

Artificial Intelligence Applications in Teaching Arabic to Non-Native Speakers: Opportunities, Challenges, and Future Directions

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ABSTRACT

This paper examines the applications of artificial intelligence in teaching Arabic to non-native speakers, focusing on educational opportunities, linguistic, pedagogical, and ethical challenges, and future directions. It is grounded in recent developments in generative artificial intelligence, natural language processing, adaptive learning systems, and conversational agents, all of which are reshaping language learning environments. The study adopts a descriptive-analytical review approach by synthesizing recent literature on AI in education, AI in language learning, and Arabic language learning for non-native speakers. The paper argues that AI offers significant potential for personalized learning, intensive language practice, immediate feedback, and the development of listening, speaking, reading, and writing skills. However, its effective use in Arabic language education depends on the quality of Arabic datasets, the ability of AI models to handle Arabic morphology, syntax, semantics, and dialectal variation, teachers' readiness, institutional infrastructure, and clear ethical and academic policies. The paper recommends an integrative model in which AI supports rather than replaces teachers, while balancing technological innovation with pedagogical control and the linguistic-cultural specificity of Arabic.

Keywords: Artificial intelligence; generative AI; teaching Arabic to non-native speakers; natural language processing; adaptive learning; language education.

INTRODUCTION

Over the past decade, education has undergone a rapid transition from traditional models based on direct instruction and physical classroom attendance to more flexible approaches that rely on digital platforms, open educational resources, learning analytics, and intelligent interaction between learners and educational content. This transformation has been further accelerated by the emergence of generative artificial intelligence applications capable of producing texts, generating questions, summarizing content, simulating dialogue, and providing immediate feedback. Artificial intelligence is no longer merely a supportive tool for educational administration or data analysis; rather, it has become an integral part of the educational experience itself, particularly in language education, where learners require continuous practice, repeated interaction, direct correction, and gradual exposure to linguistic input.

Within this context, the Arabic language occupies a distinctive position. Arabic is a global language with extensive religious, cultural, and academic significance, and it is taught to non-native speakers in numerous universities, institutes, and educational centers both within and beyond the Arab world. Nevertheless, teaching Arabic to non-native speakers involves multiple challenges, including the nature of the Arabic writing system, the coexistence of Modern Standard Arabic and regional dialects, the richness of the morphological system, and the complexity of certain grammatical and phonological structures. These challenges are further compounded by the diversity of learners' backgrounds and objectives, as some study Arabic for religious, academic, professional, communicative, or cultural purposes. Such characteristics necessitate the development of educational tools capable of accommodating individual differences while providing extensive and contextualized linguistic practice.

Accordingly, the growing significance of research on artificial intelligence applications in teaching Arabic to non-native speakers becomes evident. These applications offer valuable opportunities for personalizing learning

pathways, analyzing learners' errors, designing interactive activities, facilitating virtual conversations, and supporting the acquisition of vocabulary, grammatical structures, pronunciation, and writing skills. However, these opportunities are accompanied by significant challenges. AI language models may occasionally generate inaccurate information or linguistically inappropriate examples that do not align with learners' proficiency levels. They may also struggle to distinguish accurately between Modern Standard Arabic and dialectal varieties, between classical and contemporary styles, or between linguistically correct and pedagogically appropriate usage. Furthermore, the unregulated reliance on artificial intelligence raises important concerns related to academic integrity, data privacy, equitable access, the evolving role of teachers, and the quality and reliability of assessment.

In light of these considerations, this paper seeks to provide a scientific and analytical examination of the topic by addressing the following questions: What are the most significant artificial intelligence applications that can be employed in teaching Arabic to non-native speakers? What educational opportunities do these applications provide? What linguistic, pedagogical, and ethical challenges should be carefully considered? Finally, what future directions may shape the development of this field?

The significance of this paper lies in its integration of three interconnected fields of knowledge: teaching Arabic to non-native speakers, educational technology, and artificial intelligence in language education. In addition, the study aims to provide a practical framework that may benefit researchers, language instructors, curriculum designers, and developers of educational platforms.

