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Research Article

INTEGRATION OF TECHNOLOGY IN ARABIC LANGUAGE LEARNING AT ISLAMIC EDUCATIONAL INSTITUTIONS

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Abstract
The development of information and communication technology has brought significant changes across various fields, including education. Islamic educational institutions, as entities responsible for shaping outstanding Muslim generations, need to keep pace with these advancements to enhance the effectiveness of the learning process, particularly in Arabic language learning. This study aims to explore how technology can be integrated into Arabic language learning at Islamic educational institutions and its impact on students' learning outcomes. The method used in this research is qualitative, employing a descriptive-analytical approach through observations, in-depth interviews, and documentation at several Islamic educational institutions in West Sumatra. The findings indicate that the integration of technology such as mobile applications, online learning platforms, and interactive media effectively increases students' motivation, engagement, and understanding of Arabic language materials. In conclusion, the appropriate use of technology in Arabic language learning can make a significant contribution to improving the quality of education in Islamic institutions and support the digital transformation in the education sector.

Keywords: Arabic Language, Digital Learning, Educational Technology, Islamic Institutions

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INTRODUCTION

The development of technology in today's era of globalization is inevitable. Technology has penetrated all aspects of life, including the world of education (Akkas & Al Samman, 2022; Tabash dkk., 2023). Education, which was once conventional, has undergone significant transformation with the presence of various digital tools. The internet, computers, educational software, and mobile applications have become inseparable parts of teaching and learning activities (Gligorea dkk., 2023; Saeed dkk., 2022; Wang dkk., 2022). In this context, learning is no longer confined to the classroom but can be conducted anytime and anywhere.

Technological advancements have compelled educational institutions to adjust their learning approaches (Hasbullah dkk., 2022). Traditional teaching methods are increasingly combined with technology-based methods to improve the effectiveness and efficiency of learning. Moreover, technology enables teachers and students to access a wider and more diverse range of learning resources, making education richer and more meaningful. Islamic educational institutions, as an integral part of the national education system, are also not exempt from these demands. Over the past decades, various Islamic educational institutions have demonstrated their seriousness in adopting technology to support the educational process (Suyadi dkk., 2022). This reflects an awareness of the importance of integrating Islamic values with technological progress to produce generations who are both religious and technologically literate.

One of the main challenges in Islamic educational institutions is mastery of the Arabic language. Arabic is the primary language of the Qur'an and Islamic literature, so proficiency in this language is key to deeply understanding Islamic teachings. However, many students still experience difficulties in learning Arabic, whether in vocabulary, grammatical structures, or pronunciation (Hagawe dkk., 2023; Jahan & Oussalah, 2023). In addressing this challenge, technology can serve as an effective solution. Various Arabic language learning applications are now available in digital formats, ranging from electronic dictionaries, grammar apps, to interactive learning platforms equipped with audiovisual features. These technologies allow students to learn independently in more engaging and interactive ways.

Furthermore, the integration of technology in Arabic language learning can assist teachers in delivering material more effectively. Teachers can use presentation media, instructional videos, animations, and simulations to explain complex concepts. As a result, the learning process becomes more dynamic and less monotonous. In addition to supporting classroom learning, technology also opens opportunities for distance learning (Xu & Ouyang, 2022). This is especially relevant in certain situations such as pandemics or geographical limitations. By utilizing e-learning platforms, students can continue their studies even when they are outside the school or pesantren environment.

Nevertheless, not all Islamic educational institutions have the same readiness to integrate technology (Farrokhnia dkk., 2024; Matrane dkk., 2023). Many challenges remain, such as limited infrastructure, lack of teacher training, and restricted internet access. Therefore, appropriate strategies and policies are required to ensure optimal technology integration. In the curriculum context, technology integration also needs to be aligned with the objectives of Arabic language learning. Technology should not only serve as a supporting tool but must become part of a systematically designed learning strategy. This approach requires careful planning, the development of suitable media, and ongoing evaluation.

