AI enhanced writing skills, but also the way learners interact with the learning environment

There is evidence from this research that using an AI-based approach to teaching the Arabic language through a framework of Islamic education has not only enhanced learners' academic results but has also caused a change in how students, educators, and technology interact with one another. In other words, in addition to being sources of knowledge, educators are also sources of moral values.

Ethical Dimensions and Spiritual Values in Islamic Education

The studies by Asfar et al. (2024) and Zubaidi et al. (2025) give special attention to the ethical aspect of using artificial intelligence in Islamic education. It is emphasized that artificial intelligence must not replace human intelligence; instead, it is expected that it will be a cognitive companion in the pursuit of knowledge while upholding the values of "manners and wisdom." In using artificial intelligence, spiritual awareness is promoted through tafakkur and tazkiyah al-nafs, not merely efficiency in knowledge pursuit. This approach is in line with the views of Hanandeh et al. (2024). In line with the views of scholars in the development of humanistic and value-oriented artificial intelligence, it has been argued that technology has the potential to affect human cognition and how

knowledge is engaged. In this regard, artificial intelligence in Islamic education should be developed in such a manner that it sustains the balance between reason (aql), heart (qalb), and revelation (wahy) in the study of the Arabic language.

It appears from the literature reviewed that the use of artificial intelligence for teaching and learning Arabic may have evolved into a multi-disciplinary and reflexive approach. In addition, it appears that technology does not simply serve as a tool for teaching, but rather represents an overall shift in pedagogy towards new ways of learning, interacting, and comprehending language. The challenges associated with this shift that still exist relate primarily to data, teacher preparation, and Islamic values being upheld in how technology is used. As a result, it seems that any future Arabic instruction that utilises artificial intelligence will be the product of both the integration of technology and educational philosophy/spirituality teaching methods.

The Contribution of AI Innovation to Pedagogical Transformation and the Quality of Arabic Language Learning

The analysis in this literature shows that AI-based Arabic e-learning designs are evolving towards more interactive, contextual, and reflective learning models. The integration of AI in Arabic language learning not only serves to automate linguistic correction but also becomes a pedagogical instrument that changes the way learners interact with the language.

In general, e-learning designs that have emerged from various studies emphasize the importance of integrating the four main Arabic language skills (maharah kalām, kitābah, istimā', and qirā'ah) into a single interconnected digital system. The four skills are not developed separately, but within an adaptive and feedback-based learning framework (adaptive feedback system) that is reinforced by AI technology. The following are some suggestions for Arabic language learning designs using AI.

Learning Design for Mahārah Kalām (Speaking Skills)

The development of e-learning-based maharah kalām will thus require an interactive model with the ability to simulate natural communicative contexts and provide feedback mechanisms. The digital speaking practices currently used in several virtual learning environments, as presented by various digital tools, still heavily rely on general video-conferencing tools. These tools allow for real-time interaction, though they cannot provide an integrated feedback mechanism to evaluate students' pronunciation, syntax, and fluency. This statement is supported by Borham (2024), who designed the AI-based E-Muhadathat Kit, an Arabic conversation simulation for non-Arabic speaking students, to improve students' fluency significantly.

The most suitable e-learning model for kalām at PTKIN will thus involve an interactive model based on AI conversational agents such as ChatGPT and JAIS, designed to simulate contexts of academic and socio-Islamic discourse. The students will interact with the conversational AI and then automatically receive feedback regarding sentence structure, vocabulary, and pronunciation. The speech-to-text and text-to-speech capabilities of Natural Language Processing (NLP) may thus be used to evaluate fluency and intonation, as presented by Mulyanto et al. (2024) in an Arabic pronunciation training system.

In addition, the e-learning model will thus incorporate a dashboard to allow students to reflect on their interactions based on AI feedback scores. This will promote students' habits of auto-correction, which is one of the key elements of the self-regulated learning theory. In this way, maharah kalām will no longer need lecturer intervention to improve and will instead become more dynamic through continuous interaction with AI tools.