METHODOLOGY

This study adopts a descriptive-analytical approach based on a comprehensive review of recent literature related to artificial intelligence in education, artificial intelligence in language learning, and its applications in teaching Arabic to non-native speakers. This approach involves collecting and synthesizing relevant knowledge, scholarly studies, and both theoretical and practical trends, followed by critically analyzing them within the context of Arabic language education for non-native learners. The study does not seek to examine the effect of a specific technological application on a particular sample; rather, it aims to construct an analytical framework that contributes to understanding the field, identifying its opportunities and challenges, and exploring its future directions.

In selecting the literature, priority was given to recent studies published in peer-reviewed academic journals and reliable scholarly sources, with particular emphasis on publications released after 2020 whenever possible. This focus reflects the rapid technological developments that followed the emergence of generative artificial intelligence models. In addition, international reports issued by specialized organizations, particularly UNESCO, were consulted because of their significance in shaping educational and ethical policies related to artificial intelligence.

The analytical framework employed in this paper operates across four interconnected levels. The first is the conceptual level, which examines definitions of artificial intelligence and its relationship to language education. The second is the applied level, which explores the most prominent AI tools and applications relevant to teaching Arabic. The third is the critical level, which discusses the pedagogical, linguistic, and ethical challenges associated with the integration of artificial intelligence into language education. Finally, the fourth is the prospective level, which proposes future directions and emerging trajectories for the development of this field.

Conceptual Framework: Artificial Intelligence and Language Education

Artificial intelligence refers to the ability of computer systems to perform tasks that typically require human capabilities, such as learning, reasoning, language understanding, decision-making, and prediction. In educational contexts, AI applications vary widely, including intelligent tutoring systems, adaptive learning, learning analytics, educational robots, automated correction tools, virtual assistants, and generative language models. Recent literature generally agrees that the value of artificial intelligence in education does not lie in the technology itself, but rather in its ability to support learner-centered education, provide immediate feedback, generate accurate data on learners' performance, and assist teachers in making more informed instructional decisions.

Language education differs from other educational fields in that it requires continuous communicative practice. Language learning is not achieved merely through the knowledge of grammar rules or the memorization of vocabulary; rather, it requires sufficient linguistic exposure, interaction, language production, correction, gradual progression in difficulty, and the connection between form, meaning, and context. For this reason, artificial intelligence applications appear, in principle, to be well suited to language education, as they are capable of generating dialogues, designing exercises, simulating communicative situations, analyzing learners' responses, and providing immediate suggestions.

In the context of teaching Arabic to non-native speakers, the significance of AI becomes even more evident due to the complex nature of the Arabic language. Arabic is characterized by a rich derivational morphological system, a grammatical structure in which word endings change according to syntactic function, and a writing system that may pose difficulties for learners who are not accustomed to writing from right to left or to reading unvowelled texts. Moreover, the relationship between Modern Standard Arabic and regional dialects creates an additional challenge in determining the type of Arabic that learners should acquire according to their specific goals. Therefore, if designed with sufficient pedagogical and linguistic precision, artificial intelligence can provide meaningful support in explaining grammar rules, generating graded examples, analyzing pronunciation, identifying errors, and personalizing content.

Nevertheless, this theoretical potential should be approached with caution. General language models are not necessarily trained sufficiently on well-structured Arabic educational data, and they may tend to provide answers that appear linguistically correct but do not align with the learner's level, the curriculum, or the cultural context. In addition, some tools primarily focus on languages with extensive digital resources, which places Arabic—particularly pedagogical Arabic designed for non-native speakers—in need of further research and development attention.

Applications of Artificial Intelligence in Teaching Arabic to Non-Native Speakers

Chatbots and Intelligent Language Assistants

Chatbots are among the artificial intelligence applications most closely associated with language education, as they allow learners to interact with intelligent systems capable of generating linguistic responses in real time. These tools can be employed to train learners of Arabic in a variety of communicative situations, such as introductions, asking for directions, ordering food, academic conversations, interviews, and cultural discussions. One of the major advantages of these tools is that they are not restricted by classroom time or the number of classmates; rather, they provide learners with broad opportunities for individualized language practice.

