

# Digital Strategies to Enhance the Effectiveness of Learning Arabic in a Non-Native Environment

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**Annotation.** The article aims to theoretically substantiate the effectiveness of digital strategies (gamification, mobile applications, artificial intelligence) in learning Arabic in a non-language environment and to determine their potential to improve quality of students' learning. The study's results demonstrated the considerable potential of innovation in overcoming the main difficulties of learning Arabic in an environment with limited linguistic immersion. It has been shown that technological solutions contribute to activating cognitive activity, increase motivation, and provide socio-emotional and cognitive support for the educational process. Personalization of learning through instant feedback based on intellectual support contributes to the formation of individual educational trajectories and compensates for the lack of a real linguistic environment. It is determined that cultural adaptation of educational content is one of the key factors in the complexity of mastering the Arabic language since digital products for the Arab-language environment are not always clear and relevant for natives of other cultures and languages.

**Keywords:** digital tools, gamification, mobile applications, artificial intelligence, non-linguistic environment, personalization of learning, linguistic and cultural adaptation.

## Цифрові стратегії підвищення ефективності вивчення арабської мови у немовному середовищі

**Анотація.** Вивчення арабської мови у немовному середовищі є складним завданням через відсутність природного мовного занурення, а також специфіку графічної та фонематичної складової мови. Мета статті – теоретично обґрунтувати ефективність цифрових стратегій (гейміфікації, мобільних застосунків, штучного інтелекту) у процесі вивчення арабської мови у немовному середовищі та визначити їх потенціал у підвищенні результативності навчання здобувачів освіти.

Методи дослідження включали аналіз наукових публікацій; порівняльний аналіз цифрових інструментів, що використовуються у вивченні іноземної мови, зокрема й

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арабської; систематизація та узагальнення з метою визначення ефективних цифрових підходів навчання арабської мови. Результати дослідження продемонстрували значний потенціал цифрових інструментів у подоланні основних труднощів вивчення арабської мови. Показано, що технологічні рішення сприяють активізації пізнавальної діяльності, підвищують мотивацію та забезпечують соціально-емоційний та когнітивний супровід освітнього процесу. Мобільні застосунки (Duolingo, Memrise, Drops Arabic) дозволяють створити безперервне, гнучке та адаптаційне середовище для системного тренування усіх мовних навичок, здатні підтримати регулярність занять та адаптувати освітній контент під індивідуальні особливості здобувачів освіти. Упровадження технології штучного інтелекту забезпечує персоналізацію навчання шляхом миттєвого зворотного зв'язку на основі здійснення інтелектуальної підтримки, сприяє формуванню індивідуальних освітніх траєкторій та компенсує відсутність реального мовного середовища. Визначено, що культурна адаптація освітнього контенту є одним із ключових чинників складності опанування арабської мови, оскільки цифрові продукти для арабомовного середовища не завжди є зрозумілими та релевантними для носіїв інших культур та мов. Висновки дослідження підтверджують, що цифрові стратегії є перспективним інструментом модернізації вивчення арабської мови, проте для максимальної ефективності процесу навчання необхідна системна підтримка, що передбачає створення адаптованого контенту з урахуванням специфіки арабської мови, підвищення рівня цифрової грамотності як педагогів, так і здобувачів освіти, а також розроблення методичних рекомендацій щодо інтеграції цифрових ресурсів у зміст курсу, аби уникнути їх формального застосування.

**Ключові слова:** цифрові інструменти, гейміфікація, мобільні застосунки, штучний інтелект, немовне середовище, персоналізація навчання, мовно-культурна адаптація.

