

Future Directions of Arabic Language Learning for Young Children in the Age of Artificial Intelligence

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ABSTRACT

The rapid development of Artificial Intelligence (AI) has transformed educational practices across various disciplines, including language education. However, discussions regarding the integration of AI into Arabic language learning for young children remain limited compared to studies focusing on higher education and adult learners. This study aims to examine the characteristics of Arabic language learning in early childhood education, explore the opportunities and challenges associated with AI implementation, and propose future directions for AI-supported Arabic language instruction. This study employed a literature review approach by analyzing scholarly publications related to Arabic language education, early childhood learning, educational technology, and artificial intelligence published between 2020 and 2026, complemented by seminal works on language acquisition and child development. The findings indicate that effective Arabic language learning for young children should be grounded in meaningful social interaction, play-based learning, multisensory experiences, repetition, emotional engagement, and parental involvement. The review further reveals that AI offers significant opportunities through personalized learning, interactive storytelling, pronunciation support, adaptive instruction, teacher assistance, and enhanced home-school collaboration. Nevertheless, several challenges remain, including excessive screen exposure, reduced human interaction, linguistic limitations of AI systems, ethical and privacy concerns, cultural bias, and teacher readiness. Based on these findings, this study proposes the Human-Centered AI for Preschool Arabic Instruction (HAPI-A) Model, which integrates five key dimensions: human interaction, AI assistance, play-based learning, adaptive learning, and Islamic value integration. The model emphasizes that AI should function as a supportive educational tool rather than a replacement for human interaction. This study contributes a conceptual framework that may guide future research and educational practices concerning the integration of AI into Arabic language learning in early childhood education.

Keywords: Arabic language learning; artificial intelligence; early childhood education; educational technology; Islamic education; language acquisition.

ABSTRAK

Kecerdasan Buatan (AI) telah mengubah praktik pendidikan di berbagai disiplin ilmu, termasuk pendidikan bahasa. Namun, diskusi mengenai integrasi AI ke dalam pembelajaran bahasa Arab untuk anak-anak masih terbatas dibandingkan dengan penelitian yang berfokus pada pendidikan tinggi dan pelajar dewasa. Studi ini bertujuan untuk mengkaji karakteristik pembelajaran bahasa Arab dalam pendidikan anak usia dini, mengeksplorasi peluang dan tantangan yang terkait dengan implementasi AI, dan mengusulkan arah masa depan untuk pengajaran bahasa Arab yang didukung AI. Studi ini menggunakan pendekatan tinjauan literatur dengan menganalisis publikasi ilmiah yang terkait dengan pendidikan bahasa Arab, pembelajaran anak usia dini, teknologi pendidikan, dan kecerdasan buatan yang diterbitkan antara tahun 2020 dan 2026, dilengkapi dengan karya-karya penting tentang pemerolehan bahasa dan perkembangan anak. Temuan menunjukkan bahwa pembelajaran bahasa Arab yang efektif untuk anak kecil harus didasarkan pada interaksi sosial yang bermakna, pembelajaran berbasis bermain, pengalaman multisensorik, pengulangan, keterlibatan emosional, dan keterlibatan orang tua. Tinjauan lebih lanjut mengungkapkan bahwa AI menawarkan peluang signifikan melalui pembelajaran yang dipersonalisasi, penceritaan interaktif, dukungan pengucapan, instruksi adaptif, bantuan guru, dan kolaborasi rumah-sekolah yang ditingkatkan. Namun demikian, beberapa tantangan tetap ada, termasuk paparan layar yang berlebihan, berkurangnya interaksi manusia, keterbatasan linguistik sistem AI, masalah etika dan privasi, bias budaya, dan kesiapan guru. Berdasarkan temuan tersebut, penelitian ini mengusulkan Model Human-Centered AI for Preschool Arabic Instruction (HAPI-A), yang mengintegrasikan lima dimensi utama: interaksi manusia, bantuan AI, pembelajaran berbasis bermain, pembelajaran adaptif, dan integrasi nilai Islam. Model ini menekankan bahwa AI harus berfungsi sebagai alat pendidikan yang mendukung daripada pengganti interaksi manusia. Studi ini menyumbangkan kerangka konseptual yang dapat memandu penelitian dan praktik pendidikan di masa depan mengenai integrasi AI ke dalam pembelajaran bahasa Arab dalam pendidikan anak usia dini.

Kata kunci: Pembelajaran bahasa Arab; kecerdasan buatan; pendidikan anak usia dini; teknologi pendidikan; Pendidikan Islam; akuisisi bahasa.

INTRODUCTION

Arabic occupies a unique position within Islamic education because it serves not only as a means of communication but also as the language of the Qur'an, Hadith, and classical Islamic scholarship. For this reason, Arabic learning has long been regarded as an essential component of Islamic educational institutions, including early childhood education. Introducing Arabic during early childhood is considered strategically important because this developmental stage represents a critical period for language acquisition. During the first years of life, children demonstrate remarkable linguistic flexibility, allowing them to acquire multiple languages through meaningful exposure and interaction (Pradana, 2025).

The importance of introducing Arabic during early childhood is supported by several theories of language acquisition. Chomsky (1965) proposed that children possess an innate biological mechanism known as the Language Acquisition Device (LAD), enabling them to acquire language naturally when exposed to meaningful linguistic input. This perspective suggests that young children can absorb linguistic structures without formal grammatical instruction, making early childhood an ideal period for second-language exposure, including Arabic. Furthermore, sociocultural perspectives emphasize that language development is inseparable from social interaction. According to Vygotsky (1978), children's cognitive and linguistic growth occurs through interactions with more knowledgeable others within their social environment. Through scaffolding and guided participation, children gradually develop higher-order linguistic competencies. Similarly, Bruner (1983) introduced the concept of the Language Acquisition Support System (LASS), emphasizing the role of supportive environments in facilitating meaningful communication and language learning.

At the same time, rapid technological advancement has transformed educational practices worldwide. Traditional teacher-centered instruction has gradually evolved into more flexible and interactive learning environments supported by digital technologies. The widespread availability of smartphones, tablets, and internet connectivity has facilitated the integration of digital media into educational settings, including language learning. Mobile learning has enabled learners to access instructional materials, multimedia resources, and interactive activities beyond the physical classroom, thereby expanding opportunities for language acquisition and practice (Holmes et al., 2019).