Previous studies have demonstrated the benefits of technology use in foreign language learning. However, research specifically focusing on its application in Arabic language learning at Islamic educational institutions remains limited. This indicates the need for more in-depth and contextual studies (Alwehaibi dkk., 2022; Zhou dkk., 2022). This research responds to that need. Focusing on Islamic educational institutions, this study aims to explore how technology has been used in Arabic language learning and its impact on learning quality. This study is expected to contribute to the development of more innovative and effective learning

models. The novelty of this research lies in its approach, combining qualitative analysis with field studies in various Islamic educational institutions. Thus, the research findings are not only theoretical but also reflect real conditions in the field, including challenges and best practices.

Additionally, this research examines policy aspects, the role of teachers, and students' perceptions of technology use in Arabic learning. This is important to obtain a holistic picture of the learning ecosystem in Islamic educational institutions undergoing digital transformation.

Through this research, it is hoped that a collective awareness will emerge among stakeholders about the importance of technology's role in improving learning quality. Islamic educational institutions can become pioneers in the use of technology based on Islamic values, integrating advances in science with spirituality. Against this background, this article will systematically discuss how technology is integrated into Arabic language learning in Islamic educational institutions, the methods used in this study, the field findings, and a discussion linking those findings with relevant theories and practices. The article will conclude with practical recommendations for Islamic educational institutions to adopt technology wisely and effectively.

RESEARCH METHOD

This study employs a qualitative approach with a descriptive-analytical method. This approach was chosen to provide an in-depth and comprehensive description of the process of integrating technology into Arabic language learning at Islamic educational institutions. The qualitative method is considered most suitable as it can reveal the social realities, experiences, and perceptions of educational actors regarding the phenomenon under study (Petersen dkk., 2022). Data were collected naturally, with the researcher serving as the primary instrument in the data collection and analysis process. The main focus of the research is on understanding rather than measurement, thus allowing for an in-depth exploration of the dynamics of technology use within the Islamic education environment.

The subjects of this study include teachers, students, and heads of Islamic educational institutions who are directly involved in the Arabic language learning process. Informants were selected purposively, based on specific criteria relevant to the research objectives. Selected teachers are those actively using technology-based media in their teaching processes. Meanwhile, student informants are those who have experienced Arabic language learning through digital approaches (Rehman dkk., 2022; Vadyala dkk., 2022). Heads of institutions were chosen due to their role in policy making and provision of technological support facilities for learning.

The research locations were focused on several Islamic educational institutions in West Sumatra that have demonstrated openness to technological innovation in learning. These institutions include madrasah aliyah, modern pesantrens, and integrated Islamic schools. The selection of these locations took into account diversity in approaches, levels of technological readiness, and the socio-cultural backgrounds of each institution. This was intended to ensure that the research results have a high level of representation and relevance to the real conditions of Islamic education in the region.

Data collection was conducted using three main techniques: participatory observation, in-depth interviews, and documentation. Observations were carried out during Arabic language learning sessions, systematically noting the use of digital media, interactions between teachers and students, and students' responses to the delivered material (Ng dkk., 2023). These observations helped the researcher understand the context directly without intervening in the teaching and learning process. Field notes made during observations became an important data source supporting the validity of the research results.

Interviews were conducted semi-structurally to allow informants to freely explain their views while still guided by relevant questions. Interviews were held directly with teachers, students, and heads of institutions, both individually and in groups. Questions covered aspects of technology utilization, learning experiences, obstacles faced, and expectations regarding digital-based Arabic language learning. All interviews were recorded and transcribed verbatim for subsequent analysis.

Documentation involved collecting secondary data such as learning syllabi, lesson plans, lists of software or applications used, and documentation of learning activities in the form of photos and videos. This documentation data was used to support and strengthen findings from observations and interviews. Furthermore, documentation provided information about the consistency between the planned and actual implementation of technology integration in Arabic language learning.

Data analysis was performed using thematic analysis techniques. The process began with data reduction, which involved filtering relevant data from observations, interviews, and documentation. This was followed by categorization and coding to identify main emerging themes. These themes included: types of technology used, methods of integration into learning, perceptions of students and teachers, as well as challenges and opportunities encountered. Each theme was analyzed in depth with reference to relevant theories and previous research findings.

