

PENGEMBANGAN APLIKASI BERBASIS AI UNTUK PEMBELAJARAN PENDIDIKAN ISLAM: PENDEKATAN PERSONALISED LEARNING

Andik Wahyun Muqoyyidin, Agus Zaenul Fitri.

Universitas Pesantren Tinggi Darul Ulum Jombang, Indonesia
Universitas Islam Negeri Sayyid Ali Rahmatullah Tulungagung,
Indonesia

andikwm@fai.unipdu.ac.id; guszain@uinsatu.ac.id

Abstrak: Artikel ini bertujuan untuk mengeksplorasi pengembangan aplikasi berbasis kecerdasan buatan (AI) dalam mendukung pembelajaran Pendidikan Islam dengan pendekatan personalised learning. Di era digital, pendekatan personalised learning yang didukung teknologi AI memungkinkan penyesuaian materi dan metode pengajaran sesuai kebutuhan individu siswa, sehingga dapat meningkatkan efektivitas dan keterlibatan dalam proses pembelajaran. Penelitian ini menggunakan metode pengembangan sistem dengan model Rapid Application Development (RAD), yang melibatkan tahap perencanaan, desain, konstruksi, dan implementasi. Data dikumpulkan melalui observasi dan wawancara dengan pendidik serta siswa di beberapa lembaga pendidikan Islam. Pengujian aplikasi dilakukan dengan pendekatan user-centered design untuk menilai kemudahan penggunaan dan efektivitas aplikasi dalam memfasilitasi pembelajaran adaptif. Hasil penelitian menunjukkan bahwa aplikasi berbasis AI ini mampu mengidentifikasi pola interaksi dan karakteristik belajar siswa melalui analisis data historis dan real-time, sehingga dapat menyajikan rekomendasi materi secara otomatis yang selaras dengan preferensi dan tingkat kompetensi siswa. Aplikasi ini juga dirancang untuk menyajikan pengalaman belajar yang terstruktur, progresif, dan responsif terhadap kebutuhan masing-masing individu. Aplikasi ini juga mendapat respons positif dari pengguna terkait peningkatan motivasi belajar dan pemahaman siswa terhadap materi. Implikasi penelitian ini menunjukkan bahwa aplikasi berbasis AI dapat menjadi solusi inovatif bagi lembaga pendidikan Islam dalam mengimplementasikan pembelajaran yang lebih personal, inklusif, dan efisien. Aplikasi ini berpotensi untuk mendukung

peningkatan kualitas pendidikan Islam di tengah tantangan era teknologi

Kata Kunci: Kecerdasan buatan, pendidikan Islam, personalised learning, pengembangan aplikasi, pembelajaran adaptif

Abstract: *This article aims to explore the development of artificial intelligence (AI) based applications in supporting Islamic education through a personalised learning approach. In the digital era, the personalised learning approach, supported by AI technology, allows for the tailoring of content and teaching methods according to the individual needs of students, thereby enhancing effectiveness and engagement in the learning process. This research employs a system development method using the Rapid Application Development (RAD) model, which involves stages of planning, design, construction, and implementation. Data were collected through observations and interviews with educators and students in several Islamic educational institutions. Application testing was conducted using a user-centred design approach to assess usability and the effectiveness of the application in facilitating adaptive learning. The findings indicate that this AI-based application is capable of identifying interaction patterns and learning characteristics of students through the analysis of historical and real-time data, thus providing automated content recommendations that align with students' preferences and competency levels. The application is also designed to deliver a structured, progressive, and responsive learning experience tailored to the needs of each individual. Furthermore, the application received positive feedback from users regarding the enhancement of students' motivation to learn and their understanding of the material. The implications of this research suggest that AI-based applications can serve as an innovative solution for Islamic educational institutions in implementing more personalised, inclusive, and efficient learning. This application has the potential to support the improvement of the quality of Islamic education amidst the challenges of the technological era.*

Keywords: Artificial intelligence, Islamic education, personalised learning, application development, adaptive learning.

Pendahuluan

Revolusi teknologi yang terjadi dalam beberapa dekade terakhir telah memengaruhi berbagai aspek kehidupan, termasuk bidang Pendidikan.¹ Pendidikan Islam, sebagai bagian integral dari pembentukan karakter dan spiritualitas umat, dalam perspektif pemerhati dan praktisi pendidikan tidak luput dari tuntutan untuk beradaptasi dengan perkembangan teknologi terkini.²

¹ Ammar Abulibdeh, Esmat Zaidan, and Rawan Abulibdeh, "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* 437 (January 2024): 140527, <https://doi.org/10.1016/j.jclepro.2023.140527>; Marc Alier, Francisco García-Peñalvo, and Jorge D. Camba, *Generative Artificial Intelligence in Education: From Deceptive to Disruptive*, March 2024, <https://doi.org/10.9781/ijimai.2024.02.011>; Firas Almasri, "Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science: A Systematic Review of Empirical Research," *Research in Science Education* 54, no. 5 (October 2024): 977–97, <https://doi.org/10.1007/s11165-024-10176-3>; Utkarsh Chouhan, Vaibhav Tiwari, and Krishna Kant Agrawal, "Optimizing Cloud-Based E-Learning Platforms: A Comparative Analysis of Server-Based and Serverless Deployment Strategies," *2024 IEEE 9th International Conference for Convergence in Technology (I2CT)*, April 2024, 1–8, <https://doi.org/10.1109/I2CT61223.2024.10543608>; E .Zargoun, "Comparative Study the Role of Artificial Intelligence and Their Impact on Teaching and E-Learning Platforms (Duolingo, ALEKS, Coursera, QuestionPro)," *African Journal of Advanced Pure and Applied Sciences (AJAPAS)*, May 30, 2024, 263–74, <https://www.aaasjournals.com/index.php/ajapas/article/view/795>; Michael Olumide Edwards-Fapohunda and Modinot Adebisi Adediji, *Sustainable Development of Distance Learning in Continuing Adult Education: The Impact of Artificial Intelligence*, 8, no. 1 (2024); Anshu Prakash Murdan and Roshan Halkhoree, "Integration of Artificial Intelligence for Educational Excellence and Innovation in Higher Education Institutions," *2024 1st International Conference on Smart Energy Systems and Artificial Intelligence (SES-IAI)*, June 2024, 1–6, <https://doi.org/10.1109/SESIAI61023.2024.10599402>.

² Yunita Yunita and Mulyadi Mulyadi, "Towards Islamic Pedagogy By Exploring The Applications Of Educational Technology," *El-Ghiroh: Jurnal Studi Keislaman* 22, no. 1 (March 2024): 1, <https://doi.org/10.37092/el-ghiroh.v22i1.702>; Siminto, H. Achmad Ruslan Afendi, and Syukri Fathudin Achmad Widodo, "THE TRANSFORMATION OF MADRASAH THROUGH THE USE OF EDUCATION TECHNOLOGY," *International Journal of Teaching and Learning* 2, no. 5 (April 2024): 5, <http://injetel.org/index.php/12/article/view/163>; Kurniawan Arif Maspul, "Integration of Reading and New Literacies with Islamic Education," *Jurnal Penelitian Ilmu Ushuluddin* 4, no. 1 (January 2024): 1, <https://doi.org/10.15575/jpiu.31717>; Muhammad Rizal Masdul et al., "**Transformation of Islamic Religious Education**

Dalam konteks ini, muncul kebutuhan mendesak untuk mengintegrasikan teknologi kecerdasan buatan (*Artificial Intelligence/AI*) ke dalam metode pembelajaran guna menjawab tantangan personalisasi pembelajaran yang lebih efektif dan efisien. Afriani et al.; Musah; Musolin et al.; Surur et al.; dan Yusuf menegaskan pendekatan *personalised learning*, yang memungkinkan penyesuaian materi dan metode pengajaran berdasarkan kebutuhan individu siswa, menawarkan peluang besar bagi lembaga pendidikan Islam untuk meningkatkan kualitas dan relevansi proses pembelajaran mereka.³

Through The Use of E-Learning and Interactive Technology ,” *ScienceOpen Preprints*, ahead of print, January 5, 2024, <https://doi.org/10.14293/PR2199.000627.v1>; A. Fandir, “Transformation of Islamic Education: Implementation of Technological Innovation in Education Management,” *Jurnal Ilmiah Mandala Education* 10, no. 1 (January 2024): 1, <https://doi.org/10.58258/jime.v10i1.6625>; Omar Ali et al., “The Effects of Artificial Intelligence Applications in Educational Settings: Challenges and Strategies,” *Technological Forecasting and Social Change* 199 (February 2024): 123076, <https://doi.org/10.1016/j.techfore.2023.123076>; “Islamic Character Education in the Era of Industry 5.0: Navigating Challenges and Embracing Opportunities | Al-Hayat: Journal of Islamic Education,” accessed November 19, 2024, <https://alhayat.or.id/index.php/alhayat/article/view/493>; “Digital Transformation of Islamic Boarding School Education | Indonesian Journal of Islamic Studies,” accessed November 19, 2024, <https://ijis.umsida.ac.id/index.php/ijis/article/view/1723>; “DIGITAL LITERACY IN ISLAMIC EDUCATION: ASSESSING THE EFFICACY OF ONLINE LEARNING PLATFORMS IN FOSTERING RELIGIOUS AND ACADEMIC DEVELOPMENT | International Journal of Teaching and Learning,” accessed November 19, 2024, <http://injournal.org/index.php/12/article/view/44>.

³ Imro’atul Husna Afriani, St Shabibatul Rohmah, and Dian Arief Pradana, “DEVELOPMENT OF PERSONALIZED LEARNING MANAGEMENT SYSTEM WITH ADAPTIVE FEATURES OF MICROTEACHING AND REFLECTIVE PRACTICE COURSES FOR PRESERVICE TEACHERS;,” *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)* 8, no. 2 (October 2024): 2, <https://doi.org/10.36526/santhet.v8i2.4394>; Mohammed Borhandden Musah, “Islamic Educational Planning: Profiling the Conceptual Framework,” *International Journal of Religion* 5, no. 4 (April 2024): 4, <https://doi.org/10.61707/x5mxw957>; Mukhamad Hadi Musolin et al., “Understanding of Artificial Intelligence for Islamic Education Support and Service: Insights from Empirical Literature Review,” in *Proceedings of Ninth International Congress on Information and Communication Technology*, ed. Xin-She Yang et al. (Singapore: Springer Nature, 2025), 27–43, https://doi.org/10.1007/978-981-97-5035-1_3; Agus Miftakus Surur et al., “Personalized Learning in a Digital Environment,” *Indonesian Journal of Multidisciplinary Educational Research* 2, no. 1 (May 2024): 1, <https://doi.org/10.30762/ijomer.v2i1.2737>; Budi Yusuf, “Teknologi Dan Personalisasi

Urgensi penelitian ini didasarkan pada fakta bahwa metode pembelajaran konvensional sering kali tidak mampu mengakomodasi keragaman gaya belajar, kemampuan, dan minat siswa. Dalam pendidikan Islam, tantangan ini semakin kompleks karena materi pembelajaran tidak hanya mencakup aspek kognitif, tetapi juga pembentukan karakter dan spiritualitas. Secara terpisah, Ayeni et al.; Kaswan et al.; Laak dan Aru; Li et al.; serta Ones-Ozigagun et al. menyebut teknologi AI memiliki potensi untuk menganalisis kebutuhan belajar setiap individu secara otomatis, memberikan rekomendasi materi yang sesuai, serta menciptakan pengalaman belajar yang lebih adaptif dan inklusif.⁴

Penelitian ini memperkuat teori *constructivism* dalam pendidikan, yang menekankan bahwa pembelajaran adalah proses aktif di mana siswa membangun pemahaman berdasarkan pengalaman mereka.⁵ Dengan menggunakan aplikasi berbasis AI, siswa dapat

Pembelajaran Pendidikan Islam Untuk Generasi Z,” *Journal of Instructional and Development Researches* 4, no. 4 (August 2024): 4, <https://doi.org/10.53621/jider.v4i4.344>.

