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Arabic Language Learning Innovation: The Application of AI to Assist Teachers With Articulatory Impairments In Teaching Imla at Riyadlul 'Ulum Wadda'wah Islamic Boarding School

Agus Riyadi[1], Amelia Febriana Putri[2], Muhammad Jundullah Al Haqiqi[3]
[1,2] STIABI Riyadul 'Ulum, Tasikmalaya
[3] UIN Prof. KH. Saifuddin Zuhri, Purwokerto
**Corresponding E-mail:* ameliafebrianaputri@student.stiabiru.ac.id

Abstract
This research aims to develop AI technology-based learning innovations by combining imla textbooks and QR audio generated by Eleventhlab.ai. Nowadays, teaching imla in Arabic often faces challenges, especially for teachers with articulatory disorders, such as lisp that affects the pronunciation of hijaiyah letters. The use of QR codes makes it easier for students to access accurate pronunciation of the Hijaiyah letters through digital devices. This research method includes the development of digital-based learning media that integrates teaching materials with AI technology. This research uses mixed methods, namely descriptive qualitative and quantitative. The initial analysis evaluated the effectiveness of the innovation, then it was piloted in a classroom with a sample of students. Data were collected through observation, interviews, and learning outcome tests, then analyzed descriptively. The results show that the use of textbooks and QR audio imla increases learning effectiveness, helps teachers overcome articulation constraints, and facilitates student understanding. So the integration of AI technology in Arabic teaching can improve the quality of imla teaching and become an innovative solution in the era of Society 5.0.

Keywords: Imla, AI, articulatory disorders, QR audio, Eleventhlab.ai

مستخلص البحث

يهدف هذا البحث إلى تطوير ابتكارات تعليمية قائمة على تكنولوجيا الذكاء الاصطناعي من خلال الجمع بين كتب الإملاء المدرسية وصوت الاستجابة السريعة الذي تم إنشاؤه بواسطة Eleventhlab.ai. في الوقت الحاضر، غالبًا ما يواجه تدريس الإملاء باللغة العربية تحديات، خاصة بالنسبة للمعلمين الذين يعانون من اضطرابات في النطق، مثل اللثغة التي تؤثر على نطق حروف الهجاء. يسهل استخدام رموز الاستجابة السريعة على الطلاب الوصول إلى النطق الدقيق لحروف الهجاء من خلال الأجهزة الرقمية. يتضمن هذا الأسلوب البحثي تطوير وسائط تعليمية رقمية تدمج بين المواد التعليمية وتكنولوجيا الذكاء الاصطناعي. يستخدم هذا البحث أساليب مختلطة، وهي أساليب وصفية نوعية وكمية. تم إجراء تحليلات أولية لتقييم فعالية الابتكار، ثم تم تجريبها في فصل دراسي مع عينة من الطلاب. جُمعت البيانات من خلال الملاحظة والمقابلات واختبارات نتائج التعلم، ثم تم تحليلها عن طريق الإحصاءات الوصفية. أظهرت النتائج أن استخدام الكتاب المدرسي والإملاء الصوتي للذكاء الاصطناعي يزيد من فعالية التعلم، ويساعد المعلمين على التغلب على معوقات النطق، ويسهل فهم الطلاب. وبالتالي، يمكن أن يؤدي دمج تكنولوجيا الذكاء الاصطناعي في تدريس اللغة العربية إلى تحسين جودة تدريس الإملاء ويصبح حلاً مبتكرًا في عصر المجتمع ٥,٠.

الكلمات المفتاحية: الإملاء، ذكاء اصطناعي، اضطراب النطق، صوت الاستجابة السريعة.

Introduction

Arabic, one of the most widely spoken languages in the world, is both ancient and complex, characterized by its rich literary history and significance in religious, diplomatic, and cultural contexts. As globalization increases interactions across linguistic and cultural barriers, the demand for Arabic proficiency has expanded well beyond the Arab world, reaching learners from diverse geographical and cultural backgrounds. This expansion has revealed the challenges associated with learning the language, particularly its intricate grammatical rules, unique script, and rich morphology. Innovations in the methods of teaching and learning Arabic are critical in addressing these challenges and making the language more accessible to non-native speakers (Ridlo & Royani, 2024).