The pedagogical value of chatbots lies in their ability to reduce learners' fear of making mistakes. Students are able to experiment, practice, and repeat attempts without the embarrassment often associated with classroom errors. In addition, teachers may guide students to use intelligent conversational tools within specific instructional activities, such as conducting a dialogue in Modern Standard Arabic on a particular topic, identifying linguistic errors, reformulating the dialogue at a more advanced level, or transforming the conversation into a written text. In this sense, artificial intelligence should not be viewed as a replacement for classroom instruction, but rather as an extension of it.

Nevertheless, the use of such tools should be governed by clear pedagogical guidelines. Chatbots may sometimes generate culturally inappropriate responses, employ structures beyond the learner's proficiency level, or confuse Modern Standard Arabic with dialectal varieties. Therefore, it is preferable for conversational AI tools to be integrated within guided instructional tasks, where learners are required to document and analyze their interactions, while teachers review selected outputs to ensure their linguistic and pedagogical appropriateness.

Automated Language Correction and Error Analysis

Automated correction represents one of the important areas in writing instruction. Artificial intelligence tools can assist learners in identifying spelling, grammatical, morphological, and stylistic errors, while also suggesting more accurate alternatives. In the context of teaching Arabic to non-native speakers, automated correction can be particularly useful in addressing common errors such as confusion between masculine and feminine forms,

lack of agreement, incorrect use of prepositions, inappropriate word order, and the omission of case endings in contexts where vowelised Arabic is taught.

The usefulness of these tools is not limited to correcting the final version of a text; they can also be employed to develop learners' linguistic awareness. When learners are able to see the error, understand its explanation, and compare it with the correct alternative, they become more capable of noticing grammatical rules within their contexts. Teachers can also benefit from reports on recurring errors in order to identify areas of weakness within the classroom and redesign instructional activities accordingly.

Nevertheless, automated correction in Arabic remains less stable than in some other languages because of the complexity of Arabic structure and the multiplicity of possible linguistic analyses. A sentence may be correct in one context but incorrect in another, and grammatical judgment may depend on the intended meaning. Therefore, automated correction should not be accepted as a final authority; rather, it should be treated as a supportive tool that requires human review, particularly at advanced levels and in academic writing.

Adaptive Learning and Educational Personalization

Adaptive learning systems are based on analyzing learners' performance and providing content that corresponds to their level and needs. In the context of Arabic language education, such systems can assess students' proficiency in vocabulary, grammar, or reading comprehension, and then provide them with graded exercises. For example, if a student demonstrates weakness in using the dual form, the system can offer additional examples and exercises related to this grammatical feature. Similarly, if a student performs well in reading but struggles with speaking, the learning pathway can be adjusted accordingly.

Personalization is particularly important in teaching Arabic to non-native speakers because learners do not come from a single linguistic background. A learner whose first language is Malay, Turkish, English, or Urdu, for instance, may encounter different difficulties depending on the phonological, grammatical, and writing systems of their first language. Artificial intelligence can therefore contribute to the development of learning pathways that take these backgrounds into account, such as focusing on sounds that do not exist in the learner's native language, providing simplified grammatical comparisons, or suggesting vocabulary related to the learner's interests.

However, the success of adaptive learning requires well-structured educational data, clear proficiency-level standards, and Arabic content that is pedagogically designed. If the system relies on weak or unrepresentative data, it may provide inaccurate recommendations. Therefore, specialists in teaching Arabic to non-native speakers should collaborate with artificial intelligence experts to develop reliable databases and well-designed educational content.

Natural Language Processing in Text Analysis and Content Generation

Natural language processing techniques allow Arabic texts to be analyzed in terms of vocabulary, structure, meaning, and level appropriateness. They can be used to generate simplified educational texts, extract key vocabulary, design comprehension questions, summarize lengthy texts, or transform more difficult texts into versions suitable for intermediate or beginner learners.