Learning Design for Mahārah Kitābah (Writing Skills)

In the domain of maharah kitābah, the main challenge that emerged in the interviews is the limited time that instructors have in providing feedback on students' writing. Instructors observed that students' writing skills in Arabic are not fully developed in terms of their knowledge of nahwu-sharaf, structural coherence, and vocabulary. The research by Zubaidi et al. (2025) provided an actual solution in their study on how the Tridimensional Human-AI Collaboration model can be applied in addressing the challenge in maharah kitābah. In this model, the instructors are the validators and concept developers, while the AI is the proofreading tool. This model has been

proven effective in achieving grammatical accuracy and encouraging students' independent revision of their work.

Syntactical errors and suggest corrections with explanations on grammatical rules. In this way, students can learn from their mistakes without waiting for instructors' feedback. Ahmed's (2025) research shows that such systems improve students' understanding of tarkīb al-jumlah by up to 30% compared to traditional methods.

In addition, it is crucial to foster reflection as part of the writing process. The e-learning system has the potential to provide students with an AI journal feedback space wherein students write their daily Arabic reflection about their learning experience. The artificial intelligence will assess students' text organization, idea development, and vocabulary usage. In this way, students not only practice their writing skills but also improve their awareness of their skill development. Mahārah kitābah is used as an approach for scientific character formation, where students' precision of reasoning and accuracy of expression are honed through artificial intelligence.

Learning Design for Mahārah Istimā' (Listening Skills)

Listening skills (istimā') form one of the fields that have recorded remarkable benefits from the development of AI technology. Previous studies showed that listening exercises in Arabic language learning are still limited to traditional media such as recorded audio or online videos without the inclusion of an evaluation system. In this respect, the study by Mulyanto et al. (2024) suggested an NLP-based method of text-to-speech (TTS), which can generate native Arabic speaker voices with varying dialects and speech rates. The method recorded a remarkable improvement in phonetic perception and comprehension skills for non-Arabic speaking learners.

The best e-learning approach for maharah istimā' for PTKIN is an integration of speech synthesis and analytics of listening comprehension. In this approach, students' understanding of audio content is assessed through voice recognition technology for automatic quizzes. The AI evaluates students' performance and adjusts the difficulty of tasks based on their previous performance. For example, students who frequently fail to recognize patterns of fi'il mujarrad will be given adaptive retraining tasks with features such as reduced speech rate and additional texts. This approach not only improves listening skills but also improves phonology, an essential skill for Arabic language learning.

In addition, this approach may be further enhanced through an integration with an AI conversation practice tool. This allows for an immediate shift from listening and understanding to responding. This approach places istimā' in an entire process of communication instead of being isolated from kalām. The students will be engaged in listening, understanding, and responding through a natural and contextual framework. An additional component of self-reflection, for example, would be to include students' use of listening journals to document the addition of new vocabulary words and their definitions following each practice. This approach enhances memorization as well as encourages student accountability for their own learning (a fundamental aspect of self-directed education).

Learning Design for Mahārah Qirā'ah (Reading Skills)

Authentic, adaptable digital reading material that matches with student proficiency levels was identified as being a key barrier to developing effective eLearning for maharah qira in both the literature review and the interview study from a perspective of reading competencies. Lecturers still heavily rely on static reading material, either in the form of books or PDF files, that lack interactivity in the form of multimedia or gamification tools. A study by Allaithy & Zaki (2025) reveals that the use of artificial intelligence in the form of reading material generated through tools such as ChatGPT, Gemini, and Diffit has tremendous potential in the form of reading material that matches the difficulty level and content of the material, but it still needs to be edited to maintain the naturalness of the syntax of the Arabic language.

Therefore, the e-learning platform for maharah qirā'ah needs to incorporate two functions: the adaptive reading generator and the interactive comprehension tool. It needs to incorporate artificial intelligence in the form of the generation of reading material with variable lengths and structures according to the abilities of the reader, followed by the evaluation of the understanding of the material through the generation of automatic, semantic-based questions. It also needs to

annotate the vocabulary of the reader and provide links to dictionaries such as Al-Ma'āni or Tanzil.net to assist the reader in improving his or her vocabulary skills. By integrating the webcam, it also needs to examine the reading habits of the students to evaluate the level of focus and reading speed.