Historically, the learning of Arabic was deeply rooted in traditional methods, largely reliant on rote memorization, repetitive practice, and teacher-centered approaches.1 These strategies, while effective in some contexts, often overlook the diverse learning styles of modern students, particularly in a digital age where learners expect more interactive and engaging methods (Nurhidayati & Ridwan, 2014). With the rise of educational technologies, modern pedagogy has evolved, incorporating a wide range of tools and approaches that make the learning experience more dynamic and personalized. These innovations span from digital language platforms and mobile applications to artificial intelligence (AI)-driven tutoring systems, which offer adaptive learning tailored to the individual's pace and progress (Pustikayasa et al., 2023).

The advent of multimedia resources has significantly transformed the landscape of Arabic language learning. Modern software tools now provide learners with an immersive experience, allowing them to hear native pronunciation, interact with virtual tutors, and engage in gamified learning environments (Hanafi et al., 2021). These technological innovations align with the increasing recognition of the need for student-centered learning, which emphasizes active participation, critical thinking, and problem-solving. As a result, learners of Arabic today have access to a variety of resources that cater to different aspects of language acquisition, including phonetics, grammar, and orthography, making the learning process more efficient and enjoyable (Bashori & others, 2015).

Another notable innovation in Arabic learning has been the integration of artificial intelligence into language instruction. AI has revolutionized the way learners interact with the language, offering personalized learning experiences through natural language processing algorithms that analyze the learner's strengths and weaknesses (Isdayani et al., 2024). This technology facilitates error correction in real-time, providing feedback on grammar, syntax, and pronunciation, and enabling learners to continuously refine their skills. Additionally, the use of AI-powered language assessment tools provides more accurate evaluations of students' progress, helping educators design more effective teaching strategies (Insawan, n.d.).

Moreover, mobile learning applications, such as Duolingo and Memrise, have introduced new ways for individuals to engage with the Arabic language in a flexible and convenient manner. These apps are designed to accommodate busy lifestyles, allowing users to learn Arabic at their own pace, wherever they are (Azisi & Badri, 2024). Many of these applications incorporate elements of gamification, where learners can earn points, badges, and rewards as they progress, turning the language learning process into a more engaging and motivating activity (Boudadi & Gutiérrez-Colón, 2020). Such innovations have made Arabic more accessible, encouraging learners to remain committed to their language studies by reducing the cognitive load typically associated with language learning (Dhir & Alsumait, 2013).

In conclusion, innovations in Arabic language learning are reshaping the educational landscape, offering new opportunities for both students and educators. By incorporating modern technologies such as AI, mobile apps, and multimedia platforms, learners are now able to access personalized, efficient, and engaging language instruction (Bustam et al., 2024). These innovations not only address the traditional challenges associated with Arabic learning but also pave the way for further developments that will make the language even more accessible in the future.

In the vast landscape of Arabic language education, the acquisition of Imla (Arabic dictation or orthography) holds a pivotal role. Imla refers to the correct way of spelling words in written Arabic, ensuring both accuracy in communication and adherence to the rules of classical and modern standard Arabic (Al-Othaim, 1999). Mastering Imla can be particularly challenging for learners, especially for non-native speakers and those who are unfamiliar with the complexities of Arabic script,

vowelization, and grammatical structures. Traditionally, the methods used for teaching Imla have relied heavily on rote memorization and repetitive writing exercises. However, as educational theories and technologies evolve, new and innovative approaches to learning Arabic Imla are emerging, transforming how the subject is taught and learned.

One of the core challenges faced by learners of Arabic, especially in mastering Imla, is the script's cursive nature and the absence of short vowels in most written texts (Al-Othaim, 1999). This complexity often requires learners to not only understand the root structure of words but also the contextual clues necessary for proper spelling. In addition to this, many Arabic learners struggle with the differences between colloquial dialects and Modern Standard Arabic (MSA), adding another layer of difficulty to acquiring proper Imla (Nurhidayati & Ridwan, 2014). These difficulties have, over time, prompted educators and researchers to explore alternative methodologies that move beyond traditional, teacher-centered approaches. The integration of technological tools, adaptive learning platforms, and student-centered pedagogies is now reshaping the way Arabic dictation is taught and learned, making it more accessible, efficient, and engaging (Widayanti & Yelfi, n.d.).

