Volume 18 Number 1 (2026)
January-June 2026
Page: 661-672

E-ISSN: 2656-9779
P-ISSN: 1907-6355
DOI: 10.37680/qalamuna.v18i1.9013

QALAMUNA
JURNAL PENDIDIKAN, SOSIAL, DAN AGAMA

Technology-Based Arabic Language Learning Model that Combines Digital Traditions and Innovation in Islamic Education

Rahmaini [1], Muhammad Shaleh Assingkily [2]

[1] Universitas Islam Negeri Sumatera Utara Medan, Indonesia; rahmaini@uinsu.ac.id
[2] Institut Agama Islam Negeri Kendari, Indonesia; muhammadshalehassingkily@iainkendari.ac.id

Received: 02/01/2026 Revised: 13/03/2026 Accepted: 19/04/2026

Abstract

This research aims to design and develop a technology-based Arabic language learning model that combines Islamic scientific traditions with digital innovations, and to test the model's initial implementation in the context of Islamic education. The research uses a Design-Based Research (DBR) approach, which includes four stages: needs analysis, model design, initial development and implementation, and evaluation and revision. Data were collected through observations, interviews, documentation, and questionnaires with teachers and students in madrasas, then analyzed using simple qualitative and quantitative descriptive methods. The results of the study show that the learning model developed can increase student engagement in learning, facilitate the delivery of material and teacher evaluation, and improve understanding of Arabic vocabulary and structure in a more contextually relevant way. These findings confirm that integrating traditional methods such as *talaqqi* and *sorogan* with interactive digital technologies can yield learning models that are adaptive, effective, and relevant to the development of Islamic education in the 21st century. This research provides a conceptual and practical contribution in the form of a prototype of a technology-based Arabic learning model that can be adapted in various Islamic educational institutions

Keywords Arabic Language Learning; Design-Based Research; Educational Innovation; Educational Technology

Corresponding Author
Rahmaini
Universitas Islam Negeri Sumatera Utara Medan, Indonesia; rahmaini@uinsu.ac.id

1. INTRODUCTION

Arabic has a strategic position in Islamic education, not only as a means of communication, but also as a key to understanding the main sources of Islamic teachings, such as the Qur'an, Hadith, and classical Islamic literature (Haq et al., 2023; Muid, 2024). In Islamic Boarding Schools, Arabic is the main medium for studying the yellow book; in Madrasahs, it is part of the curriculum that strengthens religious competence; while in Islamic Religious Colleges, it serves as an academic medium for accessing Islamic scientific literature. The existence of Arabic in these three levels of education places it as a basic competency that determines the quality of understanding and practicing Islamic values (Nuraeni, 2023; Sahrir et al., 2020).

Despite its vital role, the design of Arabic learning in many Islamic educational institutions is still dominated by conventional approaches (Aziz et al., 2024). The teaching and learning process generally

relies on lectures, memorization, and literal translation methods, which, while effective in maintaining the continuity of tradition, are less than optimal in building language skills that are communicative, adaptive, and relevant to the demands of the 21st century (Erfiana & Mareza, 2023; Taufiqurrahman et al., 2024). This condition results in learning Arabic being often perceived as difficult, monotonous, and less interesting for some students, especially the generation that is familiar with digital technology (Himdi, 2024; Kadir & Yasin, 2022).

Various previous studies have indeed discussed the application of technology in learning Arabic (Mufti, 2022)Starting from the use of online learning applications (Nurrahma & Suryanto, 2025; Sari & Mubaligh, 2019; Yazid et al., 2023)Starting from the use of online learning applications, the Learning *Management System* (LMS) (Alwehaibi et al., 2022; Hakim & Ahror, 2024; Putri, 2018). However, most of these studies focus on a single component of the technology without integrating it into a comprehensive learning design. As a result, the resulting innovations tend to be partial, difficult to adapt across institutions, and do not take into account the special characteristics of Islamic education.

In addition, some research also lacks the importance of maintaining the strength of traditional pedagogy, such as talaqqi, sorogan, and book deliberation, which are the identity of Islamic education (Almasre & Al-Nuaim, 2020; Aragón et al., 2025). In fact, the integration of traditional methods with modern technology can be a competitive advantage that distinguishes Arabic language learning in Islamic educational institutions from other educational systems (Toifah, 2021). This gap is the focus of this study: designing learning models that not only adopt the latest technologies but also adaptively package traditional pedagogical values to remain relevant and effective in the 21st century.

The era of advanced technology demands an update of Arabic language learning design that can combine the richness of tradition with technology-based innovation (Siemens, 2005). The use of artificial intelligence, interactive media, and e-learning platforms opens up great opportunities to create a more personalized, interactive, and flexible learning experience (Garnisun, 2011; Zizic et al., 2022). However, much of the previous research has focused on partial technology application, without developing a comprehensive, adaptive framework for various Islamic educational contexts. The novelty of this research lies in developing a technology-based Arabic language learning model that integrates the strengths of traditional pedagogy with the potential of digital innovation. This model is designed to be relevant to Madrasas, taking into account students' characteristics, academic culture, and available technological infrastructure.