⁴ Oyebola Olusola Ayeni et al., “AI in Education: A Review of Personalized Learning and Educational Technology,” *GSC Advanced Research and Reviews* 18, no. 2 (2024): 2, <https://doi.org/10.30574/gscarr.2024.18.2.0062>; Kuldeep Singh Kaswan, Jagjit Singh Dhatteerwal, and Rudra Pratap Ojha, “AI in Personalized Learning,” in *Advances in Technological Innovations in Higher Education* (CRC Press, 2024); Kristjan-Julius Laak and Jaan Aru, “AI and Personalized Learning: Bridging the Gap with Modern Educational Goals,” arXiv:2404.02798, preprint, arXiv, April 3, 2024, <https://doi.org/10.48550/arXiv.2404.02798>; Hang Li et al., “Bringing Generative AI to Adaptive Learning in Education,” arXiv:2402.14601, preprint, arXiv, June 28, 2024, <https://doi.org/10.48550/arXiv.2402.14601>; Oseremi Ones-Ozigagun et al., “REVOLUTIONIZING EDUCATION THROUGH AI: A COMPREHENSIVE REVIEW OF ENHANCING LEARNING EXPERIENCES,” *International Journal of Applied Research in Social Sciences* 6, no. 4 (April 2024): 4, <https://doi.org/10.51594/ijarss.v6i4.1011>; “Artificial Intelligence Bringing Improvements to Adaptive Learning in Education: A Case Study,” accessed November 19, 2024, <https://www.mdpi.com/2071-1050/16/3/1347>.

⁵ Anggi Umayrah et al., “The Nature of Differentiated Learning in The Perspective of Constructivist Educational Philosophy: A Systematic Literature Review,” *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran* 10, no. 2 (June 2024): 691–703, <https://doi.org/10.33394/jk.v10i2.11474>; I. Dewa Ayu Eka Purba Dharma Tari, “FLOURISHING MAHASISWA: PERSPEKTIF TEORI KONSTRUKTIVISME

belajar sesuai dengan ritme dan gaya belajar mereka sendiri, sehingga pengalaman belajar menjadi lebih bermakna. Kajian ini juga memberikan kontribusi ilmiah dengan mengisi kesenjangan penelitian mengenai implementasi teknologi AI dalam pendidikan Islam, yang saat ini masih terbatas. Selain itu, penelitian ini menawarkan kerangka kerja inovatif untuk mengembangkan aplikasi berbasis AI menggunakan model Rapid Application Development (RAD), yang fokus pada kecepatan dan efisiensi proses pengembangan sistem.

Dalam konteks kekinian, aplikasi berbasis AI menawarkan solusi untuk meningkatkan motivasi belajar siswa dan efektivitas pembelajaran, terutama di era pandemi dan pasca-pandemi di mana pembelajaran daring menjadi norma baru.⁶ Ke depan,

JEAN PEAGET:,” *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)* 8, no. 2 (October 2024): 2, <https://doi.org/10.36526/santhet.v8i2.4533>; Zihnialul Ulya, “PENERAPAN TEORI KONSTRUKTIVISME MENURUT JEAN PIAGET DAN TEORI NEUROSCIENCE DALAM PENDIDIKAN / APPLICATION OF CONSTRUCTIVISM THEORY ACCORDING TO JEAN PIAGET AND NEUROSCIENCE THEORY IN EDUCATION,” *Al-Mudarris: Journal Of Education* 7, no. 1 (April 2024): 1, <https://doi.org/10.32478/vg1nnv56>.

⁶ Intan Rafidah Yasin et al., “E-Learning Application and Teacher Autonomy: A Comprehensive Review,” *Journal of Advanced Research in Applied Sciences and Engineering Technology*, October 7, 2024, 116–33, <https://doi.org/10.37934/araset.57.2.116133>; Rizkyana Wahyu Laras Pertiwi, Laeli Umi Kulsum, and Isnaini Amirotun Hanifah, “Evaluating the Impact of Artificial Intelligence-Based Learning Methods on Students’ Motivation and Academic Achievement,” *International Journal of Post Axial: Futuristic Teaching and Learning*, March 27, 2024, 49–58, <https://doi.org/10.59944/postaxial.v2i1.279>; Sharon Mistretta, *Reimagining Education: The Role of E-Learning, Creativity, and Technology in the Post-Pandemic Era* (BoD – Books on Demand, 2024); Yanzhen Lan, “Through Tensions to Identity-Based Motivations: Exploring Teacher Professional Identity in Artificial Intelligence-Enhanced Teacher Training,” *Teaching and Teacher Education* 151 (December 2024): 104736, <https://doi.org/10.1016/j.tate.2024.104736>; Xi-Hui Jia and Jui-Che Tu, “Towards a New Conceptual Model of AI-Enhanced Learning for College Students: The Roles of Artificial Intelligence Capabilities, General Self-Efficacy, Learning Motivation, and Critical Thinking Awareness,” *Systems* 12, no. 3 (March 2024): 3, <https://doi.org/10.3390/systems12030074>; Adil Ellikkal and S. Rajamohan, “AI-Enabled Personalized Learning: Empowering Management Students for Improving Engagement and Academic Performance,” *Vilakshan - XIMB Journal of Management* ahead-of-print, no. ahead-of-print (July 2024), world, <https://doi.org/10.1108/XJM-02-2024-0023>; “Interdisciplinary Digital Skills Development For Educational Communication: Emergency And AI-Enhanced Digitization - Borys Grinchenko Kyiv

sebagaimana prediksi Bayly-Castaneda et al.; Dina dan Sabililhaq; Hernawati et al.; serta Mahmudulhassan et al. aplikasi ini memiliki potensi untuk mendukung transformasi pendidikan Islam menjadi lebih inklusif dan berorientasi pada masa depan, dengan mengintegrasikan pendekatan teknologi yang relevan.⁷

Tujuan artikel ini adalah untuk mengeksplorasi pengembangan dan implementasi aplikasi berbasis AI dalam pembelajaran Pendidikan Islam dengan pendekatan personalised learning. Penelitian ini juga berupaya untuk menilai efektivitas aplikasi dalam mendukung pembelajaran adaptif, serta memberikan

Metropolitan University Institutional Repository,” accessed November 19, 2024, <https://elibrary.kubg.edu.ua/id/eprint/49011/>; “Impact of Artificial Intelligence (AI) on Environmental Security (ES) of Post-Pandemic Covid-19: A Literature Review Study | Research in Management of Technology and Business,” accessed November 19, 2024, <https://publisher.uthm.edu.my/periodicals/index.php/rmtb/article/view/13979>; “Disrupting Education: Artificial Intelligence in Higher Education | Emerald Insight,” accessed November 19, 2024, <https://www.emerald.com/insight/content/doi/10.1108/978-1-83549-486-820241004/full/html>; “Digital Technology Adoption and School Leadership in the Post-Pandemic Era: Insights from High School Leaders | Interdisciplinary Journal of Education Research,” accessed November 19, 2024, <https://pubs.ufs.ac.za/index.php/ijer/article/view/1205>; “CEEOL - Article Detail,” accessed November 19, 2024, <https://www.ceeol.com/search/article-detail?id=1214976>.

⁷ K. Bayly-Castaneda, M.-S. Ramirez-Montoya, and A. Morita-Alexander, “Crafting Personalized Learning Paths with AI for Lifelong Learning: A Systematic Literature Review,” *Frontiers in Education* 9 (August 2024), <https://doi.org/10.3389/feduc.2024.1424386>; Sarah Dina and Irhas Sabililhaq, “Artificial Intelligence (AI) and The Principle of Moral Responsibility: How Does It Impact Islamic Education in Indonesia?,” *Proceeding International Conference on Religion, Science and Education* 3 (April 2024): 893–903, <http://sunankaljaga.org/prosiding/index.php/icrse/article/view/1274>; Sari Hernawati, Muhammad Hafizh, and Muhammad Nurfaizi Arya Rahardja, “Adjusting the Ideal Islamic Religious Education Curriculum to the Development of AI-Based Technology,” *Progresiva: Jurnal Pemikiran Dan Pendidikan Islam* 13, no. 01 (April 2024): 01, pribadi, <https://doi.org/10.22219/progresiva.v13i01.32931>; M. Mahmudulhassan, M. Muthoifin, and Sazirul Begum, “Artificial Intelligence in Multicultural Islamic Education: Opportunities, Challenges, and Ethical Considerations,” *Solo Universal Journal of Islamic Education and Multiculturalism* 2, no. 01 (March 2024): 01, <https://doi.org/10.61455/sujiem.v2i01.114>.

rekomendasi bagi lembaga pendidikan Islam dalam mengadopsi teknologi serupa guna meningkatkan kualitas pembelajaran mereka. Dengan demikian, artikel ini diharapkan dapat menjadi referensi penting bagi pengambil kebijakan, akademisi, dan praktisi dalam bidang pendidikan Islam di era digital.

Berikut adalah tabel yang mengeksplorasi pengembangan dan implementasi aplikasi berbasis AI dalam pembelajaran Pendidikan Islam dengan pendekatan *personalised learning*:

Tabel. 1. Eksplorasi Pengembangan dan Implementasi Aplikasi Berbasis AI dalam Pembelajaran Pendidikan Islam dengan Pendekatan Personalised Learning

Aspek	Deskripsi	Pendekatan/Metode	Hasil/Manfaat	Tantangan
Tujuan Pengembangan	Meningkatkan efektivitas pembelajaran Pendidikan Islam melalui personalisasi berbasis teknologi.	<i>Personalised Learning</i> didukung AI.	Menyesuaikan materi dengan kebutuhan individu siswa.	Minimnya pemahaman teknologi di kalangan pendidik.
Metodologi Pengembangan	Menggunakan model Rapid Application Development (RAD) untuk efisiensi proses pengembangan.	Tahap: perencanaan, desain, konstruksi, dan implementasi.	Cepat dalam merancang dan mengimplementasikan aplikasi.	Keterbatasan waktu dan sumber daya.
Data yang Digunakan	Observasi dan wawancara dengan pendidik serta siswa di	Pendekatan <i>User-Centered Design</i> .	Data akurat tentang kebutuhan pengguna untuk aplikasi	Kesulitan dalam mengumpulkan data spesifik

	lembaga pendidikan Islam.		adaptif.	dari berbagai pihak.
Fitur Utama Aplikasi	Analisis otomatis kemampuan belajar siswa dan rekomendasi materi adaptif.	Algoritma AI untuk analisis kebutuhan pembelajarannya.	Memberikan pengalaman belajar yang terstruktur dan adaptif.	Pengembangan algoritma yang sesuai dengan kurikulum pendidikan Islam.
Pengujian Aplikasi	Menilai kemudahan penggunaan dan efektivitas aplikasi dalam memfasilitasi pembelajaran.	<i>User Feedback</i> dan evaluasi dari siswa serta pendidik.	Respon positif terkait motivasi belajar dan pemahaman materi.	Kesulitan mendapatkan umpan balik yang representatif.
Dampak dan Implikasi	Solusi inovatif bagi pembelajaran Islam yang personal, inklusif, dan efisien.	Integrasi teknologi dalam sistem pendidikan Islam.	Meningkatkan kualitas pendidikan di tengah tantangan era teknologi.	Hambatan adopsi teknologi di lembaga dengan sumber daya terbatas.

Tabel di atas mencakup aspek kunci dalam pengembangan, implementasi, dan evaluasi aplikasi berbasis AI untuk mendukung pendekatan *personalised learning* dalam Pendidikan Islam. Dengan inovasi ini, kita tidak hanya menciptakan pembelajaran yang lebih adaptif dan efektif, tetapi juga

menanamkan harapan baru bagi transformasi pendidikan Islam di era digital.

Metode

Penelitian ini menggunakan pendekatan metode pengembangan sistem dengan model Rapid Application Development (RAD). Model ini dipilih karena memiliki keunggulan dalam menghasilkan prototipe aplikasi secara cepat dan memungkinkan penyesuaian berulang berdasarkan umpan balik dari pengguna. Tahapan dalam metode RAD meliputi empat fase utama: perencanaan, desain, konstruksi, dan implementasi. Setiap tahapan diintegrasikan dengan pendekatan berbasis *user-centered design* untuk memastikan aplikasi yang dikembangkan relevan dengan kebutuhan pengguna.⁸

Subjek penelitian terdiri atas pendidik dan siswa dari beberapa lembaga pendidikan Islam yang memiliki variasi jenjang pendidikan. Pemilihan subjek ini dilakukan dengan teknik *purposive sampling* untuk memastikan representasi yang sesuai dengan kebutuhan penelitian. Siswa yang menjadi responden memiliki karakteristik beragam, baik dari segi gaya belajar, kemampuan akademik, maupun latar belakang sosial.