More recently, the emergence of Artificial Intelligence (AI) has introduced new possibilities for educational innovation. AI technologies can generate learning content, analyze learner performance, provide automated feedback, recognize speech, and adapt instructional materials according to individual learning needs. Research indicates that AI has considerable potential to support personalized learning experiences, increase learner motivation, and improve learning outcomes through adaptive instructional approaches (Zawacki-Richter et al., 2019; Luckin, 2018). In

Arabic language education, AI-based technologies have increasingly been utilized to support writing, speaking, vocabulary development, and autonomous learning (Huda, 2025; Kholid, 2025; Sumiarni, 2026).

The integration of generative AI technologies, such as ChatGPT and other large language models, has further accelerated interest in AI-supported language learning. Recent studies have demonstrated that AI can assist learners by generating instructional materials, facilitating conversational practice, and providing immediate feedback during learning activities (Humairoh, 2026; Zubaidi, 2025). Advances in Arabic Natural Language Processing (NLP) and Arabic large language models have also expanded opportunities for developing AI-supported Arabic learning environments, although challenges related to linguistic complexity and dialectal diversity remain significant (Rhel & Roussinov, 2025).

Despite these promising developments, an important gap remains in the existing literature. Most studies investigating AI in Arabic language education have focused on higher education contexts, university students, and adult learners. Research commonly examines AI-assisted writing, chatbot-based learning, intelligent tutoring systems, and autonomous language learning among undergraduate students (Adawiyah, 2025; Huda, 2025; Kholid, 2025). In contrast, studies examining the implications of AI for Arabic language learning in early childhood education remain extremely limited. This gap is noteworthy because young children differ substantially from older learners in terms of cognitive development, attention span, social-emotional needs, and learning characteristics. Educational technologies that are effective for university students cannot automatically be considered suitable for preschool children.

Given these circumstances, a comprehensive examination of the future role of AI in Arabic language learning for young children is both timely and necessary. Therefore, this literature review aims to examine recent developments in Arabic language learning for young children, analyze the opportunities offered by Artificial Intelligence, identify potential challenges and risks, and propose future directions for developing human-centered AI-supported Arabic language education in early childhood setting.

METHOD

This study employed a literature review approach to examine the development of Arabic language learning for young children in the era of Artificial Intelligence (AI). A literature review is an appropriate method for synthesizing existing knowledge, identifying research trends, highlighting gaps in the literature, and generating conceptual insights regarding a particular topic (Torraco, 2016). Unlike empirical studies that collect primary data from participants, literature reviews rely on published scholarly works as the primary source of data and analysis.

The literature analyzed in this study was obtained from various academic databases, including Google Scholar, Scopus, ERIC, and DOAJ. The search process focused on publications related to Arabic language learning, early childhood education, educational technology, artificial intelligence in education, language acquisition, and digital learning. To ensure the relevance and contemporariness of the discussion, priority was given to literature published between 2020 and 2026. Nevertheless, several seminal works were also included to provide a strong theoretical foundation, particularly those concerning language acquisition and child development, such as the works of Chomsky (1965), Vygotsky (1978), and Bruner (1983).

The selection of literature was conducted through several stages. First, the researcher identified publications using keywords such as *Arabic language learning*, *early childhood education*, *preschool language learning*, *artificial intelligence in education*, *AI-assisted language learning*, *educational technology*, and *Arabic language education*. Second, the retrieved literature was screened based on its relevance to the objectives of the study. Publications that discussed AI implementation in education, language learning technologies, Arabic language instruction, and early childhood learning were retained, whereas studies unrelated to educational contexts were excluded. Third, the selected publications were examined comprehensively to identify major themes, research findings, opportunities, challenges, and future directions associated with AI-supported Arabic language learning.

Data analysis was conducted using thematic analysis. Thematic analysis is widely recognized as a flexible and effective approach for identifying, organizing, and interpreting patterns of meaning across a body of literature (Braun & Clarke, 2006). Through this process, the reviewed studies were categorized according to recurring themes and concepts. Similar approaches have frequently been employed in contemporary review studies to synthesize findings and reveal dominant patterns within a field of research.

The analysis process consisted of four stages. First, the selected literature was read repeatedly to gain a comprehensive understanding of the content. Second, important findings and concepts related to Arabic language learning and AI integration were coded and organized. Third, similar codes were grouped into broader themes. Finally, the identified themes were interpreted and synthesized to develop a conceptual understanding of current trends and future directions in Arabic language learning for young children. The themes that emerged from the analysis included: (1) characteristics of Arabic language learning in early childhood education, (2) the digital transformation of language learning, (3) opportunities for AI integration in Arabic language education, (4) challenges and ethical concerns related to AI use, and (5) future directions for human-centered AI-supported Arabic language learning.

By employing a literature review and thematic analysis approach, this study aims to provide a comprehensive overview of current developments while offering

conceptual recommendations for educators, researchers, and policymakers seeking to integrate AI into Arabic language learning for young children. This approach is particularly suitable for exploring emerging educational issues where empirical evidence remains limited and theoretical synthesis is needed to guide future research and practice.

RESULT AND DISCUSSION

Characteristics of Arabic Language Learning in Early Childhood Education

The literature consistently indicates that Arabic language learning in early childhood education possesses distinctive characteristics that differentiate it from language instruction at later educational stages. These characteristics are closely associated with children's developmental needs, cognitive capacities, language acquisition processes, and socio-emotional development. Consequently, effective Arabic language instruction for young children should be grounded in the principles of early childhood education rather than merely adapting language-learning strategies designed for older learners.

One of the most fundamental characteristics of early childhood language learning is children's natural ability to acquire language through meaningful exposure and interaction. Chomsky (1965) argued that children are biologically equipped with an innate language acquisition mechanism that enables them to acquire language naturally when exposed to linguistic input. This perspective suggests that young children do not primarily learn language through formal grammatical instruction but rather through repeated interactions with meaningful language in their environment. Similarly, Owens (2020) emphasized that language development during early childhood is largely driven by communicative experiences and social engagement rather than explicit teaching of linguistic rules. Therefore, Arabic language learning for young children should prioritize meaningful communication, vocabulary exposure, and language-rich environments rather than focusing heavily on grammatical structures such as *nahwu* and *sharaf*.