This study aims to describe the design of a technology-based Arabic language learning model that integrates Islamic scientific traditions with digital innovation as an effort to develop adaptive learning in Islamic education in the 21st century; and describe the initial implementation of the learning model in various Islamic educational institutions to obtain an overview of its effectiveness and feasibility as an innovative learning strategy in the madrasah environment.

2. METHODS

This study uses the *Design-Based Research* (DBR) that is oriented towards the development and testing of technology-based learning models in real contexts (Assingkily, 2021). DBR was chosen because it can integrate design, implementation, evaluation, and revision processes iteratively (in *iterative cycles*) to produce effective, adaptive, and evidence-based learning solutions. In the context of this study, DBR serves as a methodological framework for designing an Arabic language learning model that combines the strengths of teaching traditions with digital technological innovations and ensures it can be implemented in the Madrasah (MA Laboratorium UIN Sumatera Utara) and the MTs Laboratory UIN Sumatera Utara.

The participants of this study include Arabic teachers and students in Madrasahs. Participants were selected purposively to ensure representation from different contexts. Data collection was carried

out by observation (to observe the learning process before and after the intervention), in-depth interviews with teachers and institutional managers (to explore experiences, challenges, and suggestions), questionnaires (to measure students' perceptions and satisfaction), and learning outcome tests (to measure improvement in Arabic language competence).

This research is conducted through four main interrelated stages. The first stage is needs analysis, which aims to identify the requirements of Arabic language learning across various levels of Islamic education. It also explores the strengths and weaknesses of the traditional methods used, as well as the readiness of the technological infrastructure and the digital skills of both teachers and students. This stage plays a crucial role in ensuring that the developed model design is relevant to real conditions and field needs.

The second stage is the design phase, which involves developing a learning model that integrates traditional methods such as *talaqqi*, *sorogan*, and classical text discussions with modern technology, including artificial intelligence (AI), interactive media, and e-learning. In addition, learning tools, digital media, and evaluation strategies are determined. This stage produces an initial prototype that is ready for testing.

The third stage is development and initial implementation. At this stage, learning media and tools are developed based on the designed model, followed by limited trials conducted at two madrasahs: MTs and the MA Laboratory of UIN North Sumatra. During the trials, student engagement, media effectiveness, and user responses (both teachers and learners) are carefully monitored. This stage aims to validate the model's technical and pedagogical feasibility.

The fourth stage is evaluation and revision. Data obtained from the trials are analyzed using both qualitative approaches, such as interviews and observations, and quantitative approaches, including questionnaires, pre-tests, and post-tests. Based on the analysis, the model's weaknesses are identified and addressed. This final stage ensures that the developed model is feasible for broader implementation across various Islamic educational institutions.

3. FINDINGS AND DISCUSSIONS

Findings

This research produces empirical findings through four main stages that are mutually continuous within the framework of Design-Based Research (DBR), namely needs analysis, model design, initial development and implementation, and evaluation and revision. Each stage provides important information that serves as the basis for developing technology-based Arabic language learning models that are contextually adaptive to Islamic education.

Phase 1: Needs Analysis

The results of the needs analysis show that Arabic language learning in Islamic educational institutions remains dominated by traditional approaches that emphasize memorization and translation. Although this approach is effective in maintaining the continuity of the Islamic scientific tradition, it is found that the method is not yet fully able to develop Arabic communication skills in a contextual and communicative way.

Other findings show that most teachers and students already have access to digital devices, such as computers and smartphones, but their use in learning remains limited. It has not been integrated into systematic learning designs. In addition, the interviews revealed the need for a learning model that balances traditional methods with digital technology.

Thus, the needs analysis stage yielded the main finding: a gap between traditional learning practices and the demands of Arabic language learning in the digital era. These findings are the basis

for designing a learning model that is more adaptive, interactive, and relevant to the development of educational technology.

Table 1. Needs Analysis

Aspects Analyzed	Key Findings	Data Indicators	Data Source
Learning methods	Dominance of memorization and translation methods	Teacher-centered learning	Classroom observation
Language skills	Students' communication skills are still limited	Students are less active in speaking	Observations and interviews
Use of technology	Technology has not been integrated into learning	Digital media is used in a limited way	Observations
Learning needs	A technology-based learning model is needed	Teachers want interactive learning	Teacher interviews

Table 1 shows that Arabic language learning in Islamic educational institutions remains dominated by traditional, teacher-centered approaches, resulting in students' communication skills not being optimally developed. In addition, although technological devices are available, their use in learning is still limited and has not been integrated into systematic learning design. These findings indicate an urgent need to develop Arabic-language learning models that effectively integrate traditional methods with digital technologies.