Instrumen yang digunakan dalam penelitian ini mencakup pedoman wawancara semi-terstruktur, lembar observasi, dan

⁸ Anjali Agrawal, "Rapid Application Development (RAD): The Ultimate Guide," BuzzClan, May 15, 2024, <https://buzzclan.com/digital-transformation/rapid-application-development/>; Agus Zaenul Fitri and Abad Badruzaman, *Integrative Learning Design Innovation in Islamic Religious Education Subjects in Improving Graduate Competency through an Independent Curriculum*, 2024, <https://www.researchsquare.com/article/rs-5205013/latest>; "(PDF) User Centred Rapid Application Development," ResearchGate, ahead of print, October 22, 2024, https://doi.org/10.1007/11751113_4; "The Nature of Toddlers and Nurturing Fathers | Request PDF," ResearchGate, accessed December 9, 2024, https://www.researchgate.net/publication/350601749_The_Nature_of_Toddlers_and_Nurturing_Fathers; "Rapid Application Development (RAD) | Definition, Steps & Full Guide," accessed December 9, 2024, <https://kissflow.com/application-development/rad/rapid-application-development/>; "Comparing Virtual and Real-Life Rapid Prototyping Methods for User Testing Smart City Interfaces: A Case Study," accessed December 9, 2024, <https://www.mdpi.com/2076-3417/14/21/9918>.

kuesioner. Wawancara dilakukan untuk menggali kebutuhan spesifik pengguna terkait pembelajaran adaptif berbasis AI. Observasi digunakan untuk memahami pola pembelajaran di kelas secara langsung. Kuesioner didesain untuk mengevaluasi kemudahan penggunaan, efektivitas, dan pengalaman belajar yang dihasilkan oleh aplikasi.

Data primer diperoleh dari hasil wawancara dan observasi, sedangkan data sekunder didapatkan melalui analisis dokumen, seperti kurikulum pendidikan Islam dan literatur terkait pengembangan aplikasi berbasis AI dalam pendidikan. Informan utama meliputi guru, siswa, dan pengelola lembaga pendidikan Islam.

Data kualitatif yang diperoleh dari wawancara dan observasi dianalisis menggunakan teknik analisis tematik.⁹ Teknik ini

⁹ "Thematic Analysis," SAGE Publications Ltd, November 16, 2024, <https://uk.sagepub.com/en-gb/eur/thematic-analysis/book248481>; Lorelli S. Nowell et al., "Thematic Analysis: Striving to Meet the Trustworthiness Criteria," *International Journal of Qualitative Methods* 16, no. 1 (December 2017): 1609406917733847, <https://doi.org/10.1177/1609406917733847>; Mojtaba Vaismoradi, Hannele Turunen, and Terese Bondas, "Content Analysis and Thematic Analysis: Implications for Conducting a Qualitative Descriptive Study," *Nursing & Health Sciences* 15, no. 3 (September 2013): 398–405, <https://doi.org/10.1111/nhs.12048>; Greg Guest, Kathleen M. MacQueen, and Emily E. Namey, *Applied Thematic Analysis* (SAGE Publications, Inc., 2012), <https://doi.org/10.4135/9781483384436>; Carla Willig, *Introducing Qualitative Research in Psychology: Adventures in Theory and Method*, Second ed (Maidenhead: Open university press, 2008); "The SAGE Handbook of Qualitative Research in Psychology | Request PDF," ResearchGate, accessed December 9, 2024, https://www.researchgate.net/publication/345722989_The_SAGE_Handbook_of_Qualitative_Research_in_Psychology; "The Coding Manual for Qualitative Researchers | SAGE Publications Ltd," accessed December 9, 2024, <https://uk.sagepub.com/en-gb/eur/the-coding-manual-for-qualitative-researchers/book273583>; "(PDF) Thematic Analysis: Striving to Meet the Trustworthiness Criteria," accessed December 9, 2024, https://www.researchgate.net/publication/320188032_Thematic_Analysis_Striving_to_Meet_the_Trustworthiness_Criteria; "Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J. (2017) Thematic Analysis Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16, 1-13. - References - Scientific Research Publishing," accessed December 9, 2024, <https://www.scirp.org/reference/referencespapers?referenceid=2666677>; "Guest, G., MacQueen, K. M., & Namey, E. E. (2012). *Applied Thematic Analysis*. SAGE Publications. - References - Scientific Research Publishing," accessed December 9, 2024, <https://www.scirp.org/reference/referencespapers?referenceid=3457389>;

bertujuan untuk mengidentifikasi pola dan tema utama yang relevan dengan kebutuhan pembelajaran personal di lingkungan pendidikan Islam. Sementara itu, data kuantitatif yang diperoleh dari kuesioner dianalisis menggunakan metode statistik deskriptif untuk mengukur tingkat kepuasan pengguna terhadap aplikasi.¹⁰ Validasi aplikasi dilakukan melalui pengujian berbasis *user feedback*. Prototipe awal diuji pada kelompok kecil siswa dan guru untuk mendapatkan masukan terkait kemudahan penggunaan dan kecocokan fitur aplikasi dengan kebutuhan pembelajaran. Perbaikan dan iterasi dilakukan hingga mencapai versi final yang siap diimplementasikan.

Dengan metode ini, penelitian tidak hanya mampu menghasilkan aplikasi yang relevan dengan kebutuhan pembelajaran adaptif berbasis AI, tetapi juga menawarkan pendekatan yang sistematis dan efisien dalam proses pengembangannya.

Hasil dan Pembahasan

Penelitian ini menghasilkan sebuah aplikasi berbasis kecerdasan buatan (AI) untuk pembelajaran Pendidikan Islam dengan

“Fereday, Muir-Cochrane THEMATIC ANALYSIS,” accessed December 9, 2024, https://sites.ualberta.ca/~iiqm/backissues/5_1/HTML/fereday.htm; “An Introduction to Qualitative Research | SAGE Publications Inc,” accessed December 9, 2024, <https://us.sagepub.com/en-us/nam/an-introduction-to-qualitative-research/book278983>.

¹⁰ Rizki Kusuma and Damelina Basauli Tambunan, “The Analysis of Customer Satisfaction Assessments to Determine E-Siap Product Development Strategies,” *KnE Social Sciences*, March 22, 2021, 514166, <https://doi.org/10.18502/kss.v5i5.8847>; “The Influence of Mobile Application User Experience, Service Quality, and Social Interaction on Customer Satisfaction Quantitative Research in the Online Service Industry | International Journal of Science and Society,” accessed December 9, 2024, <https://ijsoc.goacademica.com/index.php/ijsoc/article/view/1225>; “(PDF) User Satisfaction Research in Information Systems: Historical Roots and Approaches,” accessed December 9, 2024, https://www.researchgate.net/publication/321776435_User_Satisfaction_Research_in_Information_Systems_Historical_Roots_and_Approaches; “(PDF) A Descriptive Analysis of Assessing Customer Satisfaction: The SERVQUAL Method Approach,” accessed December 9, 2024, https://www.researchgate.net/publication/323143151_A_Descriptive_Analysis_of_Assessing_Customer_Satisfaction_The_SERVQUAL_Method_Approach.

pendekatan *personalised learning* yang berfokus pada pemanfaatan teknologi terkini untuk meningkatkan pengalaman belajar dalam konteks Pendidikan Islam. Dalam konteks ini, teknologi AI memiliki potensi besar untuk mengubah cara pengajaran dan pembelajaran, tidak hanya dalam hal efisiensi dan efektivitas, tetapi juga dalam menyediakan pendekatan yang disesuaikan dengan kebutuhan individu.¹¹ *Personalised learning*, atau pembelajaran yang dipersonalisasi, memungkinkan pengalaman belajar yang lebih relevan dan mendalam bagi setiap peserta didik berdasarkan kemampuan, minat, dan gaya belajar mereka.¹²

Dalam proses pengembangan aplikasi, digunakan metode Rapid Application Development (RAD) yang memungkinkan percepatan siklus pengembangan melalui iterasi cepat antara pengguna dan pengembang. Tahapan metode RAD yang diterapkan mencakup: (1) **Planning**, yaitu identifikasi kebutuhan pengguna melalui wawancara dan observasi di lembaga pendidikan Islam; (2) **User Design**, yaitu kolaborasi intensif antara tim pengembang dan calon pengguna (guru dan siswa) untuk menyusun desain

¹¹ Ali et al., "The Effects of Artificial Intelligence Applications in Educational Settings"; "(PDF) ARTIFICIAL INTELLIGENCE IN TEACHING ISLAMIC STUDIES: CHALLENGES AND OPPORTUNITIES," *ResearchGate*, ahead of print, October 22, 2024, <https://doi.org/10.32806/6ynvg541>; "(PDF) Personalized Learning through AI," *ResearchGate*, October 22, 2024, https://www.researchgate.net/publication/376814707_Personalized_learning_through_AI; Ting Zhao, *AI in Educational Technology* (2023), <https://doi.org/10.20944/preprints202311.0106.v1>; Lazar Krstić, Veljko Aleksić, and Marija Krstić, "Artificial Intelligence in Education: A Review," January 1, 2022, 223–28, <https://doi.org/10.46793/TIE22.223K>; Wayne Holmes, Maya Bialik, and Charles Fadel, *Artificial Intelligence in Education. Promise and Implications for Teaching and Learning*. (2019).

¹² Ayeni et al., "AI in Education," 2024; Laak and Aru, "AI and Personalized Learning"; "(PDF) Personalized Learning through AI"; Matthew Bernacki, Meghan Greene, and Nikki Lobczowski, "A Systematic Review of Research on Personalized Learning: Personalized by Whom, to What, How, and for What Purpose(s)?," *Educational Psychology Review* 33 (December 2021): 1–41, <https://doi.org/10.1007/s10648-021-09615-8>; Nebojsa Gavrilovic, SLOBODAN JOVANOVIĆ, and Alok Mishra, "PERSONALIZED LEARNING SYSTEM BASED ON STUDENT BEHAVIOR AND LEARNING STYLE," September 28, 2017.

antarmuka serta alur interaksi sistem yang sesuai dengan konteks pembelajaran Islam; (3) **Construction**, yakni tahap pengkodean aplikasi menggunakan algoritma pembelajaran mesin untuk profiling siswa dan merekomendasikan materi adaptif; dan (4) **Cutover**, yaitu implementasi dan uji coba aplikasi secara langsung dalam lingkungan pembelajaran nyata. Pendekatan RAD sangat efektif karena fleksibel dalam menyesuaikan perubahan kebutuhan selama proses pengembangan dan memungkinkan penyempurnaan fitur berbasis umpan balik pengguna secara cepat.

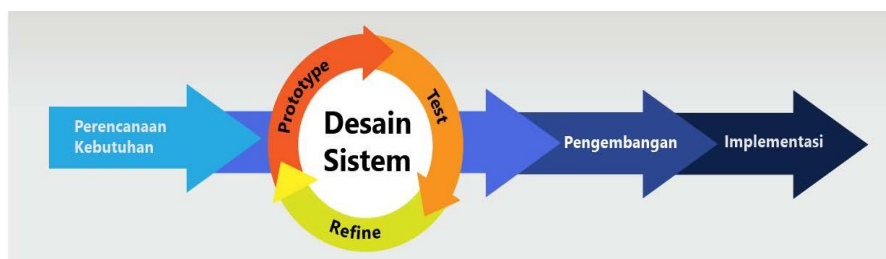


Figure: 1. Tahapan Metode RAD

Pengembangan aplikasi pembelajaran berbasis AI dalam penelitian ini menggunakan pendekatan RAD yang sangat relevan dalam konteks kebutuhan pendidikan Islam yang dinamis dan personal. Setiap tahapan RAD memiliki peran penting dalam memastikan bahwa kecerdasan buatan yang diintegrasikan benar-benar menjawab kebutuhan pembelajaran berbasis nilai. Pada tahap **planning**, kebutuhan spiritual, kognitif, dan afektif peserta didik diidentifikasi secara menyeluruh. Tahap **user design** menjadi ruang kolaboratif antara pengembang aplikasi dan pendidik agama Islam untuk menyusun rancangan fitur-fitur AI seperti personalisasi materi tafsir, fikih, dan akhlak. Tahap **construction** digunakan untuk mengimplementasikan algoritma AI yang dapat memprofilkan siswa dan menyesuaikan konten secara otomatis. Sementara tahap **cutover** memastikan penerapan aplikasi dilakukan secara bertahap dengan umpan balik dari guru dan siswa, menciptakan ekosistem pembelajaran yang adaptif dan kontekstual. Dengan kata lain, RAD bukan

hanya metode teknis, melainkan pendekatan strategis dalam mewujudkan sistem pembelajaran Islam berbasis AI yang cepat, adaptif, dan tepat sasaran.