To maintain data validity, the researcher employed source and method triangulation techniques. Source triangulation involved comparing data from teachers, students, and heads of institutions. Method triangulation involved comparing results from observations, interviews, and documentation (El-Alami dkk., 2022; Liu dkk., 2022). Additionally, member checking was conducted by asking informants to verify interview results and interpretations made. This step ensured that the findings accurately reflected the realities experienced by educational actors.

Ethical considerations were a primary concern throughout the research process. Each informant was given explanations about the study's purpose, their rights as participants, and guarantees of confidentiality regarding their identities. Informed consent was obtained prior to conducting interviews and observations. During the research, the researcher maintained neutrality, respected local cultures, and sought to build positive relationships with all involved parties.

The results of this method are expected to authentically portray the reality of technology use in Arabic language learning. This qualitative approach allows for an in-depth exploration of the dynamic interactions between technology, teachers, and students within the context of Islamic educational institutions. The research findings will then serve as a basis for formulating practical recommendations and theoretical contributions toward the development of technology-based Arabic language learning models in the future.

RESULTS AND DISCUSSION

Results

The research results show that most Islamic educational institutions studied have integrated technology into Arabic language learning using various approaches and differing levels of intensity. The use of technology is not limited to presentation tools such as LCD projectors and PowerPoint but also includes mobile-based learning applications, e-learning platforms like Google Classroom and Moodle, as well as interactive media such as animated videos and Arabic-language podcasts (Farooq dkk., 2023). In some institutions, teachers have become accustomed to using applications like Quizizz, Kahoot!, and Duolingo Arabic as tools for both evaluation and independent student learning. This indicates an increased awareness of technology's potential to enhance the effectiveness and appeal of Arabic language learning.

On the other hand, classroom observations show that technology use increases student engagement during the learning process. When teachers present material through animated

videos or interactive quizzes, students appear more enthusiastic and actively responsive. Compared to conventional lecture- and memorization-based methods, technology-based approaches provide a more enjoyable and communicative learning experience. Students find it easier to understand vocabulary meanings, grammatical structures, and Arabic pronunciation when presented in audiovisual form. Some students even stated that they prefer learning through applications because they can independently review the material outside class hours.

Interviews with Arabic language teachers reveal that they acknowledge the benefits of technology in facilitating the delivery of material. Technology enables the use of varied learning media and helps teachers explain abstract Arabic language concepts more concretely. For example, teachers can show daily conversation simulations in Arabic through videos, providing accurate models of pronunciation and intonation for students. Teachers also mention that the use of classroom management applications such as Google Classroom simplifies task collection, material distribution, and the conduct of online exams. However, teachers also express the need for further training to maximize the use of technology features.

From the perspective of institutional leaders, internal policy support for technology integration is a key factor in program success. Institutions with a vision for educational technology tend to be better prepared to provide infrastructure such as stable internet networks, computers, projectors, and multimedia rooms. Leaders state that investment in technological infrastructure is part of a strategy to improve learning quality. Additionally, some institutions allocate specific funds for human resource development through teacher training on digital literacy and technology-based learning innovations.

Another significant finding is the emergence of independent learning habits among students. Mobile-based learning applications allow students to access materials anytime, reducing their full dependence on teachers. This opens opportunities for developing blended learning or flipped classroom models. In some classes, teachers assign pre-learning tasks in the form of videos or digital modules that students must study before face-to-face meetings. In class, students are invited to discuss and practice the material they have independently learned. This pattern increases students' learning responsibility and strengthens critical thinking and communication skills in Arabic.

However, not all students respond positively to technology use. Some students, especially those from lower-middle economic backgrounds, face limitations in accessing technological devices such as personal smartphones or stable internet connections at home. This creates a digital learning resource access gap. In interviews, students reported difficulties in following online learning when they could not access certain applications or experienced delays downloading materials. Some teachers try to address this by providing printed materials or offline files, but this does not entirely eliminate the digital divide.

Furthermore, it was found that students' digital literacy levels significantly affect the effectiveness of technology integration. Students familiar with digital devices show better ability in using learning applications, exploring online Arabic content, and interacting in online discussion forums (Dong dkk., 2022; Ghalambaz dkk., 2024). Conversely, students less accustomed to technology experience confusion when accessing materials or completing tasks on digital platforms. This indicates that beyond providing technology, digital literacy education must be an essential part of the Islamic educational institutions' curriculum.