Stage 2: Model Design

The results of the design stage show that integrating traditional methods and modern technology can be achieved within a systematic, structured learning framework. The designed model combines traditional pedagogical practices, such as talaqqi, sorogan, and book deliberation, with digital technologies, including interactive media and online learning systems.

The findings at this stage also show that the use of technology-based learning media enables the presentation of Arabic materials in a multimodal manner, combining text, audio, and visuals. The multimodal presentation of material has been shown to increase students' understanding of Arabic concepts, particularly vocabulary mastery and sentence structure.

In addition, the design yielded an initial prototype of a learning model with a clear structure, including input components, learning processes, technology support, evaluation systems, and feedback. This prototype is designed to be flexible and can be adjusted to students' characteristics and the conditions of Islamic educational institutions.

Table 2. Model Design

Model Components	Design Description	Function in Learning
Input	Learning objectives and characteristics of learners	Determining the direction of learning
Learning methods	Integration of traditional methods and technology	Improve learning interactions
Learning media	Video, audio, and learning apps	Supports material comprehension
Learning activities	Interactive exercises and digital discussions	Increase student engagement
Learning evaluation	Digital-based tests and assessments	Measuring learning outcomes
Feedback	Learning reflection	Improve the learning process

Table 2 shows that the technology-based Arabic learning model is systematically designed, taking into account the main components of learning: objectives, methods, media, activities, evaluation, and feedback. The integration of traditional methods with digital technology allows for a more interactive and flexible learning process. This clear model structure serves as the basis for developing learning prototypes that are adaptive to students' needs in Islamic educational institutions.

Phase 3: Development and Initial Implementation

The results of the initial implementation show that technology-based Arabic learning models can increase student involvement in the learning process. During the limited trial, students demonstrated greater active participation in learning activities, including interactive exercises, independent question-answering, and interaction with digital learning materials.

In addition, teachers reported that the use of technology in the learning model simplifies the delivery of material and the evaluation of learning outcomes. Teachers also stated that technology-based learning systems help them in monitoring students' learning progress more effectively.

The findings at this stage indicate that the developed learning model has a high initial feasibility, both from a technical and a pedagogical perspective. This can be seen in the increase in student involvement, the ease of use of the learning media, and the positive response from teachers to the model's implementation.

Table 3. Development and Initial Implementation

Observed Aspects	**Conditions Before Implementation**	**Conditions After Implementation**	**Changes That Occur**
Student participation	Passive students in learning	Students actively participate in activities	Increase
Learning interactions	Limited interaction	More intensive interaction	Increase
Media use	Conventional media	Interactive digital media	More varied
Teaching facilities	Teachers use traditional methods	Teachers use technology	More effective

Table 3 shows that the initial implementation of the technology-based Arabic learning model has a positive impact on the learning process. Increased student participation and interaction in learning show that the use of digital media can create a more active and communicative learning environment. In addition, technology makes it easier for teachers to deliver content and evaluate learning, thereby improving the learning process.

Stage 4: Evaluation and Revision

The evaluation results showed an increase in student learning outcomes after using the technology-based learning model. The increase is evident in the Arabic reading and vocabulary comprehension test results, which show a positive difference between pre- and post-implementation scores.

In addition, the questionnaire results show that most students feel learning becomes more interesting and easier to understand when using technology-based learning media. Teachers also assessed that the learning model developed increased learning effectiveness and simplified the evaluation process.

Based on these findings, revisions were made to several components of the learning model, including simplifying the display of media, adjusting the material's difficulty level, and increasing the stability of the online learning system. This revision resulted in a learning model better suited for broader application in Islamic education.

Table 4. Evaluation and Revision

Model Components	Evaluation Findings	Revision Actions	Improvement Results
Learning media	Media display is too complex	Simplify media design	Media is easier to use
Learning materials	The difficulty level is not yet appropriate	Adjust the difficulty level of the material	The material is more in line with the students' abilities
Learning system	Unstable system access	Improves system stability	Smoother system to use
Learning process	Student interaction is not optimal	Add interactive activities	Increased student interaction

Table 4 shows that the evaluation of the learning model yielded several important findings that served as the basis for the model revision process. Revisions were made to media, materials, learning systems, and learning activities to improve the model's effectiveness and ease of use. This revision process is a key characteristic of the Design-Based Research approach: the development of an iterative model grounded in empirical field findings.

