

Integration of Artificial Intelligence (AI) Technology in Arabic Language Learning; Opportunities and Challenges

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ARTICLE INFORMATION	ABSTRACT
Article History: Received, 25-08-2024 Accepted, 09-10-2024 Published, 07-12-2024	<i>This study aims to analyze the integration of Artificial Intelligence (AI) technology in Arabic language learning and identify the opportunities and challenges that arise from the implementation of this technology. In the digital era, the use of AI in education is growing, providing various benefits for language teaching including improving language skills adaptively. This study uses a qualitative method with a literature study approach and in-depth interviews with several lecturers and Arabic language education experts who have used AI. The results of the study indicate that AI integration has the potential to increase the effectiveness of Arabic language learning, especially in terms of istima', kalam, qira'ah, and kitabah skills. Technologies such as virtual assistants, AI-based learning applications, and automated evaluation platforms have made it easier to provide fast and accurate feedback. However, this study also found a number of challenges, including limited technological infrastructure in several educational institutions, lack of digital literacy among teachers, and concerns about replacing the role of humans in the learning process. The right strategy is needed in its implementation, including technology training for teachers and curriculum development that balances human and technological interactions. These challenges must be overcome to ensure that AI can be used as an effective supporting tool in improving the quality of Arabic language education in the future.</i>
Keywords: <i>Integration; Artificial Intelligence, Arabic Language</i>	

INTRODUCTION

Arabic language learning has undergone many developments in methodology and approaches. Along with the development of technology, especially Artificial Intelligence (AI) technology, new opportunities have emerged to integrate this technological innovation into language learning (Straw & Callison-Burch, 2020) (Azhar et al., 2023) . AI offers various solutions to improve learning effectiveness, such as interactive software development, AI-based mobile applications, and machine learning-supported platforms *that* can adjust the level of difficulty according to the learner's ability (R. Xu et al., 2024) (W. Xu & Ouyang, 2022) . The application of AI in Arabic language learning is expected to help accelerate the process of language acquisition, increase student engagement, and provide a more personal and interactive learning experience (Dave & Patel, 2023) .

Arabic language learning, like other languages, has evolved from traditional methods to more modern and interactive methods (Fitrianto, 2024) . This includes the use of technology, applications, and digital devices that facilitate the learning process (Aidah Novianti Putri & Moh. Abdul Kholiq Hasan, 2022) . With the presence of AI, new opportunities have opened up to utilize this technology in the language learning process (Salam et al., 2023) . AI can be used to make the learning process more efficient, for example through interactive software that responds to user input in real-time (Hang et al., 2024) , mobile applications that utilize AI to teach vocabulary or grammar, and digital platforms that use machine learning to customize lessons according to the individual needs of learners (Ramadhan, 2023) .

Lutfiyatun et al., (2023) stated that AI has the ability to increase the effectiveness of learning because this technology can present materials that are appropriate to the abilities of each student. Simon (2023) added that AI is also able to adjust the level of difficulty of the lesson based on student progress, which makes learning more efficient and focused. In addition, Rachmayanti & Alatas (2023) argue that the use of AI is expected to accelerate language acquisition, increase student motivation and engagement through interactive methods, and provide a more personalized learning experience. However, in addition to these great opportunities, significant challenges are also faced in the process of integrating AI into Arabic language learning. These challenges include the gap in technological infrastructure in some regions, the lack of Arabic language learning materials optimized for AI, and the need for teacher training to make the most of this technology (Aulia Gusli et al., 2023) . One of the main challenges in implementing AI in Arabic language learning is the gap in technological infrastructure in some regions, especially in the Middle East and North Africa (MENA) such as limited internet access, lack of technological devices in schools, and high costs to adopt new technologies (Rachmayanti & Alatas, 2023) . Fitrianto (2024) stated that around 50-60% of households in MENA countries have adequate internet access, thus slowing down the implementation of digital technology in education. The development of Arabic language learning materials that are compatible with AI-based systems is still limited.

Arabic is not only made up of words, but is also closely related to cultural, religious, and traditional aspects (Novita & Munawir, 2022) . According to research by Dimitriadou & Lanitis (2023) , AI is still unable to fully capture these cultural aspects, which are integral to a deep understanding of Arabic. This is important because mastering Arabic is not only about grammar and vocabulary, but also about understanding the cultural context inherent in the language (Anwar & Ahyarudin, 2023) .