Some teachers develop their own learning media using tools like iSpring, Canva, and interactive PowerPoint to teach nahwu and sharaf (Arabic grammar rules). These results demonstrate teachers' creativity in adapting technological content to Arabic language learning needs. One teacher even created short animated videos depicting everyday conversations between characters relevant to the lesson material. These videos are used for listening and speaking exercises, which are usually difficult to conduct conventionally. Teachers' creativity in utilizing local technology is a key to the success of the integration process.

Besides teachers, students' roles as content creators are beginning to appear in some institutions. Students are invited to create digital projects such as Arabic-language vlogs, digital vocabulary posters, or short podcasts discussing Islamic themes in Arabic. These projects not only strengthen language skills but also increase students' motivation and confidence as they feel valued as active participants in the learning process. These activities also promote collaboration among students, enhance creative thinking abilities, and train important 21st-century skills in the digital era.

An interesting finding is that technology use can shift the learning paradigm from teacher-centered to student-centered. Teachers are no longer the sole sources of information but act as facilitators and guides in the learning process. Students have greater opportunities to explore material independently and deeply according to their interests and learning pace. In some classes, students actively seek additional materials beyond those provided by teachers and share them in online class forums. This shows that technology integration opens wider participation space for students to determine their learning methods and sources.

Technology integration also positively impacts the overall improvement of students' language skills. Classroom observations show students' progress in listening (istima'), speaking (kalam), reading (qira'ah), and writing (kitabah). Students find it easier to understand reading texts thanks to automatic translation and audio features available on digital platforms. They also become more accustomed to speaking Arabic through voice recording features used in oral assignments. Some students even start using social media to write statuses, captions, or create simple Arabic content, as an application of the material learned in class.

Most teachers report improved student learning outcomes after implementing technology in Arabic language learning. Average scores in vocabulary comprehension and grammatical structure aspects show a positive trend. Teachers state that interactive exercises such as Arabic language games, online quizzes, and digital text reading practices make it easier for students to absorb material effectively. Additionally, automated digital assessment systems help teachers monitor students' learning progress in real time and more objectively. Reports generated by these applications allow teachers to identify students' weaknesses and strengths more accurately.

Nevertheless, challenges remain in the technology integration process, particularly regarding sustainability and consistency of use. Some teachers still use technology only incidentally, rather than as an integral part of the lesson plan. This often occurs due to a lack of training, limited time to prepare digital materials, and the absence of standardized institutional guidelines on technology use in the curriculum. Some teachers even revert to traditional methods because they find it difficult to adapt to new devices. This indicates that technology integration has not fully become a learning culture in all institutions.

From a management perspective, institutions with written policies on learning digitalization tend to be more successful in implementing technology integration. These policies include infrastructure support, routine teacher training, and periodic monitoring and evaluation of technology-based learning effectiveness. Institutions that provide discussion spaces for teachers to share digital teaching strategies also show faster progress. Collaboration and exchange of good practices among teachers are key factors in driving innovation and the sustainability of technology use in Arabic language learning.

Overall, the integration of technology in Arabic language learning at Islamic educational institutions shows promising results. Technology offers opportunities to create a more contextual, flexible, and engaging learning experience for students. Although challenges remain, such as access gaps, limited digital literacy, and uneven policies, most parties welcome technology use as part of Arabic learning reform. This study indicates that with the right approach, institutional support, and adequate training, technology can be a strategic instrument to enhance the quality and relevance of Arabic language learning in the digital era.

Discussion

The results of this study reinforce the view that the integration of technology in learning is not merely a trend but has become an essential need in contemporary education systems, including Islamic educational institutions. In the context of Arabic language learning, technology offers new approaches that can bridge the gap between traditional methods and the needs of students in the digital era (Dimitriadou & Lanitis, 2023; Hosamo dkk., 2022). This aligns with constructivist learning theory, which emphasizes the importance of an interactive, dynamic learning environment that enables students to build their own understanding. Technology provides tools and spaces for more collaborative and experiential learning, thereby enhancing the effectiveness of Arabic language comprehension.