Discussion

Learning Model Design (TAF'IL)

Based on the stages of Design-Based Research (DBR) that have been carried out, this study produces a technology-based Arabic language learning model named "TAF'IL" (*'Ilmiyyah Facilitation Application Technology*). This model integrates the principles of Communicative Language Teaching (CLT) with the support of artificial intelligence–based interactive media and e-learning platforms. The TAF'IL model comprises five core components. The first is input, which consists of multimedia-based teaching materials integrating text, audio, and interactive video. The second is process, which involves both synchronous and asynchronous learning activities, supported by adaptive learning pathways tailored to students' initial abilities. The third component is support, provided through an AI chatbot system that assists with vocabulary, grammar, and conversational practice. The fourth is assessment, which applies online evaluations equipped with automatic error analysis. The final component is feedback, offering real-time responses for both teachers and students.

Furthermore, the TAF'IL (Technology-Assisted Framework for Interactive Arabic Learning) model is specifically designed to address the challenges of Arabic language learning in Islamic educational institutions in the digital era. It encompasses five main elements: needs analysis, media design, AI-based implementation, adaptive feedback, and continuous evaluation. These components are interconnected in a layered structure, forming a dynamic and sustainable learning cycle.

This model adopts the principles of design-based research, allowing iterative development through limited trials and continuous refinement. Each component contributes to strengthening students' Arabic language competencies comprehensively, including *istima'* (listening), *kalam* (speaking), *qira'ah* (reading), and *kitabah* (writing) (Sugiyono, 2010).

Technology Features Used

The TAF'IL platform integrates AI for personalized learning, *speech recognition* for pronunciation training, *interactive e-learning modules*, and *gamification* to increase motivation. The real-time feedback system leverages *machine learning* to tailor material to students' abilities, while an analytics dashboard helps teachers monitor each student's progress.

Table 5. The following contains a summary of the main features of the TAF'IL model and its functions:

Technology Features	Main Functions	Benefits of Learning Arabic
AI Personalization	Arrange materials according to the student's ability level	The learning process becomes adaptive and effective
Speech Recognition	Analyze students' pronunciation in real-time	Increased phonetic accuracy
Gamification Elements	Interactive points, badges, and challenge systems	Increase motivation and engagement
Interactive E-Modules	Text-based, audio, and interactive video materials	Meet diverse learning styles
Learning Analytics	Data-driven progress reports	Facilitate teachers in lesson planning

Based on Table 5, the application of the TAF'IL learning model shows a significant improvement across the measured aspects. Student engagement scores have risen consistently, reflecting high active participation during the learning process. The motivation aspect also shows a positive trend, indicating that the use of interactive media and AI features can sustainably encourage interest in learning Arabic. Teachers' positive responses to indicators of ease of implementation and the usefulness of the technology reinforce the finding that these designs are not only student-friendly but also adaptable for teachers. These results confirm the initial effectiveness of the TAF'IL model compared to conventional approaches, especially in integrating technology as a reinforcement of the Arabic language learning process in the Islamic education environment. Supporting the table above, the following is shown a schema image of the TAF'IL learning model.

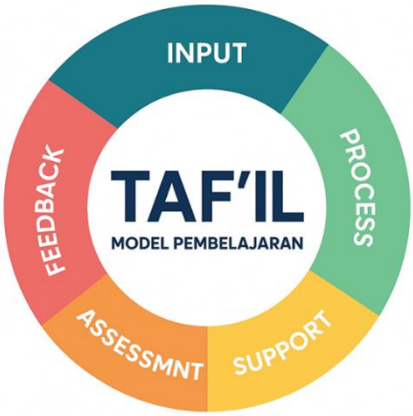

Figure 1. TAF'IL Learning Model Scheme

The findings in Table 5 align with the visualization in Figure 1, which shows the TAF'IL learning model with five core components interacting with one another. The scheme makes clear how each component, from planning to AI-based evaluation, contributes to increased motivation, engagement, and learning effectiveness. The visualization helps map the interconnectedness of aspects reflected in the quantitative data, thereby strengthening the understanding that the model's success results from the synergy between innovative learning design and the strategic use of technology.

Teacher and Student Responses

The limited trial at two madrassas showed positive responses from teachers and students. Teachers consider this platform **to** facilitate material management and improve learning efficiency. Students report a more enjoyable, interactive, and relevant learning experience in the digital world they are

familiar with.

Table 6. Teacher and Student Responses to the TAF'IL Learning Model

Respondents	Response Indicators	Percentage
Students	More motivated to use TAF'IL than conventional methods	85%
Teacher	Want to integrate TAF'IL into the regular curriculum	78%

From the table above, 85% of students reported being more motivated to use TAF'IL than conventional methods, and 78% of teachers expressed a desire to integrate it into the regular curriculum.