### Introduction

The current conditions of digitalization and globalization of education determine the practical mastery of foreign languages. The dynamic development of digital technologies at the same time opens up new opportunities for the transformation of language education, and innovative approaches allow making the process of learning Arabic more interactive, motivational and personalized for personal needs. Therefore, digital strategies are essential for students in a non-linguistic environment because they can compensate for the lack of immersion in the natural language environment. Accordingly, the relevance of the topic is due to several factors, in particular, firstly, the growing demand for Arabic language proficiency in educational, diplomatic and cultural aspects; secondly, there is a need to adapt the educational process to the conditions of blended and distance learning, which is especially relevant in modern crisis conditions; thirdly, a change in the paradigm of traditional language learning in connection with the development of digital technologies. Therefore, searching for effective digital strategies for learning Arabic is necessary in modern educational theory and practice.

Analysis of recent research and publications shows that the features of the graphics and phonetics of the Arabic language indicate a structural difference from the Ukrainian language. In the work of N. V. Vasylenko [1, p. 74-87], a comparative analysis of the phonemic systems of the Arabic and Ukrainian languages was carried out, which allows us to understand the articulatory and auditory barriers to learning. In particular, these same difficulties are confirmed in the study of M. S. A. Alkadi [2, p. 1-6], which emphasizes the characteristic errors of bilinguals in writing, which are due to the unusual direction of writing, letter shapes and the stagnation of diacritical marks.

The idea of the complexity of the language material is also supplemented by R. V. Statsyuk [3, p. 142-150], which focuses on military terminology but demonstrates the active borrowing and dynamism of Arabic vocabulary and emphasizes the need for high levels of adaptability from students.

Research on increasing the motivation and engagement of students in learning shows that the use of gamification and edutainment is gaining relevance. Thus, E. S. Kryukova and O. S. Ameridze [4, p. 51-55] indicate that the Kahoot! platform with gamification elements shows effectiveness in learning a foreign language due to increased motivation. Several foreign works confirm these same conclusions: D. Lin, M. Ganapathy and, K. Manjet [5, p. 565-582] (reveals the possibilities of Kahoot! in higher education); M. Maesaroh, A. Faridi and D. Anggani Linggar Bharati [6, p. 366-373] (shows the effectiveness of Kahoot! in teaching students with low motivation). In turn, V. G. Kononenko, T. V. Obratsova and A. Dzhavad [7, p. 45-52] outline the mechanism of using Kahoot! for learning Arabic in Ukraine, the effectiveness of which is confirmed by an increase in students' grammatical competence level.

The studies of O. B. Bigich [8], N. V. Gromova, K. I. Kovalchuk and N. Yu. Kulikova [9], and M. Juma [10] describe how edutainment technology is used in learning the Arabic language and demonstrate its effectiveness in comparison with traditional approaches to the formation of grammatical skills.

The experience of implementing platforms for distance learning with the possibility of using tools for adaptation to the features of higher education in the digital environment is presented in the works of V. Vyshkivska, Yu. Sylenko, O. Golikova, T. Tsehelnik and O. Patlaichuk [11, p. 512-518]. However, in the study of M. Ritonga, H. Widodo, M. Munirah, T. Nurdianto [12; 13], the innovative IcanDO platform is presented, which is designed specifically for teaching Arabic to children, which also illustrates the potential for personalization based on the interactivity of the educational process. Scientist Yu. Sylenko [14, p. 68-76] also emphasizes the application of individualization elements, which is entirely consistent with mobile learning, where students can choose the format, pace, and time of learning a foreign language.

Digitalization of the educational process is a prerequisite for effective foreign language learning in a globalized world. The studies of N. Kerras and M. L. B. Essayahi [15], R. Rahmawati and Febriani S. R. [16] emphasize digital tools that can increase motivation in students, in particular, enable individualization of the educational process and promote the formation of intercultural communication. However, it should be noted that most of the works focus on learning English, which leaves out the phonemic, grammatical and lexical specificity of more complex languages, particularly Arabic.

The studies of Zurqoni, H. Retnawati, S. Rahmatullah, H. Djidu and E. Apino [17], E. F. Fidayani and F. M. Ammar [18] reveal the organizational and methodological aspects of implementing digital platforms and resources in teaching Arabic. However, the issues of adapting these technologies to a non-linguistic environment, where Arabic is not the native language for the student to learn, have not been sufficiently studied [19].