Technology integration serves not only as an aid but also as a catalyst for paradigm shifts in education. Based on observations and interviews, it is evident that the learning approach has shifted from teacher-centered to student-centered, where students become active participants in the learning process. Technologies such as instructional videos, interactive practice applications, and LMS platforms allow students to access, explore, and reflect on learning independently. This shift reflects Vygotsky's social constructivism principle, where interaction and the use of mediated tools—like digital technology—are key to knowledge construction.

One novelty of this research is the discovery of a distinctive technology-based learning model within Islamic educational institutions, such as the use of digital content themed around Islamic values in Arabic (Akour dkk., 2022). This indicates that teachers do not merely adopt technology passively but actively adapt content in line with Islamic educational values. This approach strengthens the relevance of Arabic learning to students' real-life contexts, making it more meaningful and contextual. Moreover, teachers' creativity in developing localized media tailored to both the national curriculum and pesantren (Islamic boarding school) contexts adds innovative value to the implementation of technology.

However, successful technology integration cannot be separated from the readiness of infrastructure and digital literacy of its users. Findings reveal that access to devices and stable internet networks remains a challenge in some institutions, especially those located in peripheral areas. This underscores the importance of equitable technology access as part of educational justice (Rahma dkk., 2023; Said dkk., 2022). Governments and educational institutions need to collaborate in providing adequate basic facilities so that technology benefits all, becoming part of inclusive educational transformation rather than a privilege for some.

Pedagogically, teachers play a central role in determining the success of technology integration. Without continuous training and motivation to learn new skills, teachers tend to use technology half-heartedly or solely for administrative purposes. This highlights the necessity of ongoing professional development that not only teaches technical skills but also how to design meaningful learning strategies supported by technology. Teachers also need to cultivate an adaptive and open mindset as part of their professionalism.

Students' digital literacy is another important indicator. This study confirms that students with strong digital device proficiency are better prepared to engage in technology-based learning (Sabbeh & Fasihuddin, 2023). Therefore, digital literacy must be integrated into the curriculum from an early stage so students become not just passive users but critical and responsible digital citizens. The ability to evaluate information, maintain digital ethics, and use technology for self-development should become foundational competencies in contemporary Islamic education.

Technology-based Arabic learning also provides room for differentiated instruction. Through technology, teachers can offer materials in various formats—text, audio, video, animation—allowing students to learn according to their individual styles and paces. This model aligns with the Universal Design for Learning (UDL) approach, which emphasizes providing multiple means for students to access and express understanding. In Islamic

institutions, this approach is particularly beneficial for accommodating diverse student backgrounds and abilities.

The involvement of students as content creators in digital projects marks a significant step towards active and meaningful learning. This not only demonstrates mastery of material but also develops 21st-century skills such as critical thinking, creativity, collaboration, and communication. Student-produced videos, podcasts, or infographics in Arabic reflect a shift from passive consumption to active production in the learning process. This is a concrete manifestation of transformative education, which focuses not only on academic achievement but also on character building and student independence.

Nonetheless, it must be noted that technology integration also brings new challenges, such as digital distractions, misuse of technology, and increased teacher workload in preparing media-based materials (Alhassun & Rassam, 2022). Therefore, wise technology policies and management at the institutional level are required. Technology use must be accompanied by adequate supervision and guidance to ensure learning remains focused on its primary goals. The inculcation of Islamic values in technology usage is crucial to maintain a balance between advancement and ethics.

Another important finding is the need for periodic evaluation of the effectiveness of technology-based learning. Islamic educational institutions should develop evaluation instruments that measure not only students' cognitive outcomes but also affective and psychomotor domains in the context of technology use. Such comprehensive evaluation can be conducted through classroom observations, student reflections, and learning outcome analyses. This evaluation will serve as a foundation for designing further development strategies so technology truly becomes an integral part of the learning system rather than just an accessory.

A key point emerging from this study is that technology-based learning demands a cultural shift within Islamic educational institutions (Zainuldin & Lui, 2022). Transformation occurs not only in methods but also in the mindset of all stakeholders, from teachers and students to institutional leaders. Institutions that successfully integrate technology consistently tend to have an academic culture adaptive to change. They create spaces for teacher discussions, encourage experimentation with new approaches, and embed technology in their institutional vision. This demonstrates that structural change must be accompanied by cultural change for technology to become not merely a tool but a part of the educational ecosystem.