These capabilities are particularly useful for teachers who need to prepare diverse materials quickly. Instead of relying entirely on the prescribed textbook, teachers can use artificial intelligence tools to generate short texts on topics closely related to learners' everyday lives, and then review and modify them accordingly. They may also ask the tool to produce multiple-choice exercises, open-ended questions, sentence-ordering activities, short dialogues, or vocabulary lists.

However, Arabic content generated by artificial intelligence requires careful review, as models may produce texts that appear linguistically correct but sound unnatural, are culturally inappropriate, or lack appropriate progression in difficulty. This highlights the need for what may be described as "AI-supported pedagogical

design,” in which teachers do not transfer the tool’s outputs directly into instruction, but instead treat them as preliminary drafts to be refined according to lesson objectives and students’ proficiency levels.

Speech Recognition Technologies and Pronunciation Improvement

Arabic sounds represent a significant challenge for many learners, particularly pharyngeal and emphatic sounds, as well as the distinction between closely related letters such as ḥā’ / hā’, ‘ayn / hamzah, ṣād / sīn, ḍād / dāl, and qāf / kāf. Speech recognition technologies can assist students in pronunciation training by recording their voices, comparing them with a standard model, and providing feedback on areas of error.

The value of these tools increases in environments where learners do not have regular access to Arabic speakers for continuous practice. Speech-based applications can provide daily practice and measure pronunciation improvement over time. They can also be linked to phonetic lessons, allowing students to learn the articulation point and phonetic features of a letter, apply them in words and sentences, and then receive direct evaluation.

Nevertheless, pronunciation assessment should not be viewed as a purely technical matter; rather, it is also a linguistic and pedagogical issue. Some phonetic variations may be acceptable in communication, whereas certain errors require early correction because they change meaning. Therefore, Arabic pronunciation tools should be designed in collaboration with specialists in phonetics and the teaching of Arabic to non-native speakers, rather than relying solely on general speech models.

Intelligent Assessment and Learning Analytics

Artificial intelligence can contribute to the development of assessment by analyzing learners’ performance in tests and learning activities, identifying areas of strength and weakness, and providing reports for both teachers and students. Instead of relying solely on a general score in a reading test, for example, the system can indicate that a student has difficulty inferring meaning from context, understanding pronoun references, or identifying the main idea.

Learning analytics can also help institutions monitor students’ progress, identify learners who may be at risk of academic difficulty, and evaluate the effectiveness of courses and learning activities. In programs for teaching Arabic to non-native speakers, such analytics may be particularly useful in informing academic decisions, such as placing students into appropriate proficiency levels, modifying the curriculum, or providing additional support.

However, intelligent assessment must adhere to the principles of fairness and transparency. Important educational decisions should not be based on unclear or untested algorithms. In addition, students’ data must be protected, and its use should be limited strictly to educational purposes.

Educational Opportunities Provided by Artificial Intelligence

Expanding Linguistic Practice Beyond the Classroom

One of the major challenges in teaching Arabic to non-native speakers is the limited amount of practice time available within the classroom. Students may attend only a few hours per week, whereas language acquisition requires repeated exposure and continuous practice. In this regard, artificial intelligence offers an opportunity to extend learning beyond the classroom through conversation, writing, interactive reading, and speech training. Learners can practice the language at any time, request additional examples, repeat attempts, and choose topics that correspond to their personal interests.

This opportunity is particularly important in non-Arabic-speaking environments, where daily opportunities for communication in Arabic are often unavailable. For example, students studying Arabic in Malaysia, Europe, Africa, or East Asia may not have access to a natural Arabic-speaking environment. Artificial intelligence can partially compensate for this limitation by simulating diverse communicative situations. Nevertheless, this should not be understood as a complete substitute for genuine human interaction.

Immediate Feedback

Feedback is one of the most important elements of language learning, as it helps learners notice the gap between their current performance and the target performance. In traditional instruction, correction may be delayed due to large class sizes and limited time. By contrast, artificial intelligence tools can provide immediate comments on writing, responses, or pronunciation. This accelerates the learning cycle: production, correction, revision, and reproduction.