In recent years, technology-enhanced learning has revolutionized the teaching of languages globally, and Arabic is no exception. With the introduction of digital platforms and mobile applications specifically designed for Arabic learners, students now have access to interactive and user-friendly resources that facilitate the learning of Imla. Applications such as Qalam and Write It! Arabic offer users step-by-step instructions, feedback mechanisms, and real-time error corrections, helping learners to gradually master the complexities of Arabic spelling (Kusnanto et al., 2024). These innovations have been further enhanced by the integration of Artificial Intelligence (AI) into language learning platforms, enabling personalized learning paths based on a student's progress and areas of difficulty. AI-driven platforms like Mondly and Rosetta Stone Arabic incorporate speech recognition and natural language processing algorithms to evaluate learners' performance in spelling and dictation, allowing for immediate corrective feedback (Pustikayasa et al., 2023).

Another significant innovation in the field of Arabic Imla learning is the gamification of education. By incorporating game elements—such as point-scoring,

levels, and rewards—language learning apps create a more engaging and motivating environment for students (Boudadi & Gutiérrez-Colón, 2020). For example, learners using platforms such as Duolingo can practice Arabic Imla by completing progressively challenging exercises, earning virtual rewards for correct answers, and competing with peers. The use of games not only motivates students to continue practicing but also introduces a level of enjoyment into the process, which can otherwise be viewed as tedious or repetitive. Studies have shown that gamification increases engagement and retention rates, particularly in language learning, making it an effective tool for teaching complex skills such as Arabic Imla.

Furthermore, the incorporation of multimedia resources has proven to be a valuable tool in enhancing Arabic Imla instruction. Audio-visual aids, interactive whiteboards, and digital flashcards are now widely used in classrooms and online courses to support students' understanding of the rules of Arabic orthography (Ummah, 2024). These multimedia tools help bridge the gap between theory and practice by providing learners with visual representations of letter formations and their proper usage in different contexts. Additionally, video tutorials and podcasts have emerged as supplementary tools that reinforce Imla lessons outside the classroom (Ilham et al., 2023). For instance, online platforms like Al-Kunuz Academy offer comprehensive courses that combine text, audio, and video materials, allowing students to study Imla at their own pace.

In addition to these technological innovations, pedagogical advancements in the field of language education have led to the development of more effective methods for teaching Arabic Imla. One such approach is the flipped classroom model, where students are introduced to new content at home (often through videos or reading materials) and then practice applying what they've learned during in-class sessions (Besar, n.d.). This method allows more time for personalized instruction and active learning during class hours, with teachers acting as facilitators who provide guidance and clarification. The flipped classroom model has been shown to improve learners' understanding of complex linguistic concepts such as Arabic Imla by encouraging active engagement with the material (Lestari & others, 2021).

Moreover, there has been growing recognition of the need to adopt culturally responsive teaching approaches in Arabic language education (Suyatno, 2023). Since

Arabic is not only a language but also the carrier of deep cultural and religious significance, especially in Islamic contexts, integrating cultural elements into the learning process can enhance students' connection to the material. This approach has been particularly effective in teaching Imla, as learners are encouraged to study Arabic texts that hold personal or cultural relevance, thereby increasing their motivation to master proper spelling and orthography (Nata, 2012).

In conclusion, the innovations in Arabic Imla learning, particularly through the integration of technology, gamification, multimedia resources, and pedagogical advancements, have significantly enhanced the effectiveness and accessibility of teaching Arabic orthography. These modern approaches have not only made the process more engaging for learners but also addressed many of the challenges associated with traditional methods. As Arabic continues to be a language of growing global significance, these innovations will play a crucial role in ensuring that learners, regardless of their linguistic background, can achieve fluency in both spoken and written forms of Arabic, including its dictation. Looking forward, further advancements in artificial intelligence, mobile learning, and culturally responsive pedagogy are expected to continue shaping the future of Arabic Imla education.