The reading education model has the potential to significantly promote autonomous reading habits among learners. The learners can engage with reading materials that are relevant to their interests, such as interpretation, culture, or science, and get instant feedback on their reading comprehension. The adaptive reading model not only improves language skills but also develops intellectual interest in reading. In Islamic education, reading is not just limited to understanding literal meanings but is also associated with tadabbur, or contemplation, of knowledge. Hence, within this framework, AI-based maharah qir'ah has the potential to fulfill two functions: developing language skills and promoting intellectual interest in reading.

Empirical studies on various aspects of AI-based reading models have found that there is an integrative pattern in which AI acts as a cognitive partner that reinforces the relationship between humans and technology in the learning process. In the context of AI-based e-learning models, it has been found that the results of mastering one skill can be used as input for other skills, such as using results from listening skills as input for speaking skills, or using written text as input for reading skills. The cyclical pattern is associated with constructivist learning models in which knowledge is constructed through dynamic interactions with the learner's environment. The implications of this study on the use of AI-based Arabic e-learning models point to the importance of developing a cohesive, adaptive, and reflective learning ecosystem. The implications of this study on using AI-based e-learning models in Islamic education point to the importance of not just promoting technological efficiency but also ensuring pedagogical meaning that is associated with intellectual and ethical values, ensuring that AI is used as a partner in developing Arabic language proficiency with scientific integrity.

Results from this study demonstrate something larger than just the usage of AI simply as a tool, because AI acts as a "catalyst" for new types of interaction between human learners. Since we are now able to collaborate with AI, this opens up new avenues of adaptive learning/collaborative learning methods, while at the same time providing teachers with validation, ethics, and authority as an educator within the classroom setting. All of this ensures that AI-created content is not only linguistically accurate but also has pedagogical wisdom, due to the Islamic values incorporated in the material created through the use of AI. These results show that the future of teaching the Arabic language will be based upon a blending of innovative approaches to education along with value-based teachings.

LIMITATIONS

There are two key limitations in this study. First, there are relatively few studies on artificial intelligence and Arabic linguistics published from 2023 through 2025. Thus, the results of this review may not be generalizable to all of the available research on this topic. Second, the methodologies used by the researchers in these studies exhibit considerable variability, both in terms of their methodologies (e.g., methods of data collection) and in terms of their sample sizes, evaluation criteria, and so forth. This variability will present significant challenges in conducting a comprehensive comparative analysis or synthesizing the results from one study to another. Finally, the tools used in the above-mentioned studies also exhibit different levels of technological maturity, and Islamic institutions of higher education exhibit different levels of institutional maturity. Therefore, this will further limit the extent to which one can generalize the findings from these studies. In addition, the majority of the studies reviewed have emphasized the technological capabilities of these tools rather than the potential long-term educational or ethical implications of their use.

CONCLUSION

This study claims that AI in teaching Arabic has developed from using only technology to using both the textbook and technology. Rather than simply automating language, AI will be an integral part of how we build an interactive learning environment. For example, using chatbots,

text-to-speech, and an Essay Assistance Application has enabled Arabic learners to interact with Arabic in a much more contextually relevant manner. This is thus a change from the traditional model of education to one that uses AI as a mental partner in the collaborative learning process. The review, however, points to some of the challenges that may affect the implementation of AI in the context of Islamic education, including the availability of Arabic language corpora, the lack of automated assessment tools that are compatible with the linguistic structure of the Arabic language, as well as the readiness of the educational institutions and the instructors themselves. Of great concern is how to integrate ethics into AI systems and ensure AI can provide an educational outcome that is aligned with the principles of Islamic pedagogy, while also respecting the humanity of the education process. AI, therefore, has tremendous potential in the education of the Arabic language, especially with regard to the effectiveness of the learning process, the availability of digital resources, and the learner-centered approach itself. Future studies, therefore, should focus on the construction of an integrated AI-based e-learning design that combines maharah kalām, kitābah, istimā', and qirā'ah in an adaptive learning environment that balances technological, pedagogical, and ethical concerns.

AUTHOR CONTRIBUTIONS

YH led the conceptualization, research design, synthesis, and development of the full manuscript draft, thereby making the most significant contribution to this study. SNA assisted with article screening, thematic analysis, and refining pedagogical interpretation. MMu provided expertise in Arabic linguistics and Islamic epistemology in terms of education, ensuring that the study is aligned with linguistics as well as ethical considerations. MMa assisted with data extraction, visualization, and language editing. All authors reviewed this manuscript for approval.

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