

RESEARCH LANDSCAPE OF ARTIFICIAL INTELLIGENCE IN ISLAMIC EDUCATION: A BIBLIOMETRIC ANALYSIS

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ABSTRACT

The rapid development of Artificial Intelligence (AI) has expanded research interest in Islamic education; however, the field's intellectual structure, thematic development, and research trajectory remain insufficiently understood. This study examines the research landscape of Artificial Intelligence in Islamic Education through a bibliometric analysis. We analysed 102 Scopus-indexed documents published between 2020 and 15 August 2026. The PRISMA framework guided the systematic identification and selection of documents. At the same time, bibliometric analysis used Bibliometrix/Biblioshiny and VOSviewer through performance analysis and science mapping techniques, including keyword co-occurrence, thematic mapping, co-authorship, bibliographic coupling, and co-citation analysis. The findings indicate significant publication growth, particularly since 2024, with Indonesia and Malaysia emerging as major contributors to scientific production and collaboration. Artificial intelligence, machine learning, deep learning, speech recognition, and Qur'anic learning technologies dominate the conceptual structure. At the same time, research themes have expanded to include AI literacy, personalised learning, technology acceptance, ethics, and governance. Generative AI and ChatGPT have emerged as new research directions but have not yet become dominant themes. This study contributes an integrated knowledge map by revealing the publication development, thematic evolution, collaboration structures, research fronts, and intellectual foundations of AI research in Islamic education, providing a foundation for future scholarly development.

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INTRODUCTION

The advancement of Artificial Intelligence (AI) has broadened technology's role in education, including personalised learning, automated assessment, learner performance analysis, intelligent tutoring systems, and adaptive learning environments. (Aulia, B.Fernandez, et al., 2026; Aulia, Kurnianingrum, et al., 2026). Developments in machine learning, deep learning, natural language processing, and generative artificial intelligence (GenAI) have further expanded these applications. The introduction of ChatGPT and large language models has enabled AI for text generation, feedback provision, conversational interaction, and support for learning processes, in addition to prediction and classification. (Meyer et al., 2023). These advancements demonstrate that AI is increasingly discussed within educational practices and learning environments, extending beyond its traditional computational functions. (Bond et al., 2024).

Integrating AI in Islamic education adds complexity because it intersects with pedagogical, linguistic, religious, and epistemological dimensions. (Arifin Ahmad, 2025). Islamic education encompasses not only knowledge transmission but also the cultivation of values, religious understanding, Qur'anic learning, moral education, and the relationships among teachers, students, and sources of Islamic knowledge. (Hanifah et al., 2026). Therefore, the application of AI in Islamic education must be assessed beyond technological capability alone. (Djazilan et al., 2024). Considerations such as the accuracy of religious information, knowledge authority, value sensitivity, ethical use of technology, and teachers' role in the learning process require careful attention. (Khoiruddin & Dzulkifli, 2026). This complexity differentiates AI development in Islamic education from its use in general education and requires more targeted mapping.

Recent studies demonstrate that AI has been implemented in diverse contexts within Islamic education (Hakiem, 2026). Technologies such as machine learning, deep learning, and speech recognition support Qur'anic recitation recognition, tajwid evaluation, pronunciation error detection, and memorisation and revision processes (Al-Fadhli et al., 2023). Beyond Qur'anic learning, AI is increasingly used for adaptive learning, student ability

classification, Arabic language instruction, and the development of educational technology in Islamic educational institutions (An et al., 2025). The advent of GenAI has further broadened research scope by enabling the generation of materials, explanations, questions, summaries, and responses in natural language (Giannakos et al., 2025). Nevertheless, these advancements introduce challenges related to information reliability, hallucinations, bias, academic integrity, user competence, and AI's limitations in representing and transmitting religious knowledge (Augenstein et al., 2024).

Previous bibliometric studies have provided valuable insights into the development of artificial intelligence research in education; however, most investigations have focused on broader educational contexts rather than the specific characteristics of Islamic education. For example, Wang et al, (2024) examined the conceptual structure, research themes, and technological applications of artificial intelligence in education, while Ramli et al. (2025) focused on publication trends, intellectual structures, and emerging research directions within AI education research. Other studies have explored AI integration within specific educational settings, such as higher education, by examining research productivity, ethical issues, and emerging thematic areas. (Xu & Thien, 2026). Although these studies have contributed to understanding the broader AI education landscape, they do not specifically address the intersection between artificial intelligence and Islamic education, where technological development interacts with religious knowledge, linguistic contexts, ethical considerations, and educational values.