AI dalam pendidikan Islam memungkinkan pengajaran berbasis data, yang dapat memperhatikan aspek-aspek penting seperti penguasaan materi ajar, kecepatan belajar, dan kebutuhan khusus setiap peserta didik. Pendekatan berbasis AI memungkinkan adaptasi materi ajar secara dinamis sesuai dengan tingkat pemahaman dan minat siswa, yang pada gilirannya dapat meningkatkan efektivitas pembelajaran.¹³

AI memungkinkan pembuatan sistem pembelajaran cerdas yang mampu menilai dan memberi umpan balik secara otomatis. Dalam Pendidikan Islam, ini berarti pengajaran nilai-nilai Islami dan konsep-konsep dalam Al-Qur'an, Hadits, serta berbagai disiplin ilmu Islam lainnya dapat disesuaikan untuk memenuhi kebutuhan siswa dengan cara yang lebih relevan dan efektif. Selain itu, AI dapat digunakan untuk meningkatkan keterlibatan

¹³ Herwinskyah Herwinskyah, Ahsanul Ridho Ridho, and Danang Dwi Prasetyo, "Revolutionizing Islamic Education: Integrating Artificial Intelligence into Islamic Education," *Islam in World Perspectives* 4, no. 2 (2025): 2, <http://journal2.uad.ac.id/index.php/IWP/article/view/11452>; Ayeni et al., "AI in Education," 2024; Naila Hayati and Eskarni Ushalli, "DIGITAL TRANSFORMATION IN ISLAMIC EDUCATION: INTEGRATING AI AND MACHINE LEARNING FOR PERSONALIZED LEARNING IN MADRASAH," *Journal of Scientech Research and Development* 6, no. 2 (October 2024): 2, <https://doi.org/10.56670/jsrd.v6i2.528>; Elihami Elihami, Muwafiq Ibrahim Mas'ud, and Abdi Darmawan, "Exploring the Landscape: Challenges and Opportunities in Islamic Education Technology," *Jurnal Pendidikan Progresif* 14, no. 2 (August 2024): 2, <https://jurnal.fkip.unila.ac.id/index.php/jpp/article/view/30611>; Onesio-Ozigagun et al., "REVOLUTIONIZING EDUCATION THROUGH AI"; Sodikin Sodikin, "Transformasi Pendidikan Agama Islam Melalui Artificial Intelligent (AI): Upaya Meningkatkan Kemampuan Berpikir Kritis Mahasiswa," *Academicus: Journal of Teaching and Learning* 3 (September 2024): 78–89, <https://doi.org/10.59373/academicus.v3i2.65>; "(PDF) ARTIFICIAL INTELLIGENCE IN TEACHING ISLAMIC STUDIES"; Tufan Adiguzel, Mehmet Haldun Kaya, and Fatih Kürsat Cansu, "Revolutionizing Education with AI: Exploring the Transformative Potential of ChatGPT," *Contemporary Educational Technology* 15, no. 3 (July 2023): ep429, <https://doi.org/10.30935/cedtech/13152>; Liu Yufei et al., "Review of the Application of Artificial Intelligence in Education," *International Journal of Innovation, Creativity and Change*, April 24, 2020, 548–62, <https://doi.org/10.53333/IJICC2013/12850>.

siswa dengan menyediakan materi ajar yang lebih interaktif dan menarik, serta memberikan analisis berbasis data yang dapat membantu pengajaran lebih lanjut.¹⁴

Sementara pendekatan *personalised learning* di bidang Pendidikan Islam berfokus pada menciptakan pengalaman belajar yang lebih individual bagi setiap siswa. Ini memungkinkan siswa untuk belajar dengan kecepatan dan cara mereka sendiri, serta memberi mereka kontrol lebih besar atas apa yang mereka pelajari. Misalnya, aplikasi AI bisa mendeteksi area di mana siswa kesulitan, seperti dalam mempelajari tafsir atau fikih, dan kemudian menyarankan materi yang lebih sesuai untuk memperbaiki pemahaman mereka.¹⁵

¹⁴ Ayeni et al., "AI in Education," 2024; Zhao, *AI in Educational Technology*; "7 Principles on Responsible AI Use in Education | World Economic Forum," accessed December 9, 2024, <https://www.weforum.org/stories/2024/01/ai-guidance-school-responsible-use-in-education/>.

¹⁵ Sodikin, "Transformasi Pendidikan Agama Islam Melalui Artificial Intelligent (AI)"; Achruh Achruh et al., "Challenges and Opportunities of Artificial Intelligence Adoption in Islamic Education in Indonesian Higher Education Institutions," *International Journal of Learning, Teaching and Educational Research* 23, no. 11 (December 2024): 11, <https://www.ijlter.org/index.php/ijlter/article/view/11682>; Pradana Anis Riantory and Pujiyanto Pujiyanto, "Peran Teknologi Kecerdasan Buatan Dalam Metode Pengajaran Al-Qur'an Dan Hadis," *Jurnal Mathlaul Fattah : Jurnal Pendidikan Dan Studi Islam* 15, no. 1 (September 2024): 1, <https://journal.stitdaarulfatah.ac.id/index.php/jmf/article/view/79>; Mey Mayangsari, Miftakhul Putra, and Moh Makmun, "Leveraging Artificial Intelligence Technology to Enhance Teacher Performance in Secondary Islamic Schools," *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan* 10 (November 2024): 209–20, <https://doi.org/10.32678/tarbawi.v10i02.9881>; Tholkhatul Khoir et al., "Enhancing Fiqh Learning Outcomes through Artificial Intelligence Applications at Sekolah Indonesia Johor Bahru," *Edelweiss Applied Science and Technology* 8 (September 2024): 1764–77, <https://doi.org/10.55214/25768484.v8i4.1551>; Liza Efriyanti, "Application of Artificial Intelligence in Determining the Learning Model of Islamic Religious Education (Pai) In Higher Education:," *Procedia of Social Sciences and Humanities* 5 (July 2024): 99–112, <https://doi.org/10.21070/pssh.v5i.562>; Pertiwi, Kulsum, and Hanifah, "Evaluating the Impact of Artificial Intelligence-Based Learning Methods on Students' Motivation and Academic Achievement"; Sofyan Mustoip, Purwadi Purwadi, and Muhammad Ziyad Fakhri Fadhlullah, "AI Integration in Islamic Character Development: Study of Elementary School Education Management in Indonesia-Türkiye," *International Conference of Bunga Bangsa* 2, no. 1 (February 2024): 1, <https://journal.epublish.id/index.php/icobba/article/view/133>; Hayati and Ushalli, "DIGITAL TRANSFORMATION IN ISLAMIC EDUCATION"; Ziyadul Muttaqin,

Pendekatan ini sangat penting dalam Pendidikan Islam, karena setiap individu mungkin memiliki kebutuhan yang sangat berbeda terkait pemahaman agama dan budaya mereka. Dalam konteks ini, AI juga dapat digunakan untuk mengembangkan konten pembelajaran yang relevan dengan berbagai latar belakang budaya, memperkenalkan elemen-elemen budaya Islam yang lebih beragam, dan memperkaya pengalaman belajar secara keseluruhan.¹⁶

Hasil implementasi aplikasi menunjukkan bahwa:

1. Kemampuan Adaptasi Aplikasi

Aplikasi ini mampu menganalisis preferensi belajar siswa secara otomatis menggunakan algoritma berbasis AI. Data yang diperoleh dari siswa diolah untuk memberikan rekomendasi materi pembelajaran yang sesuai dengan tingkat kemampuan individu mereka. Hasil ini didukung oleh 80% responden yang

“Implementation of Islamic Education Learning with Artificial Intelligence (CHATGPT),” *International Conference on Islamic Studies (ICIS)*, July 31, 2023, 1–9, <https://proceeding.uingusdur.ac.id/index.php/icis/article/view/1436>; “Integration of AI Tools in Islamic Education Curriculum Development Management: Challenges and Opportunities | Journal of Loomingulus Ja Innovatsioon,” accessed December 9, 2024, <https://journal.ypidathu.or.id/index.php/innovatsioon/article/view/1298>; “Integration of Adaptive Learning Technology in the Context of Islamic Education in Indonesia | Alfianto | Proceeding International Seminar and Conference on Islamic Studies (ISCIS),” accessed December 9, 2024, <https://jurnal.uinsu.ac.id/index.php/ISCIS/article/view/21907>; “Artificial Intelligence (AI) Dan Dampaknya Dalam Distorsi Pendidikan Islam | Urwatul Wutsqo: Jurnal Studi Kependidikan Dan Keislaman,” accessed December 9, 2024, <https://jurnal.stitujombang.ac.id/index.php/UrwatulWutsqo/article/view/1330>.

¹⁶ Fadlillah, M. Imam Bukhori Bukhori, and Zohaib Hassan Sain, “THE INFLUENCE OF AI ON ISLAMIC EDUCATION: REVOLUTIONIZING LEARNING MODELS AND STRATEGIES,” *Proceeding of International Conference on Education and Sharia* 1 (August 2024): 336–42, <https://proceedings.uas.ac.id/index.php/ices/article/view/57>; Muttaqin, “Implementation of Islamic Education Learning with Artificial Intelligence (CHATGPT)”; Krstić, Aleksić, and Krstić, “Artificial Intelligence in Education”; “E-Relevance of Education and Culture in the Age of AI - Freedom of Expression - Www.Coe.Int,” *Freedom of Expression*, accessed December 9, 2024, <https://www.coe.int/en/web/freedom-expression/e-relevance-of-education-and-culture-in-the-age-of-ai>; “Artificial Intelligence in Culture and Education,” *Educate Magis*, accessed December 9, 2024, <https://www.educatemagis.org/global-stories/artificial-intelligence-in-culture-and-education/>.

menyatakan aplikasi mempermudah proses belajar mereka dibandingkan metode konvensional.

2. Peningkatan Motivasi Belajar

Berdasarkan survei pengguna, sebanyak 85% siswa melaporkan peningkatan motivasi belajar ketika menggunakan aplikasi. Fitur interaktif seperti kuis adaptif dan umpan balik instan menjadi salah satu faktor yang mendorong keterlibatan siswa.

3. Efektivitas dalam Pemahaman Materi

Hasil tes yang dilakukan sebelum dan sesudah penggunaan aplikasi menunjukkan peningkatan rata-rata 30% dalam skor pemahaman materi pembelajaran, terutama dalam topik Al-Qur'an, Fiqh, dan Akhlak.

4. Respon Positif dari Guru

Sebanyak 90% pendidik memberikan tanggapan positif terkait kemudahan integrasi aplikasi ke dalam kurikulum yang telah ada. Guru juga merasa terbantu dalam memahami perkembangan belajar siswa melalui laporan analitik yang disediakan aplikasi.