The social nature of language acquisition further reinforces the importance of interaction in early childhood language learning. According to Vygotsky (1978), language development occurs through social interactions with more knowledgeable individuals who provide guidance and support within the child's Zone of Proximal Development (ZPD). Through scaffolding, children gradually develop linguistic competence by participating in meaningful communicative activities. Bruner (1983) extended this perspective through the concept of the Language Acquisition Support System (LASS), arguing that language learning is facilitated by supportive environments that encourage active participation in communication. In Arabic language classrooms, these theoretical perspectives imply that teachers should function as facilitators who create opportunities for authentic interaction through

storytelling, conversations, songs, and collaborative activities rather than acting solely as providers of information.

Another important characteristic identified in the literature is the significance of play-based learning. Developmentally Appropriate Practice (DAP) emphasizes that young children learn most effectively through active exploration, play, and social interaction (Copple & Bredekamp, 2009). Research on play-based pedagogy further demonstrates that play provides meaningful contexts for language use while simultaneously supporting cognitive and social development (Pyle & Danniels, 2017). Within Arabic language education, play-based activities such as role-playing, language games, puppet shows, movement-based learning, and storytelling create enjoyable opportunities for children to encounter and practice new vocabulary. These activities reduce anxiety, increase motivation, and foster positive attitudes toward language learning.

The literature also highlights the importance of multisensory learning experiences in early childhood education. Young children learn most effectively when information is presented through multiple sensory channels, including visual, auditory, tactile, and kinesthetic experiences. Sousa (2022) explained that multisensory learning strengthens memory formation by activating multiple neural pathways simultaneously. In Arabic language learning, multisensory approaches may include picture cards, illustrated storybooks, songs, videos, gestures, physical movement, and hands-on activities. Such approaches are particularly important because Arabic is often introduced as a foreign language in many educational settings, requiring children to associate unfamiliar sounds and symbols with meaningful experiences. Multisensory instruction therefore facilitates comprehension and retention while maintaining children's engagement throughout the learning process.

Repetition emerges as another essential characteristic of Arabic language learning during early childhood. Unlike older learners who may rely on conscious memorization strategies, young children develop language proficiency through repeated exposure and use. Language acquisition research suggests that frequent encounters with vocabulary and linguistic structures contribute significantly to long-term retention and communicative competence (Lightbown & Spada, 2021). However, repetition in early childhood education should not take the form of monotonous drills. Instead, repeated exposure should be embedded within diverse and enjoyable activities, such as songs, stories, games, classroom routines, and everyday interactions. This approach enables children to encounter the same linguistic elements in different contexts, thereby strengthening understanding while preserving motivation and enjoyment.

Another notable characteristic concerns the developmental sequence of language learning. Early childhood language programs generally prioritize listening and speaking before reading and writing. According to Lightbown and Spada (2021), receptive and expressive oral language skills provide the foundation upon which

literacy development can later be built. In Arabic language education, this progression is particularly important because children must first become familiar with Arabic sounds, pronunciation patterns, and basic vocabulary before being introduced to the Arabic script. Activities that emphasize listening comprehension, oral communication, songs, and simple conversations are therefore considered more developmentally appropriate than intensive literacy instruction during the preschool years.

Furthermore, Arabic language learning presents unique linguistic challenges that distinguish it from many other foreign languages. Arabic contains several phonemes that are unfamiliar to non-Arabic-speaking children, including emphatic consonants and guttural sounds. In addition, Arabic employs a writing system that differs significantly from the Latin alphabet used in many countries. These linguistic characteristics require instructional approaches that emphasize listening, imitation, repetition, and contextual use before formal literacy instruction is introduced (Hermawan, 2021). Gradual exposure to Arabic sounds and vocabulary enables children to develop phonological awareness and familiarity with the language without experiencing excessive cognitive demands.

The reviewed literature also demonstrates that emotional engagement significantly influences language learning outcomes. Children are more likely to participate actively and retain new vocabulary when learning experiences are enjoyable, meaningful, and emotionally positive. Developmentally appropriate educational practices emphasize the importance of creating supportive learning environments where children feel secure, valued, and motivated to communicate (NAEYC, 2020). In the context of Arabic language learning, positive emotional experiences may be fostered through praise, encouragement, storytelling, songs, and interactive activities that connect language learning with children's interests and everyday experiences.

Finally, parental involvement represents an important factor in supporting Arabic language acquisition during early childhood. Language learning extends beyond the classroom and is strengthened when children receive consistent exposure in their home environments. Parents can reinforce Arabic vocabulary, songs, stories, and expressions introduced at school, thereby increasing opportunities for meaningful language use. In Islamic educational settings, Arabic language exposure can be naturally integrated into daily religious practices, such as prayers, Qur'anic recitation, greetings, and Islamic expressions. Such authentic exposure strengthens children's familiarity with Arabic while simultaneously supporting religious identity development.

Overall, the literature suggests that Arabic language learning in early childhood should be understood as a holistic process that integrates cognitive, linguistic, social, emotional, and cultural dimensions. Effective instruction is characterized by meaningful interaction, play-based experiences, multisensory engagement, repeated exposure, emotional support, and collaboration between teachers and families. These

characteristics provide an essential foundation for evaluating how emerging technologies, including Artificial Intelligence, can be integrated into Arabic language education without compromising the developmental needs of young children.

Trends in Arabic Language Learning in the Digital Era

The reviewed literature demonstrates that Arabic language learning has undergone significant transformation over the past two decades, driven by rapid advancements in information and communication technologies. This transformation has affected not only the tools used in instruction but also pedagogical approaches, learner engagement strategies, and the overall learning environment. While traditional Arabic language instruction was predominantly characterized by teacher-centered practices, rote memorization, and textbook-based learning, contemporary approaches increasingly emphasize learner-centered, interactive, and technology-supported experiences. These developments have created new opportunities for enhancing Arabic language acquisition, particularly in contexts where Arabic is taught as a foreign language.

