

Integration of Tradition and Technology: Digitalization Strategies in Islamic Education at Pesantren in Banyuwangi, Indonesia

Lu'at Happyana¹, Fina Zaidatul Istiqomah²,
Miratu Khasanah,³ Mohamad Hussin⁴

^{1,2,3} KH. Mukhtar Syafaat University Blokagung Banyuwangi, Indonesia

⁴ University of Malaya, Malaysia

*Correspondence:

 luathappyana762@gmail.com

Article History:

Received:

November 10, 2024

Revised:

December 26, 2024

Accepted:

December 27, 2024

Published:

January 8, 2025

Keywords:

Integration,
Tradition,
Technology,
Digitalization
Strategies, Islamic
Education,
Islamic Boarding
Schools

Abstract: *This study analyzes the strategies employed by Islamic boarding schools (pesantren) to manage cultural conflicts in non-Muslim communities. Using a qualitative approach with a case study method, data were collected through interviews, observations, and documentation, and subsequently analyzed using an interactive model, which included data reduction, data presentation, data depiction, and conclusion drawing. The results revealed that the pesantren implemented various strategies, such as intercultural dialogue, joint social activities, synergy in religious social events, collaboration with government agencies, and enhancing their image through achievements. These strategies play a crucial role in preventing and resolving cultural conflicts, as well as fostering harmonious relationships with the surrounding community. This research demonstrates that pesantren serve not only as religious education institutions but also as social agents that contribute to intercultural integration and harmony, particularly in plural societies. These findings underscore the significant role of pesantren in promoting cross-cultural dialogue and collaboration, ultimately fostering more inclusive and harmonious relationships in non-Muslim communities.*

Abstrak: Penelitian ini menganalisis strategi pesantren dalam mengelola konflik budaya di komunitas non-Muslim. Menggunakan pendekatan kualitatif dengan metode studi kasus, data dikumpulkan melalui wawancara, observasi, dan dokumentasi, kemudian dianalisis menggunakan model interaktif, yang meliputi reduksi data, penyajian data, pemaparan data, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa pesantren menerapkan berbagai strategi, seperti dialog antarbudaya, kegiatan sosial bersama, sinergi dalam kegiatan sosial keagamaan, kolaborasi dengan lembaga pemerintah, dan peningkatan citra melalui prestasi. Strategi-strategi ini memainkan peran penting dalam mencegah dan menyelesaikan konflik budaya, serta membangun hubungan harmonis dengan komunitas sekitar. Penelitian ini mengungkapkan bahwa pesantren tidak hanya berfungsi sebagai lembaga pendidikan agama, tetapi juga sebagai agen sosial yang berkontribusi pada integrasi dan keharmonisan antarbudaya, khususnya di masyarakat yang plural. Temuan ini mengonfirmasi peran penting pesantren dalam mempromosikan dialog lintas budaya dan kolaborasi untuk menciptakan hubungan yang lebih inklusif dan harmonis di komunitas non-Muslim.

Please cite this article in APA style as:

Happyana, Lu'at; Istiqomah, Fina Zaidatul; Khasanah, Miratu; and Hussin, Mohamad. (2025). Integration of Tradition and Technology: Digitalization Strategies in Islamic Education at Pesantren in Banyuwangi, Indonesia. *Journal of Islamic Education Research*, 6 (1), 1–18; doi: <https://doi.org/10.35719/jier.v6i1.446>



INTRODUCTION

Digitalization in Islamic boarding schools (*pesantren*) is not merely about adopting new technologies but about integrating these technologies with existing traditions to produce harmonious and sustainable solutions (Rifat, et al., 2020; Nasir, et al., 2024; Al-Jayyousi, et al., 2022; Suroso et al., 2021; Mursidi et al., 2021). Technologies like social media, websites, and online learning applications can effectively disseminate Islamic values and teachings. Research indicates that Islamic boarding schools that successfully integrate technology report increased student participation in learning activities (Syafei, I. 2023; Wahono, et al., 2023; Salsabila et al., 2022). However, this integration faces challenges, as it must balance traditional values with technological advancement to ensure sustainability and relevance (Abulibdeh, et al., 2024; Martínez-Peláez, et al., 2023; Furstenau, et al., 2020).

From a theoretical perspective, digitalization in education is often explained using concepts like technology adoption and digital transformation, focusing on the use of digital tools to enhance learning efficiency and reach (Mohamed Hashim, et al., 2022; Bygstad, et al., 2022; Mukul, et al., 2023; Qureshi, et al., 2021). However, these theories are predominantly developed in the context of general education and fail to address the unique needs of traditional institutions like Islamic boarding schools. Moreover, while theories of cultural and technological integration exist in cultural studies, their application to religious education is limited (Zembylas, 2023; Weisberg & Dawson, 2023; Qury, 2024). This creates a theoretical gap in understanding how technology can support spiritual and ethical values within traditional educational systems (Zhao, et al., 2024; Alshahrani, et al., 2024; Sadid & Munir, 2024).

Previous studies have explored the challenges and benefits of digitalizing Islamic boarding schools. For example, Mukarromah et al. (2024), Muhith et al. (2023), and Nikmatullah et al. (2023) highlight the importance of adapting to technological advancements to maintain relevance in the digital era. Furthermore, research by Sadid & Munir (2024), Zhao, et al. (2023), Adel (2024), and Lasekan, et al. (2024) underscores that technology can enhance student participation and learning effectiveness without compromising traditional values. Despite these insights, most studies lack depth in exploring effective solutions for integrating technology and tradition harmoniously, leaving a critical gap in understanding sustainable digitalization strategies for Islamic boarding schools.

This study aims to provide a comprehensive strategy for integrating technology and tradition in Islamic boarding schools. By addressing the challenges of balancing traditional values with digital advancements, this research seeks to ensure these institutions remain relevant and attractive to the younger, tech-savvy generation. The strategies proposed here are intended to help Islamic boarding schools navigate the digital era without compromising their core values. Additionally, the study will utilize case studies to identify factors that support or hinder the adoption of technology, offering practical recommendations for improving digitalization in Islamic boarding schools.

The integration of technology in Islamic boarding schools is most effective when approached holistically. Existing research often focuses either on the advantages or the obstacles of technology adoption without proposing actionable strategies to harmonize tradition and innovation (Enstroem, et al., 2024; Mehta, et al., 2024; Barikzai, et al., 2024). This study argues that active involvement from all community stakeholders, including administrators, teachers, and parents, is crucial for creating a robust digital adaptation model. Furthermore, a well-defined integration strategy can help Islamic boarding schools maintain their identity while remaining relevant in the modern age (Jubba, et al., 2022; Roqib, 2021; Hanafi, et al., 2021). This argument is supported by the need for theoretical advancements that combine traditional values with technological capabilities, as highlighted by recent studies (Maatuk, et al., 2022; Lynch, et al., 2021; Miranda, et al., 2021).