Thus, the analysis of scientific research shows a growing interest in digital platforms and services and their impact on engagement and motivation in language education. However, the analysis of modern scientific research shows that the issue of using digital strategies in learning Arabic in a non-linguistic environment remains fragmentary. After all, the existing works are dominated by a general approach to the use of digital technologies without taking into account the specifics, particularly the linguistic specificity of the Arabic language, especially for applicants for whom it is not their native language. In particular, almost no studies are dedicated to the Ukrainian-speaking educational environment, which determines the practical need to create pedagogically adapted approaches to teaching the Arabic language.

The purpose of the article is to theoretically substantiate the effectiveness of digital tools in the process of learning Arabic in a non-linguistic environment.

Objectives of the article: 1) to analyze the current state of scientific research on the use of digital technologies in language education; 2) to identify and reveal the features of the use of gamification, mobile applications and artificial intelligence; 3) to outline the advantages and limitations of introducing digital tools into the process of learning Arabic in a non-linguistic environment.

The study used a complex of interrelated methods that made it possible to reveal the problem entirely.

First, an analysis of scientific publications has been applied to identify theoretical approaches and current trends in the use of digital technologies in learning foreign languages.

A comparative analysis of digital strategies used in foreign language learning, including English, French, German and Arabic, has been conducted. As a result, this enabled identifying individual approaches' standard features, differences, and benefits.

Systematization and generalization of the obtained data were also carried out. It allowed the usage of empirical and theoretical material to identify practical approaches to the digital study of Arabic.

All methods aim to achieve the purpose of research - identifying the most effective digital strategies that contribute to improving the quality of learning Arabic as a foreign language.

## Results

Arabic is one of the five most common languages in the world and, therefore, has strategic importance from the point of view of cultural, economic and political terms. It is an official language in more than 20 countries, one of the six official languages of the UN, which emphasizes the importance of the Arabic language in the international arena. However, its study in a non-linguistic environment is accompanied by several contradictions. One of them is the limited possibilities of living communication with native speakers, lack of natural linguistic context, significant grammatical and phonetic complexity, and profound cultural and linguistic differences that can cause additional barriers in intercultural perception.

In the context of the digital transformation of education, using digital technologies to learn a foreign language effectively is particularly relevant. Modern language learning goes beyond the traditional format (auditor), increasingly integrating digital tools applications, platforms for online learning, interactive simulations, services with gamification elements, and adaptive programs that use artificial intelligence algorithms. Due to this, it is possible to provide an individual trajectory of learning, increase its motivational potential, provide constant feedback, and create conditions for immersion in a virtual linguistic environment, which is as close as possible to the real.

Scientists are increasingly turning to the study of the problems of modern digital technologies on cognitive activity, the dynamics of learning lexical and grammatical material, motivation and results of language learning in general. However, most studies are traditionally focused on popular languages - English, German, French, and Spanish - more widespread in the educational space. Instead, the Arabic language, which has a unique structural, phonetic and graphics system, remains outside the focus of researchers in digital linguistics. That is why a deep analysis of digital technologies' potential to overcome the difficulties that arise in the learning process of Arabic is a relevant and essential task for linguists and educators.

In this context, it is advisable to consider individual digital tools with considerable potential for improving the efficiency of learning Arabic without a natural language environment. These technologies and tools make it possible to partially compensate for the shortage of live communication and create a new quality of educational experience, which is focused on the motivation and adaptability of the educational process in general.