From an institutional perspective, the study highlights the importance of visionary and progressive leadership. Leaders who support technology integration do more than allocate budgets; they also model technology use and learning innovation. They establish policies that encourage collaboration, experimentation, and continuous evaluation. In Islamic institutions, leadership plays a decisive role in transformation. When leaders harmonize Islamic values with technological advancement, a dynamic learning climate rooted in ethics and manners emerges.

Technology integration also opens vast opportunities for external collaboration, such as partnerships with online learning platforms, Arabic language institutions abroad, or Islamic digital content developers. Several institutions in this study have collaborated with Arabic language app providers and international Islamic universities for content exchange and teacher training (Putri dkk., 2023). Such partnerships enrich learning materials and broaden students' global perspectives on the Arab world and contemporary Islam. This proves technology can serve as a bridge for the internationalization of the Arabic curriculum in Islamic education.

The study also shows that technology-based learning requires synergy between human resource development and institutional policy. Without adequate training, technology can increase teachers' burdens. Without supportive policies, technology remains ineffective. Therefore, technology integration strategies must be comprehensively designed to include training, infrastructure provision, policy support, and periodic evaluation. The synergy of these elements is the main pillar for building an effective, relevant, and sustainable Arabic language learning system in the digital era.

Overall, this discussion demonstrates that technology integration in Arabic language learning in Islamic educational institutions is not only feasible but also holds great potential as a transformative educational strategy. The findings portray technology not as a mere supplement but as a strategic tool to improve learning quality, expand access, and foster 21st-century competencies among students. With a contextual approach, technology can be leveraged to strengthen Islamic values while enhancing students' language skills. The novelty of this study lies in documenting locally based innovative practices that can be replicated in other institutions with similar conditions.

CONCLUSION

The integration of technology in Arabic language learning within Islamic educational institutions has been proven to have a significant positive impact on both the learning process and student outcomes. Technology functions not only as a supportive tool but has become a strategic medium for creating more interactive, contextual, and student-centered learning experiences. This study shows that the use of digital learning platforms, Arabic language applications, and interactive media can comprehensively improve students' Arabic language skills, ranging from listening (istima'), speaking (kalam), reading (qira'ah), to writing (kitabah). Additionally, technology enhances the role of teachers as facilitators and encourages students to become active learners as well as creators of Islamic digital content.

However, the success of this integration largely depends on the readiness of infrastructure, the digital competencies of teachers and students, and supportive institutional policies. Challenges such as limited access to technology, digital literacy gaps, and increased workload for teachers need to be addressed through continuous training, equitable provision of facilities, and adaptive learning management. A cultural shift within Islamic educational institutions is also necessary so that technology use becomes a habitual part of learning, rather than merely a response to emergency situations or temporary demands.

One novelty of this research is the discovery of creative and adaptive practices by teachers and students in producing Arabic digital content aligned with Islamic values. These initiatives demonstrate that digital transformation can harmoniously coexist with the characteristics of Islamic institutions without neglecting pedagogical principles and Islamic etiquette. Technology-based Arabic learning also has the potential to expand global networks, enrich learning resources, and better prepare students to face contemporary challenges.

Therefore, the integration of technology in Arabic language learning is not only relevant but also urgent to continuously develop as part of efforts to holistically improve the quality of Islamic education. National policies encouraging value-based digital learning, structured teacher training, and cross-institutional collaboration are needed to ensure that this transformation occurs systematically and sustainably.