Research addressing the integration of tradition and technology in Islamic boarding schools is essential for several reasons. First, it provides practical guidance for these institutions to remain competitive and relevant in the digital era. Second, it bridges the theoretical gap in understanding how technology can complement traditional educational values. Lastly, the findings can serve as a model for similar traditional institutions worldwide, demonstrating how to adapt effectively to digital advancements while preserving cultural and religious identities. This research contributes not only to the academic field but also to the practical development of Islamic boarding schools, reinforcing their role in spreading Islamic teachings in a modern, connected world.

The integration of technology in Islamic boarding schools requires a theoretical framework that bridges cultural and technological perspectives. Existing theories on digital transformation and technology adoption often overlook the unique needs of traditional educational systems. For instance, educational technology models are generally designed for institutions focused on academic outcomes rather than holistic spiritual development (Chanifah, et al., 2021; Joshi, 2022; Alam & Mohanty, 2023; Selwyn, 2023). Therefore, this research aims to contribute to the development of a theoretical framework that incorporates the spiritual, ethical, and traditional dimensions of Islamic boarding schools into digitalization strategies.

This study will propose a set of practical strategies to address the challenges of integrating technology in Islamic boarding schools. These include fostering collaboration between stakeholders, providing adequate training for teachers and administrators, and developing customized technological tools that align with the values and traditions of Islamic boarding schools. Additionally, case studies will illustrate successful examples of digital integration, offering a blueprint for other institutions to follow. Case studies conducted in various Islamic boarding schools will provide insights into the factors that support or hinder the adoption of technology. These case studies will highlight the role of leadership, community involvement, and resource availability in shaping the success of digital initiatives. Furthermore, they will explore the impact of digitalization on student engagement, learning outcomes, and the preservation of traditional values.

The findings of this research will serve as a foundation for future studies exploring the long-term impacts of digitalization in traditional educational settings.

Potential areas of exploration include the development of digital tools specifically designed for Islamic education, the role of government policies in supporting digitalization, and the impact of global digital trends on local traditions. The digitalization of Islamic boarding schools represents a critical area of study for balancing tradition and modernity. By integrating theoretical insights with practical strategies, this research aims to contribute to the sustainable development of these institutions in the digital era. The findings will not only benefit Islamic boarding schools but also provide valuable lessons for other traditional educational systems worldwide, ensuring they remain relevant and effective in a rapidly evolving technological landscape.

METHOD

The object of this research is the Darussalam Blokagung Islamic Boarding School in Banyuwangi, which has integrated technology into various aspects of its education. This Islamic boarding school was selected as a case study to gain a comprehensive understanding of how technology is implemented within the context of Islamic boarding schools in the region. The Darussalam Blokagung Islamic Boarding School was chosen because it has a long history of maintaining traditional Islamic values while adapting to technological advancements in education. This institution not only serves as a center for religious learning but also seeks to integrate technology in order to expand access to education and enhance its quality for students.

The successes and challenges encountered during the digitalization process at this Islamic boarding school provide an opportunity to explore how tradition and technology can be harmoniously aligned. Additionally, the school has a large and diverse community, making it a representative example for other Islamic boarding schools to address the challenges of sustainable digitalization. The purposive sampling method (Budiman & Rosmiati, 2020) was used to select this institution due to its representativeness and the relevance of its experience in integrating technology.

This study adopts a qualitative approach with a case study method, allowing for an in-depth exploration of the unique context of Pondok Pesantren Darussalam Blokagung, including how technology is applied in both education and religious teachings. The case study approach aligns with the theory that emphasizes the use of case studies in qualitative research to examine complex issues within specific contexts (Efrem Jelahun, 2022).

The main informants in this study are teaching staff, school administrators, and students who are directly involved in the use of technology at Darussalam Blokagung Islamic Boarding School. Purposive sampling will be employed to select informants with relevant experience and knowledge concerning technology implementation. Data triangulation theory (Susanto & Jailani, 2023) will be applied to ensure the validity of the data by combining information from multiple sources. The following table presents the informants for the research on technology implementation at Darussalam Blokagung Islamic Boarding School, Banyuwangi, using purposive sampling and data triangulation to ensure data validity.

Table 1. Determination of Research Informants

No.	Type of Informant	Selection Criteria	Number of Informants
1	Teaching Staff	Teaching experience at Islamic Boarding School	5 people
2	Islamic Boarding School Manager	Playing a role in technology decisions	3 people
3	Active Students	Engage in everyday use of technology	10 people

This study will involve a total of 18 informants consisting of teaching staff, Islamic boarding school managers, and active students selected based on the criteria of relevance and experience in using technology in the context of the Darussalam Blokagung Islamic Boarding School.

Data collection techniques will involve in-depth interviews with teaching staff and Islamic boarding school managers, as well as group discussions with students who actively use technology in their education. Participatory observation will also be conducted to directly observe the implementation of technology in daily activities at Darussalam Blokagung Islamic Boarding School. This approach aligns with Cohen theory, which highlights the importance of diverse and in-depth data collection in qualitative research (Rifa'i, 2023).

The qualitative data collected will be analyzed using a thematic analysis approach. This approach enables researchers to identify thematic patterns or motifs emerging from the data and interpret them within a relevant theoretical context (Sitasari, 2022; Rozali, 2022). Thematic analysis will reveal various aspects of how Pondok Pesantren Darussalam Blokagung integrates technology into its education and its impact on the learning process and traditional values.

In this study, data analysis will follow the thematic analysis approach to identify emerging patterns related to technology integration at Darussalam Blokagung Islamic Boarding School. The stages of thematic analysis include: first, familiarization with the data, which involves repeatedly reading and understanding data from interviews, observations, and discussions to gain a comprehensive overview. Second, initial coding, where the data is broken down into meaningful units and coded according to the emerging themes. Third, theme discovery, which involves grouping similar codes into relevant themes, such as the role of technology in learning or its impact on Islamic boarding school values. Fourth, theme review, which ensures that each theme aligns with the research objectives and has clear meaning. Finally, naming and interpretation of themes, where descriptive names are assigned to the themes, and they are interpreted within a theoretical context to reveal the strategies used by the Islamic boarding school in combining tradition with technology. This approach provides an in-depth understanding of the interaction between technology and tradition in the Islamic boarding school environment.