Historically, Arabic language learning in many educational institutions relied heavily on conventional instructional media such as textbooks, flashcards, blackboards, and direct teacher explanations. In early childhood settings, educators frequently employed songs, picture cards, storytelling, and repetition-based activities to introduce vocabulary and simple expressions. These approaches remain relevant because they align with children's developmental characteristics and support meaningful language exposure. However, the increasing availability of digital technologies has expanded the range of instructional resources available to teachers and learners, enabling more dynamic and engaging learning experiences (Almelhi, 2021).

The first major phase of digital transformation in language education was marked by the adoption of multimedia learning technologies. Multimedia environments combine text, images, audio, animation, and video to create richer learning experiences than traditional print-based materials. Mayer's Cognitive Theory of Multimedia Learning suggests that learners understand information more effectively when verbal and visual information are presented together in meaningful ways (Mayer, 2021). In Arabic language education, multimedia resources such as animated videos, interactive presentations, digital storybooks, and audiovisual vocabulary applications have increasingly been used to support vocabulary acquisition, listening comprehension, and pronunciation development. For young children, multimedia content provides concrete representations of abstract linguistic concepts, making language learning more accessible and engaging.

The expansion of internet access and mobile technologies subsequently gave rise to mobile learning (*m-learning*), which has become one of the most influential trends in contemporary education. Mobile learning allows learners to access

educational content through smartphones, tablets, and other portable devices regardless of time and location. In the context of Arabic language learning, mobile applications offer opportunities for vocabulary practice, pronunciation exercises, interactive games, and self-paced learning activities. Research has shown that mobile-assisted language learning can increase learner motivation, engagement, and opportunities for repeated language exposure, which are critical factors in language acquisition (Kukulska-Hulme & Viberg, 2018). For young children, mobile applications designed with age-appropriate content and parental supervision can complement classroom instruction by extending language learning into home environments.

Another prominent trend identified in the literature is the growing integration of gamification into language education. Gamification refers to the incorporation of game elements such as points, rewards, challenges, badges, and progress tracking into learning activities. Numerous studies have reported that gamified learning environments can increase learners' motivation, participation, and persistence in language learning tasks (Deterding et al., 2011; Hamari et al., 2014). In Arabic language learning, educational games have been developed to teach vocabulary, letter recognition, listening skills, and basic communication through enjoyable and interactive experiences. For young children, gamification aligns particularly well with play-based learning principles because it transforms language practice into meaningful and engaging activities rather than routine academic exercises.

The emergence of online learning platforms has further expanded opportunities for Arabic language instruction. Learning management systems, educational websites, video-sharing platforms, and virtual classrooms enable learners to access diverse learning materials and interact with instructors beyond traditional classroom settings. The COVID-19 pandemic accelerated the adoption of online learning technologies worldwide and encouraged educators to develop innovative digital teaching practices. In Arabic language education, online platforms have facilitated the dissemination of instructional videos, digital learning resources, interactive exercises, and collaborative learning activities. These developments have contributed to greater accessibility and flexibility in language learning, particularly for learners who may have limited access to qualified Arabic language instructors in their local contexts.

More recently, the educational landscape has entered a new phase characterized by the integration of Artificial Intelligence (AI). Unlike earlier digital technologies that primarily served as delivery tools for instructional content, AI technologies possess the ability to analyze data, adapt learning experiences, generate content, and provide personalized feedback. This shift represents a significant development in language education because it enables learning systems to respond dynamically to individual learner needs rather than providing uniform instructional experiences (Luckin, 2018; Holmes et al., 2019).

In language education, AI applications have rapidly expanded in recent years. Intelligent tutoring systems, speech recognition technologies, automated writing evaluation tools, conversational agents, and adaptive learning platforms are increasingly being used to support language acquisition. These technologies can identify learner strengths and weaknesses, recommend appropriate learning activities, and provide immediate feedback that supports continuous improvement. Research suggests that personalized learning experiences facilitated by AI can enhance learner engagement and improve learning outcomes by accommodating individual differences in pace, ability, and learning preferences (Zawacki-Richter et al., 2019).

Arabic language education has also begun to experience the impact of AI-driven innovations. Recent studies have documented the use of AI-based applications for vocabulary development, pronunciation training, writing assistance, translation support, and conversational practice (Huda, 2025; Kholid, 2025; Sumiarni, 2026). The emergence of generative AI technologies, particularly large language models such as ChatGPT, has further expanded the possibilities for Arabic language learning. These systems can generate dialogues, stories, exercises, quizzes, and learning materials that can be adapted to learners' specific needs and proficiency levels. In addition, AI-powered speech recognition technologies offer opportunities to support pronunciation development by providing immediate feedback on learners' spoken language performance.

Despite these promising developments, the literature indicates that the adoption of advanced technologies in Arabic language education remains uneven. Many existing studies focus on higher education contexts and adult learners, while research involving early childhood education remains relatively limited. Furthermore, technological integration often encounters challenges related to teacher readiness, digital literacy, infrastructure availability, and concerns regarding the developmental appropriateness of technology use among young children (NAEYC, 2020). Consequently, while digital technologies and AI offer substantial opportunities for enhancing Arabic language learning, their implementation in early childhood settings requires careful consideration of pedagogical principles and child development needs.

Overall, the evolution of Arabic language learning in the digital era reflects a gradual shift from traditional instructional approaches toward more interactive, learner-centered, and technology-enhanced environments. The progression from conventional teaching materials to multimedia resources, mobile learning, gamification, online learning platforms, and AI-based systems demonstrates the growing influence of technology on language education. These developments provide a foundation for exploring how Artificial Intelligence can be effectively utilized to support Arabic language learning for young children while maintaining the principles of developmentally appropriate practice. Therefore, the next section examines the specific opportunities that AI offers for enhancing Arabic language learning in early childhood education.

Opportunities of Artificial Intelligence in Arabic Language Learning for Young Children

The rapid advancement of Artificial Intelligence (AI) has created new opportunities for transforming educational practices across various disciplines, including language education. Unlike previous educational technologies that primarily functioned as tools for delivering content, AI has the capacity to analyze learner behavior, personalize learning experiences, generate educational materials, and provide real-time feedback. These capabilities have generated considerable interest among educators and researchers seeking innovative approaches to improve learning effectiveness. Within the context of Arabic language learning for young children, AI presents significant opportunities to create more engaging, adaptive, and developmentally responsive learning environments.