According to research conducted by Rusmiyanto et al., (2023) , the use of AI can improve students' speaking and listening skills because of direct feedback from a speech recognition-based system. Meanwhile, a study by Belda-Medina & Calvo-Ferrer (2022) explored the use of AI-based chatbots to teach grammar that AI chatbots supported by Natural Language Processing (NLP) can help students understand grammar concepts faster by providing adaptive explanations according to student questions. Research by Salam et al., (2023) shows that AI has great potential to improve the quality of Arabic language learning. This study aims to explore the opportunities and challenges in integrating AI technology into Arabic language learning.

METHOD

This study uses a mixed methods approach, which combines qualitative and quantitative methods to provide more comprehensive results. This approach is important because it will allow researchers to understand opportunities and challenges statistically (quantitative) and in-depth (qualitative). This study uses a sequential exploratory design, where qualitative data

will be collected first to explore the phenomenon, and then the results will be strengthened or verified through quantitative data collection (Azwar, 2010) . Qualitative population, researchers choose Arabic teachers, AI experts in education, and educational technology developers. While qualitative samples, researchers take 10-15 people selected by purposive sampling based on their direct involvement in the use of AI technology in Arabic language learning.

Population is students, teachers, and institutions that have used or plan to use AI technology in the Arabic language teaching and learning process. The quantitative sample is 100-200 respondents selected by stratified random sampling based on region, education level, and experience of using AI (Rifa'i Abubakar, 2021) . The qualitative instrument is an interview guideline in which open-ended questions are designed to explore in-depth insights into the experiences, views, and suggestions of participants regarding the use of AI in Arabic language learning. Participant observation, researchers will directly observe the learning process with AI technology in the classroom. The quantitative instrument is a questionnaire, closed-ended questions and a Likert scale designed to measure the perceptions, effectiveness, and challenges experienced by teachers and students in using AI technology. The questionnaire will be distributed online.

For data collection, researchers use 1) interview techniques where data will be collected through direct interviews or online using Zoom or Google Meet, depending on the availability of participants. 2) observation techniques where researchers will observe the use of AI in Arabic classes, including analysis of the AI software or applications used. 3) Surveys where questionnaires will be shared online via the Google Forms or SurveyMonkey platforms, and distributed through relevant school and educational institution networks.

The data analysis techniques used are 1) qualitative analysis where interview data will be analyzed using thematic analysis techniques, where researchers will identify the main themes that emerge from interviews related to the opportunities and challenges of AI integration. While quantitative analysis where data from the questionnaire will be analyzed using descriptive statistics and simple linear regression to see the relationship between independent variables (AI) and dependent variables (learning effectiveness, learning motivation, etc.). Qualitative Validity where researchers will conduct member checking and triangulation of data with other sources to ensure data validity. Quantitative Reliability where the Cronbach's Alpha Test will be conducted to ensure internal consistency of the questionnaire.

RESULTS AND DISCUSSION

Qualitative Results

Qualitative data were obtained through in-depth interviews with 10 Arabic language teachers, 3 AI technology experts in education, and 2 AI application developers. The main findings from these interviews are as follows:

1. AI Integration Opportunities in Arabic Language Learning:

a. Increased Interactivity

Artificial intelligence (AI) technologies such as chatbots and speech recognition systems *have* brought significant changes to Arabic language learning, especially in terms of interactivity (Alderazi et al., 2021) . One of its most useful applications is in conversation and pronunciation practice. Chatbots specifically designed for language learning allow students to practice speaking Arabic independently, as if they were talking to a real teacher or conversation partner (Özkaya Marangoz, 2023) . With this feature,

students can have conversations tailored to their level of ability, receive immediate feedback, and correct their mistakes in real-time. (Burhanuddin, 2024) .

This technology is able to analyze how students pronounce words or sentences in Arabic, then provide assessments and suggestions for improvement (Hasan et al., 2024) . This is very useful because Arabic has many different phonemes from other languages, so pronunciation accuracy is very important (Niqie, 2024) . One teacher stated, "AI helps students be more confident in practicing speaking without fear of being teased by their classmates." In conventional classroom situations, students often feel anxious or embarrassed when practicing speaking in front of their friends, especially when they make mistakes (Evy Nur Rohmawaty et al., 2024) . With chatbots and speech recognition, they can practice privately, improve their pronunciation without social pressure, and repeat the exercises as many times as needed until they feel confident (Syamsudin, 2021).