RESULT AND DISCUSSION

Result

Utilization of Social Media for Preaching and Education in Islamic Boarding Schools

Darussalam Blokagung Islamic Boarding School utilizes social media as the main tool for preaching and education. Educational content developed specifically for this platform not only supports Islamic learning but also improves students' understanding of Islamic teachings. The active involvement of the Islamic boarding school community in online activities is also recorded as high, indicating broad participation in spreading Islamic values through social media. Social media provides a broad and easily accessible platform for Islamic boarding schools to reach a global audience.

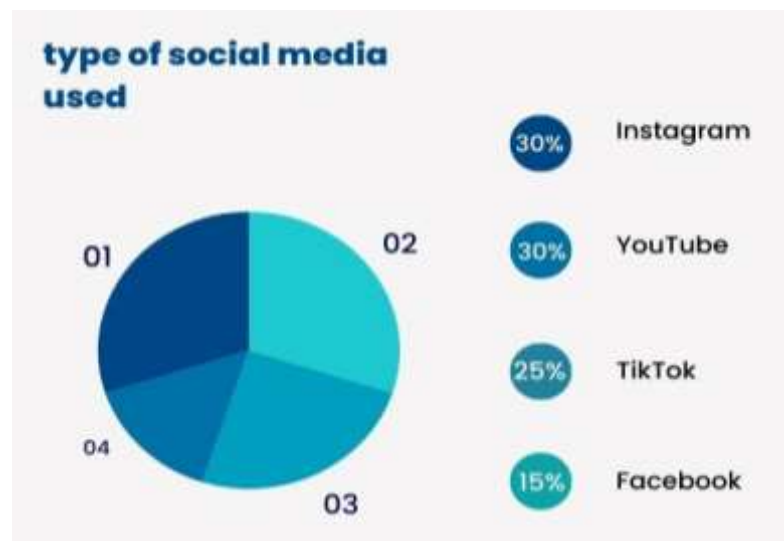


Figure 1. Utilization of social media for Islamic boarding school preaching and education

The pie chart above illustrates the use of various platforms as mediums for preaching at the Darussalam Blokagung Islamic Boarding School, specifically Instagram, YouTube, TikTok, and Facebook. Among these, Instagram and YouTube are the most widely utilized, each accounting for 30% of the total platform use. This preference is due to their popularity among alumni. TikTok and Facebook follow with usage rates of 25% and 15%, respectively. The content shared on these platforms includes updates on Islamic boarding school activities, *maqolah kyai* (the wisdom of religious scholars), educational materials, and more. Tailored educational content for social media further enhances students' learning quality and deepens their understanding of Islamic teachings.

The novelty of this research lies in its detailed exploration of how Darussalam Blokagung Islamic Boarding School strategically utilizes social media not only as a tool for preaching but also as an integral part of its educational framework. Unlike previous studies that may focus solely on the presence of Islamic institutions in digital spaces, this study highlights the structured and purposeful approach in content creation, platform selection, and community engagement. The

emphasis on Instagram and YouTube, driven by alumni preferences, underscores a data-driven adaptation to audience behavior, which enhances the effectiveness of Islamic education and preaching. Furthermore, the study provides empirical evidence of how social media fosters a more participatory and interactive learning environment within the pesantren ecosystem, bridging traditional religious education with modern digital outreach.

Technology-Based Assessment in Islamic Boarding Schools: Improving Accuracy and Efficiency

Darussalam Blokagung Islamic boarding school, for example, a system called Si Santri has been adopted, which integrates daily student assessments, tracking of academic achievements, and monitoring of moral development. The Si Santri application offers a comprehensive and user-friendly approach to managing these assessments, providing a modern solution to the traditional educational setting.



Figure 2. Si Santri Application

These systems facilitate advanced data analysis, providing actionable information that can be used to tailor teaching strategies, identify gaps in knowledge, and allocate resources more effectively. For Islamic boarding schools, where holistic education—encompassing both religious and general studies—is a priority, such innovations ensure a balanced approach to nurturing intellectual and moral development. In addition, the integration of technology in assessments not only aligns these institutions with modern educational standards but also empowers educators with tools to maintain accountability and transparency. Ultimately, this adoption can significantly enhance the overall quality and competitiveness of education provided by Islamic boarding schools in an increasingly technology-driven world.

The novelty of this research lies in its in-depth analysis of how the Si Santri application revolutionizes the assessment system in Islamic boarding schools by seamlessly integrating academic evaluation with moral development tracking. Unlike conventional assessment methods that rely on manual records, Si Santri introduces a structured, data-driven approach that enhances transparency, efficiency, and adaptability in student monitoring. This study also highlights how such technological integration aligns pesantren education with modern educational standards while preserving its core values. Furthermore, the research underscores the transformative potential of digital assessment tools in optimizing resource allocation and tailoring teaching strategies, marking a significant advancement in the modernization of Islamic boarding school education.

Digitization of Islamic Boarding School Libraries

One notable example is the successful digitization of libraries by Islamic boarding schools, providing students with easy access to thousands of classical books through digital platforms such as "*Maktabah Syamilah*." This initiative has significantly increased students' participation in library activities since the introduction of digital access. By enabling students to access various classical Islamic texts more efficiently, digitization reduces the need to carry multiple physical books for study. Instead, students can rely on the convenience of the Maktabah Syamilah platform, which consolidates extensive collections of books into a portable and efficient digital format. An illustration of the Maktabah Syamilah application is as follows.