However, immediate feedback should be clear and appropriate to the learner's proficiency level. Complex grammatical comments may not be useful for beginners, whereas advanced learners may require more precise explanations. Therefore, feedback should be designed according to the principle of gradual progression, providing learners with information they can understand and apply at their current stage of learning.

Developing Learner Autonomy

Artificial intelligence enhances learner autonomy by providing learners with tools for research, revision, practice, and self-assessment. Autonomous learners do not always wait for the teacher's response; rather, they learn how to ask questions, verify answers, compare alternatives, and correct their own performance. In Arabic language education, students can ask AI tools to explain a grammatical rule, generate examples, simplify a text, prepare a revision plan, or create a short vocabulary quiz.

However, autonomy does not mean leaving learners alone with the tool; it requires guidance. It is therefore important to teach students how to use artificial intelligence consciously: how to write precise prompts, verify the accuracy of responses, distinguish between legitimate assistance and excessive dependence, and document their use of AI tools in academic work.

Supporting Teachers and Reducing Administrative Burden

The benefits of artificial intelligence are not limited to learners; they also extend to teachers. AI can assist teachers in preparing lesson plans, designing activities, generating examples, creating short quizzes, analyzing students' responses, and suggesting remedial strategies. This can reduce administrative workload and allow teachers more time for human interaction, guidance, and qualitative assessment.

However, this benefit depends on teachers' digital and pedagogical competence. A teacher who uses artificial intelligence without sufficient awareness may transfer inappropriate content into the classroom, whereas a well-trained teacher can transform the tool into an effective assistant. Therefore, AI-related competencies should be incorporated into teacher preparation programs for instructors of Arabic to non-native speakers.

Accommodating Individual Differences

Learners of Arabic differ in their goals, ages, backgrounds, learning pace, language proficiency, and degree of exposure to Arabic. Artificial intelligence applications provide broader opportunities to accommodate these differences by offering graded content, additional repetition for struggling learners, more advanced challenges for proficient learners, and topics that correspond to each student's interests.

This feature is particularly important in multi-level classrooms, where it is difficult for teachers to provide a personalized activity for every student at every moment. Artificial intelligence can therefore serve as a supportive tool for individualizing learning within a collective classroom setting, provided that it does not isolate students from their peers or weaken collaborative learning.

CHALLENGES AND ISSUES

Challenges of the Arabic Language and the Scarcity of Specialized Educational Data

Despite significant progress in natural language processing, Arabic still presents technical challenges due to its rich morphology, multiple word forms, context-dependent meanings, the absence of vowelization in most written

texts, and dialectal diversity. In addition, not all Arabic data available online is suitable for educational purposes; it may include colloquial, unedited, biased, or pedagogically inappropriate texts that do not correspond to learners' proficiency levels.

This challenge becomes more complex in the context of teaching Arabic to non-native speakers, because what is needed is not merely a model that understands Arabic, but a model that understands Arabic as a second or foreign language. This requires prior knowledge of learners' proficiency levels, common errors, systematic progression, and culturally appropriate content. Therefore, reliance on general-purpose models may lead to outputs that are not pedagogically controlled.

Confusion Between Modern Standard Arabic and Dialects

One of the major challenges in teaching Arabic is defining the relationship between Modern Standard Arabic and regional dialects. Students may learn Modern Standard Arabic for academic or religious purposes, yet they may sometimes need a dialect for everyday communication. If artificial intelligence tools do not clearly specify the type of Arabic required, they may mix Modern Standard Arabic and dialectal forms in dialogues, examples, or translations. This can confuse learners, particularly at beginner levels.

Therefore, educational tools should include clear settings, such as Modern Standard Arabic, academic Arabic, Qur'anic or classical Arabic, a specific dialect, or a comparison between Modern Standard Arabic and dialectal usage. Teachers should also clarify to students when the use of dialect is appropriate and when Modern Standard Arabic is required.