Tabel. 2. Peningkatan Skor Pemahaman Materi Siswa Sebelum dan Sesudah Penggunaan Aplikasi

Aspek	Sebelum Penggunaan (%)	Sesudah Penggunaan (%)	Peningkatan (%)
Pemahaman Al-Qur'an	55	80	25
Fiqh	50	75	25
Akhlak	60	90	30

Hasil penelitian ini menunjukkan bahwa aplikasi berbasis AI dengan pendekatan *personalised learning* memiliki potensi besar untuk meningkatkan kualitas pembelajaran Pendidikan Islam. Temuan ini konsisten dengan teori *constructivism*, yang oleh Loyens dan Gijbels; Saarsar; Tanjung et al.; dan Triantafyllou menekankan pentingnya penyesuaian pembelajaran terhadap kebutuhan individu siswa untuk menciptakan pengalaman belajar

yang lebih efektif dan bermakna.¹⁷ Penelitian ini juga menunjukkan efektivitas aplikasi berbasis kecerdasan buatan (AI) dalam mendukung pembelajaran Pendidikan Islam melalui pendekatan *personalised learning*. Temuan utama, seperti peningkatan motivasi siswa, pemahaman materi, dan penerimaan positif dari pendidik, mengindikasikan bahwa teknologi AI dapat menjadi alat revolusioner dalam pendidikan Islam. Namun, penting untuk menganalisis hasil ini secara mendalam untuk memahami dampaknya terhadap tujuan penelitian dan relevansinya dalam konteks teori dan praktik pendidikan.

Temuan ini mendukung penelitian oleh Ayeni et al., yang menyatakan bahwa teknologi berbasis AI dapat meningkatkan hasil belajar melalui personalisasi konten.¹⁸ Selain itu, penelitian ini sejalan dengan kajian oleh Dina dan Sabililhaq; Hayati dan Ushalli; serta Musolin et al. yang menemukan bahwa penggunaan aplikasi edukatif berbasis teknologi dalam pendidikan Islam meningkatkan keterlibatan siswa.¹⁹ Aplikasi yang dikembangkan mampu secara otomatis menyesuaikan materi pembelajaran dengan kemampuan individu siswa. Hal ini mendukung konsep *learner-centered education*, sebagaimana ditegaskan oleh Piaget, dalam Ulya, di mana teorinya mengenai *constructivism*, menyatakan bahwa proses belajar yang berpusat pada individu

¹⁷ Sofie Loyens and David Gijbels, "Effects of Constructivist Learning Environments: Introducing a Multi-Directional Approach. *Instructional Science*, 36(5/6), 351-357," *Instructional Science* 36 (September 2008): 351-57, <https://doi.org/10.1007/s11251-008-9059-4>; Priyamvada Saarsar, *Exploring the Constructivist Approach in Education: Theory, Practice, and Implications*, 05 (June 2018): 717-25; Yul Ifda Tanjung et al., "THE EFFECT OF CONSTRUCTIVISM LEARNING ON STUDENT LEARNING OUTCOMES: A META ANALYSIS STUDY," *ISER (Indonesian Science Education Research)* 5, no. 1 (July 2023): 1, <https://doi.org/10.24114/iser.v5i1.49409>; Serafeim Triantafyllou, "Constructivist Learning Environments," April 10, 2022, <https://doi.org/10.33422/5th.icate.2022.04.10>.

¹⁸ Oyebola Olusola Ayeni et al., "AI in Education: A Review of Personalized Learning and Educational Technology," *GSC Advanced Research and Reviews* 18, no. 2 (2024): 2, <https://doi.org/10.30574/gscarr.2024.18.2.0062>.

¹⁹ Dina and Sabililhaq, "Artificial Intelligence (AI) and The Principle of Moral Responsibility"; Hayati and Ushalli, "DIGITAL TRANSFORMATION IN ISLAMIC EDUCATION"; Musolin et al., "Understanding of Artificial Intelligence for Islamic Education Support and Service."

lebih efektif dalam membangun pengetahuan yang bermakna.²⁰ Dalam konteks Pendidikan Islam, personalisasi ini tidak hanya relevan tetapi juga mendukung pencapaian tujuan holistik, yaitu mengintegrasikan pemahaman kognitif dan penguatan nilai-nilai spiritual.²¹

Peningkatan skor pemahaman materi setelah penggunaan aplikasi menunjukkan bahwa pendekatan adaptif memungkinkan siswa memahami konsep secara lebih mendalam. Hal ini juga menunjukkan bahwa teknologi AI tidak hanya menjadi alat tambahan, tetapi juga katalis untuk transformasi metode pembelajaran. Temuan bahwa skor pemahaman materi siswa meningkat sebesar 30% setelah penggunaan aplikasi mencerminkan efektivitas pendekatan adaptif dalam pembelajaran. Hasil ini sejalan dengan penelitian Li et al.; Dumitru; El-Sabagh; Fadieieva; serta Rane, yang menemukan bahwa teknologi adaptif membantu siswa menguasai topik dengan lebih baik karena pembelajaran disesuaikan dengan kecepatan dan gaya belajar mereka.²² Selain itu, fitur interaktif

²⁰ Ulya, "PENERAPAN TEORI KONSTRUKTIVISME MENURUT JEAN PIAGET DAN TEORI NEUROSCIENCE DALAM PENDIDIKAN / APPLICATION OF CONSTRUCTIVISM THEORY ACCORDING TO JEAN PIAGET AND NEUROSCIENCE THEORY IN EDUCATION."

²¹ Hayati and Ushalli, "DIGITAL TRANSFORMATION IN ISLAMIC EDUCATION"; *Deep Learning – Bima Utama Press*, n.d., accessed January 24, 2026, <https://bimautama.net/deep-learning/>; "Integrasi Deep Learning Dan Nilai Islam Dalam Pendidikan IPA: Menyiapkan Generasi Intelektual Spiritual," accessed October 19, 2025, https://scholar.google.com/citations?view_op=view_citation&hl=id&user=bKaapVgAAAAJ&sortby=pubdate&citation_for_view=bKaapVgAAAAJ:YohjEiUPhakC.

²² Li et al., "Bringing Generative AI to Adaptive Learning in Education"; Cristina Dumitru, *Future of Learning. Adaptive Learning Systems Based on Language Generative Models in Higher Education* (2024), 12, <https://doi.org/10.1201/9781032644509-3>; Hassan A. El-Sabagh, "Adaptive E-Learning Environment Based on Learning Styles and Its Impact on Development Students' Engagement," *International Journal of Educational Technology in Higher Education* 18, no. 1 (October 2021): 53, <https://doi.org/10.1186/s41239-021-00289-4>; Liliia Fadieieva, "Adaptive Learning: A Cluster-Based Literature Review (2011-2022)," *Educational Technology Quarterly* 2023 (September 2023): 319–66, <https://doi.org/10.55056/etq.613>; Nitin Liladhar Rane, "Education 4.0 and 5.0: Integrating Artificial Intelligence (AI) for Personalized and Adaptive Learning," *Journal*

yang dirancang dalam aplikasi, seperti umpan balik instan, memberikan pengalaman belajar yang lebih kaya, sebagaimana disarankan oleh Fitriyah et al.; Almasri; Al-Zahrani dan Alasmari, bahwa interaktivitas dalam teknologi pendidikan meningkatkan keterlibatan dan hasil belajar siswa.²³

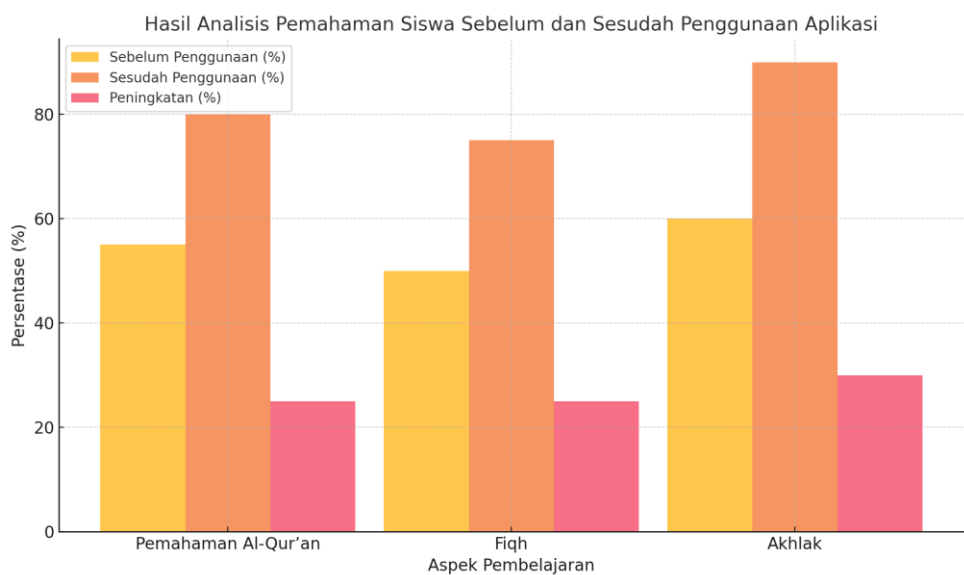


Figure: 2. Hasil Analisis Pemahaman Siswa Sebelum Dan Sesudah Penggunaan Aplikasi

Diagram di atas menggambarkan hasil analisis pemahaman siswa sebelum dan sesudah penggunaan aplikasi berbasis AI dalam

of *Artificial Intelligence and Robotics*, ahead of print, June 24, 2024, <https://doi.org/10.61577/jaiar.2024.100006>.

²³ Isnani Juni Fitriyah et al., “Exploring the Role of Moderators in the Effectiveness of Digital Games for Stem Education: A Systematic Review and Meta-Analysis,” *Discover Education* 4, no. 1 (August 2025): 297, <https://doi.org/10.1007/s44217-025-00756-4>; Isnani Juni Fitriyah et al., *Development of an E-Module on the Material of Substance Pressure and Its Use in Daily Life, Based on Science Process Skills*, 2025, <https://journal.uin.ac.id/IJCER/article/download/38193/18124>; Almasri, “Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science”; Abdulrahman M. Al-Zahrani and Talal M. Alasmari, “Exploring the Impact of Artificial Intelligence on Higher Education: The Dynamics of Ethical, Social, and Educational Implications,” *Humanities and Social Sciences Communications* 11, no. 1 (July 2024): 1–12, <https://doi.org/10.1057/s41599-024-03432-4>.

pembelajaran Pendidikan Islam. Diagram ini menunjukkan peningkatan signifikan dalam aspek pemahaman Al-Qur'an, Fiqh, dan Akhlak, yang menjadi bukti keberhasilan pendekatan *personalised learning* menggunakan teknologi AI.

Implikasi penelitian ini sangat relevan dalam menjawab tantangan era digital di mana institusi pendidikan Islam perlu beradaptasi dengan teknologi untuk tetap kompetitif. Aplikasi ini memberikan solusi inovatif bagi pembelajaran yang lebih personal, efektif, dan inklusif. Dalam era digital saat ini, Pendidikan Islam menghadapi tantangan besar untuk tetap relevan dengan kebutuhan siswa generasi Z yang sangat terbiasa dengan teknologi.²⁴ Aplikasi ini tidak hanya menjawab tantangan tersebut tetapi juga membuka peluang baru untuk mengintegrasikan pembelajaran agama dengan pendekatan teknologi yang relevan. Sebagai contoh, analitik data yang digunakan untuk melacak kemajuan siswa dapat membantu guru memahami kebutuhan individu secara lebih akurat, mendukung konsep *assessment for learning* yang dipopulerkan oleh Black dan Wiliam.²⁵

Meskipun hasilnya menjanjikan, terdapat beberapa keterbatasan, seperti kebutuhan akan pelatihan guru dalam menggunakan teknologi dan keterbatasan infrastruktur di beberapa lembaga pendidikan Islam. Penelitian ini juga terbatas pada lingkup tertentu sehingga generalisasi hasil memerlukan kajian lebih lanjut. Salah satu tantangan utama adalah kesiapan pendidik untuk mengadopsi teknologi baru, sebagaimana diungkapkan oleh responden guru yang merasa memerlukan pelatihan tambahan. Selain itu, infrastruktur teknologi di beberapa lembaga pendidikan Islam masih terbatas, sehingga implementasi aplikasi

²⁴ Mujamil Qomar and Agus Zaenul Fitri, "Innovative Learning Strategies for Islamic Religious Education Based on Merdeka Belajar Curriculum in Vocational High Schools," *Al-Hayat: Journal of Islamic Education* 8, no. 3 (2024): 966–81, <https://ejournal.alhayat.or.id/index.php/ajie/article/view/43>.