Despite ongoing progress, the literature on AI in Islamic education remains fragmented across multiple disciplines and areas of focus. Research on speech recognition, Qur'anic recitation, and tajwid detection often intersects with computer science and engineering. In contrast, studies on Islamic religious education, AI literacy, technology acceptance, ethics, and pedagogical integration sit within educational and Islamic studies literature. This fragmentation complicates efforts to understand the field's development through individual studies alone. Although recent bibliometric studies have begun to explore artificial intelligence research in Islamic education (Azzukhruf,

2026; Hakiem, 2026), existing investigations have mainly focused on publication trends, collaboration patterns, or specific aspects of AI development. However, these studies have not yet provided a comprehensive understanding of the field's evolution across dimensions such as conceptual structures, thematic development, international collaboration networks, research fronts, and intellectual foundations. Therefore, the primary research gap is not the complete absence of bibliometric studies, but the limited availability of an integrated mapping approach that explains the development of AI research in Islamic education as an emerging knowledge domain. The primary research gap, therefore, concerns not only the volume of studies but also the lack of integrative mapping across these dimensions.

This gap has become increasingly critical given the rapid advancement of AI and the evolving research landscape. While technical applications such as machine learning, deep learning, and speech recognition continue to progress, emerging issues include AI literacy, technology acceptance, ethics, governance, personalised learning, and GenAI. (Kamalov et al., 2023). Without systematic mapping, it remains unclear whether these themes are mainstream, nascent, or limited to specific research groups. Therefore, a comprehensive bibliometric investigation is needed to determine the field's current state using bibliographic evidence. This approach enables identification of established themes, emerging trajectories, knowledge structures, and underexplored areas, including GenAI's position within the broader development of AI research in Islamic education.

This study uses bibliometric analysis to integrate productivity measurement with knowledge-structure mapping. (Hoang, 2025). The analysis identifies publication trends, sources, authors, institutions, countries, and influential documents. Science mapping further examines the field's conceptual, social, and intellectual relationships using techniques such as keyword co-occurrence, thematic mapping, thematic evolution, country co-authorship analysis, bibliographic coupling, and co-citation analysis. This approach enables a comprehensive analysis of AI development in Islamic education, considering both publication volume and the interrelationships among actors, themes, documents, and references.

The analysis focuses on Scopus publications from 2020 to 15 August 2026 to map the development, conceptual structure, collaboration patterns, research fronts, and intellectual foundations of AI research in Islamic education. This period reflects the field's contemporary evolution, particularly the emergence of GenAI in the literature. The 2026 data represent a partial year, including only documents indexed in Scopus up to 15 August 2026; thus, the study does not claim to capture the full scholarly output for that year. Using a systematic selection process based on the PRISMA framework, the study identified 102 documents as the final corpus for bibliometric analysis.

To address these gaps, this study asks four research questions: (RQ1) How has scientific production related to AI research in Islamic education evolved between 2020 and 15 August 2026? (RQ2) What are the most prominent publication sources, authors, institutions, countries, and documents? (RQ3) What is the conceptual structure and thematic development of the research? (RQ4) How are international collaboration, research fronts, and intellectual foundations characterised within the field? The primary aim is to map the development, conceptual structure, collaboration patterns, research fronts, and intellectual foundations of AI research in Islamic education, thereby addressing the limited understanding of the field's comprehensive development.

This study contributes an integrated understanding of AI research in Islamic education as an emerging knowledge domain. Unlike previous bibliometric studies that have generally emphasised publication productivity, research trends, or specific technological contexts, this study connects scientific development with conceptual, social, and intellectual structures. By examining publication growth, thematic evolution, collaboration networks, research fronts, and intellectual foundations, this study shows how AI research in Islamic education has shifted from technology-oriented investigations to broader educational, institutional, ethical, and governance concerns. Furthermore, this study positions GenAI using bibliometric evidence, showing whether it represents a dominant transformation or an emerging research trajectory within the field.

METHOD

This study uses a bibliometric research design that combines performance analysis and science mapping to examine the development of Artificial Intelligence (AI) research within Islamic Education. Performance analysis evaluates scientific productivity, including publication trends, influential sources, authors, institutions, countries, and cited documents. Meanwhile, science mapping explores the field's conceptual, social, and intellectual structures by analyzing keyword relationships, collaboration networks, thematic development, and citation patterns. (Aria & Cuccurullo, 2017; Donthu et al., 2021). Document identification, screening, and selection followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure a systematic and transparent corpus construction process. (Page et al., 2021). In this study, PRISMA was used only as a framework for document selection, while bibliometric analysis was subsequently applied to the metadata of eligible publications.