In addition, the use of AI technology also allows students to learn at their own pace. They can access materials anytime and anywhere, which provides flexibility and the opportunity to practice more intensively compared to traditional learning methods (Alzahrani, 2022) . For example, with chatbots available 24/7, students can get conversational experience in Arabic even outside of class hours. AI also helps teachers monitor student progress more effectively (Shabur et al., 2023) . With data collected by chatbots and speech recognition systems, teachers can see areas where students often make mistakes or show difficulties (Rafi et al., 2023) . Overall, AI technologies such as chatbots and speech recognition systems have made Arabic language learning more dynamic and interactive. They not only provide a means for students to improve their conversation and pronunciation skills independently, but they also help create a more inclusive learning environment and boost students' confidence in speaking Arabic.

b. Personalized Learning

Personalized learning *with* the help of AI applications presents a new way to customize the learning experience for each student based on their needs, abilities, and learning pace (Allam et al., 2024) and provide customized materials and exercises to improve those weaknesses (Alhashmi, 2019) . Advanced AI applications can analyze the error patterns made by students during practice, whether in terms of sentence structure, use of nahwu rules, or pronunciation (Alabbas, 2024) . For example, if a student frequently makes mistakes in using i'rab (marking the harakat at the end of a word in a sentence), AI can identify these errors and provide more practice related to the rule. Thus, students do not just repeat the entire material, but focus on the aspects that they have not mastered, making learning more effective (Fitrianto, 2024) .

An Arabic teacher at a madrasah stated that "AI helps detect students' weaknesses in grammar and provides specific exercises. The AI application can provide practice questions that focus on the rules of nahwu about isim marfu', mansub, or majrur, which are often a source of confusion for students. This system not only provides exercises, but also provides immediate feedback, so that students can correct their mistakes on the spot (Ali, 2016) . Furthermore, AI can adjust the difficulty level of the material according to the student's ability. If a student has mastered the basic concepts of nahwu, such as the use of fi'il and isim, the application can provide more complex challenges, such as the rules of causality (*ta'lil*) or the structure of idhafah and vice versa (Azhar et al., 2023) .

In addition, AI also allows teachers to monitor student progress in more detail and systematically. Every student interaction with learning materials is recorded and analyzed by the system, which then compiles a report on their development (Syamsudin, 2021) . This allows teachers to provide more personalized guidance and adjust teaching strategies based on accurate data (Hasan et al., 2024) . The advantage of personalized learning through AI is that this process gives students more control over their own learning. They can learn at their own pace, repeat difficult material, or move on to new topics when they feel ready (Aulia Gusli et al., 2023) .

c. Automatic Learning

AI-based automated learning has become one of the most significant innovations in language education, including Arabic. AI systems facilitate self-learning by providing autocorrect features that allow students to get quick and accurate feedback on grammar and vocabulary exercises (Rodrigues & Garcia, 2022) . AI technologies, such as text recognition algorithms, are able to analyze students' responses in nahwu exercises, detecting errors such as incorrect use of i'rab, errors in word order, or inappropriate application of nahwu rules (Tululi, 2022) . After detecting the error, the system automatically provides a brief explanation and suggestions for improvement, so that students not only know what is wrong, but also why it is wrong and how to fix it.

If a student misinterprets or uses a word incorrectly, the AI will immediately provide a correction, complete with a definition or example of correct usage (Sofa et al., 2022) . Another advantage of this automatic correction system is the ability to adjust the exercises according to the student's ability level. If a student continues to make the same mistake, the AI will adjust the difficulty level of the material and provide more practice in weak areas (Alabbas, 2024) , and vice versa (Rafi et al., 2023).

Students can do exercises anytime and anywhere , without having to wait for manual assessments from teachers. This speeds up the learning cycle and provides opportunities for students to learn independently more effectively (Allam et al., 2024). This AI-based automated learning provides a more interactive and immersive learning experience, while increasing student independence in mastering Arabic. The integration of AI in Arabic language learning shows significant opportunities, especially in improving the quality of personalized learning. AI's ability to personalize the learning experience is a relevant innovation for language learning. AI can automatically detect student errors and provide instant feedback, which accelerates the learning process (Fitrianto, 2024) .