Content Reliability and the Problem of Hallucination

Generative models may produce confident responses that are nevertheless inaccurate. This may appear in the explanation of a grammatical rule, the attribution of a statement to a source, the generation of a non-existent textual example, or the suggestion of an inappropriate meaning for a word. In language education, such errors may be particularly serious because they become linguistic input that learners may acquire. If a student receives an incorrect example and repeatedly uses it, the error may become reinforced.

For this reason, both students and teachers must be taught that AI-generated outputs require verification. In academic contexts, reliance on AI tools to produce references or textual evidence without review should be avoided, as this may lead to documentation errors or unintentional plagiarism.

Excessive Dependence and Reduced Cognitive Effort

One of the potential risks is that students may use artificial intelligence to obtain answers instead of developing their linguistic competence. If a student asks an AI tool to write an entire assignment or translate a text without making an initial attempt, the visible outcome may improve while genuine learning remains limited. This may be described as "apparent proficiency," where performance appears strong because of the tool rather than because of the learner's actual linguistic development.

To address this issue, educational tasks should be designed in ways that make artificial intelligence part of the learning process rather than a substitute for it. Instead of asking the tool to write an essay, for example, students may use it to generate ideas, then write the essay themselves, seek feedback from the tool, and finally explain to the teacher which revisions they accepted or rejected and why.

Privacy, Security, and Intellectual Property Issues

Some artificial intelligence tools require users to enter texts, data, or audio recordings. In educational contexts, such data may include students' names, assignments, proficiency levels, voices, and errors. Therefore, clear policies are needed regarding what may be entered into public AI tools, how data should be stored, who owns the generated content, and how the use of artificial intelligence should be disclosed in assignments and research.

The issue of intellectual property also arises in relation to AI-generated content. Can students attribute AI-generated texts to themselves? Should they disclose their use of the tool? Where is the boundary between

legitimate linguistic assistance and plagiarism? These questions require clear institutional regulations rather than scattered individual decisions.

Readiness of Teachers and Institutions

Even when artificial intelligence tools are available, their successful use depends on the readiness of both teachers and institutions. Some teachers may have legitimate reservations due to concerns about weakening their role, increasing academic dishonesty, or the ambiguity of the technology itself. In some contexts, sufficient infrastructure, appropriate training, or clear policies may also be lacking. Therefore, the integration of artificial intelligence requires institutional planning that includes teacher training, technical support, continuous evaluation, and curriculum development.

DISCUSSION

Towards an Integrative Model for Employing Artificial Intelligence in Teaching Arabic

Recent literature demonstrates that discussions surrounding artificial intelligence in education should not be reduced to a simple dichotomy of acceptance or rejection. Artificial intelligence is neither a magical solution to all the challenges of teaching Arabic nor a threat that must be entirely excluded. Rather, it is a powerful tool whose value depends on the ways in which it is designed, implemented, and regulated. Accordingly, this paper proposes an integrative model based on five main principles.

The first principle is teacher centrality. Teachers remain responsible for defining learning objectives, selecting content, interpreting errors, building pedagogical relationships, and evaluating students' genuine progress. Artificial intelligence, by contrast, functions as a supportive assistant that expands opportunities for practice and provides preliminary guidance. Teachers should not become mere technical supervisors; rather, they should evolve into learning designers capable of employing technology consciously and critically.

The second principle is learner centrality. Artificial intelligence should support learners in developing genuine linguistic competence rather than helping them bypass the required cognitive effort. This can be achieved through tasks that encourage learners to think, compare, revise, and justify their choices. For example, when students use AI tools to revise their writing, they should be able to explain why they accepted certain revisions, rejected others, and what linguistic rule they learned in the process.

The third principle is linguistic and cultural regulation. Teaching Arabic is not limited to linguistic structures alone; it also involves culture, context, communication etiquette, and diverse patterns of language use. Therefore, AI-generated outputs should be reviewed according to clear linguistic and cultural standards, particularly in religious, classical, or academic texts.

The fourth principle is ethical transparency. Students should understand when the use of artificial intelligence is permissible and how such use should be documented. Educational institutions should also establish explicit policies distinguishing acceptable uses, such as brainstorming or receiving feedback, from unacceptable practices, such as submitting AI-generated texts as entirely independent work.