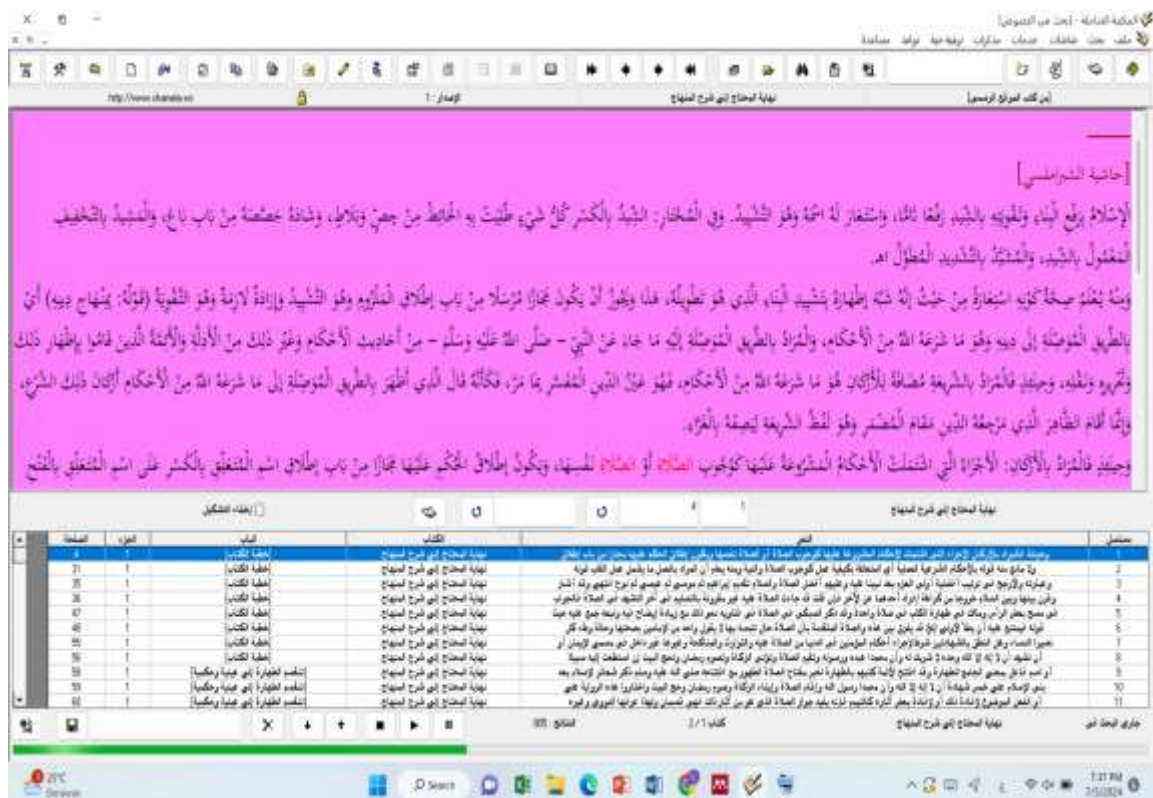


Figure 3. Syamilah Mosque

The novelty of this research lies in its exploration of how the digitization of libraries, particularly through platforms like Maktabah Syamilah, transforms the learning experience in Islamic boarding schools. Unlike traditional library systems that may limit access due to physical constraints, this study highlights how digital platforms significantly enhance accessibility, engagement, and efficiency in Islamic studies. By reducing students' dependency on physical books, digitization streamlines the learning process while preserving the integrity of classical Islamic texts. Furthermore, this research provides empirical insights into the impact of digital libraries on student participation, demonstrating how technology-driven innovations can modernize and optimize the educational ecosystem of Islamic boarding schools without compromising their traditional values.

Discussion

In the current digital era, social media has become an essential tool for communication, particularly in education and religious outreach (Saleh et al., 2022; Adiyono & Anshor, 2024; Kwaah, 2024). For Islamic boarding schools, social media presents opportunities to expand the reach of da'wah and education beyond traditional boundaries. Platforms such as Instagram, YouTube, TikTok, and Facebook play a significant role in disseminating Islamic teachings, with Instagram and YouTube emerging as the most utilized due to their popularity among alumni. This strategic use of social media aligns with previous research emphasizing its role in fostering engagement, shaping public perception, and enhancing the visibility of educational institutions (Kholili et al., 2024; Raya, 2024; Ju'subaidi et al., 2024). The ability of social media to facilitate broad participation in religious discourse and provide access to tailored educational content further reinforces its importance in modernizing Islamic education (Islamic et al., 2023; Ilham et al., 2024).

The integration of social media in preaching and education at Islamic boarding schools not only reinforces Islamic values in the public sphere but also supports students' learning processes on a global scale. By engaging with the wider community through social media, Islamic boarding schools extend their reach, amplifying the positive impact of Islamic education. This aligns with Junaidi et al. (2024); Bhagat & Kim (2022); Chen et al. (2022); David (2021); Todisco et al. (2021), which highlights the crucial role of social media in disseminating information and shaping public perception.

In addition to leveraging social media for educational outreach, Islamic boarding schools are increasingly adopting technology-driven assessment systems to enhance the accuracy and efficiency of student evaluations. The implementation of the *Si Santri* application at Darussalam Blokagung Islamic Boarding School exemplifies this transition. This system integrates daily student assessments, tracks academic achievements, and monitors moral development, ensuring a comprehensive evaluation process. By employing structured, data-driven assessment methods, Islamic boarding schools can maintain higher levels of transparency and accountability, a finding consistent with studies on digital assessment efficiency (Papakostas, 2024; Chenari et al., 2024; Kamalov et al., 2023; Al-Hail et al., 2024). The use of such applications also aligns with the broader educational technology framework, which emphasizes the role of digital tools in optimizing learning environments and improving decision-making processes.

regarding student progress (Alneyadi et al., 2023; Oguguo et al., 2021; Alam & Mohanty, 2023; Cai et al., 2022).

By adopting technology in assessment systems, Islamic boarding schools have the potential to revolutionize their decision-making processes, thereby fostering a more effective and supportive learning environment for students. This perspective is strongly supported by studies such as those by Rahtikawatie et al. (2021), Ali et al. (2021), and Xu & Saleh (2021), which underscore the critical role of precise and efficient assessment mechanisms in enhancing educational outcomes. Technology-driven assessments allow for streamlined data collection, enabling schools to gather comprehensive insights into student performance, learning progress, and areas needing improvement.

Furthermore, the digitization of libraries within Islamic boarding schools has significantly enhanced students' access to classical Islamic texts. The adoption of platforms such as *Maktabah Syamilah* has transformed the way students engage with religious literature, allowing them to efficiently access and study a vast collection of Islamic books without the limitations of physical storage. This initiative aligns with the theory of diffusion of innovation, which suggests that technological adoption within traditional educational institutions depends on the integration of new tools with existing cultural values (Okour et al., 2021; Menzli et al., 2022). Moreover, the digitalization of libraries aligns with the educational ecosystem theory, which highlights how external factors—such as technological readiness, community support, and institutional policies—affect the success of digital transformation in education (Kadir & Umiarso, 2023; Oyinlola et al., 2024). The success of digital libraries in pesantren also reflects Rogers' (2003) innovation diffusion model, where early adopters of technology pave the way for widespread implementation across similar institutions (Abubakari et al., 2024; Rahman et al., 2024).