2. Challenges of AI Integration in Arabic Language Learning:

a. Arabic Content Limitations

The limited Arabic content in AI applications is a significant challenge, especially since most application developers focus more on popular languages such as English, Mandarin, and Spanish. This makes learning materials and supporting technologies for Arabic not as comprehensive as other languages (Ali, 2016) . One of the main obstacles is the complexity of the Arabic language itself, especially due to the wide variety of dialects in various Arab countries. AI application developers often struggle to develop speech recognition algorithms for Arabic that can accurately capture all of these dialect variations (Kashyap, 2024) .

b. Lack of Teacher Skills in Technology

The limited skills of teachers in operating technology, especially AI software, are one of the main obstacles in implementing digital technology in the classroom (Nur et al., 2022) . One teacher admitted, "I have to learn more to be able to maximize the use

of AI applications,” indicating that most teachers feel the need to improve their technical skills. In addition, limited formal training and limited technical support in some educational institutions also exacerbate this situation. Without adequate skills, the potential of AI in personalizing learning, developing students' skills, and monitoring their progress cannot be maximized, hampering innovation in teaching.

c. Costs and Infrastructure

Some educational institutions face significant barriers to adopting AI technology for learning, especially related to cost and infrastructure. The cost of accessing premium AI software is often a major barrier (Manan & Nasri, 2024) . In addition, the hardware needed to support these applications, such as computers, tablets, or dedicated servers, also requires significant investment (Rusmiyanto et al., 2023) . Another problem that often arises is unstable internet connectivity. In some areas, especially in rural areas, fast and stable internet access is still a challenge. AI technologies that require real-time updates, cloud access, or online learning are ineffective without a reliable connection.

Quantitative Results

A survey of 150 respondents, consisting of 100 students and 50 teachers, provided interesting results regarding the use of AI technology in Arabic language learning. The survey revealed several important aspects related to the effectiveness of learning , the obstacles faced, and the statistical relationship between the use of AI and the improvement of students' skills.

1. Learning Effectiveness with AI

As many as 85% of students surveyed stated that the use of AI-based applications significantly helped them improve their understanding of grammar (nahwu) and vocabulary. AI technology is able to provide interactive exercises that make it easier for students to learn independently, especially in identifying and correcting errors in sentence structure and vocabulary use. (Simon, 2023) . From the teacher's perspective, 78% of them felt that AI helped increase student engagement in the learning process, especially in terms of pronunciation and dialogue. AI technology, such as chatbots and speech recognition systems, allows students to practice speaking and pronouncing words more confidently. (Ramadhan, 2023) .

2. Barriers to AI Use

Despite the clear benefits, the survey also revealed several barriers to implementing AI technology in the classroom. As many as 65% of teachers felt less confident in their ability to optimally integrate AI into learning. This shows that even though AI technology is available, training and mentoring are still needed for teachers so that they are more skilled in utilizing this technology to support the teaching and learning process (Salam et al., 2023) . Most teachers stated that they needed additional support, both in the form of technical and pedagogical training, in order to use AI effectively.

Additionally, 40% of institutions surveyed reported experiencing barriers to accessing advanced technologies such as AI due to funding constraints . Procuring adequate hardware and subscribing to AI-based applications often requires a large budget, which is not always available in many schools, especially in areas with limited resources. This is a major challenge for educational institutions that want to adopt modern technologies but are constrained by financial constraints.

3. Quantitative Statistical Analysis

From the simple linear regression test analysis, a significant relationship was found between the use of AI in learning and the improvement of students' language skills. With a correlation coefficient of $r = 0.72$, this result shows that there is a strong positive relationship between the frequency of use of AI technology and learning effectiveness. This means that the more often students use AI in the learning process, the greater the impact on improving their language skills, both in grammar, vocabulary, and pronunciation.

Overall, this survey shows that AI technology has great potential to improve the effectiveness of Arabic language learning. However, barriers such as lack of teacher training and limited access to technology remain challenges that need to be overcome to maximize the benefits of AI in educational settings (Aulia Gusli et al., 2023). To overcome these challenges, teacher training in the use of AI technology needs to be strengthened, and the development of Arabic-based AI content must be improved, both in terms of the availability of resources and algorithms that are able to handle variations in language dialects. The government and the private sector also need to work together to ensure that the AI applications developed can be accessed by educational institutions at an affordable cost, as well as support the improvement of the quality of technological infrastructure in schools.