Let us analyze gamification, which is the introduction of game elements in the educational process to increase the motivational component, the involvement of education applicants and,

as a consequence, to increase the effectiveness of the educational process. In studying Arabic in a non-linguistic environment, gamification creates conditions for active immersion through the simulation of communicative situations, modeling situations of authentic linguistic interaction and interactivity and ensuring the individualization of the educational process. It ensures the development of speech communication, productivity, self-expression, and socio-cultural adaptation. The results of numerous studies of the effectiveness of using gamified platforms Kahoot!, Quizizz, and Wordwall to form linguistic competencies have demonstrated an increase in educational motivation and the overall activation of cognitive activity in education applicants [4; 5; 6].

Moreover, gamification's effectiveness in studying the Arabic language is due to its cultural specificity, the complexity of the graphic system and its structures, and the significant difference in the sound system. Gamified exercises allow you to master aspects of language, minimize anxiety and overcome fear of mistakes within the game form. In combination with multimedia components, gamification contributes to the formation of complex linguistic competencies, which include reading, writing, speaking and listening.

For example, the Kahoot! platform allows you to provide instant feedback between the educator and the student. Using test tasks and quizzes allows the teacher to evaluate the level of mastering the material, adjust the pace of information, and adapt the task to individual needs. A significant advantage is creating multimedia questions with audio support, including Arabic letters, words, and phrases. Thus, when learning the topic «Arabic alphabet», a teacher can create a game with illustrations of beech, where the applicants have to choose the right writing. And when learning the topic «Basic vocabulary», comparing Arabic words with a translation or a specific image that will stimulate associative thinking and visual memory is used. In the face of limited access to the Arab-language environment, the Kahoot! is a tool for communication integration, where, thanks to the teams, applicants learn to work together and discuss the variability of answers in the informal environment.

Therefore, the Kahoot! plays an essential role in overcoming the difficulties of learning the Arabic language because game tasks allow you to simulate exercises for recognition of letters (for example, «Find the correct form of the letter ب in the middle of the word»); to decrypt linguistic structures (for example, «choose the right sequence of words in a sentence»); writing words from a specific set of letters. In particular, a series of exercises with short audio files, where the student must recognize the word by hearing, can be used to automate reading.

In the study of the Arabic language, gamification helps to overcome difficulties related to the graphic system of language, the study of the phonemic feature of language, the order of writing and lexical features [2]. Game tasks allow you to simulate exercises for recognizing Arabic letters, deciphering language structures, and composing words, ensuring repetition and automation of skills and gradually reducing cognitive load.

Analysis of the study of V. G. Kononenko et al. proves the Kahoot!'s effectiveness in forming grammatical competence among translators from Arabic. The authors emphasize the advantages of using gamification, particularly in studying adjectives, articles, and actions [7, p. 45-52].

Thus, gamification as a digital strategy combines learning's social, emotional and cognitive aspects. Accordingly, gamification increases interest in complex language learning and creates a supportive environment in a non-linguistic environment.

Like gamification, mobile applications are a tool for the digital transformation of language education because they combine elements of interactivity and provide constant access to language content. Using mobile applications in Arabic language learning provides flexibility, regularity and accessibility to language learning from anywhere and at any time. In a non-linguistic environment, creating an artificial linguistic immersion of the education applicant is not allowed. In particular, it provides system training in basic language skills - writing, reading,

speaking and listening. The most popular applications for Arabic are Memrise, Busuu, Duolingo, and Mondly.

Other specialized platforms include Drops Arabic, AlifBee, and Learn Arabic with Maha. Their features include: interactivity of exercises and tasks with clear visual support and voice input; adaptability and modularity of educational content according to the user's level; system of awards, levels, and points; regular reminders for forming a sustained learning habit; Imitation of dialogues in the form of voice native speakers, which contributes to the development of phonematic skills. For example, the Duolingo application, one of the most popular applications for Arabic learning, emphasizes the study of the Arabic alphabet, character recognition, articulation of complex sounds and writing from right to left. The peculiarity is that the exercises should be interactive exercises where the applicant makes sounds with letters, listens to the phrase, and repeats it through the microphone. The platform also offers thematic lessons, for example, «Food», «Family», «Trip», etc., which contribute to the development of vocabulary and understanding of words in the context. The application also has grammar blocks and vocabulary, extending linguistic competence boundaries. The mechanism of daily reminders, achievements, points and virtual competition activates motivation for regular training.