A more nuanced theoretical approach to analyzing the digitalization of Islamic boarding schools includes integrating educational technology concepts that respect the unique traditional and cultural dynamics of these institutions. For instance, the theory of adaptive change offers insights into how Islamic boarding schools, deeply rooted in tradition, can gradually adapt to technological advancements. This process minimizes conflicts with established values while safeguarding the core identity of these institutions (da Silva & Cardoso, 2024; Rohmatulloh et al., 2023). Such an approach frames digitalization not as a disruptive transformation but as a measured evolution aligned with traditional principles.

By synthesizing these theoretical perspectives, the discussion underscores that the digital transformation of Islamic boarding schools is not merely a technical shift but a socio-cultural process. The integration of social media, digital assessment systems, and online libraries represents a strategic adaptation that balances tradition with modern educational advancements. This study contributes to the growing body of literature on the role of technology in Islamic education, demonstrating that digital innovation can enhance accessibility, engagement, and institutional efficiency while preserving the core values of Islamic boarding schools.

CONCLUSION

Based on the discussion of the findings above, it can be concluded that the Darussalam Blokagung Islamic boarding school has adopted a solution-oriented approach that combines tradition with technology to address the challenges of digitalization. The use of social media platforms such as Instagram, YouTube, TikTok, and Facebook has successfully become a primary tool for preaching and education, enhancing student engagement and amplifying the positive impact of Islamic education. Additionally, the implementation of a technology-based assessment system has improved the accuracy and efficiency of managing students' learning outcomes, while the digitization of libraries through platforms like *Maktabah Syamilah* has expanded access to classical Islamic literature. This approach not only reinforces Islamic values in the public eye but also supports global learning processes and elevates the quality of education in Islamic boarding schools. Thus, the Darussalam Blokagung Islamic boarding school demonstrates that integrating technology with traditional values can provide effective solutions to the challenges of the digital era.

Based on the results of this study, several practical implications can serve as recommendations for other Islamic boarding schools planning to adopt technology for preaching, assessment, and library digitization. First, when utilizing social media for preaching, it is essential for Islamic boarding schools to create content that aligns with their target audience while leveraging popular platforms such as Instagram, YouTube, and TikTok to reach diverse groups, particularly alumni and the younger generation. Establishing a dedicated media team to manage preaching content can help maintain the consistency and quality of the message. Second, in adopting technology-based assessment systems, Islamic boarding schools should consider investing in software tailored to the specific needs of religious education. Providing intensive training for teachers on using these applications will ensure data accuracy and enhance the efficiency of learning outcome management. Technology-based assessments not only streamline processes but also support better decision-making in educational evaluations. Third, library digitization efforts can begin by identifying key literature frequently used by students and integrating them into easily accessible digital platforms, such as *Maktabah Syamilah*. Training students on the use of digital libraries is equally important to maximize the benefits of this technology. Library digitization facilitates broad access to classical texts without compromising the traditional values of pesantren learning.

ACKNOWLEDGMENT

We would like to express our deepest gratitude to Darussalam Islamic Boarding School, Blokagung, Banyuwangi, East Java, for their invaluable support and collaboration throughout this research. Our sincere thanks go to the administrators, teachers, and students of the school who participated and contributed to the success of this study. Your assistance has been essential in completing this research. Additionally, we extend our heartfelt thanks to the editorial team of the Journal of Islamic Education Research (JIER) for providing us with the opportunity to publish this work. Your professionalism and guidance throughout the publication process are greatly appreciated, and it is an honor for us to contribute to your esteemed journal.

REFERENCES

- Abubakari, M. S., Zakaria, G. A. N., & Musa, J. (2024). Perceived compatibility and students' intention to adopt digital technologies in Islamic education institutions. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2430869>
- Abulibdeh, A., Zaidan, E., & Abulibdeh, R. (2024). Navigating the Confluence of Artificial Intelligence and Education for Sustainable Development in the Era of Industry 4.0: Challenges, Opportunities, and Ethical Dimensions. *Journal of Cleaner Production*, 140527. <https://doi.org/10.1016/j.jclepro.2023.140527>
- Adel, A., Ahsan, A., & Davison, C. (2024). ChatGPT Promises and Challenges in Education: Computational and Ethical Perspectives. *Education Sciences*, 14(8), 814. <https://doi.org/10.3390/educsci14080814>
- Adiyono, A., & Anshor, A. M. (2024). Islamic Character Education in the Era of Industry 5.0: Navigating Challenges and Embracing Opportunities. *Al-Hayat: Journal of Islamic Education*, 8(1), 287–304. <https://alhayat.or.id/index.php/alhayat/article/view/493>
- Alam, A., & Mohanty, A. (2023). Cultural Beliefs and Equity in Educational Institutions: Exploring the Social and Philosophical Notions of Ability Groupings in Teaching and Learning of Mathematics. *International Journal of Adolescence and Youth*, 28(1). <https://doi.org/10.1080/02673843.2023.2270662>
- Alam, A., Mohanty, A. (2023). Predicting Students' Performance Employing Educational Data Mining Techniques, Machine Learning, and Learning Analytics. In: Tomar, R.S., et al. Communication, Networks and Computing. CNC 2022. *Communications in Computer and Information Science*, vol 1893. Springer, Cham. https://doi.org/10.1007/978-3-031-43140-1_15
- Ali, M. M., Paul, B. K., Ahmed, K., Bui, F. M., Quinn, J. M., & Moni, M. A. (2021). Heart disease prediction using supervised machine learning algorithms: Performance analysis and comparison. *Computers in Biology and Medicine*, 136, 104672. <https://doi.org/10.1016/j.combiomed.2021.104672>
- Al-Jayyousi, O., Tok, E., Saniff, S. M., Wan Hasan, W. N., Janahi, N. A., & Yesuf, A. J. (2022). Re-Thinking Sustainable Development within Islamic Worldviews: A Systematic Literature Review. *Sustainability*, 14(12), 7300. <https://doi.org/10.3390/su14127300>
- Alneyadi, S., Wardat, Y., Alshannag, Q., & Abu-Al-Aish, A. (2023). The Effect of Using Smart E-Learning App on the Academic Achievement of Eighth-Grade Students. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(4), em2248. <https://doi.org/10.29333/ejmste/13067>
- Alshahrani, B. T., Pileggi, S. F., & Karimi, F. (2024). A Social Perspective on AI in the Higher Education System: A Semisystematic Literature Review. *Electronics*, 13(8), 1572. <https://doi.org/10.3390/electronics13081572>