²⁵ Paul Black and Dylan Wiliam, "Assessment and Classroom Learning," *Assessment in Education: Principles, Policy & Practice* 5, no. 1 (March 1998): 7–74, <https://doi.org/10.1080/0969595980050102>.

ini memerlukan dukungan kebijakan yang lebih kuat dari pemerintah dan institusi terkait. Sebagaimana dikemukakan oleh Bates, adopsi teknologi dalam pendidikan memerlukan sinergi antara teknologi, pedagogi, dan kebijakan.²⁶

Penelitian ini tidak hanya berkontribusi pada pengembangan aplikasi berbasis AI, tetapi juga memberikan sumbangan terhadap kerangka teori *personalised learning* dalam konteks pendidikan Islam. Selain itu, aplikasi ini menciptakan peluang untuk mengintegrasikan nilai-nilai spiritual dan teknologi modern, menjadikannya relevan dalam pendidikan berbasis moral. Untuk penelitian di masa depan, disarankan untuk mengembangkan fitur tambahan seperti pembelajaran kolaboratif berbasis AI dan pengayaan materi melalui multimedia interaktif. Penelitian ini menjadi langkah awal menuju transformasi pendidikan Islam di era teknologi, yang diharapkan mampu menjawab kebutuhan pendidikan generasi mendatang.

Kesimpulan

Penelitian ini menyimpulkan bahwa pengembangan aplikasi berbasis kecerdasan buatan (AI) dengan pendekatan *personalised learning* mampu memberikan kontribusi signifikan dalam pembelajaran Pendidikan Islam. Aplikasi ini terbukti efektif dalam meningkatkan motivasi, pemahaman materi, dan keterlibatan siswa melalui penyesuaian materi pembelajaran yang sesuai dengan kebutuhan individu. Respon positif dari pendidik dan siswa memperkuat kesimpulan bahwa teknologi AI dapat menjadi alat yang transformatif dalam membentuk metode pembelajaran yang lebih inklusif, adaptif, dan efisien di era digital.

Aplikasi ini berhasil mengintegrasikan teori *constructivism* dalam desain pembelajarannya, memungkinkan siswa untuk belajar secara aktif dan bermakna. Dengan dukungan teknologi AI, aplikasi mampu menganalisis kebutuhan belajar individu dan

²⁶ A.W. (Tony) Bates, *Technology, e-Learning and Distance Education*, 0 ed. (Routledge, 2005), <https://doi.org/10.4324/9780203463772>.

memberikan rekomendasi materi yang relevan, sehingga menciptakan pengalaman belajar yang terstruktur dan adaptif. Peningkatan rata-rata skor pemahaman siswa sebesar 30% mencerminkan keberhasilan pendekatan ini dalam mendukung pencapaian tujuan pembelajaran yang lebih baik.

Rekomendasi Bagi Peneliti Selanjutnya. Penelitian di masa depan disarankan untuk memperluas cakupan subjek penelitian, mencakup jenjang pendidikan yang lebih beragam, serta mengeksplorasi integrasi fitur tambahan seperti pembelajaran kolaboratif dan evaluasi otomatis berbasis AI. Selain itu, penelitian lebih lanjut diperlukan untuk mengeksplorasi bagaimana teknologi ini dapat diimplementasikan secara efektif di lingkungan pendidikan dengan keterbatasan infrastruktur.

Bagi Praktisi Pendidikan. Lembaga pendidikan Islam diharapkan dapat mengadopsi aplikasi ini sebagai bagian dari strategi pengajaran mereka. Namun, pelatihan bagi pendidik dalam penggunaan teknologi ini harus menjadi prioritas untuk memastikan efektivitas implementasi. **Bagi Pengambil Kebijakan.** Diperlukan kebijakan yang mendukung pengembangan dan penerapan teknologi AI dalam pendidikan Islam, termasuk penyediaan infrastruktur yang memadai dan dukungan finansial untuk pengembangan aplikasi berbasis teknologi.

Dengan demikian, penelitian ini tidak hanya memberikan solusi untuk tantangan pembelajaran Pendidikan Islam di era digital tetapi juga membuka jalan bagi inovasi pendidikan yang lebih maju, relevan, dan berorientasi masa depan. Implementasi aplikasi berbasis AI dalam Pendidikan Islam diharapkan dapat menjadi model yang mendukung transformasi pendidikan global yang berbasis nilai spiritual dan teknologi.

Daftar Pustaka

“7 Principles on Responsible AI Use in Education | World Economic Forum.” Accessed December 9, 2024.

<https://www.weforum.org/stories/2024/01/ai-guidance-school-responsible-use-in-education/>.

Abulibdeh, Ammar, Esmat Zaidan, and Rawan Abulibdeh. "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* 437 (January 2024): 140527. <https://doi.org/10.1016/j.jclepro.2023.140527>.

Achruh, Achruh, Muhammad Rapi, Muhammad Rusdi, and Ridwan Idris. "Challenges and Opportunities of Artificial Intelligence Adoption in Islamic Education in Indonesian Higher Education Institutions." *International Journal of Learning, Teaching and Educational Research* 23, no. 11 (December 2024): 11. <https://www.ijlter.org/index.php/ijlter/article/view/11682>.

Adiguzel, Tufan, Mehmet Haldun Kaya, and Fatih Kürşat Cansu. "Revolutionizing Education with AI: Exploring the Transformative Potential of ChatGPT." *Contemporary Educational Technology* 15, no. 3 (July 2023): ep429. <https://doi.org/10.30935/cedtech/13152>.

Afriani, Imro'atul Husna, St Shabibatul Rohmah, and Dian Arief Pradana. "DEVELOPMENT OF PERSONALIZED LEARNING MANAGEMENT SYSTEM WITH ADAPTIVE FEATURES OF MICROTEACHING AND REFLECTIVE PRACTICE COURSES FOR PRESERVICE TEACHERS." *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)* 8, no. 2 (October 2024): 2. <https://doi.org/10.36526/santhet.v8i2.4394>.

Agrawal, Anjali. "Rapid Application Development (RAD): The Ultimate Guide." BuzzClan, May 15, 2024. <https://buzzclan.com/digital-transformation/rapid-application-development/>.

Ali, Omar, Peter A. Murray, Mujtaba Momin, Yogesh K. Dwivedi, and Tegwen Malik. "The Effects of Artificial Intelligence Applications in Educational Settings: Challenges and Strategies." *Technological Forecasting and Social Change*

- 199 (February 2024): 123076.
<https://doi.org/10.1016/j.techfore.2023.123076>.
- Alier, Marc, Francisco García-Peñalvo, and Jorge D. Camba. *Generative Artificial Intelligence in Education: From Deceptive to Disruptive*. March 2024.
<https://doi.org/10.9781/ijimai.2024.02.011>.
- Almasri, Firas. "Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science: A Systematic Review of Empirical Research." *Research in Science Education* 54, no. 5 (October 2024): 977–97. <https://doi.org/10.1007/s11165-024-10176-3>.
- Al-Zahrani, Abdulrahman M., and Talal M. Alasmari. "Exploring the Impact of Artificial Intelligence on Higher Education: The Dynamics of Ethical, Social, and Educational Implications." *Humanities and Social Sciences Communications* 11, no. 1 (July 2024): 1–12.
<https://doi.org/10.1057/s41599-024-03432-4>.
- "An Introduction to Qualitative Research | SAGE Publications Inc." Accessed December 9, 2024. <https://us.sagepub.com/en-us/nam/an-introduction-to-qualitative-research/book278983>.
- "Artificial Intellegence (AI) Dan Dampaknya Dalam Distorsi Pendidikan Islam | Urwatul Wutsqo: Jurnal Studi Kependidikan Dan Keislaman." Accessed December 9, 2024. <https://jurnal.stituwjombang.ac.id/index.php/UrwatulWutsqo/article/view/1330>.
- "Artificial Intelligence Bringing Improvements to Adaptive Learning in Education: A Case Study." Accessed November 19, 2024. <https://www.mdpi.com/2071-1050/16/3/1347>.
- Ayeni, Oyebola Olusola, Nancy Mohd Al Hamad, Onyebuchi Nneamaka Chisom, Blessing Osawaru, Ololade Elizabeth Adewusi, Oyebola Olusola Ayeni, Nancy Mohd Al Hamad, Onyebuchi Nneamaka Chisom, Blessing Osawaru, and Ololade Elizabeth Adewusi. "AI in Education: A Review of Personalized Learning and Educational Technology." *GSC*

Advanced Research and Reviews 18, no. 2 (2024): 2.
<https://doi.org/10.30574/gscarr.2024.18.2.0062>.

———. “AI in Education: A Review of Personalized Learning and Educational Technology.” *GSC Advanced Research and Reviews* 18, no. 2 (2024): 2.
<https://doi.org/10.30574/gscarr.2024.18.2.0062>.

Bates, A.W. (Tony). *Technology, e-Learning and Distance Education*. 0 ed. Routledge, 2005.
<https://doi.org/10.4324/9780203463772>.

Bayly-Castaneda, K., M.-S. Ramirez-Montoya, and A. Morita-Alexander. “Crafting Personalized Learning Paths with AI for Lifelong Learning: A Systematic Literature Review.” *Frontiers in Education* 9 (August 2024).
<https://doi.org/10.3389/educ.2024.1424386>.

Bernacki, Matthew, Meghan Greene, and Nikki Lobczowski. “A Systematic Review of Research on Personalized Learning: Personalized by Whom, to What, How, and for What Purpose(s)?” *Educational Psychology Review* 33 (December 2021): 1–41. <https://doi.org/10.1007/s10648-021-09615-8>.

Black, Paul, and Dylan Wiliam. “Assessment and Classroom Learning.” *Assessment in Education: Principles, Policy & Practice* 5, no. 1 (March 1998): 7–74.
<https://doi.org/10.1080/0969595980050102>.

“Bringing Generative AI to Adaptive Learning in Education.” Accessed December 9, 2024.
<https://arxiv.org/html/2402.14601v3>.

“CEEOL - Article Detail.” Accessed November 19, 2024.
<https://www.ceeol.com/search/article-detail?id=1214976>.

Chouhan, Utkarsh, Vaibhav Tiwari, and Krishna Kant Agrawal. “Optimizing Cloud-Based E-Learning Platforms: A Comparative Analysis of Server-Based and Serverless Deployment Strategies.” *2024 IEEE 9th International Conference for Convergence in Technology (I2CT)*, April 2024, 1–8. <https://doi.org/10.1109/I2CT61223.2024.10543608>.

“Comparing Virtual and Real-Life Rapid Prototyping Methods for User Testing Smart City Interfaces: A Case Study.” Accessed December 9, 2024. <https://www.mdpi.com/2076-3417/14/21/9918>.

Deep Learning – Bima Utama Press. n.d. Accessed January 24, 2026. <https://bimautama.net/deep-learning/>.

“DIGITAL LITERACY IN ISLAMIC EDUCATION: ASSESSING THE EFFICACY OF ONLINE LEARNING PLATFORMS IN FOSTERING RELIGIOUS AND ACADEMIC DEVELOPMENT | International Journal of Teaching and Learning.” Accessed November 19, 2024. <http://injetel.org/index.php/12/article/view/44>.

“Digital Technology Adoption and School Leadership in the Post-Pandemic Era: Insights from High School Leaders | Interdisciplinary Journal of Education Research.” Accessed November 19, 2024. <https://pubs.ufs.ac.za/index.php/ijer/article/view/1205>.

“Digital Transformation of Islamic Boarding School Education | Indonesian Journal of Islamic Studies.” Accessed November 19, 2024. <https://ijis.umsida.ac.id/index.php/ijis/article/view/1723>.

Dina, Sarah, and Irhas Sabililhaq. “Artificial Intelligence (AI) and The Principle of Moral Responsibility: How Does It Impact Islamic Education in Indonesia?” *Proceeding International Conference on Religion, Science and Education* 3 (April 2024): 893–903. <http://sunankalijaga.org/prosiding/index.php/icrse/article/view/1274>.

“Disrupting Education: Artificial Intelligence in Higher Education | Emerald Insight.” Accessed November 19, 2024. <https://www.emerald.com/insight/content/doi/10.1108/978-1-83549-486-820241004/full/html>.

Dumitru, Cristina. *Future of Learning. Adaptive Learning Systems Based on Language Generative Models in Higher Education*. 2024. <https://doi.org/10.1201/9781032644509-3>.