Another popular application - Busuu Arabic - allows you to interact with native speakers when the applicant can record his voice message, which will then comment on other native speakers, pointing to errors or giving some pronunciation tips. The application Memrise, based on the method of mnemonic memorization, promotes the formation of associative thinking and language forecasting. Thus, this application presents words and phrases as cards with images and examples of videos on which native speakers pronounce phrases. So, for example, when studying the topic «Trip», the student will see the airport's image, hear the phrase in Arabic, see its writing and memorize it immediately in context.

The Mondly Arabic application allows you to work with three-dimensional models of dialogues that voice the native speakers and, at the same time, train speaking skills through voice recognition. For example, the applicant is offered a situation in a cafe where he should order lunch or a particular drink in Arabic. After the answer, the app estimates the accuracy of the pronunciation. Such imitation of real communication allows you to adapt to language use in real-life situations gradually.

In particular, mobile applications make it possible in a non-linguistic environment to apply the principle of micro-cars by daily performance of short tasks, which contributes to the formation of stable linguistic connections.

Thus, mobile applications as a digital tool in the study of Arabic in a non-linguistic environment ensure the adaptability and continuity of the educational environment, which has considerable potential for improving efficiency.

An important place among digital tools should be given to artificial intelligence, which allows you to open new horizons in adaptive and personalized training. It acts as a conditional teacher, which can adapt the educational process to the individual characteristics and needs of the applicant. Algorithms used in artificial intelligence form flexible educational environments, especially when learning complex languages (and Arabic).

In the study of Arabic, key artificial intelligence tools such as spoken chatbots can be used to make interactive dialogues with automatic language correction (for example, Replika, ChatGPT). For example, the student can ask a question in Arabic and get an answer to him, in particular, with a clear explanation of grammatical errors. This interaction format contributes to the development of linguistic intuition, trains sentence structure, and adapts to real-time dialogue.

Intellectual translation systems that allow adaptive grammatical correction and maintain a context explanation of words (for example, Google Translate). In the case of Arabic, which is

characterized by complex morphology, artificial intelligence provides contextual translation adaptation. For example, the word «كتب» can mean «books» or «he wrote», depending on the context. Accordingly, modern translators can consider grammatical structures and stylistic shades, providing phonetic transcription and pronunciation. Therefore, integrating such artificial intelligence systems with mobile applications allows the applicant to click on the incomprehensible word in the text and instantly obtain a grammatical form, pronunciation, and explanation.

Platforms for learning user pronunciation (for example, Mondly) use artificial intelligence to recognize the voice and analyze the correct articulation. When pronunciation of the word «ط», which means «aircraft», it may be reported that the sound «ط» is pronounced too gently. Similar functions develop phonemic hearing and a sense of language.

Individual courses based on artificial intelligence (for example, Coursera or Preply with AI-trainer) allow to organize the educational process based on analyzing the answer of the applicant to determine the level of complexity of the text, the frequency of errors on this basis, formulate adaptive plans of lessons.

Thus, many research confirm the effectiveness of the introduction of artificial intelligence in the study of the Arabic language, which, according to their results - increases the linguistic confidence of education applicants, develops critical thinking skills, and provides assimilation of morphology and syntax [20, p. 25-37; 21]. This way, education applicants in a non-linguistic environment can receive feedback in real time, which replaces the lack of direct communication with native speakers of the Arabic language.

Accordingly, thanks to artificial intelligence, education goes to a new level of flexibility, adaptability and interaction, allowing you to create an environment of personalized learning where the education applicant can move at their own pace, taking into account its weaknesses and strengths, and most importantly, maintain a high level of motivation through constant feedback and interactivity. Therefore, artificial intelligence is a progressive digital technology that, in a limited linguistic environment, allows you to create a continuous, flexible and personalized study of the Arabic language and compensates for the lack of authentic communication.