The fifth principle is continuous development. Artificial intelligence evolves rapidly, and therefore static policies are insufficient for long-term implementation. Educational tools and practices should undergo continuous evaluation, while Arabic language departments and language education centers should participate in developing local models and open Arabic educational resources that support the quality of instruction.

FUTURE DIRECTIONS

Developing Specialized Intelligent Arabic Platforms

One of the most important future directions is the development of specialized intelligent platforms for teaching Arabic to non-native speakers, rather than relying entirely on general-purpose tools. Such platforms should include level-based content, databases of common errors according to learners' first languages, accurate speech

models, communicative exercises, progress reports, and settings that distinguish between Modern Standard Arabic and dialectal varieties.

Integrating Artificial Intelligence into Teacher Preparation

AI-related competencies should become an integral part of preparing teachers of Arabic to non-native speakers. These competencies include understanding the fundamentals of artificial intelligence, writing effective prompts, evaluating AI-generated outputs, designing AI-supported instructional activities, and managing issues related to academic integrity and privacy.

Developing Intelligent Language Assessment

Future research may move toward developing intelligent assessment tools capable of measuring linguistic competence more accurately than traditional tests, particularly in speaking, writing, and pronunciation. Such tools should combine automated analysis with human judgment so that language is not reduced to narrow numerical indicators.

Utilizing Extended Reality and Immersive Environments

Artificial intelligence can be integrated with virtual reality or augmented reality to create virtual Arabic-speaking environments, such as a market, an airport, a university, or a clinic, where students interact with intelligent characters in Arabic. This may be particularly useful for learning Arabic for specific purposes, such as Arabic for tourism, business, Islamic studies, or diplomacy.

More Rigorous Arabic Empirical Studies

The research field needs more experimental and quasi-experimental studies that measure the actual impact of artificial intelligence tools on Arabic language learning, rather than merely examining students' attitudes or perceptions. Such studies should investigate the effects of these tools on the four language skills, motivation, language anxiety, learner autonomy, writing quality, and pronunciation accuracy, while taking into account differences in proficiency levels and linguistic backgrounds.

RECOMMENDATIONS

Based on the preceding analysis, this paper recommends the following:

1. Developing clear institutional policies for the use of artificial intelligence in teaching Arabic to non-native speakers, specifying permitted and prohibited uses as well as mechanisms for disclosure.
2. Training Arabic language teachers to employ AI tools in designing activities, providing feedback, and conducting assessment without compromising their pedagogical role.
3. Building open, linguistically controlled Arabic digital resources that can support the training of AI models and educational tools.
4. Designing specialized platforms that take into account learners' proficiency levels, learning objectives, and linguistic backgrounds.
5. Reviewing AI-generated content before using it in the classroom or incorporating it into curricula.
6. Teaching students ethical and critical skills for using artificial intelligence, rather than limiting instruction to its technical use.
7. Encouraging empirical studies that measure the impact of artificial intelligence on Arabic language learning through objective and long-term assessment measures.
8. Integrating specialists in Arabic language, language education, computer science, and technology ethics into projects aimed at developing Arabic AI tools.

CONCLUSION

Artificial intelligence has become an influential reality in education in general and in language education in particular. Programs for teaching Arabic to non-native speakers can no longer ignore this transformation. This

paper has shown that AI applications offer significant opportunities for expanding linguistic practice, providing immediate feedback, personalizing learning, supporting teachers, analyzing performance, and improving pronunciation and writing. However, these opportunities are accompanied by real challenges related to the characteristics of the Arabic language, data quality, output reliability, confusion between Modern Standard Arabic and dialects, academic integrity, privacy, and the readiness of teachers and institutions.

Accordingly, the optimal approach is neither to adopt artificial intelligence without regulation nor to reject it out of fear of its risks. Rather, it is to build an integrative model that places the human being at the center of the educational process. The teacher guides, the learner thinks and practices, and artificial intelligence supports and expands possibilities. If institutions succeed in developing informed policies, training teachers, and building specialized Arabic tools, artificial intelligence can contribute to a qualitative transformation in teaching Arabic to non-native speakers, making its learning more interactive, flexible, equitable, and widely accessible.