One of the most promising opportunities offered by AI is the personalization of learning experiences. Early childhood classrooms often consist of children with diverse developmental levels, learning styles, interests, and language abilities. Traditional instructional approaches may struggle to accommodate these individual differences effectively. AI-powered educational systems, however, can analyze learner performance and adapt content according to individual needs. Adaptive learning technologies can provide personalized vocabulary exercises, recommend suitable learning activities, and adjust the difficulty level of tasks based on children's progress (Luckin, 2018). Such personalization is particularly valuable in Arabic language learning because children frequently demonstrate varying levels of familiarity with Arabic vocabulary, pronunciation, and religious expressions depending on their home and educational backgrounds.

Another significant opportunity lies in the development of interactive storytelling experiences. Storytelling has long been recognized as one of the most effective strategies for language development during early childhood because it promotes vocabulary acquisition, listening comprehension, imagination, and communication skills. Recent advances in generative AI enable the creation of interactive stories that can adapt to children's responses and interests. Unlike traditional storybooks, AI-generated stories can provide personalized narratives, modify story complexity, and introduce target vocabulary within meaningful contexts. For Arabic language learning, AI-assisted storytelling offers opportunities to expose children to Arabic vocabulary, expressions, and cultural values through engaging and age-appropriate narratives. Furthermore, stories can be designed to incorporate Islamic themes, thereby supporting both language development and religious education.

AI also offers substantial potential for supporting pronunciation development through speech recognition technologies. Accurate pronunciation is particularly important in Arabic because many Arabic phonemes differ significantly from those

found in other languages. Young learners often encounter difficulties when attempting to produce sounds such as ع ('ain), ح (ha'), خ (kha'), and ق (qaf), which may not exist in their native language. AI-powered speech recognition systems can analyze children's pronunciation and provide immediate corrective feedback. Unlike traditional classroom environments where teachers may not always be able to provide individualized attention to every child, AI systems can offer continuous pronunciation practice opportunities. This feature has the potential to strengthen phonological awareness and improve oral language development through repeated exposure and guided practice.

In addition to supporting learners directly, AI can serve as a valuable resource for teachers. One of the challenges frequently reported in Arabic language education is the limited availability of engaging instructional materials that are developmentally appropriate for young children. Generative AI technologies can assist teachers in creating stories, songs, vocabulary lists, games, worksheets, and classroom activities tailored to specific learning objectives. Teachers can also use AI tools to generate differentiated learning materials for children with varying levels of ability. By reducing the time required for instructional preparation, AI may allow educators to focus more on facilitating meaningful interactions and supporting children's learning processes. Importantly, AI should be viewed as a tool that enhances teacher effectiveness rather than replacing the teacher's central role in the learning environment.

Another notable opportunity involves strengthening home-school collaboration. Parental involvement has consistently been identified as a significant factor in children's language development. AI-powered educational applications can extend Arabic language learning beyond the classroom by providing parents with accessible resources and guidance for supporting language practice at home. For example, AI systems can recommend daily vocabulary activities, generate simple Arabic stories, suggest interactive games, and monitor children's learning progress. Such features may increase opportunities for meaningful language exposure in home environments while encouraging parents to participate more actively in their children's language development. This opportunity is particularly relevant within Islamic educational settings, where Arabic language exposure can be integrated naturally into daily religious practices and family routines.

The integration of AI with gamified learning environments represents another promising area for Arabic language education. Gamification has been shown to increase learner motivation, engagement, and persistence by incorporating game elements into educational activities (Hamari et al., 2014). AI can enhance gamification by creating adaptive learning experiences that respond to individual learner performance. For instance, an AI-powered Arabic language game may adjust vocabulary difficulty, provide personalized rewards, or generate new challenges based on children's progress. Such adaptive systems can maintain an optimal level of

challenge while preventing frustration or boredom. Given the importance of play-based learning in early childhood education, AI-supported gamification has considerable potential to make Arabic language learning more enjoyable and meaningful.

Recent developments in multimodal AI technologies further expand the possibilities for Arabic language learning. Multimodal AI systems are capable of processing and generating information across multiple formats, including text, speech, images, and video. These capabilities align closely with the principles of multisensory learning, which emphasize the importance of engaging multiple sensory channels during instruction (Sousa, 2022). Through multimodal AI applications, children can simultaneously hear Arabic vocabulary, view corresponding images, interact with visual content, and receive spoken feedback. Such integrated experiences may enhance comprehension, retention, and engagement by providing richer and more meaningful learning opportunities.

Beyond linguistic outcomes, AI also has the potential to support inclusive education. Children differ considerably in their learning needs, developmental trajectories, and abilities. Some children may require additional support due to language delays, learning difficulties, or diverse learning preferences. AI-powered adaptive systems can offer individualized assistance that accommodates these differences, thereby promoting more equitable access to learning opportunities. Although research on AI-supported Arabic language learning for children with special educational needs remains limited, findings from broader educational contexts suggest that AI may contribute positively to differentiated instruction and personalized support (Holmes et al., 2019).

Despite these promising opportunities, the literature consistently emphasizes that AI should be integrated within a human-centered pedagogical framework. Young children learn most effectively through social interaction, emotional connection, play, and meaningful communication. Consequently, AI should not be viewed as a substitute for teachers, parents, or peer interactions. Instead, it should function as a supportive tool that enriches learning experiences while preserving the fundamental principles of early childhood education. Technologies that enhance interaction, creativity, and engagement are more likely to contribute positively to children's development than those that simply automate instructional processes.