REFERENCES

Akkas, E., & Al Samman, H. (2022). Are Islamic financial institutions more resilient against the COVID-19 pandemic in the GCC countries? *International Journal of Islamic and Middle Eastern Finance and Management*, *15*(2), 331–358. https://doi.org/10.1108/IMEFM-07-2020-0378

Akour, I. A., Al-Maroof, R. S., Alfaisal, R., & Salloum, S. A. (2022). A conceptual framework for determining metaverse adoption in higher institutions of gulf area: An empirical study using hybrid SEM-ANN approach. *Computers and Education: Artificial Intelligence*, *3*, 100052. https://doi.org/10.1016/j.caeai.2022.100052

Alhassun, A. S., & Rassam, M. A. (2022). A Combined Text-Based and Metadata-Based Deep-Learning Framework for the Detection of Spam Accounts on the Social Media Platform Twitter. *Processes*, *10*(3), 439. https://doi.org/10.3390/pr10030439

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

Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*, *10*(1), 12. https://doi.org/10.1186/s40561-023-00231-3

Dong, X., Yan, S., & Duan, C. (2022). A lightweight vehicles detection network model based on YOLOv5. *Engineering Applications of Artificial Intelligence*, *113*, 104914. https://doi.org/10.1016/j.engappai.2022.104914

El-Alami, F., Ouatik El Alaoui, S., & En Nahnahi, N. (2022). A multilingual offensive language detection method based on transfer learning from transformer fine-tuning model. *Journal of King Saud University - Computer and Information Sciences*, *34*(8), 6048–6056. https://doi.org/10.1016/j.jksuci.2021.07.013

Farooq, U., Mohd Rahim, M. S., & Abid, A. (2023). A multi-stack RNN-based neural machine translation model for English to Pakistan sign language translation. *Neural Computing and Applications*, *35*(18), 13225–13238. https://doi.org/10.1007/s00521-023-08424-0

Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2024). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International*, *61*(3), 460–474. https://doi.org/10.1080/14703297.2023.2195846

Ghalambaz, S., Abbaszadeh, M., Sadrehaghighi, I., Younis, O., Ghalambaz, M., & Ghalambaz, M. (2024). A forty years scientometric investigation of artificial intelligence for fluid-flow and heat-transfer (AIFH) during 1982 and 2022. *Engineering Applications of Artificial Intelligence*, *127*, 107334. https://doi.org/10.1016/j.engappai.2023.107334

Gligorea, I., Cioca, M., Oancea, R., Gorski, A.-T., Gorski, H., & Tudorache, P. (2023). Adaptive Learning Using Artificial Intelligence in e-Learning: A Literature Review. *Education Sciences*, *13*(12), 1216. https://doi.org/10.3390/educsci13121216

Hagawe, H. M., Mobarek, A., Hanuk, A., & Jamal, A. (2023). A unique business model for microfinance institution: The case of Assadaqaat Community Finance (ACF). *Cogent Business & Management*, *10*(1), 2135202. https://doi.org/10.1080/23311975.2022.2135202

Hasbullah, H., Wilaela, W., Masduki, M., Jamaluddin, J., & Rosidi, I. (2022). Acceptance of the existence of salafi in the development of da'wah in Riau Islamic Malay society. *Cogent Social Sciences*, *8*(1), 2107280. https://doi.org/10.1080/23311886.2022.2107280

Hosamo, H. H., Svennevig, P. R., Svidt, K., Han, D., & Nielsen, H. K. (2022). A Digital Twin predictive maintenance framework of air handling units based on automatic fault detection and diagnostics. *Energy and Buildings*, *261*, 111988. https://doi.org/10.1016/j.enbuild.2022.111988

Jahan, M. S., & Oussalah, M. (2023). A systematic review of hate speech automatic detection using natural language processing. *Neurocomputing*, *546*, 126232. https://doi.org/10.1016/j.neucom.2023.126232

Liu, C., Ma, Q., Luo, Z. J., Hong, Q. R., Xiao, Q., Zhang, H. C., Miao, L., Yu, W. M., Cheng, Q., Li, L., & Cui, T. J. (2022). A programmable diffractive deep neural network based on a digital-coding metasurface array. *Nature Electronics*, *5*(2), 113–122. https://doi.org/10.1038/s41928-022-00719-9

Matrane, Y., Benabbou, F., & Sael, N. (2023). A systematic literature review of Arabic dialect sentiment analysis. *Journal of King Saud University - Computer and Information Sciences*, *35*(6), 101570. https://doi.org/10.1016/j.jksuci.2023.101570