Bibliographic data were sourced from Scopus due to its comprehensive coverage. (Baas et al., 2020) and its provision of the necessary metadata for bibliometric analysis, including titles, abstracts, author keywords, author names, affiliations, publication sources, publication years, citation counts, DOIs, and citation lists. However, relying solely on Scopus may limit coverage, as relevant publications indexed in other databases may not be included. Therefore, interpret the findings as reflecting the development of AI research in Islamic Education within the Scopus-indexed literature. The search was conducted using the Advanced Search feature on 15 August 2026, utilising the TITLE-ABS-KEY field to capture titles, abstracts, and keywords. We applied no restrictions on year, language, or document type during the initial search; we introduced these restrictions during screening to ensure full traceability of exclusion decisions within the PRISMA framework. Because Scopus is continuously updated, we included only documents indexed up to the search date. The research period was thus defined as 2020 to 15 August 2026, with data from 2026 not representing the full calendar year.

The search strategy integrated three sets of terms representing Islamic Education, Artificial Intelligence technologies, and the educational context. The Scopus search query used was as follows:

TITLE-ABS-KEY (("Islamic education" OR "Islamic religious education" OR "Islamic learning" OR "Islamic pedagogy" OR "Islamic teaching" OR "Islamic studies" OR "Islamic higher education" OR "Islamic education institution*" OR "Islamic school*" OR "Islamic universit*" OR "Muslim education" OR madrasah OR madrasa OR "*madrasah aliyah*" OR "madrasah tsanawiyah" OR "madrasah ibtidaiyah" OR pesantren OR "Islamic boarding school*" OR santri OR "Quranic education" OR "Qur'anic education" OR "Quran learning" OR "Qur'an learning" OR "Quran teaching" OR "Qur'an teaching" OR "Quran memorization" OR "Qur'an memorization" OR tahfiz OR tahfidz OR hifz OR tajwid OR *tajweed* OR "Quranic studies" OR "Qur'anic studies" OR "hadith education" OR "Quran and Sunnah Studies" OR "Pendidikan Agama Islam" OR "Akidah Akhlak") AND ("artificial intelligence" OR "machine learning" OR "deep learning" OR "natural language processing" OR "large language model*" OR LLM* OR "generative AI" OR "generative artificial intelligence" OR GenAI OR ChatGPT OR chatbot* OR "intelligent tutoring system*" OR "adaptive learning" OR "educational data mining" OR "expert system*" OR "decision support system*" OR "recommender system*" OR "speech recognition" OR "computer vision" OR "AI-based" OR "AI-assisted" OR "AI-powered") AND (educat* OR learn* OR teach* OR student* OR teacher* OR curriculum OR assessment OR pedagogy OR instruction* OR school* OR universit* OR madras* OR pesantren))

The query identified 296 documents initially. We exported all retrieved metadata as a CSV for screening and analysis. Before screening, we checked the retrieved records for duplicate entries and metadata inconsistencies. We removed duplicate records and standardised author names, keywords, and bibliographic information to improve data consistency before bibliometric analysis. The exported records included bibliographic information such as titles, abstracts, author keywords, authors, affiliations, publication sources, publication years, citation information, DOI records, and reference lists. The first screening limited publications to those from 2020 to 15 August 2026, excluding

48 documents published prior to 2020 and leaving 248 documents. The next phase retained publications in English and Malay, excluding three documents in other languages, leaving 245 documents. Screening by document type retained relevant journal articles, review articles, conference papers, and book chapters, while excluding conference reviews, full books, errata, data papers, and other publication types not aligned with the unit of analysis. At this stage, 23 documents were eliminated, leaving 222 documents for relevance assessment based on title, abstract, and keywords.

Documents were retained if AI or related technologies constituted a substantive part of the research and maintained a direct connection to Islamic education, Qur'anic learning, madrasah, *pesantren*, Islamic higher education, Islamic religious instruction, teacher competency, assessment, AI literacy, ethics, education governance, or other Islamic learning contexts. Conversely, documents were excluded if AI was only mentioned as a general context, used solely as a data analysis technique, or was not a substantive part of the research problem. Documents were also excluded if "Islamic" referred only to an institution or research location, or if the research focused on Islamic finance, health, industry, cybersecurity, hate speech detection, or other technical applications not substantively related to Islamic education.

To ensure rigour and minimise bias in line with PRISMA guidelines, two reviewers independently screened the title, abstract, and keywords of the 222 documents. Inter-rater reliability was assessed prior to resolving discrepancies, yielding a high level of agreement (Cohen's kappa = 0.86). Reviewers resolved disagreements about document eligibility and borderline cases by jointly re-examining the full text until they reached consensus. Of the 222 documents reviewed, 109 were excluded as irrelevant, while 11 were categorised as borderline because of insufficient linkage between AI and Islamic education. These results indicate that studies directly integrating AI and Islamic education within substantive educational contexts remain relatively limited, highlighting the need for a focused corpus to accurately map the development of this emerging research domain. Following the consensus process, we conservatively

excluded borderline documents, resulting in a final corpus of 102 documents. Figure 1 presents the selection process.