Overall, the reviewed literature suggests that AI offers considerable opportunities for enhancing Arabic language learning in early childhood education. These opportunities include personalized learning, interactive storytelling, pronunciation support, teacher assistance, parental engagement, adaptive gamification, multimodal learning experiences, and inclusive educational practices. When implemented thoughtfully and in accordance with developmentally appropriate principles, AI has the potential to enrich Arabic language learning while addressing some of the limitations associated with traditional instructional

approaches. Nevertheless, realizing these benefits requires careful consideration of the challenges and risks associated with AI implementation, which are discussed in the following section

Challenges and Risks of Artificial Intelligence in Arabic Language Learning for Young Children

Despite the numerous opportunities offered by Artificial Intelligence (AI), the literature also highlights a range of challenges and risks associated with its implementation in early childhood education. While AI technologies have the potential to enhance learning experiences, their use among young children requires careful consideration of developmental, pedagogical, ethical, and technological factors. Unlike older learners, young children are still developing fundamental cognitive, social, emotional, and self-regulation skills, making them particularly vulnerable to the unintended consequences of inappropriate technology use. Therefore, discussions concerning AI in Arabic language learning should not focus solely on innovation and efficiency but also on the potential risks that may emerge when technology is integrated without adequate pedagogical safeguards.

One of the most frequently discussed concerns involves excessive screen exposure. Although digital technologies can provide engaging learning experiences, prolonged screen time has been associated with various developmental challenges among young children. Research suggests that excessive use of digital devices may negatively affect attention regulation, sleep quality, physical activity, and opportunities for social interaction (Madigan et al., 2019). Since language development in early childhood depends heavily on active communication and interpersonal engagement, overreliance on AI-based applications may reduce opportunities for meaningful interactions with teachers, parents, and peers. In the context of Arabic language learning, there is a risk that children may become passive consumers of digital content rather than active participants in communicative experiences. Consequently, AI-supported learning should complement rather than replace direct human interaction and hands-on learning activities.

Another significant concern relates to the potential reduction of social and emotional interactions. Sociocultural theories of learning emphasize that children's cognitive and linguistic development occurs through social engagement and collaborative experiences (Vygotsky, 1978). Teachers and caregivers provide emotional support, scaffolding, encouragement, and immediate responses that cannot be fully replicated by AI systems. While conversational AI and educational chatbots can simulate interaction, they lack genuine emotional understanding and the ability to respond appropriately to the complex social and emotional needs of young children. Excessive dependence on AI-mediated communication may therefore limit opportunities for developing empathy, social competence, and interpersonal

communication skills, all of which are essential components of holistic child development.

The literature also highlights concerns regarding the linguistic limitations of AI systems in Arabic language education. Although advances in Arabic Natural Language Processing (NLP) have improved the capabilities of AI applications, Arabic remains one of the most linguistically complex languages for computational processing. The language contains rich morphological structures, extensive inflection patterns, multiple dialects, and varying levels of formality between Modern Standard Arabic and colloquial varieties (Rhel & Roussinov, 2025). Consequently, AI-generated content may occasionally contain linguistic inaccuracies, inappropriate vocabulary choices, incorrect grammatical structures, or pronunciation errors. Such inaccuracies can be particularly problematic for young children, who are still developing foundational language knowledge and may struggle to distinguish correct language forms from erroneous ones. Therefore, human supervision remains essential when AI-generated materials are used in Arabic language instruction.

Another challenge concerns the quality and developmental appropriateness of AI-generated educational content. Generative AI systems are designed to produce content based on patterns identified within large datasets rather than on pedagogical principles specific to early childhood education. As a result, AI-generated stories, activities, or instructional materials may not always align with children's developmental characteristics, cultural contexts, or learning needs. Content that appears linguistically appropriate may still be cognitively too complex, emotionally unsuitable, or educationally ineffective for young learners. Furthermore, AI systems may generate information that lacks contextual relevance to children's experiences, thereby reducing its educational value. This concern is particularly important in Arabic language learning, where language instruction is often closely connected with cultural and religious values that require careful contextualization.

Ethical and privacy issues represent another area of concern. AI-powered educational applications often collect substantial amounts of user data to personalize learning experiences and improve system performance. These data may include learning records, behavioral information, voice recordings, and interaction histories. In early childhood contexts, concerns regarding data security, privacy protection, and informed consent become especially important because young children are unable to make informed decisions regarding the collection and use of their personal information. International organizations and educational researchers have increasingly emphasized the need for strong ethical frameworks to govern AI implementation in educational settings (UNESCO, 2021). Educational institutions, developers, and policymakers must therefore ensure that AI systems used with young children comply with appropriate standards of data protection and ethical responsibility.

Bias and cultural representation also pose potential challenges. AI systems learn from large datasets that may contain cultural, linguistic, or ideological biases. Consequently, AI-generated content may inadvertently reproduce stereotypes, exclude diverse perspectives, or present information that conflicts with local cultural and educational values. In Arabic language education, this issue becomes particularly significant because language learning is often intertwined with cultural identity, religious traditions, and social norms. Educational content generated by AI should therefore be carefully reviewed to ensure cultural sensitivity, linguistic accuracy, and alignment with educational objectives.

Teacher readiness represents another important challenge identified in the literature. The successful integration of AI into educational practice depends not only on technological availability but also on teachers' knowledge, attitudes, and competencies. Many educators remain unfamiliar with AI technologies and may lack the digital literacy required to evaluate, adapt, and effectively implement AI-supported learning tools (Zawacki-Richter et al., 2019). In some cases, teachers may perceive AI as a threat to their professional roles, while others may overestimate its capabilities and rely on it excessively. Therefore, professional development programs are essential to help educators develop critical AI literacy and pedagogical competence. Teachers must be able to recognize both the strengths and limitations of AI in order to make informed decisions regarding its use in early childhood Arabic language education.

Furthermore, concerns have been raised regarding the potential erosion of creativity and independent thinking. While AI can provide rapid answers, generate stories, and complete various educational tasks, excessive reliance on AI-generated solutions may reduce opportunities for children to engage in imaginative play, creative problem-solving, and independent exploration. Early childhood education places significant emphasis on creativity, curiosity, and active discovery. If AI systems dominate learning experiences, children may become more dependent on automated assistance rather than developing their own ideas and solutions. Therefore, AI should be designed to stimulate creativity and exploration rather than simply providing ready-made answers.

The reviewed literature consistently emphasizes that technological innovation should not overshadow the fundamental principles of early childhood education. Developmentally Appropriate Practice (DAP) advocates learning experiences that prioritize active engagement, social interaction, exploration, play, and meaningful relationships (NAEYC, 2020). AI technologies should therefore be evaluated according to their ability to support these principles rather than solely on the basis of efficiency or technological sophistication. The ultimate goal of education is not merely to optimize learning outcomes but also to foster children's holistic development, well-being, and lifelong learning capacities.