CONCLUSION

Based on the results of this study, the integration of AI technology in Arabic language learning provides great opportunities to improve the effectiveness of learning, especially in terms of personalization and interactivity. AI integration has the potential to improve the effectiveness of Arabic language learning, especially in terms of istima', kalam, qira'ah, and kitabah skills. Technologies such as virtual assistants, AI-based learning applications, and automated evaluation platforms have made it easier to provide fast and accurate feedback. However, this study also found a number of challenges, including limited technological infrastructure in several educational institutions, lack of digital literacy among teachers, and concerns about replacing the role of humans in the learning process. The right strategy is needed in its implementation, including technology training for teachers and curriculum development that is balanced between human and technological interaction. These challenges must be overcome to ensure that AI can be used as an effective supporting tool in improving the quality of Arabic language education in the future.

REFERENCES

- Aidah Novianti Putri, & Moh. Abdul Kholiq Hasan. (2022). Penerapan Kecerdasan Buatan sebagai Media Pembelajaran Bahasa Arab di Era Society 5.0. *Tarling : Journal of Language Education*, 7(1). <https://doi.org/10.24090/tarling.v7i1.8501>
- Alabbas, A. (2024). Applied Sciences Tayseer : A Novel AI-Powered Arabic Chatbot Framework for Technical and Vocational Student Helpdesk Services and Enhancing Student Interactions. *Applied Sciences (MDPI)*, 14(2547), 1–28.
- Alderazi, F., Algosaiibi, A. A., & Alabdullatif, M. A. (2021). The Use of Arabic Language COVID-19 Tweets Analysis in IoT Applications. *2021 IEEE Global Conference on Artificial Intelligence and Internet of Things, GCAIoT 2021*. <https://doi.org/10.1109/GCAIoT53516.2021.9693080>
- Alhashmi, S. A. M. A. A. (2019). *Critical Success Factors for Implementing Artificial Intelligence (AI) Projects in Dubai Government United Arab Emirates (UAE) Health Sector : Applying the Extended Technology Acceptance Model (TAM)* *تأثير عوامل النجاح الحرجة في تنفيذ مشاريع الذكاء الاصطناعي في القطاع الصحي في حكومة دبي دولة الإمارات العربية المتحدة : تطبيق نموذج تقبل التكنولوجيا الموسع (TAM)*

قبيطت يف (Issue March).