- Alshanqiti, A. M. S. (2021). *Exploring the concept of a digital Waqf library*. University of Glasgow. <https://theses.gla.ac.uk/82929/2/2021AlshanqitiPhD.pdf>
- Barikzai, S., Bharathi S, V., & Perdana, A. (2024). Challenges and Strategies in e-Learning Adoption in Emerging Economies: a Scoping Review. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2400415>
- Bhagat, S., & Kim, D. J. (2022). Examining Users' News Sharing Behaviour on Social Media: Role of Perception of Online Civic Engagement and Dual Social Influences. *Behaviour & Information Technology*, 42(8), 1194–1215. <https://doi.org/10.1080/0144929X.2022.2066019>
- Budiman, H., & Rosmiati, M. (2020). Penerapan Teori Belajar Van Hiele Berbantuan Geogebra untuk Meningkatkan Kemampuan Penalaran Matematis Siswa. *Prisma*, 9(1), 47. <https://doi.org/10.35194/jp.v9i1.845>
- Bygstad, B., Øvrelid, E., Ludvigsen, S., & Dæhlen, M. (2022). From Dual Digitalization to Digital Learning Space: Exploring the Digital Transformation of Higher Education. *Computers & Education*, 182, 104463. <https://doi.org/10.1016/j.compedu.2022.104463>
- Cai, Z., Mao, P., Wang, D. et al. Effects of Scaffolding in Digital Game-Based Learning on Student's Achievement: a Three-Level Meta-analysis. *Educ Psychol Rev* 34, 537–574 (2022). <https://doi.org/10.1007/s10648-021-09655-0>
- Chanifah, N., Hanafi, Y., Mahfud, C., & Samsudin, A. (2021). Designing a Spirituality-Based Islamic Education Framework for Young Muslim Generations: a Case Study From Two Indonesian Universities. *Higher Education Pedagogies*, 6(1), 195–211. <https://doi.org/10.1080/23752696.2021.1960879>
- Chen, L., Chen, J., & Xia, C. (2022). Social Network Behavior and Public Opinion Manipulation. *Journal of Information Security and Applications*, 64, 103060. <https://doi.org/10.1016/j.jisa.2021.103060>
- da Silva, A., & Cardoso, A. J. M. (2024). Value Creation in Technology-Driven Ecosystems: Role of Coopetition in Industrial Networks. *Journal of Theoretical and Applied Electronic Commerce Research*, 19(3), 2343-2359. <https://doi.org/10.3390/jtaer19030113>
- David, Y. (2021). Public Opinion, Media and Activism: the Differentiating Role of Media Use and Perceptions of Public Opinion on Political Behaviour. *Social Movement Studies*, 21(3), 334–354. <https://doi.org/10.1080/14742837.2021.1875321>
- Efrem Jelahun, F. (2022). *Aneka Teori & Jenis Penelitian Kualitatif (Sebuah Review pada Buku Second Edition-Qualitative Inquiry & Research Design Choosing Among Five Approachers*, London: Sage Publication, 2007). *Akademia Pustaka*, 24. https://www.researchgate.net/publication/363275383_Aneka_Teori_Dan_Jenis_Penelitian_Kualitatif
- Enstroem, R., Singh Kang, P. and Bhawna, B. (2024), The Harmonized Information-Technology and Organizational Performance Model (HI-TOP), *International*

Journal of Organizational Analysis, <https://doi.org/10.1108/IJOA-03-2024-4403>

- Furstenau, L. B., Sott, M. K., Kipper, L. M., Machado, E. L., Lopez-Robles, J. R., Dohan, M. S., ... & Imran, M. A. (2020). Link Between Sustainability and Industry 4.0: Trends, Challenges and New Perspectives. *IEEE Access*, 8, 140079-140096. <https://doi.org/10.1109/ACCESS.2020.3012812>
- Hanafi, Y., Taufiq, A., Saefi, M., Ikhsan, M. A., Diyana, T. N., Thoriquattyas, T., & Anam, F. K. (2021). The New Identity of Indonesian Islamic Boarding Schools in the "New Normal": the Education Leadership Response to Covid-19. *Heliyon*, 7(3). <https://doi.org/10.1016/j.heliyon.2021.e06549>
- Ilham, M., Wan Jamaludin Z, Subandi, & Heni Noviarita. (2024). Creating a Sustainable Green Environment in Philanthropy Religious-Based Schools: The Cases of Darul Ishlah and Darussalam Syafa'at Islamic Boarding Schools in Indonesia. *Educational Administration: Theory and Practice*, 30(5), 743–750. <https://doi.org/10.53555/kuey.v30i5.2940>
- Islamic, G., Supriyono, Ishaq, M., & Dayati, U. (2023). Character Education Through Philosophical Values in Traditional Islamic Boarding Schools. *Kasetsart Journal of Social Sciences*, 45(1), 31–42. <https://so04.tci-thaijo.org/index.php/kjss/article/view/269466>
- Joshi, M.S. (2022), Holistic Design of Online Degree Programmes in Higher Education, a Case Study From Finland, *International Journal of Educational Management*, 36(1_), 32-48. <https://doi.org/10.1108/IJEM-12-2020-0588>
- Ju'subaidi, Mujahidin, A., Abdullah, I., & Choirul Rofiq, A. (2024). Students' Critical Awareness of the Internet and Social Media use as Resources for Islamic Learning in Indonesian Public Senior High Schools. *British Journal of Religious Education*, 1–16. <https://doi.org/10.1080/01416200.2024.2368888>
- Jubba, H., Pabbajah, M., Abdullah, I., & Juhansar, J. (2022). Document-reorienting moral education for millennial Muslims-the changing role of Islamic Boarding Schools in Indonesia. *Islamic Quarterly*, 65(3), 423-442.
- Junaidi, A., Basrowi, B., Sabtohadhi, J., Wibowo, A., Wibowo, S., Asgar, A., Pramono, E & Yenti, E. (2024). The Role of Public Administration and Social Media Educational Socialization in Influencing Public Satisfaction on Population Services: The Mediating Role of Population Literacy Awareness. *International Journal of Data and Network Science*, 8(1), 345-356. <https://doi.org/10.5267/j.ijdns.2023.9.019>
- Kadir, A., & Umiarso. (2023). The Effectiveness of Leadership, Coaching Systems, and Organizational Climate on the Work Effectiveness of Boarding School Caregivers. *International Journal of Instruction*, 16(3), 655–676. Retrieved from <https://e-iji.net/ats/index.php/pub/article/view/100>
- Kholili, M., Izudin, A., & Hakim, M. L. (2024). Islamic Proselytizing in Digital Religion in Indonesia: the Challenges of Broadcasting Regulation. *Cogent Social Sciences*, 10(1). <https://doi.org/10.1080/23311886.2024.2357460>