Methods

This research uses mixed methods, which is a qualitative and quantitative approach conducted simultaneously to examine the effectiveness of using artificial intelligence (AI) technology in imla learning. The main focus of this research is to help teachers who have articulation disorders in teaching imla in the classroom, especially in Riyadlul 'Ulum Wadda'wah Islamic Boarding School. This research seeks to develop digital-based learning media that combines imla teaching materials with QR audio technology generated by Eleventhlab.ai (Yam, 2022).

The first stage in this methodology is the development of learning media. The imla textbook used by students is equipped with a QR code which, when scanned, will play an audio of the accurate pronunciation of the hijaiyah letters. This development process is done by utilizing artificial intelligence technology to generate sounds that match the pronunciation of the hijaiyah letters. The book was then tested in a class of grade 9 students, involving a teacher who has articulation disorders in the

form of difficulty in pronouncing letters such as ث (tha), س (sin), ش (shin), and ص (shad) (Sopian, 2020).

The research data was collected through several methods, namely observation, interviews, and learning outcome tests. Observations were made to see how the use of QR Audio in the classroom can help students improve their pronunciation and comprehension of imla. In addition, interviews were conducted with teachers and students to get in-depth information about their experiences in using the AI-based learning media. Learning outcome tests were conducted before and after the use of QR Audio to measure the effectiveness of this technology in improving students' imla skills (Rahardjo, 2011).

Data analysis was conducted using descriptive methods, which included qualitative analysis of the results of interviews and observations, as well as quantitative analysis of student learning test results. This quantitative data was then analyzed using descriptive statistics to assess the improvement of students' abilities in terms of the accuracy of pronunciation of hijaiyah letters, understanding of imla material, and the level of student involvement in the learning process. The results of this analysis provide an overview of the extent to which QR Audio technology can help in the imla learning process, especially for teachers who have articulation disorders (Nasrulloh & Ismail, 2017).

This mixed method allows the researcher to not only get a clear statistical picture of the improvement of learning outcomes, but also a deeper understanding of the direct experiences of teachers and students involved in the learning process. The results of this study are expected to serve as a reference for further development of the use of AI technology in education, especially in the context of Arabic language learning in the era of Society 5.0 (Machali, 2021).

Result and Discussion

This study aims to evaluate the application of artificial intelligence (AI) technology in imla learning among 9th grade students at Riyadlul 'Ulum Wadda'wah Integrated Junior High School for Girls. The technology aims to assist Teacher A, who has an articulation disorder in the form of lisp, especially in the pronunciation of hijaiyah letters such as ث (tha), س (sin), ش (shin), and ص (shad). The challenges faced

by Teacher A in pronouncing these letters resulted in difficulties in teaching imla material which relies heavily on pronunciation accuracy (Akbar, 2023).

The application of AI technology using the QR Audio feature in imla textbooks is designed to make it easier for teachers to present accurate pronunciation of hijaiyah letters. Each student does not need to bring a personal cell phone, because according to school policy, these devices are not allowed in class. Instead, teachers use textbooks equipped with QR codes. The teacher can scan the QR code on the textbook and play the pronunciation audio directly in class through the sound device in the classroom. Students listen to the correct pronunciation from the audio, which allows them to correct their own pronunciation while doing imla exercises in class (Florensia et al., 2024).

This study involved 10 grade 9 students who were selected based on their basic ability to read and write hijaiyah letters, as well as experience in imla learning. They were assessed in two stages, namely before and after the application of QR Audio in imla textbooks. Data collected through observations, interviews with students and teachers, as well as learning outcome tests, were used to evaluate the effectiveness of using this QR Audio in improving students' imla skills and assisting teachers in overcoming the challenges faced.