- E .Zargoun. “Comparative Study the Role of Artificial Intelligence and Their Impact on Teaching and E-Learning Platforms (Duolingo, ALEKS, Coursera, QuestionPro).” *African Journal of Advanced Pure and Applied Sciences (AJAPAS)*, May 30, 2024, 263–74. <https://www.aaasjournals.com/index.php/ajapas/article/view/795>.
- Educate Magis. “Artificial Intelligence in Culture and Education.” Accessed December 9, 2024. <https://www.educatemagis.org/global-stories/artificial-intelligence-in-culture-and-education/>.
- Edwards-Fapohunda, Michael Olumide, and Modinot Adebisi Adediji. *Sustainable Development of Distance Learning in Continuing Adult Education: The Impact of Artificial Intelligence*. 8, no. 1 (2024).
- Efriyanti, Liza. “Application of Artificial Intelligence in Determining the Learning Model of Islamic Religious Education (Pai)In Higher Education.” *Procedia of Social Sciences and Humanities* 5 (July 2024): 99–112. <https://doi.org/10.21070/pssh.v5i.562>.
- Elihami, Elihami, Muwafiq Ibrahim Mas’ud, and Abdi Darmawan. “Exploring the Landscape: Challenges and Opportunities in Islamic Education Technology.” *Jurnal Pendidikan Progresif* 14, no. 2 (August 2024): 2. <https://jurnal.fkip.unila.ac.id/index.php/jpp/article/view/30611>.
- Ellikkal, Adil, and S. Rajamohan. “AI-Enabled Personalized Learning: Empowering Management Students for Improving Engagement and Academic Performance.” *Vilakshan - XIMB Journal of Management* ahead-of-print, no. ahead-of-print (July 2024). World. <https://doi.org/10.1108/XJM-02-2024-0023>.
- El-Sabagh, Hassan A. “Adaptive E-Learning Environment Based on Learning Styles and Its Impact on Development Students’ Engagement.” *International Journal of Educational*

- Technology in Higher Education* 18, no. 1 (October 2021): 53.
<https://doi.org/10.1186/s41239-021-00289-4>.
- Fadieieva, Liliia. "Adaptive Learning: A Cluster-Based Literature Review (2011-2022)." *Educational Technology Quarterly* 2023 (September 2023): 319–66. <https://doi.org/10.55056/etq.613>.
- Fadlillah, M. Imam Bukhori Bukhori, and Zohaib Hassan Sain. "THE INFLUENCE OF AI ON ISLAMIC EDUCATION: REVOLUTIONIZING LEARNING MODELS AND STRATEGIES." *Proceeding of International Conference on Education and Sharia* 1 (August 2024): 336–42. <https://proceedings.uas.ac.id/index.php/ices/article/view/57>.
- Fandir, A. "Transformation of Islamic Education: Implementation of Technological Innovation in Education Management." *Jurnal Ilmiah Mandala Education* 10, no. 1 (January 2024): 1. <https://doi.org/10.58258/jime.v10i1.6625>.
- "Fereday, Muir-Cochrane THEMATIC ANALYSIS." Accessed December 9, 2024. https://sites.ualberta.ca/~iiqm/backissues/5_1/HTML/fereday.htm.
- Fitri, Agus Zaenul, and Abad Badruzaman. *Integrative Learning Design Innovation in Islamic Religious Education Subjects in Improving Graduate Competency through an Independent Curriculum*. 2024. <https://www.researchsquare.com/article/rs-5205013/latest>.
- Fitriyah, Isnanik Juni, Sony Yunior Erlangga, Andik Wahyun Muqoyyidin, and Septi Aprilia. "Exploring the Role of Moderators in the Effectiveness of Digital Games for Stem Education: A Systematic Review and Meta-Analysis." *Discover Education* 4, no. 1 (August 2025): 297. <https://doi.org/10.1007/s44217-025-00756-4>.
- Fitriyah, Isnanik Juni, Ratna Dewi Firdaus, Andik Wahyun Muqoyyidin, and Septi Aprilia. *Development of an E-Module on the Material of Substance Pressure and Its Use in Daily Life, Based on Science Process Skills*. 2025. <https://journal.uii.ac.id/IJCER/article/download/38193/18124>.

Freedom of Expression. “E-Relevance of Education and Culture in the Age of AI - Freedom of Expression - Wwww.Coe.Int.” Accessed December 9, 2024. <https://www.coe.int/en/web/freedom-expression/e-relevance-of-education-and-culture-in-the-age-of-ai>.

Gavrilovic, Nebojsa, SLOBODAN JOVANOVIĆ, and Alok Mishra. “PERSONALIZED LEARNING SYSTEM BASED ON STUDENT BEHAVIOR AND LEARNING STYLE.” September 28, 2017.

“Guest, G., MacQueen, K. M., & Namey, E. E. (2012). Applied Thematic Analysis. SAGE Publications. - References - Scientific Research Publishing.” Accessed December 9, 2024. <https://www.scirp.org/reference/referencespapers?referenceid=3457389>.

Guest, Greg, Kathleen M. MacQueen, and Emily E. Namey. *Applied Thematic Analysis*. SAGE Publications, Inc., 2012. <https://doi.org/10.4135/9781483384436>.

Hayati, Naila, and Eskarni Ushalli. “DIGITAL TRANSFORMATION IN ISLAMIC EDUCATION: INTEGRATING AI AND MACHINE LEARNING FOR PERSONALIZED LEARNING IN MADRASAH.” *Journal of Scientech Research and Development* 6, no. 2 (October 2024): 2. <https://doi.org/10.56670/jsrd.v6i2.528>.

Hernawati, Sari, Muhammad Hafizh, and Muhammad Nurfaizi Arya Rahardja. “Adjusting the Ideal Islamic Religious Education Curriculum to the Development of AI-Based Technology.” *Progresiva: Jurnal Pemikiran Dan Pendidikan Islam* 13, no. 01 (April 2024): 01. Pribadi. <https://doi.org/10.22219/progresiva.v13i01.32931>.

Herwinsyah, Herwinsyah, Ahsanul Ridho Ridho, and Danang Dwi Prasetyo. “Revolutionizing Islamic Education: Integrating Artificial Intelligence into Islamic Education.” *Islam in World Perspectives* 4, no. 2 (2025): 2. <http://journal2.uad.ac.id/index.php/IWP/article/view/11452>.

Holmes, Wayne, Maya Bialik, and Charles Fadel. *Artificial Intelligence in Education. Promise and Implications for Teaching and Learning*. 2019.

“Impact of Artificial Intelligence (AI) on Environmental Security (ES) of Post-Pandemic Covid-19: A Literature Review Study | Research in Management of Technology and Business.” Accessed November 19, 2024. <https://publisher.uthm.edu.my/periodicals/index.php/rmtb/article/view/13979>.

“Integrasi Deep Learning Dan Nilai Islam Dalam Pendidikan IPA: Menyiapkan Generasi Intelektual Spiritual.” Accessed October 19, 2025. https://scholar.google.com/citations?view_op=view_citation&hl=id&user=bKaapVgAAAAJ&sortby=pubdate&citation_for_view=bKaapVgAAAAJ:YohjEiUPhakC.

“Integration of Adaptive Learning Technology in the Context of Islamic Education in Indonesia | Alfiyanto | Proceeding International Seminar and Conference on Islamic Studies (ISCIS).” Accessed December 9, 2024. <https://jurnal.uinsu.ac.id/index.php/ISCIS/article/view/21907>.

“Integration of AI Tools in Islamic Education Curriculum Development Management: Challenges and Opportunities | Journal of Loomingulus Ja Innovatsioon.” Accessed December 9, 2024. <https://journal.ypidathu.or.id/index.php/innovatsioon/article/view/1298>.

“Interdisciplinary Digital Skills Development For Educational Communication: Emergency And AI-Enhanced Digitization - Borys Grinchenko Kyiv Metropolitan University Institutional Repository.” Accessed November 19, 2024. <https://elibrary.kubg.edu.ua/id/eprint/49011/>.

“Islamic Character Education in the Era of Industry 5.0: Navigating Challenges and Embracing Opportunities | Al-Hayat: Journal of Islamic Education.” Accessed November 19, 2024. <https://alhayat.or.id/index.php/alhayat/article/view/493>.

- Jia, Xi-Hui, and Jui-Che Tu. "Towards a New Conceptual Model of AI-Enhanced Learning for College Students: The Roles of Artificial Intelligence Capabilities, General Self-Efficacy, Learning Motivation, and Critical Thinking Awareness." *Systems* 12, no. 3 (March 2024): 3. <https://doi.org/10.3390/systems12030074>.
- Kaswan, Kuldeep Singh, Jagjit Singh Dhatteval, and Rudra Pratap Ojha. "AI in Personalized Learning." In *Advances in Technological Innovations in Higher Education*. CRC Press, 2024.
- Khoir, Tholkhatul, Mohd Fadzil Hanid, Moh Khasan, Noor Atan, Misbah Elizabeth, and Shahrin Hashim. "Enhancing Fiqh Learning Outcomes through Artificial Intelligence Applications at Sekolah Indonesia Johor Bahru." *Edelweiss Applied Science and Technology* 8 (September 2024): 1764–77. <https://doi.org/10.55214/25768484.v8i4.1551>.
- Krstić, Lazar, Veljko Aleksić, and Marija Krstić. "Artificial Intelligence in Education: A Review." January 1, 2022, 223–28. <https://doi.org/10.46793/TIE22.223K>.
- Kusuma, Rizki, and Damelina Basauli Tambunan. "The Analysis of Customer Satisfaction Assessments to Determine E-Siap Product Development Strategies." *KnE Social Sciences*, March 22, 2021, 514166. <https://doi.org/10.18502/kss.v5i5.8847>.
- Laak, Kristjan-Julius, and Jaan Aru. "AI and Personalized Learning: Bridging the Gap with Modern Educational Goals." arXiv:2404.02798. Preprint, arXiv, April 3, 2024. <https://doi.org/10.48550/arXiv.2404.02798>.
- Lan, Yanzhen. "Through Tensions to Identity-Based Motivations: Exploring Teacher Professional Identity in Artificial Intelligence-Enhanced Teacher Training." *Teaching and Teacher Education* 151 (December 2024): 104736. <https://doi.org/10.1016/j.tate.2024.104736>.
- Li, Hang, Tianlong Xu, Chaoli Zhang, Eason Chen, Jing Liang, Xing Fan, Haoyang Li, Jiliang Tang, and Qingsong Wen.