- Kwaah, C. Y. (2024). Social Media Use Among Basic School Teachers in Ghana: Exploring Opportunities and Challenges. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2310978>
- Lasekan, O. A., Pachava, V., Godoy Pena, M. T., Golla, S. K., & Raje, M. S. (2024). Investigating Factors Influencing Students' Engagement in Sustainable Online Education. *Sustainability*, 16(2), 689. <https://doi.org/10.3390/su16020689>
- Lundeto, A., Talibo, I., & Nento, S. (2021). Challenges and Learning Strategies of Islamic Education in Islamic Boarding Schools in the Industrial Revolution Era 4.0. *Al-Ishlah: Jurnal Pendidikan*, 13(3), 2231–2240. <https://journal.staihubbulwathan.id/index.php/alishlah/article/view/1153>
- Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2021). Combining Technology and Entrepreneurial Education Through Design Thinking: Students' Reflections on the Learning Process. *Technological Forecasting and Social Change*, 164, 119689. <https://doi.org/10.1016/j.techfore.2019.06.015>
- Maatuk, A.M., Elberkawi, E.K., Aljawarneh, S. et al. (2022). The Covid-19 Pandemic and E-learning: Challenges and Opportunities from the Perspective of Students and Instructors. *J Comput High Educ* 34, 21–38. <https://doi.org/10.1007/s12528-021-09274-2>
- Martínez-Peláez, R., Ochoa-Brust, A., Rivera, S., Félix, V. G., Ostos, R., Brito, H., ... & Mena, L. J. (2023). Role of Digital Transformation for Achieving Sustainability: Mediated Role of Stakeholders, Key Capabilities, and Technology. *Sustainability*, 15(14), 11221. <https://doi.org/10.3390/su151411221>
- Mehta, A. M., Rauf, A., & Senathirajah, A. R. B. S. (2024). Achieving World Class Manufacturing Excellence: Integrating Human Factors and Technological Innovation. *Sustainability*, 16(24), 11175. <https://doi.org/10.3390/su162411175>
- Menzli, L. J., Smirani, L. K., Boulahia, J. A., & Hadjouni, M. (2022). Investigation of open educational resources adoption in higher education using Rogers' diffusion of innovation theory. *Heliyon*, 8(7). [https://www.cell.com/heliyon/fulltext/S2405-8440\(22\)01173-2](https://www.cell.com/heliyon/fulltext/S2405-8440(22)01173-2)
- Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J. M., Ramírez-Montoya, M. S., Navarro-Tuch, S. A., ... & Molina, A. (2021). The Core Components of Education 4.0 in Higher Education: Three Case Studies in Engineering Education. *Computers & Electrical Engineering*, 93, 107278. <https://doi.org/10.1016/j.compeleceng.2021.107278>
- Mohamed Hashim, M., Tlemsani, I. & Matthews, R. (2022). Higher Education Strategy in Digital Transformation. *Educ Inf Technol* 27, 3171–3195 <https://doi.org/10.1007/s10639-021-10739-1>
- Muhith, A., Dwiyoono, Y., Munawati, S., Mustofa, A., & Haryanto, S. (2023). Challenges of Islamic Boarding School Organizational Culture in The Millennial Generation and The Digital Era 4.0. *Nazhruna: Jurnal Pendidikan Islam*, 6(3), 457–474. <https://doi.org/10.31538/nzh.v6i3.4231>

- Mukarromah, A., Nur, M., & Banqitoh, A. S. (2024). *Strategy of Islamic Boarding School-Based in facing the era of revolution 4 . 0 towards the era of society 5 . 0*. 10(2), 234–244.
- Mukul, E., & Büyüközkan, G. (2023). Digital Transformation in Education: A Systematic Review of Education 4.0. *Technological Forecasting and Social Change*, 194, 122664. <https://doi.org/10.1016/j.techfore.2023.122664>
- Mursidi, A., Kamal, M., Noviandari, H., Agustina, N., & Nasyafiallah, M. H. (2021). Virtual Boarding School Education Management. *Linguistics and Culture Review*, 5(S3), 1054–1066. <https://doi.org/10.21744/lingcure.v5ns3.1790>
- Nasir, Mohd., Rizal, S., Basri, & Pabbajah, M. (2024). Revolutionizing Teungku Dayah Learning Model: Exploring the Transformative Impact of Technological Advancements on Islamic Education in Aceh. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2335720>
- Nikmatullah, C., Wahyudin, W., Tarihoran, N., & Fauzi, A. (2023). Digital Pesantren: Revitalization of the Islamic Education System in the Disruptive Era. *Al-Izzah: Jurnal Hasil-Hasil Penelitian*, 18(1), 1. <https://doi.org/10.31332/ai.v0i0.5880>
- Oguguo, B.C.E., Nannim, F.A., Agah, J.J. et al. Effect of Learning Management System on Student's Performance in Educational Measurement and Evaluation. *Educ Inf Technol* 26, 1471–1483 (2021). <https://doi.org/10.1007/s10639-020-10318-w>
- Okour, M. K., Chong, C. W., & Abdel Fattah, F. A. M. (2021). Knowledge management systems usage: application of diffusion of innovation theory. *Global Knowledge, Memory and Communication*, 70(8/9), 756-776. <https://doi.org/10.1108/GKMC-08-2020-0117>
- Oyinlola, M., Kolade, O., Schröder, P., Odumuyiwa, V., Rawn, B., Wakunuma, K., Sharifi, S., Lendelvo, S., Akanmu, I., Whitehead, T., Mtonga, R., Tijani, B. and Abolfathi, S. (2024), "The environment for a digitally enabled circular plastics economy in Africa: lessons from cross-sectional stakeholder engagements", *Journal of Strategy and Management*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/JSMA-07-2023-0153>
- Qureshi, M. I., Khan, N., Raza, H., Imran, A., & Ismail, F. (2021). Digital Technologies in Education 4.0. Does it Enhance the Effectiveness of Learning?. <http://hdl.handle.net/123456789/25661>
- Qury, S. (2024). Dakwah Kontemporer dan Teknologi Informasi di Dunia Pendidikan Pondok Pesantren. *Al-Munawwarah: Jurnal Pendidikan Islam*, 16(1), 70–86. <https://stainwsamawa.ac.id/jurnal/index.php/munawwarah/article/view/352>
- Rahman, Md. H., Ahmad, A. B., & Mohamed Sawal, M. Z. H. B. (2024). The influence of personal factors on resistance to technology adoption in university libraries in Bangladesh. *Information Development*, 0(0). <https://doi.org/10.1177/02666669241257196>