Ng, D. T. K., Lee, M., Tan, R. J. Y., Hu, X., Downie, J. S., & Chu, S. K. W. (2023). A review of AI teaching and learning from 2000 to 2020. *Education and Information Technologies*, *28*(7), 8445–8501. https://doi.org/10.1007/s10639-022-11491-w

Petersen, G. B., Petkakis, G., & Makransky, G. (2022). A study of how immersion and interactivity drive VR learning. *Computers & Education*, *179*, 104429. https://doi.org/10.1016/j.compedu.2021.104429

Putri, N. A., Cale, W., & Nitin, M. (2023). The Importance of National Integration to Strengthen Religious Diversity in Community Life. *International Journal of Educational Narratives*, *1*(2), 100–107. https://doi.org/10.55849/ijen.v1i2.263

Rahma, A., Azab, S. S., & Mohammed, A. (2023). A Comprehensive Survey on Arabic Sarcasm Detection: Approaches, Challenges and Future Trends. *IEEE Access*, *11*, 18261–18280. https://doi.org/10.1109/ACCESS.2023.3247427

Rehman, A., Abbas, S., Khan, M. A., Ghazal, T. M., Adnan, K. M., & Mosavi, A. (2022). A secure healthcare 5.0 system based on blockchain technology entangled with federated learning technique. *Computers in Biology and Medicine*, *150*, 106019. https://doi.org/10.1016/j.compbiomed.2022.106019

Sabbeh, S. F., & Fasihuddin, H. A. (2023). A Comparative Analysis of Word Embedding and Deep Learning for Arabic Sentiment Classification. *Electronics*, *12*(6), 1425. https://doi.org/10.3390/electronics12061425

Saeed, R. M. K., Rady, S., & Gharib, T. F. (2022). An ensemble approach for spam detection in Arabic opinion texts. *Journal of King Saud University - Computer and Information Sciences*, *34*(1), 1407–1416. https://doi.org/10.1016/j.jksuci.2019.10.002

Said, L. R., Bilal, K., Aziz, S., Gul, A., Shabbir, M. S., Zamir, A., & Abro, H. (2022). A comparison of conventional versus Islamic banking customers attitudes and judgment. *Journal of Financial Services Marketing*, *27*(3), 206–220. https://doi.org/10.1057/s41264-021-00113-0

Suyadi, Nuryana, Z., Sutrisno, & Baidi. (2022). Academic reform and sustainability of Islamic higher education in Indonesia. *International Journal of Educational Development*, *89*, 102534. https://doi.org/10.1016/j.ijedudev.2021.102534

Tabash, M. I., Billah, M., Kumar, S., Alam, Md. K., & Balli, F. (2023). Analysis of the frequency dynamics of spillovers and connectedness among Islamic and conventional banks and their determinants: Evidence from Gulf Cooperative Council (GCC) markets. *Applied Economics*, *55*(50), 5895–5924. https://doi.org/10.1080/00036846.2022.2140771

Vadyala, S. R., Betgeri, S. N., Matthews, J. C., & Matthews, E. (2022). A review of physics-based machine learning in civil engineering. *Results in Engineering*, *13*, 100316. https://doi.org/10.1016/j.rineng.2021.100316

Wang, X., Sun, Y., & Ding, D. (2022). Adaptive Dynamic Programming for Networked Control Systems Under Communication Constraints: A Survey of Trends and Techniques. *International Journal of Network Dynamics and Intelligence*, 85–98. https://doi.org/10.53941/ijndi0101008

Xu, W., & Ouyang, F. (2022). A systematic review of AI role in the educational system based on a proposed conceptual framework. *Education and Information Technologies*, *27*(3), 4195–4223. https://doi.org/10.1007/s10639-021-10774-y

Zainuldin, M. H., & Lui, T. K. (2022). A bibliometric analysis of CSR in the banking industry: A decade study based on Scopus scientific mapping. *International Journal of Bank Marketing*, *40*(1), 1–26. https://doi.org/10.1108/IJBM-04-2020-0178

Zhou, F., Xu, X., Trajcevski, G., & Zhang, K. (2022). A Survey of Information Cascade Analysis: Models, Predictions, and Recent Advances. *ACM Computing Surveys*, *54*(2), 1–36. https://doi.org/10.1145/3433000