Overall, the challenges and risks associated with AI in Arabic language learning for young children highlight the importance of a balanced and critical approach to technological integration. Concerns regarding screen time, reduced human interaction, linguistic inaccuracies, developmental appropriateness, ethical issues, cultural bias, teacher readiness, and creativity must be carefully addressed to ensure that AI contributes positively to children's learning experiences. These findings suggest that AI should function as a supportive educational tool rather than a replacement for human relationships and pedagogical expertise. Consequently, future efforts should focus on developing human-centered approaches that integrate AI within developmentally appropriate and pedagogically sound educational frameworks. This need provides the foundation for proposing a conceptual model of AI-supported Arabic language learning for young children in the following section.

Future Directions: A Human-Centered AI Model for Arabic Language Learning in Early Childhood Education

The opportunities and challenges identified in the previous sections suggest that the future of Artificial Intelligence (AI) in Arabic language learning for young children should not be framed as a choice between technology and human interaction. Instead, the literature indicates that the most promising direction lies in developing a balanced approach that integrates technological innovation with the fundamental principles of early childhood education. While AI can enhance learning through personalization, adaptive feedback, and interactive experiences, young children's language development continues to depend primarily on meaningful social interaction, emotional support, play, and guided participation. Therefore, future educational initiatives should focus on designing AI-supported learning environments that place human relationships at the center of the learning process.

Based on the synthesis of the reviewed literature, this article proposes a conceptual framework called Human-Centered AI for Preschool Arabic Instruction (HAPI-A). The model is designed to provide a theoretical foundation for integrating AI into Arabic language learning while maintaining alignment with developmentally appropriate practice and the unique characteristics of early childhood education. Rather than positioning AI as a replacement for teachers or parents, the HAPI-A model conceptualizes AI as a supportive tool that enhances human-mediated learning experiences.

The first component of the model is Human Interaction. Research on language acquisition consistently demonstrates that children learn language most effectively through interactions with caregivers, teachers, and peers (Vygotsky, 1978; Bruner, 1983). Consequently, all AI-supported activities should be embedded within social learning environments that encourage communication and collaboration. Teachers remain responsible for facilitating discussions, modeling language use, providing emotional support, and creating opportunities for authentic interaction. AI should

function as a supplementary resource that enriches these experiences rather than replacing them. For example, an AI-generated story may serve as a stimulus for classroom discussion, role-playing, or collaborative language activities led by the teacher.

The second component is AI Assistance. The literature suggests that AI can contribute positively to language learning when used to support personalization, content generation, and adaptive feedback (Luckin, 2018; Holmes et al., 2019). Within the HAPI-A model, AI serves as an instructional assistant that helps teachers design learning materials and provides children with individualized learning opportunities. AI can generate age-appropriate stories, vocabulary exercises, interactive games, and pronunciation activities tailored to children's developmental levels. However, all AI-generated content should be reviewed and adapted by educators to ensure linguistic accuracy, cultural relevance, and developmental appropriateness.

The third component is Play-Based Learning. Play remains the primary mode of learning during early childhood and should continue to guide the design of AI-supported educational experiences (Copple & Bredekamp, 2009). The reviewed literature emphasizes that language acquisition occurs most effectively when children engage in enjoyable and meaningful activities rather than formal instruction. Therefore, future AI applications should incorporate elements of storytelling, role-playing, exploration, creativity, and gamification. Instead of encouraging passive screen consumption, AI should support active participation and imaginative engagement. For example, AI-assisted storytelling applications could allow children to interact with characters, make choices within narratives, and use newly acquired Arabic vocabulary in playful contexts.

The fourth component is Islamic Value Integration. Unlike many foreign language learning contexts, Arabic language education in Islamic institutions is closely connected to religious identity, moral development, and cultural values. Consequently, future AI-supported Arabic learning systems should not focus solely on linguistic outcomes but also support the integration of Islamic values and cultural understanding. AI-generated stories, conversations, and learning activities can incorporate themes related to honesty, kindness, gratitude, respect, and other values emphasized in Islamic teachings. Such integration may strengthen children's motivation to learn Arabic while simultaneously supporting character development and religious literacy.

The fifth component is Adaptive Learning. One of AI's most significant strengths is its capacity to accommodate individual differences among learners. Children vary considerably in their developmental pace, prior experiences, interests, and language abilities. Adaptive learning systems can provide differentiated learning pathways that respond to these differences while maintaining appropriate levels of challenge and support. In Arabic language education, adaptive systems may adjust vocabulary difficulty, provide personalized pronunciation practice, or recommend

learning activities based on children's progress. Such personalization has the potential to enhance engagement and learning outcomes while respecting individual developmental trajectories.

The HAPI-A model further proposes that the relationship among these five components should be viewed as dynamic and interconnected rather than hierarchical. Human interaction remains the central element because it provides the social and emotional foundation necessary for language development. AI assistance functions as a supporting mechanism that enhances educational experiences without replacing human relationships. Play-based learning ensures that educational activities remain developmentally appropriate and engaging, while Islamic value integration provides cultural and moral relevance. Adaptive learning enables personalization that accommodates individual learner differences. Together, these components create a balanced framework that aligns technological innovation with established principles of early childhood education.

The proposed model also offers several practical implications for educators and policymakers. First, teacher preparation programs should incorporate AI literacy training that emphasizes pedagogical rather than purely technical competencies. Educators need to understand not only how AI technologies function but also how they can be integrated responsibly within child-centered learning environments. Second, developers of educational technologies should collaborate with early childhood educators, Arabic language specialists, psychologists, and curriculum experts to ensure that AI-supported applications reflect developmental and pedagogical principles. Third, policymakers should establish ethical guidelines and quality standards governing the use of AI in early childhood education, particularly regarding data privacy, content quality, and children's well-being.