- Rahtikawatie, Y., Chalim, S., & Ratnasih, T. (2021). Investigating the Role of Religious Leadership at Indonesia's Islamic Boarding Schools in the Sustainability of School Management. *Eurasian Journal of Educational Research*, 96, 51-65. <https://eric.ed.gov/?id=EJ1325844>
- Raya, M.K.F. (2024). Digital Islam: New Space for Authority and Religious Commodification Among Islamic Preachers in Contemporary Indonesia. *Cont Islam*. <https://doi.org/10.1007/s11562-024-00570-z>
- Rifa'i, Y. (2023). Analisis Metodologi Penelitian Kualitatif dalam Pengumpulan Data di Penelitian Ilmiah pada Penyusunan Mini Riset. *Cendekia Inovatif Dan Berbudaya*, 1(1), 31–37. <https://doi.org/10.59996/cendib.v1i1.155>
- Rifat, M. R., Toriq, T., & Ahmed, S. I. (2020). Religion and Sustainability: Lessons of Sustainable Computing from Islamic Religious Communities. *Proceedings of the ACM on Human-Computer Interaction*, 4 (CSCW2), 1-32. <https://doi.org/10.1145/3415199>
- Rohmatulloh, R., Hasanah, A., Sahlani, L., & Zuhri, M. T. (2023). Energy-saving triangle: internalizing Islamic ethical values on energy saving in integrative learning. *Religions*, 14(10), 1284. <https://doi.org/10.3390/rel14101284>
- Roqib, M. (2021). Increasing Social Class Through Islamic Boarding Schools in Indonesia. *Journal of Social Studies Education Research*, 12(2), 305-329. <https://www.learntechlib.org/p/219841/>
- Rozali, Y. A. (2022). Penggunaan Analisis Konten dan Analisis Tematik. *Penggunaan Analisis Konten Dan Analisis Tematik Forum Ilmiah*, 19, 68. <https://ejurnal.esaunggul.ac.id/index.php/Formil/article/view/5070>
- Sadid, M. Ashilus & Abdulloh Munir. (2024). Inklusi Keuangan Digital Syariah di Pondok Pesantren Bumi Damai Al-Muhibbin Tambakberas Jombang Perspektif Maqashid Syariah Jasser Auda. *Qawānīn Journal of Economic Syaria Law*, 8(1), 30–48. <https://doi.org/10.30762/qaw.v8i1.432>
- Saleh, S. P., Cangara, H., Sabreen, S., & Ab, S. (2022). Digital Da'wah Transformation: Cultural and Methodological Change of Islamic Communication in the Current Digital Age. *International Journal of Multidisciplinary Research and Analysis*, 5(08), 2022–2043. <https://ijmra.in/v5i8/18.php>
- Salsabila, U. H., Nuri, N. S., Fiddini, P. F., Sholikhah, D. A., & Rahmah AR, N. K. (2022). The Development Of Educational Technology In The Realm Of Islamic Boarding School Learning. *MA'ALIM: Jurnal Pendidikan Islam*, 3(01), 10–20. <https://doi.org/10.21154/maalim.v3i1.3413>
- Selwyn, N. (2023). Digital Degrowth: Toward Radically Sustainable Education Technology. *Learning, Media and Technology*, 49(2), 186–199. <https://doi.org/10.1080/17439884.2022.2159978>
- Sitasari, N. W. (2022). Mengenal Analisa Konten dan Analisa Tematik dalam Penelitian Kualitatif. *Forum Ilmiah*, 19(1), 77–84. <https://ejurnal.esaunggul.ac.id/index.php/Formil/article/view/5082>
- Suharto, B., & Fatmawati, E. (2022). Digital learning transformation at Islamic boarding schools: digital-based learning patterns in Salaf and modern Islamic

- boarding schools in Jember. *Journal of Positive School Psychology*, 6(2), 5319–5329. <https://mail.journalppw.com/index.php/jpsp/article/view/3279>
- Suroso, A., Hendriarto, P., Kartika MR, G. N., Pattiasina, P. J., & Aslan, A. (2021). Challenges and Opportunities Towards Islamic Cultured Generation: Socio-Cultural Analysis. *Linguistics and Culture Review*, 5(1), 180–194. <https://doi.org/10.21744/lingcure.v5n1.1203>
- Susanto, D., & Jailani, M. S. (2023). Teknik Pemeriksaan Keabsahan Data Dalam Penelitian Ilmiah. *QOSIM: Jurnal Pendidikan, Sosial & Humaniora*, 1(1), 53–61. <https://ejournal.yayasanpendidikandzurriyatulquran.id/index.php/qosim/article/view/60>
- Syafei, I. (2023). Enhancing Arabic Literacy Skills in Indonesian Boarding Schools: Empirical Evidence of an Innovative Learning Model for Reading Religious Texts. *European Journal for Philosophy of Religion*, 15(4), 82–103. <https://doi.org/10.24204/ejpr.2023.4236>
- Todisco, L., Tomo, A., Canonico, P., Mangia, G., & Sarnacchiaro, P. (2021). Exploring Social Media Usage in the Public Sector: Public Employees' Perceptions of ICT's Usefulness in Delivering Value Added. *Socio-Economic Planning Sciences*, 73, 100858. <https://doi.org/10.1016/j.seps.2020.100858>
- Wahono, M., Budimansyah, D., Malihah, E., & Fitriasari, S. (2023). The Role of Social Capital of Islamic Students (Santri) in Facing the Impacts of Globalization: A Case Study at Buntet Islamic Boarding School. *Society*, 11(2), 377–397. <https://doi.org/10.33019/society.v11i2.591>
- Weisberg, L., & Dawson, K. (2023). The Intersection of Equity Pedagogy and Technology Integration in Preservice Teacher Education: A Scoping Review. *Journal of Teacher Education*, 74(4), 327–342. <https://doi.org/10.1177/00224871231182129>
- Xu, Z., & Saleh, J. H. (2021). Machine learning for reliability engineering and safety applications: Review of current status and future opportunities. *Reliability Engineering & System Safety*, 211, 107530. <https://doi.org/10.1016/j.ress.2021.107530>
- Zembylas, M. (2023). Reframing Phenomenological Approaches in religious Education: Insights from Affect Theory and the Aesthetics of Religion. *Journal of Beliefs & Values*, 44(2), 215–228. <https://doi.org/10.1080/13617672.2022.2076961>
- Zhao, Y., Zhao, M. & Shi, F. (2024). Integrating Moral Education and Educational Information Technology: A Strategic Approach to Enhance Rural Teacher Training in Universities. *J Knowl Econ* 15, 15053–15093. <https://doi.org/10.1007/s13132-023-01693-z>