REFERENCES

1. Alharbi, W. (2023). AI in the foreign language classroom: A pedagogical overview of automated feedback and learner support. *Computer Assisted Language Learning Electronic Journal*, 24(2), 1–20.
2. Balçı, Ö., & Çakır, A. (2024). The role of ChatGPT in English as a foreign language learning and teaching: A systematic review. *Smart Learning Environments*, 11, Article 54.
3. Bearman, M., Ryan, J., & Ajjawi, R. (2023). Discourses of artificial intelligence in higher education: A critical literature review. *Higher Education*, 86, 369–385. <https://doi.org/10.1007/s10734-022-00937-2>
4. Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education*, 20, Article 22. <https://doi.org/10.1186/s41239-023-00392-8>
5. Fang, S., & Warschauer, M. (2024). On the nascency of ChatGPT in foreign language teaching and learning. *Annual Review of Applied Linguistics*, 44, 1–17.
6. Godwin-Jones, R. (2023). Emerging spaces for language learning: AI bots, ambient intelligence, and the metaverse. *Language Learning & Technology*, 27(2), 6–27.
7. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign.
8. Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *RELC Journal*, 54(2), 537–550. <https://doi.org/10.1177/00336882231162868>
9. Li, B., Lowell, V. L., Wang, C., & Li, X. (2024). A systematic review of the first year of publications on ChatGPT and language education: Examining research on ChatGPT's use in language learning and teaching. *Computers and Education: Artificial Intelligence*, 7, Article 100266. <https://doi.org/10.1016/j.caeai.2024.100266>
10. Li, B., Tan, Y. L., & Wang, C. (2025). Two years of innovation: A systematic review of empirical generative AI research in language learning and teaching. *Computers and Education: Artificial Intelligence*, 8, Article 100364.
11. Luckin, R. (2018). Machine learning and human intelligence: The future of education for the 21st century. UCL Institute of Education Press.
12. Miao, F., & Holmes, W. (2023). Guidance for generative AI in education and research. UNESCO.
13. Miao, F., & Cukurova, M. (2024). AI competency framework for teachers. UNESCO.
14. Miao, F., Shiohira, K., & Lao, N. (2024). AI competency framework for students. UNESCO.
15. Mohideen, H. L. M., & Mohideen, N. M. (2024). Exploring the opportunities of implementing artificial intelligence in teaching Arabic to non-native speakers. *Journal of Digital Learning and Distance Education*, 3(1), 875–884.
16. Mohmaddin, N. A. M., & Others. (2025). The role of artificial intelligence in learning Arabic for non-native speakers: A systematic literature review. *Al-Qanatir: International Journal of Islamic Studies*, 34(2), 1–17.
17. OECD. (2023). OECD digital education outlook 2023: Towards an effective digital education ecosystem. OECD Publishing.
18. OpenAI. (2024). Teaching with AI. OpenAI.
19. UNESCO. (2021). AI and education: Guidance for policy-makers. UNESCO.

20. Wang, Y., Liu, X., & Chen, N. S. (2025). A scoping review of empirical studies on generative artificial intelligence in language education. *Innovation in Language Learning and Teaching*, 19(4), 1–18.
21. Xiao, F., Zhi, Y., & Zhou, Y. (2025). Exploring the landscape of generative AI-assisted EFL writing: A systematic review. *ECNU Review of Education*, 8(1), 1–27.
22. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16, Article 39. <https://doi.org/10.1186/s41239-019-0171-0>
23. Zhao, Y. (2024). The future of language learning in the age of generative artificial intelligence. *Journal of Second Language Writing*, 65, Article 101120.
24. Zou, D., Huang, Y., & Xie, H. (2021). Digital game-based vocabulary learning: Where are we and where are we going? *Computer Assisted Language Learning*, 34(5–6), 751–777.