- Ali, M. A. (2016). International Journal of Advanced and Applied Sciences Artificial intelligence and natural language processing: the Arabic corpora in online translation software. *International Journal of Advanced and Applied Sciences*, 3(9), 59–66.
- Allam, A. H., Eltewacy, N. K., Alabdallat, Y. J., Owais, T. A., Salman, S., Ebada, M. A., & Group, E. (2024). Knowledge, Attitude and Perception of Arab medical Students Towards Artificial Intelligence In Medicine and Radiology : A Multi National Cross Sectional Study. *Allam et Al. European Radiology*, 3(4), 4393–4406. <https://doi.org/10.1007/s00330-023-10509-2>
- Alzahrani, A. (2022). A Systematic Review Of Artificial Intelligence In Education In The Arab World. *Revista Amazonia Investiga*, 11(54), 293–305. <https://doi.org/10.34069/ai/2022.54.06.28>
- Anwar, M. R., & Ahyarudin, H. A. (2023). AI-Powered Arabic Language Education in the Era of Society 5.0. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, 5(1). <https://doi.org/10.34306/itsdi.v5i1.607>
- Aulia Gusli, R., Zakir, S., & Akhyar, M. (2023). Tantangan Guru terhadap Perkembangan Teknologi Agar Memanfaatkan Artificial Intelligence Dalam Meningkatkan Kemampuan Siswa. *Idarah Tarbawiyah: Journal of Management in Islamic Education*, 4(3), 229–240. <https://doi.org/10.32832/itjmie.v4i3.15418>
- Azhar, M., Wahyudi, H., Promadi, & Masrun. (2023). Penggunaan Teknologi dalam Pembelajaran Bahasa Arab di Indonesia. *Jurnal Review Pendidikan Dan Pengajaran*, 6(4), 3160–3164. <https://journal.universitaspahlawan.ac.id/index.php/jrpp/article/view/20984/15794>
- Azwar, S. (2010). Metodologi penelitian kuantitatif. *Yogyakarta: Perpustakaan Pelajaran*.
- Belda-Medina, J., & Calvo-Ferrer, J. R. (2022). Using Chatbots as AI Conversational Partners in Language Learning. *Applied Sciences (Switzerland)*, 12(17). <https://doi.org/10.3390/app12178427>
- Burhanuddin, B. (2024). Pengembangan Materi Ajar Berbasis Komunikasi Dalam Pendidikan Bahasa Arab. *Jurnal Pendidikan Indonesia*, 4(12), 1318–1328. <https://doi.org/10.59141/japendi.v4i12.2583>
- Dave, M., & Patel, N. (2023). Artificial Intelligence In Healthcare and Education. *British Dental Journal*, 234(10). <https://doi.org/10.1038/s41415-023-5845-2>
- Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. In *Smart Learning Environments* (Vol. 10, Issue 1). <https://doi.org/10.1186/s40561-023-00231-3>
- Evy Nur Rohmawaty, Danial Hilmi, M Sholih Salimul Uqba, & Ummu Sulaimah Saleh. (2024). Peran Artificial Intelligence (AI) dalam Pembelajaran Bahasa Arab Mahasiswa Pascasarjana UIN Maulana Malik Ibrahim Malang. *Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora*, 4(3), 316–328. <https://doi.org/10.55606/khatulistiwa.v4i3.4023>
- Fitrianto, I. (2024). Innovation and Technology in Arabic Language Learning in Indonesia : Trends and Implications. *Internasional Journal Of Post AXIAL Futuristic Teaching and Learning*, 2(3), 134–150.
- Hang, Y., Khan, S., Alharbi, A., & Nazir, S. (2024). Assessing English teaching linguistic and artificial intelligence for efficient learning using analytical hierarchy process and Technique for Order of Preference by Similarity to Ideal Solution. *Journal of Software: Evolution and Process*, 36(2). <https://doi.org/10.1002/smr.2462>
- Hasan, L. M. U., Aziz, M. T., & Rido'i, M. (2024). Menyelami Integrasi Kurikulum untuk Penerapan TPACK dalam Pembelajaran Bahasa Arab. *Journal of Practice Learning and Educational Development*, 4(3), 143–150. <https://doi.org/10.58737/jpled.v4i3.291>