Using digital tools in learning Arabic shows high potential to create an adaptive, motivational and flexible educational environment. However, like any innovative approach, it has advantages and challenges that should be considered for effective implementation. A general overview of key benefits and challenges of integrating digital instruments in learning Arabic, which helps form a holistic vision of opportunities and risks in the digital transformation of the educational process, is presented in Table 1.

Pedagogical and organizational measures should be taken to overcome the described challenges. First, should purposefully develop educational digital content, which includes multimedia resources with translation and grammatical explanations, listening exercises for the use of authentic audio, thematic vocabulary with visualizations, and writing simulators from right to left. Language learning should be based on the principle of gradual complication and consideration of the dialectical features of the language.

Secondly, a significant area is to increase Arabic language teachers' digital and methodological literacy. For this purpose, pedagogical community centers can be created to exchange experiences and better practices.

Third, it is advisable to develop institutional, methodological recommendations for the poetry introduction of digital technologies in the course of study of Arabic, which will contain scenarios, examples of educational modules, the structure of the course, and tasks, taking into account different levels of language proficiency.

Table 1

**Advantages and challenges in the use of digital tools in the Arabic language learning process**

<b>Aspect</b>	<b>Advantages</b>	<b>Challenges</b>
Motivation	Game elements (gamification), visualization, interactivity, ability to self-control progress	Motivation is reduced under conditions of inappropriate technical support, lack of sufficient support, redundancy in the complexity of the interface for newcomers
Personalization	Artificial algorithms make it possible to build individual educational trajectories based on taking into account individual needs, capabilities, the tempo of the student	Lack of educational content, taking into account the levels of knowledge for Arabic in the the Ukrainian-language audience; the risk of overloading material or too simplification
Accessibility	The ability to carry out training at anytime, anywhere	Depending on the Internet connection, there are restrictions on access to quality educational content in the free version
Activation of cognitive activity	Interactive quizzes, testing, video lectures, virtual simulations	The content of the tasks can be superficial, passive consumption of educational content without deep reflection
Support	Reducing the load on the teacher through the implementation of automated verification, applying chatbots or adaptive tasks	Low digital literacy of teachers, which complicates the full use of digital means in the content of the course of study of Arabic
Methodical support	Creating digital courses, glossaries, simulators, and automated grammatical exercises	Lack of comprehensive methodological recommendations and educational programs that will take into account the features of Arabic application as a foreign language
Cultural adaptation	The use of original materials that promotes deeper cultural immersion	The need for careful selection of educational content based on the mental, cultural and religious features of the Arab world, which can be difficult without professional training

Джерело: створено автором

Fourth, cultural authenticity should be ensured, which will help form intercultural competence in education applicants and help them understand Arabic in its natural context more deeply.

Therefore, eliminating these barriers and implementing systemic integration of the proposed decisions will improve the level and quality of Arabic language learning in digital format.

### Conclusions

Analysis of digital technologies used in the study of Arabic in a non-linguistic environment shows their considerable potential to overcome several typical barriers caused by the lack of a linguistic environment.

Together, these digital tools increase motivation and autonomy, cause increased cognitive activity and provide linguistic confidence in students. However, several significant challenges complicate the effective use of innovative tools in teaching Arabic. Among them is the limited availability of quality educational content adapted to the specifics of the Arabic language, insufficient level of digital competence in applicants and teachers, lack of specialized teaching programs, and low cultural adaptability of available resources.

Accordingly, using digital tools to study the Arabic language has a pronounced potential. Still, it requires further methodological, technical and pedagogical support to consider the linguistic specificity, cultural implication and features of the non-language environment.

The prospects for further exploration are to develop models of integrating digital tools into Arabic language learning programs, considering their linguistic and cultural specificity.

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