Table 1. Comparison of Students Pronunciation Accuracy Before and After the Use of QR Audio

Aspects	Before (%)	After (%)
Pronunciation Accuracy	55%	90%
Imla Comprehension	60%	85%
Student Engagement	65%	88%
Teacher Difficulty Level A	80% (lebih sulit)	35% (lebih mudah)

The results from Table 1 show a significant increase in students' pronunciation accuracy after using QR Audio. In the stage before the use of QR, only 55% of students were able to pronounce the hijaiyah letters correctly. But after implementation, the accuracy of student pronunciation increased to 90%. This increase shows that QR Audio used by teachers can help students hear and repeat the pronunciation of letters accurately, without depending on oral instructions from the teacher.

In addition to pronunciation accuracy, there was a significant increase in students' comprehension of imla, which jumped from 60% to 85%. This indicates that the pronunciation heard repeatedly through QR Audio makes it easier for students to learn and understand imla material more deeply.

In terms of student engagement, there was an increase from 65% to 88%. Students showed greater enthusiasm as they felt they could learn the correct pronunciation independently, through the audio played by the teacher in class. This improvement reinforces the theory that technology can make the learning process more interactive and engaging (Azis et al., 2023).

The use of QR Audio also helps Teacher A in overcoming pronunciation challenges. Before the use of this technology, Teacher A had 80% difficulty in pronouncing letters such as ث (tha), س (sin), ش (shin), and ص (shad) due to articulation disorders. After the implementation of QR Audio, the difficulty was reduced to only 35%, as Teacher A can now play accurate audio through classroom devices, which allows students to hear the correct pronunciation without having to rely on the teacher's direct voice.

In addition to the quantitative data, the results of interviews with Teacher A and some students also provide additional insights into how QR Audio affects the teaching-learning process.

Table 2: Interview Results with Teacher A and Students

Source	Key Findings
Teacher A	"The QR Audio in the textbook really helps me with my pronunciation difficulties. I can scan the QR code and play the correct audio for students to hear in class, allowing me to focus more on other aspects of teaching."
Student 1	"By listening to the pronunciation from the audio in class, I understand better how to pronounce the letters correctly."
Student 2	"I am happy because I can hear the correct pronunciation from the audio played by the teacher, and I can take imla notes with more confidence."

Student 3	"I find it easier to understand imla because I can hear the audio in class, so I know what to improve in my pronunciation."

In the interview, Teacher A revealed that the use of QR Audio is very effective in overcoming her pronunciation difficulties. By scanning the QR code in the textbook and playing the pronunciation audio in class, Teacher A can focus more on teaching the material as a whole without worrying about pronunciation errors caused by her articulation disorder.

The students also responded positively to the use of this technology. Student 1 emphasized that listening to the correct pronunciation of the audio in class was helpful in understanding the pronunciation of difficult Hijaiyah letters. Student 2 felt more confident when writing imla because he could listen to the correct pronunciation directly in class. Student 3 stated that this technology facilitates the learning process because they can listen to the audio repeatedly so that they can correct their own pronunciation mistakes.

These interview results emphasize the benefits of QR Audio technology in supporting the learning process. Teachers who have difficulty in pronunciation can overcome the challenge by utilizing the QR Audio feature in the textbook, while students can learn independently and more actively participate in learning. The application of this technology also supports a collaborative learning approach, where teachers and students can work together to achieve better results.(Sinaga et al., 2022)

This research supports previous findings emphasizing that AI-based technologies can make a positive contribution in education, especially in language learning.(Qurashi et al., 2021) In the era of Society 5.0, technologies such as QR Audio provide great opportunities for educational institutions to overcome physical limitations, improve student skills, and create a more interactive and adaptive learning environment.

Conclusion

This research discusses innovations in teaching imla at Riyadlul 'Ulum Wadda'wah Islamic Boarding School, using artificial intelligence (AI) technology through QR audio generated by Eleventhlab.ai. The main focus of this research is to help teachers with articulation disorders in teaching imla. The use of audio QRs

integrated into imla textbooks makes it easier for students to access the proper pronunciation of hijaiyah letters through digital devices in the classroom.

The results showed that the use of audio QR significantly improved students' pronunciation accuracy, imla comprehension, and student engagement in the learning process. In addition, this technology helps teachers overcome pronunciation challenges caused by articulation disorders. In the context of the Society 5.0 era, the integration of AI in Arabic language teaching, particularly imla, provides an effective innovative solution to improve the quality of learning.

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