- Kashyap, S. (2024). The Influence of Artificial Intelligence on Cybersecurity. *International Journal of Innovative Research in Computer and Communication Engineering*, 12(Special Is), 13–22. <https://doi.org/10.15680/ijircce.2024.1203503>
- Lutfiyatun, E., Kurniati, D., & Fajriah, N. (2023). Pemanfaatan Artificial Intelligence (AI) Dalam Tarjamah dan Muhadatsah Di Perguruan Tinggi. *Balai Diklat Keagamaan Aceh*, 2(2).
- Manan, A., & Nasri, U. (2024). Tantangan dan Peluang Pendidikan Bahasa Arab: Perspektif Global. *Jurnal Ilmiah Profesi Pendidikan*, 9(1). <https://doi.org/10.29303/jipp.v9i1.2042>
- Niqie, M. S. R. (2024). Integrating a.I Technology in Arabic Language Learning: the Strategic Role of the Library At Islamic University Tribakti. *Kitaba*, 2(1), 36–45. <https://doi.org/10.18860/kitaba.v2i1.25259>
- Novita, A., & Munawir, M. (2022). Media Pembelajaran Bahasa Arab Berbasis Teknologi Informasi Komunikasi pada Pembelajaran Daring di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 4(1), 1378–1386. <https://doi.org/10.31004/edukatif.v4i1.1947>
- Nur, S. A., Mahya2, A. F. P., & Santoso3, G. (2022). Revolusi Pendidikan di Era Society 5.0; Pembelajaran, Tantangan, Peluang, Akses, Dan Keterampilan Teknologi. *Jurnal Pendidikan Transformatif (Jupetra)*, Vol. 01 No, 18–28.
- Özkaya Marangoz, E. (2023). The Transformative Role of Artificial Intelligence and Machine Learning in Interpreting and Language Services. *RumeliDE Dil ve Edebiyat Araştırmaları Dergisi*, 36. <https://doi.org/10.29000/rumelide.1372500>
- Rachmayanti, I., & Alatas, M. A. (2023). Pemanfaatan AI sebagai Media Pembelajaran Digital dalam Foreign Language Development Program (FLDP) IAIN Madura. *GHANCARAN: Jurnal Pendidikan Bahasa Dan Sastra Indonesia*. <https://doi.org/10.19105/ghancaran.vi.11752>
- Rafi, R., Ghozali, A., Suharto, R., & Rahma, A. N. (2023). Opportunities and Challenges of Early Childhood Arabic Education in The Digital Age. *Lentera PAUD*, 2(1), 1–9.
- Ramadhan, A. R. (2023). Strategi Penggunaan Chatbot Artificial Intelligence Dalam Pembelajaran Bahasa Arab Pada Perguruan Tinggi Di Indonesia. *Jurnal Oase Nusantara*, 2(2).
- Rifa'i Abubakar. (2021). *Pengantar Metodologi Penelitian*. SUKA-Press UIN Sunan Kalijaga.
- Rodrigues, A. L., & Garcia, D. A. (2022). Instructional Methods and Hybrid Learning in Preservice Teacher Education—Case Studies in Portugal and Spain. *Journal of Higher Education Theory and Practice*, 22(3), 47–60. <https://doi.org/10.33423/jhetp.v22i3.5080>
- Rusmiyanto, R., Huriati, N., Fitriani, N., Tyas, N. K., Rofi'i, A., & Sari, M. N. (2023). The Role Of Artificial Intelligence (AI) In Developing English Language Learner's Communication Skills. *Journal on Education*, 6(1). <https://doi.org/10.31004/joe.v6i1.2990>
- Salam, M. Y., Putri, N. A., Mudinillah, A., & ... (2023). Implementasi Pembelajaran Bahasa Arab Berbasis Kecerdasan Buatan dalam Konteks Smart Learning. *Proceedings Series of ...*, 3(4), 89–101.
- Shabur, A., Amadi, M., & Sholikhah, D. W. (2023). Perkembangan Pendidikan Bahasa Arab di Era Digital: Sistematis Literature Review. *Jurnal Motivasi Pendidikan Dan Bahasa*, 1(3), 301–309. <https://journal.widyakarya.ac.id/index.php/jmpb-widyakarya/article/view/1112>
- Simon, A. S. (2023). Prospek Pembelajaran Bahasa Arab di Era Generative Artificial Intelligence. *Assuthur: Jurnal Pendidikan Bahasa Arab*, 2(2). <https://doi.org/10.58194/as.v2i2.1306>
- Sofa, A. R., Aziz, A., & Ichsan, M. (2022). Hybrid Learning Lectures for Achieving Arabic Language Competence in the Free Curriculum Frame for Independent Learning (MBKM) at Zainul Hasan Islamic *ULIL ALBAB: Jurnal Ilmiah ...*, 1(4).
- Straw, I., & Callison-Burch, C. (2020). Artificial Intelligence in mental health and the biases of

- language based models. *PLoS ONE*, 15(12 December).
<https://doi.org/10.1371/journal.pone.0240376>
- Syamsudin, N. (2021). Model-Model Pengembangan Media Teknologi Pembelajaran Bahasa Arab Naidin Syamsuddin Pendahuluan Metode. *Jurnal Pendidikan Refleksi*, 10(3), 248.
<https://p3i.my.id/index.php/refleksi/article/view/158>
- Tululi, I. (2022). *Apa Itu Artificial Intelligence (AI) dan Contohnya!* Imrantuli.Net.
- Xu, R., Sun, Y., Ren, M., Guo, S., Pan, R., Lin, H., Sun, L., & Han, X. (2024). AI for Social Science and Social Science of AI: A Survey. *Information Processing and Management*, 61(3).
<https://doi.org/10.1016/j.ipm.2024.103665>
- Xu, W., & Ouyang, F. (2022). The Application of AI Technologies In Stem Education: A Systematic Review From 2011 to 2021. In *International Journal of STEM Education* (Vol. 9, Issue 1). <https://doi.org/10.1186/s40594-022-00377-5>