Early Effectiveness

Initial measurements in small groups showed significant improvement in vocabulary and pronunciation after 4 weeks of TAF'IL use. Students who initially had difficulty understanding Arabic texts increased their average reading test score by 18%. These results indicate the potential for this model to be adopted more widely, although further research is needed for large-scale testing. Further, it can be seen in the graph below:

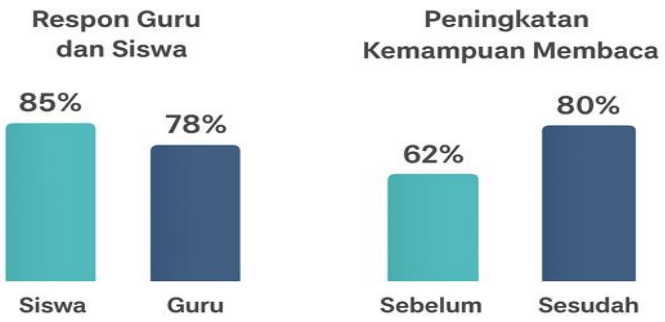

Figure 2. Teacher-Student Response and Reading Ability Improvement

The images presented show that the majority of students (85%) felt an increase in learning motivation when using the TAF'IL learning model compared to conventional methods. This confirms that TAF'IL's technology-based approach and interactivity can provide a more engaging and relevant learning experience for their needs. Meanwhile, 78% of teachers expressed interest in integrating TAF'IL into the regular curriculum, reflecting positive acceptance and belief that this model can enrich Arabic learning strategies in the classroom. These findings not only indicate the initial success of implementation but also open up wider adoption opportunities in Islamic educational institutions, noting that training and infrastructure support need to be strengthened (Al-Shaikh et al., 2024; Mousa et al., 2024).

TAF'IL's learning model shows fundamental differences compared to conventional methods in Arabic language teaching. Traditional methods that generally emphasize memorization of vocabulary and literal translation often leave students feeling bored, especially at the madrasah level (Alhamami, 2025; Subait et al., 2025). In contrast, TAF'IL integrates a technology-based approach with the task-based learning principle, resulting in a more contextual and interactive learning experience. Data show that 85% of students are more motivated to use TAF'IL, which can be attributed to the presence of multimedia elements, gamification, and the adaptation of materials to individual abilities, something rarely found in conventional approaches.

From a pedagogical perspective, TAF'IL successfully combines *cognitive load theory* with the principle *of multimodal learning*. Interactive media helps reduce students' cognitive load by presenting information simultaneously through text, audio, and visuals. In contrast to the whiteboard and teacher-

led lecture methods, this approach provides students with an opportunity to build independent associations of meaning. The effect can be seen in the 18% increase in average student reading test scores following limited implementation, suggesting that technology can serve as a facilitator of comprehension rather than just a tool.

From a pedagogical perspective, TAF'IL successfully combines *cognitive load theory* with the principle *of multimodal learning*. Interactive media helps reduce students' cognitive load by presenting information simultaneously through text, audio, and visuals. In contrast to the whiteboard and teacher-led lecture methods, this approach provides students with an opportunity to build independent associations of meaning. The effect can be seen in the 18% increase in average student reading test scores following limited implementation, suggesting that technology can serve as a facilitator of comprehension rather than just a tool.

The implications of applying TAF'IL in Arabic language learning in the digital era are significant. First, learning is no longer limited by space and time; Students can access the material at any time through digital devices. Second, this approach facilitates personalized learning tailored to individual learning styles. In the context of globalization, Arabic language skills supported by digital literacy skills will prepare students to access authentic resources in Islamic studies, diplomacy, and international trade (Arsyad, 2019; Hadiyanto et al., 2020; Yasin et al., 2023).

In addition, TAF'IL has the potential to become a reference model for Arabic learning innovations in madrassas and universities. The integration of technologies such as *speech recognition* and *real-time feedback* can speed up the learning process. This approach is also in line with the vision *of Education 5.0*, which demands a blend of artificial intelligence, adaptive learning, and student creativity (Al-Rafi'i et al., 2024; Widayat et al., 2021).

In addition, teachers' readiness to operate and utilize TAF'IL features is a determining factor in the success of implementation. In addition, the readiness of teachers in operating and utilizing TAF'IL features is a determining factor for the success of implementation (Abdullah et al., 2025; Enramika, 2023).

In terms of learning culture, another challenge is resistance to change. Some educators and parents still view technology-based learning as a distraction rather than an educational tool (Alamsyah et al., 2025; Aprilia, 2021; Yurianto et al., 2023). This requires an effective socialization and training strategy so that TAF'IL is understood as a method that reinforces, not replaces, the values of Islamic education.

Thus, although TAF'IL has shown great potential to improve motivation and understanding of Arabic, the sustainability of its implementation requires a holistic approach. Synergy is needed between technological innovation, teacher capacity building, infrastructure support, and acceptance of Islamic education culture. If these challenges are overcome, TAF'IL has the opportunity to become an effective, inclusive, and relevant Arabic-language learning model in the digital age.