- “Bringing Generative AI to Adaptive Learning in Education.” arXiv:2402.14601. Preprint, arXiv, June 28, 2024. <https://doi.org/10.48550/arXiv.2402.14601>.
- Loyens, Sofie, and David Gijbels. “Effects of Constructivist Learning Environments: Introducing a Multi-Directional Approach. *Instructional Science*, 36(5/6), 351-357.” *Instructional Science* 36 (September 2008): 351–57. <https://doi.org/10.1007/s11251-008-9059-4>.
- Mahmudulhassan, M., M. Muthoifin, and Sazirul Begum. “Artificial Intelligence in Multicultural Islamic Education: Opportunities, Challenges, and Ethical Considerations.” *Solo Universal Journal of Islamic Education and Multiculturalism* 2, no. 01 (March 2024): 01. <https://doi.org/10.61455/sujiem.v2i01.114>.
- Masdul, Muhammad Rizal, Eka Firmansyah, Kuliawati Kuliawati, and Ismail Suardi Wekke. “**Transformation of Islamic Religious Education Through The Use of E-Learning and Interactive Technology .**” *ScienceOpen Preprints*, ahead of print, January 5, 2024. <https://doi.org/10.14293/PR2199.000627.v1>.
- Maspul, Kurniawan Arif. “Integration of Reading and New Literacies with Islamic Education.” *Jurnal Penelitian Ilmu Ushuluddin* 4, no. 1 (January 2024): 1. <https://doi.org/10.15575/jpiu.31717>.
- Mayangsari, Mey, Miftakhul Putra, and Moh Makmun. “Leveraging Artificial Intelligence Technology to Enhance Teacher Performance in Secondary Islamic Schools.” *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan* 10 (November 2024): 209–20. <https://doi.org/10.32678/tarbawi.v10i02.9881>.
- Mistretta, Sharon. *Reimagining Education: The Role of E-Learning, Creativity, and Technology in the Post-Pandemic Era*. BoD – Books on Demand, 2024.
- Murdan, Anshu Prakash, and Roshan Halkhoree. “Integration of Artificial Intelligence for Educational Excellence and

- Innovation in Higher Education Institutions.” *2024 1st International Conference on Smart Energy Systems and Artificial Intelligence (SESAT)*, June 2024, 1–6. <https://doi.org/10.1109/SESAT61023.2024.10599402>.
- Musah, Mohammed Borhandden. “Islamic Educational Planning: Profiling the Conceptual Framework.” *International Journal of Religion* 5, no. 4 (April 2024): 4. <https://doi.org/10.61707/x5mxw957>.
- Musolin, Mukhamad Hadi, Mohamad Hazli Ismail, Moh Farhan, Nur Rois, Azman Ismail, Miftachul Huda, and Moh Abdul Rohim. “Understanding of Artificial Intelligence for Islamic Education Support and Service: Insights from Empirical Literature Review.” In *Proceedings of Ninth International Congress on Information and Communication Technology*, edited by Xin-She Yang, R. Simon Sherratt, Nilanjan Dey, and Amit Joshi, 27–43. Singapore: Springer Nature, 2025. https://doi.org/10.1007/978-981-97-5035-1_3.
- Mustoip, Sofyan, Purwadi Purwadi, and Muhammad Ziyad Fakhri Fadhlullah. “AI Integration in Islamic Character Development: Study of Elementary School Education Management in Indonesia-Türkiye.” *International Conference of Bunga Bangsa* 2, no. 1 (February 2024): 1. <https://journal.epublish.id/index.php/icobba/article/view/133>.
- Muttaqin, Ziyadul. “Implementation of Islamic Education Learning with Artificial Intelligence (CHATGPT).” *International Conference on Islamic Studies (ICIS)*, July 31, 2023, 1–9. <https://proceeding.uingusdur.ac.id/index.php/icis/article/view/1436>.
- Nowell, Lorelli S., Jill M. Norris, Deborah E. White, and Nancy J. Moules. “Thematic Analysis: Striving to Meet the Trustworthiness Criteria.” *International Journal of Qualitative Methods* 16, no. 1 (December 2017): 1609406917733847. <https://doi.org/10.1177/1609406917733847>.

- “Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J. (2017) Thematic Analysis Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16, 1-13. - References - Scientific Research Publishing.” Accessed December 9, 2024. <https://www.scirp.org/reference/referencespapers?referenceid=2666677>.
- Onesi-Ozigagun, Oseremi, Yinka James Ololade, Nsisong Louis Eyo-Udo, and Damilola Oluwaseun Ogundipe. “REVOLUTIONIZING EDUCATION THROUGH AI: A COMPREHENSIVE REVIEW OF ENHANCING LEARNING EXPERIENCES.” *International Journal of Applied Research in Social Sciences* 6, no. 4 (April 2024): 4. <https://doi.org/10.51594/ijarss.v6i4.1011>.
- “(PDF) A Descriptive Analysis of Assessing Customer Satisfaction: The SERVQUAL Method Approach.” Accessed December 9, 2024. https://www.researchgate.net/publication/323143151_A_Descriptive_Analysis_of_Assessing_Customer_Satisfaction_The_SERVQUAL_Method_Approach.
- “(PDF) ARTIFICIAL INTELLIGENCE IN TEACHING ISLAMIC STUDIES: CHALLENGES AND OPPORTUNITIES.” *ResearchGate*, ahead of print, October 22, 2024. <https://doi.org/10.32806/6ynvg541>.
- “(PDF) Personalized Learning through AI.” *ResearchGate*, October 22, 2024. https://www.researchgate.net/publication/376814707_Personalized_learning_through_AI.
- “(PDF) Thematic Analysis: Striving to Meet the Trustworthiness Criteria.” Accessed December 9, 2024. https://www.researchgate.net/publication/320188032_Thematic_Analysis_Striving_to_Meet_the_Trustworthiness_Criteria.
- “(PDF) User Centred Rapid Application Development.” *ResearchGate*, ahead of print, October 22, 2024. https://doi.org/10.1007/11751113_4.

“(PDF) User Satisfaction Research in Information Systems: Historical Roots and Approaches.” Accessed December 9, 2024.

https://www.researchgate.net/publication/321776435_User_Satisfaction_Research_in_Information_Systems_Historical_Roots_and_Approaches.

Pertiwi, Rizkyana Wahyu Laras, Laeli Umi Kulsum, and Isnaini Amirotn Hanifah. “Evaluating the Impact of Artificial Intelligence-Based Learning Methods on Students’ Motivation and Academic Achievement.” *International Journal of Post Axial: Futuristic Teaching and Learning*, March 27, 2024, 49–58. <https://doi.org/10.59944/postaxial.v2i1.279>.

Qomar, Mujamil, and Agus Zaenul Fitri. “Innovative Learning Strategies for Islamic Religious Education Based on Merdeka Belajar Curriculum in Vocational High Schools.” *Al-Hayat: Journal of Islamic Education* 8, no. 3 (2024): 966–81. <https://ejournal.alhayat.or.id/index.php/ajie/article/view/43>.

Rane, Nitin Liladhar. “Education 4.0 and 5.0: Integrating Artificial Intelligence (AI) for Personalized and Adaptive Learning.” *Journal of Artificial Intelligence and Robotics*, ahead of print, June 24, 2024. <https://doi.org/10.61577/jaiar.2024.100006>.

“Rapid Application Development (RAD) | Definition, Steps & Full Guide.” Accessed December 9, 2024. <https://kissflow.com/application-development/rad/rapid-application-development/>.

ResearchGate. “The Nature of Toddlers and Nurturing Fathers | Request PDF.” Accessed December 9, 2024. https://www.researchgate.net/publication/350601749_The_Nature_of_Toddlers_and_Nurturing_Fathers.

———. “The SAGE Handbook of Qualitative Research in Psychology | Request PDF.” Accessed December 9, 2024. https://www.researchgate.net/publication/345722989_The_SAGE_Handbook_of_Qualitative_Research_in_Psychology.

- Riantory, Pradana Anis, and Pujiyanto Pujiyanto. "Peran Teknologi Kecerdasan Buatan Dalam Metode Pengajaran Al-Qur'an Dan Hadis." *Jurnal Mathlaul Fattah: Jurnal Pendidikan Dan Studi Islam* 15, no. 1 (September 2024): 1. <https://journal.stitdaarulfatah.ac.id/index.php/jmf/article/view/79>.
- Saarsar, Priyamvada. *Exploring the Constructivist Approach in Education: Theory, Practice, and Implications*. 05 (June 2018): 717–25.
- SAGE Publications Ltd. "Thematic Analysis." November 16, 2024. <https://uk.sagepub.com/en-gb/eur/thematic-analysis/book248481>.
- Siminto, H. Achmad Ruslan Afendi, and Syukri Fathudin Achmad Widodo. "THE TRANSFORMATION OF MADRASAH THROUGH THE USE OF EDUCATION TECHNOLOGY." *International Journal of Teaching and Learning* 2, no. 5 (April 2024): 5. <http://injotel.org/index.php/12/article/view/163>.
- Sodikin, Sodikin. "Transformasi Pendidikan Agama Islam Melalui Artificial Intelligent (AI): Upaya Meningkatkan Kemampuan Berpikir Kritis Mahasiswa." *Academicus: Journal of Teaching and Learning* 3 (September 2024): 78–89. <https://doi.org/10.59373/academicus.v3i2.65>.
- Surur, Agus Miftakus, Saida Ulfa, Yerry Soepriyanto, and Mohamed Hasnah Binti. "Personalized Learning in a Digital Environment." *Indonesian Journal of Multidisciplinary Educational Research* 2, no. 1 (May 2024): 1. <https://doi.org/10.30762/ijomer.v2i1.2737>.
- Tanjung, Yul Ifda, Irfandi Irfandi, Teguh Febri Sudarma, Lufri Lufri, Asrizal Asrizal, and Hardeli Hardeli. "THE EFFECT OF CONSTRUCTIVISM LEARNING ON STUDENT LEARNING OUTCOMES: A META ANALYSIS STUDY." *ISER (Indonesian Science Education Research)* 5, no. 1 (July 2023): 1. <https://doi.org/10.24114/iser.v5i1.49409>.

- Tari, I. Dewa Ayu Eka Purba Dharma. "FLOURISHING MAHASISWA: PERSPEKTIF TEORI KONSTRUKTIVISME JEAN PEAGET." *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)* 8, no. 2 (October 2024): 2. <https://doi.org/10.36526/santhet.v8i2.4533>.
- "The Coding Manual for Qualitative Researchers | SAGE Publications Ltd." Accessed December 9, 2024. <https://uk.sagepub.com/en-gb/eur/the-coding-manual-for-qualitative-researchers/book273583>.
- "The Influence of Mobile Application User Experience, Service Quality, and Social Interaction on Customer Satisfaction Quantitative Research in the Online Service Industry | International Journal of Science and Society." Accessed December 9, 2024. <https://ijsoc.goacademica.com/index.php/ijsoc/article/view/1225>.
- Triantafyllou, Serafeim. "Constructivist Learning Environments." April 10, 2022. <https://doi.org/10.33422/5th.icate.2022.04.10>.
- Ulya, Zihniatul. "PENERAPAN TEORI KONSTRUKTIVISME MENURUT JEAN PIAGET DAN TEORI NEUROSCIENCE DALAM PENDIDIKAN / APPLICATION OF CONSTRUCTIVISM THEORY ACCORDING TO JEAN PIAGET AND NEUROSCIENCE THEORY IN EDUCATION." *Al-Mudarris: Journal Of Education* 7, no. 1 (April 2024): 1. <https://doi.org/10.32478/vg1nnv56>.
- Umayrah, Anggi, Prana Dwija Iswara, Syifa Salsabila, Siti Silmi Azzahra, and Mariana Jeujanen. "The Nature of Differentiated Learning in The Perspective of Constructivist Educational Philosophy: A Systematic Literature Review." *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran* 10, no. 2 (June 2024): 691–703. <https://doi.org/10.33394/jk.v10i2.11474>.
- Vaismoradi, Mojtaba, Hannele Turunen, and Terese Bondas. "Content Analysis and Thematic Analysis: Implications for Conducting a Qualitative Descriptive Study." *Nursing &*

- Health Sciences* 15, no. 3 (September 2013): 398–405.
<https://doi.org/10.1111/nhs.12048>.
- Willig, Carla. *Introducing Qualitative Research in Psychology: Adventures in Theory and Method*. Second ed. Maidenhead: Open university press, 2008.
- Yasin, Intan Rafidah, Ahmad Zabidi Abdul Razak, Zuraidah Abdullah, Wan Azani Mustafa, and Eko Risdianto. “E-Learning Application and Teacher Autonomy: A Comprehensive Review.” *Journal of Advanced Research in Applied Sciences and Engineering Technology*, October 7, 2024, 116–33. <https://doi.org/10.37934/araset.57.2.116133>.
- Yufei, Liu, Salmiza Saleh, Huang Jiahui, and Syed Mohamad Syed Abdullah. “Review of the Application of Artificial Intelligence in Education.” *International Journal of Innovation, Creativity and Change*, April 24, 2020, 548–62. <https://doi.org/10.53333/IJICC2013/12850>.
- Yunita, Yunita, and Mulyadi Mulyadi. “Towards Islamic Pedagogy By Exploring The Applications Of Educational Technology.” *El-Ghiroh: Jurnal Studi Keislaman* 22, no. 1 (March 2024): 1. <https://doi.org/10.37092/el-ghiroh.v22i1.702>.
- Yusuf, Budi. “Teknologi Dan Personalisasi Pembelajaran Pendidikan Islam Untuk Generasi Z.” *Journal of Instructional and Development Researches* 4, no. 4 (August 2024): 4. <https://doi.org/10.53621/jider.v4i4.344>.
- Zhao, Ting. *AI in Educational Technology*. 2023. <https://doi.org/10.20944/preprints202311.0106.v1>.