The HAPI-A model also highlights several directions for future research. Most existing studies concerning AI in Arabic language education focus on higher education contexts, leaving significant gaps in knowledge regarding early childhood applications. Future empirical studies should investigate the effectiveness of AI-supported storytelling, pronunciation training, adaptive vocabulary instruction, and parent-assisted learning applications among preschool children. Researchers should also examine children's engagement, language outcomes, social development, and ethical considerations associated with AI implementation. Such studies would contribute valuable evidence for refining and validating the proposed conceptual framework.

In summary, the future of Arabic language learning for young children should not be characterized by technological determinism or resistance to innovation. Instead, it should be guided by a balanced perspective that recognizes both the opportunities and limitations of AI. The Human-Centered AI for Preschool Arabic Instruction (HAPI-A) model offers a conceptual framework that places children's developmental needs, human relationships, and educational values at the center of technological

integration. By combining human interaction, AI assistance, play-based learning, Islamic value integration, and adaptive learning, the model provides a foundation for designing Arabic language learning environments that are innovative, meaningful, and developmentally appropriate. As AI technologies continue to evolve, maintaining this human-centered orientation will be essential for ensuring that technological advancement contributes positively to children's language development and overall well-being.

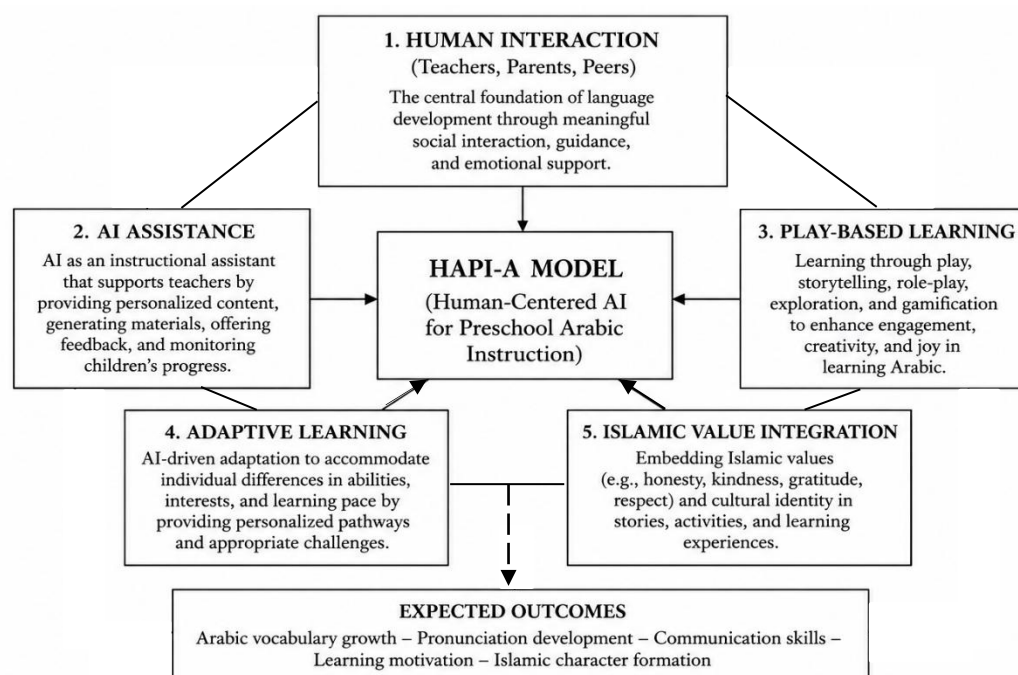


Figure 1. The HAPI-A Model (Human-Centered AI for Preschool Arabic Instruction)

The HAPI-A Model illustrates a human-centered framework for integrating Artificial Intelligence (AI) into Arabic language learning for young children. The model positions human interaction involving teachers, parents, and peers as the central foundation of language development, while AI functions as a supportive tool rather than a replacement for human engagement. The framework integrates five interconnected dimensions: human interaction, AI assistance, play-based learning, adaptive learning, and Islamic value integration. These dimensions collectively support the development of Arabic vocabulary, pronunciation, communication skills, learning motivation, and Islamic character formation. The model emphasizes that effective AI implementation in early childhood Arabic education should remain aligned with developmentally appropriate practices, meaningful social interaction, and the cultural-religious context of Islamic education. The proposed model serves as a conceptual framework for guiding future research and educational practices related to AI-supported Arabic language learning in early childhood settings.

CONCLUSION

The review also demonstrates that Arabic language education has evolved from traditional instructional approaches toward increasingly digital and technology-enhanced learning environments. The emergence of mobile learning, multimedia resources, gamification, and online learning platforms has expanded opportunities for language acquisition and engagement. More recently, AI technologies have introduced new possibilities for personalized learning, interactive storytelling, pronunciation support, adaptive instruction, teacher assistance, and home-based learning support. These developments suggest that AI has considerable potential to enhance Arabic language learning experiences when implemented appropriately. However, the literature further reveals that AI implementation in early childhood education is accompanied by several challenges and risks. Concerns regarding excessive screen time, reduced human interaction, linguistic inaccuracies, developmental appropriateness, ethical issues, privacy protection, cultural bias, and teacher readiness highlight the need for a cautious and balanced approach. AI should not be viewed as a substitute for teachers, parents, or peer interaction, as human relationships remain central to children's cognitive, linguistic, social, and emotional development.

In response to these opportunities and challenges, this study proposed the Human-Centered AI for Preschool Arabic Instruction (HAPI-A) Model as a conceptual framework for integrating AI into Arabic language learning for young children. The model emphasizes five interconnected dimensions: human interaction, AI assistance, play-based learning, adaptive learning, and Islamic value integration. By positioning human interaction as the core foundation of learning, the model seeks to ensure that technological innovation supports rather than replaces developmentally appropriate educational practices. Overall, the future of Arabic language learning in early childhood education should not be characterized by technological determinism but by a balanced integration of technological innovation and human-centered pedagogy. AI has the potential to enrich learning experiences, increase accessibility, and support personalized instruction; however, its effectiveness ultimately depends on how it is designed, implemented, and aligned with children's developmental needs. Future empirical research is needed to examine the effectiveness of AI-supported Arabic language learning interventions, validate the proposed HAPI-A Model, and explore the long-term implications of AI integration within diverse early childhood educational contexts.

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