4. CONCLUSION

This study demonstrates that developing a technology-based Arabic language learning model that integrates traditional pedagogical practices with digital innovation is a relevant and adaptive approach to addressing the challenges of Islamic education in the digital era. Through the Design-Based Research (DBR) approach, the developed learning model is not only oriented toward theoretical development but also toward practical application that can be implemented effectively within the context of learning in madrasahs.

The findings from the needs analysis stage revealed a gap between Arabic language learning practices that remain focused on traditional methods and the growing demand for more contextually and communicatively oriented Arabic language skills. The design stage produced a systematic learning

model framework by integrating traditional methods such as *talaqqi* and *sorogan* with interactive digital technologies. Furthermore, the development and initial implementation stage showed that the use of the technology-based learning model increased student engagement in the learning process, facilitated teachers in delivering instructional materials, and supported more effective evaluation processes. The evaluation and revision stage also indicated improvements in student learning outcomes, particularly in vocabulary mastery and understanding of Arabic sentence structures, demonstrating that the developed learning model has a good level of initial feasibility and effectiveness.

Conceptually, this study contributes to Arabic language education by proposing a technology-based learning model that combines the strengths of Islamic scholarly traditions with digital innovation within a structured, adaptive instructional design framework. In practice, the resulting model can serve as an innovative learning strategy for Arabic language teachers in Islamic educational institutions to enhance learning that is more interactive, contextual, and aligned with the characteristics of 21st-century learners.

Nevertheless, this study has limitations related to the scope of implementation, which was conducted on a limited scale. Therefore, further research is required to examine the effectiveness of the learning model on a broader scale by involving a larger number of participants and more diverse educational contexts. Future studies may also explore integrating more specific technologies, such as online learning platforms, artificial intelligence, and application-based learning media, to strengthen the sustainability of innovation in Arabic language learning.

REFERENCES

Abdullah, M., Al-shathry, N. I., Alzaidi, M. S. A., Aljubailan, A. A., Darem, A. A., Al Sultan, H., Alzahrani, A. A., & Alkharashi, A. (2025). An integration of corpus applied Linguistics with deep learning for Arabic Spam and Ham Tweets Detection model. *Journal of Radiation Research and Applied Sciences*, *18*(2), 1–12. https://doi.org/10.1016/j.jrras.2025.101463

Alamsyah, F., Majid, M. N., Kosim, N., & Fauziah, E. L. (2025). Project Based Learning Dalam Pembelajaran Bahasa Arab di MA Miftahul Falah Bandung. *NASKHI: Jurnal Kajian Pendidikan dan Bahasa Arab*, *7*(1), 24–36. https://doi.org/10.47435/naskhi.v7i1.3346

Alhamami, M. (2025). Intention Over Motivation: A Holistic Analysis of Psychological Constructs in Arabic as a Foreign Language Learning. *Acta Psychologica*, *258*(1), 1–12. https://doi.org/10.1016/j.actpsy.2025.105142

Almasre, M. A., & Al-Nuaim, H. (2020). A Comparison of Arabic Sign Language Dynamic Gesture Recognition Models. *Heliyon*, *6*(3), 1–14. https://doi.org/10.1016/j.heliyon.2020.e03554

Al-Rafi'i, M. S., Nursyamsyiah, N., & Supriadi, R. (2024). Meningkatkan Hasil Belajar Kosakata Bahasa Arab: Pengaruh Metode Problem-Based Learning Abad Ke-21. *Nusantara: Jurnal Pendidikan Indonesia*, *4*(2), 371–382. https://doi.org/10.14421/njpi.2024.v4i2-3

AlShaikh, R., Al-Malki, N., & Almasre, M. (2024). The Implementation of the Cognitive Theory of Multimedia Learning in the Design and Evaluation of an AI Educational Video Assistant Utilizing Large Language Models. *Heliyon*, *10*(3), 1–19. https://doi.org/10.1016/j.heliyon.2024.e25361

Alwehaibi, A., Bikdash, M., Albogmi, M., & Roy, K. (2022). A study of the performance of embedding methods for Arabic short-text sentiment analysis using deep learning approaches. *Journal of King Saud University - Computer and Information Sciences*, *34*(8), 6140–6149. https://doi.org/10.1016/j.jksuci.2021.07.011

Aprilia, U. (2021). Pembelajaran Keterampilan Berbicara di Era Abad ke-21 Berbasis Pendekatan Quantum. *Al-Ittijah: Jurnal Keilmuan Dan Kependidikan Bahasa Arab*, *13*(2), 170–185. https://doi.org/10.32678/al-ittijah.v13i2.4678

Aragón, M. E., López-Monroy, A. P., Montes-y-Gómez, M., & Losada, D. E. (2025). Adapting language models for mental health analysis on social media. *Artificial Intelligence in Medicine*, *168*(1), 1–16.

https://doi.org/10.1016/j.artmed.2025.103217

Arsyad, M. H. (2019). Metode-Metode Pembelajaran Bahasa Arab Berdasarkan Pendekatan Komunikatif Untuk Meningkatkan Kecakapan Berbahasa. *Shaut al Arabiyyah*, *7*(1), 13–30. https://doi.org/10.24252/saa.v1i1.8269

Assingkily, M. S. (2021). *Metode Penelitian Pendidikan: Panduan Menulis Artikel Ilmiah dan Tugas Akhir* (T. Siregar, Ed.). Penerbit K-Media.

Aziz, M. T., Hasan, L. M. U., & Rido'i, M. (2024). Analisis Kurikulum Bahasa Arab Berbasis 4C (Critical Thinking, Communication, Collaboration, Creativity) untuk Pengembangan Kompetensi Abad ke-21 pada Siswa. *Daarus Tsaqofah: Jurnal Pendidikan Pascasarjana Universitas Qomaruddin*, *2*(1), 216–222. https://jurnalpasca.uqgresik.ac.id/index.php/pendidikan|216

Enramika, T. (2023). Pengembangan media pembelajaran bahasa Arab berbasis aplikasi Canva dalam meningkatkan keterampilan pendidik abad ke-21. *Shibgoh: Prosiding Ilmu Kependidikan UNIDA Gontor*.

Erfiana, N. A. N. E., & Mareza, N. (2023). Pendampingan Guru MI/SD dalam Pengelolaan Pembelajaran Abad 21 di SDI Al-Munawwar Tulungagung. *The Elementary Journal*, *1*(1), 39–44. https://doi.org/10.56404/tej.v1i1.50

Garnisun, D. R. (2011). *E-Learning di abad ke-21: Kerangka Kerja untuk Penelitian dan Praktik*. Routledge.

Hadiyanto, A., Samitri, C., & Ulfah, S. M. (2020). Model Pembelajaran Bahasa Arab Multiliterasi Berbasis Kearifan Lokal di Perguruan Tinggi Negeri. *Hayula: Indonesian Journal of Multidisciplinary Islamic Studies*, *4*(1), 117–140. https://doi.org/10.21009/hayula.004.1.07

Hakim, B., & Ahror, B. (2024). Deep Learning for Accurate Recognition of Arabic Handwritten Words in Historical Documents. *Procedia Computer Science*, *244*, 57–65. https://doi.org/10.1016/j.procs.2024.10.178

Haq, M. A., Mulyani, S., & Soleh, A. (2023). Paradigma Pembelajaran Bahasa Arab (Analisis Kontrastif Metode Pembelajaran Konvensional dan Kontemporer). *Takuana: Jurnal Pendidikan, Sains, Dan Humaniora*, *2*(1), 63–75. https://doi.org/10.56113/takuana.v2i1.71

Himdi, H. (2024). Arabic Idiom Detection Using Deep Learning and Transformer-based Models. *Procedia Computer Science*, *244*, 37–48. https://doi.org/10.1016/j.procs.2024.10.176

Kadir, S. D., & Yasin, Z. (2022). Implementasi Standar Isi Kurikulum KMA 183 Terhadap Peningkatan Al-Maharah Al-Lughawiyyah dalam Model Pembelajaran Bahasa Arab Komunikatif di Kelas VII. *Assuthur Journal*, *1*(1), 24–36. https://journal.iaingorontalo.ac.id/index.php/al/article/view/1866

Mousa, A., Shahin, I., Nassif, A. B., & Elnagar, A. (2024). Detection of Arabic Offensive Language in Social Media Using Machine Learning Models. *Intelligent Systems with Applications*, *22*, 1–13. https://doi.org/10.1016/j.iswa.2024.200376

Mudinillah, A. (2019). Pemanfaatan Aplikasi Lectora Inspire Sebagai Media Pembelajaran Interaktif Pada Pelajaran Bahasa Arab. *Jurnal Penelitian IPTEKS*, *4*(2), 248–258.

Mufti, A. (2022). Project-Based Learning untuk Meningkatkan Kemampuan Berpikir Tingkat Tinggi pada Mata Pelajaran Bahasa Arab. *Al-Ma'rifah*, *19*(1), 13–22. https://doi.org/10.21009/almakrifah.19.01.02

Muid, A. (2024). ICT-Based Arabic Learning: A 21st Century Learning Innovation. *Edu Journal Innovation in Learning and Education*, *02*(1). https://doi.org/10.55352/edu

Nuraeni, A. (2023). Pendekatan Pedagogi Genre dalam Mata Pelajaran Bahasa Arab Kurikulum Merdeka. *Jurnal Inovasi Pendidikan Dasar*, *3*(3), 105–111.

Nurrahma, S., & Suryanto, C. (2025). Arabic Language Learning Model in the Era of Independent Curriculum that is Relevant in the 21st Century. *LOGHAT ARABI Jurnal Bahasa Arab Dan Pendidikan Bahasa Arab*, *6*(1), 1–19. https://doi.org/10.36915/la.v6i1.282

Putri, V. R. (2018, September). Memaksimalkan Kompetensi Guru Melalui Fitur Kelas Maya dalam Pembelajaran Bahasa Arab sebagai Inovasi Pembelajaran Zaman Now. *3rd International*

Conference on Education. www.belajar.kemdikbud.go.id

Sahrir, M. S., Osman, N., & Muhammad, I. S. (2020). Aplikasi "Konsep 4C" Pembelajaran Abad ke-21 dalam Kalangan Guru Pelajar Sarjana Mod Pengajian Pendidikan Bahasa Arab Cuti Sekolah UIAM. *E-Jurnal Bahasa Dan Linguistik*, *2*(1). http://ejbl.kuis.edu.my

Sari, R. R., & Mubaligh, A. (2019). Scamper Sebagai Strategi Menulis Kreatif Bahasa Arab Abad Ke-21. *Journal of Arabic Studies*, *4*(2), 178–187. https://doi.org/10.24865/ajas.v4i2.182

Siemens, G. (2005). Konektivisme: Teori Pembelajaran untuk Era Digital. *Jurnal Internasional Teknologi Instruksional dan Pembelajaran Jarak Jauh*, *2*(1), 3–10.

Subait, W. bin, Asiri, M. M., Alzaidi, M. S. A., Alanazi, M. H., Alshammeri, M., Yafoz, A., Alsini, R., & Khadidos, A. O. (2025). Artificial Intelligence-based Natural Language Processing for sarcasm detection and classification on Arabic Corpus. *Alexandria Engineering Journal*, *125*, 320–331. https://doi.org/10.1016/j.aej.2025.03.125

Sugiyono, S. (2010). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif dan R&D*. Alfabeta.

Sukirman, S., Zaenuri, M., & Hasanah, L. Q. (2023). Pengembangan Rencana Pembelajaran Semester (RPS) Mata Kuliah Mahārat al-Istimā' Berbasis Kecakapan Abad ke-21. *Al-Ma'rifah: Jurnal Budaya, Bahasa, Dan Sastra Arab*, *20*(1), 1–20. https://doi.org/10.21009/almakrifah.20.01.01

Taufiqurrahman, T., Ali, M., & Khalid, S. M. (2024). Analisis Penggunaan Duolingo sebagai Media Pembelajaran Maharah Istima' pada Abad ke-21. *Jurnal Ilmiah Ar-Risalah: Media Keislaman, Pendidikan Dan Hukum Islam*, *22*(1).

Toifah, N. (2021). Pembelajaran Berbicara Arab Tentang Anamnesis Berbasis Keterampilan Abad ke-21 di Prodi Pendidikan Dokter. *Arabia: Jurnal Pendidikan Bahasa Arab*, *13*(1), 169. https://doi.org/10.21043/arabia.v13i1.10102

Widayat, P. A., Munthe, B., & Musthofa, T. (2021). Penerapan Model Pembelajaran Berbasis Kecerdasan Interaksional untuk Meningkatkan Kompetensi Berbahasa Arab Siswa. *Arabi : Journal of Arabic Studies*, *6*(1), 39–53. https://doi.org/10.24865/ajas.v6i1.310

Yasin, A., Fadlurrahman, F., Sayadi, S., & Muhammad, M. (2023). Urgensi Strategi Pembelajaran Bahasa Arab di Era Milennial. *INNOVATIVE: Journal Of Social Science Research*, *3*(2), 275–286. https://j-innovative.org/index.php/Innovative

Yazid, Mohd. T. Mohd., Sulong, W. M. W., Mustapha, N. F., & Jabar, M. A. A. (2023). Potensi e-Modul dalam Pembelajaran Bahasa Arab pada Era Globalisasi. *Innovative Teaching and Learning Journal*, *7*(1), 1–11. http://www.belajarbahasaarab.com/

Yurianto, R., Karimah, L. H., & Aliah, M. (2023). Model Pembelajaran Berbasis Proyek Dengan Menggunakan Platform Raptivity Pada Mata Kuliah Bahasa Arab. *Lisanan Arabiya: Jurnal Pendidikan Bahasa Arab*, *07*(02), 201–216. https://doi.org/10.32699/liar.v7vi2.5720

Zizic, M. C., Mladineo, M., Gjeldum, N., & Celent, L. (2022). From Industry 4.0 toward Industry 5.0: A Review and Analysis of Paradigm Shift for People, Organizations, and Technology. *Energies*, *15*(14), 5221. https://doi.org/10.3390/en15145221