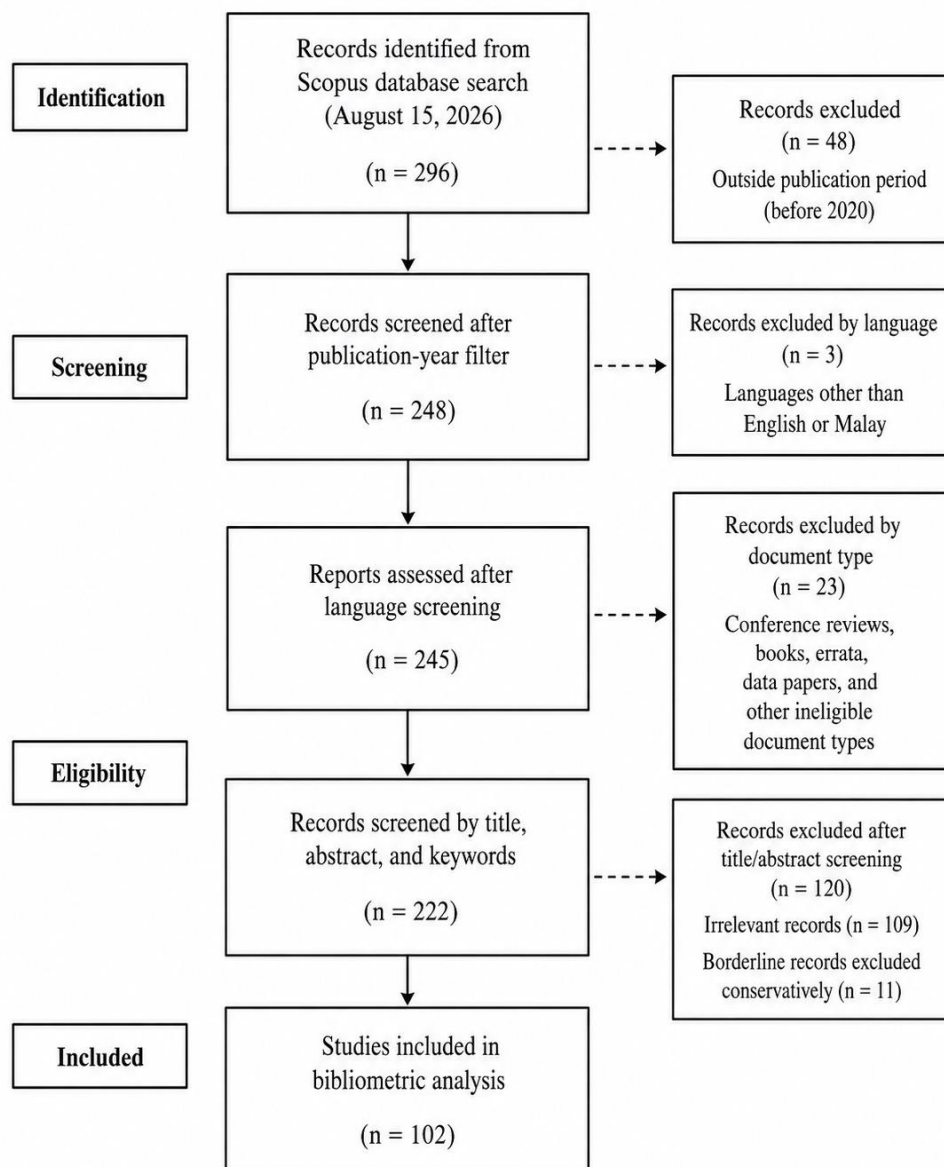


Figure 1. PRISMA Framework

We analysed the 102 documents in the final corpus using two principal approaches: performance analysis and science mapping. Performance analysis identified annual publication trends, publication sources, authors, affiliations, countries, and the most-cited documents. Science mapping mapped the field's conceptual, social, and intellectual structure through analyses of author keyword frequency, thematic maps, thematic evolution, keyword co-occurrence, country co-authorship, bibliographic coupling, and co-citation analysis. Data

processing was conducted using Bibliometrix/Biblioshiny and VOSviewer. Biblioshiny was used to analyze the main characteristics of the corpus, including annual scientific production, publication sources, authors, affiliations, country distribution, highly cited documents, author keyword frequency, thematic maps, and thematic evolution (Aria & Cuccurullo, 2017; Donthu et al., 2021; Julia et al., 2020). We used VOSviewer to visualize keyword co-occurrence, country co-authorship, bibliographic coupling, and co-citation networks.

Before keyword analysis, we standardized variations of terms with equivalent meanings using a thesaurus to minimize term fragmentation. For example, AI and artificial intelligence (AI) were standardized as artificial intelligence, machine learning (ML) as machine learning, different spellings of tajwid as *tajweed*, and various terms for Qur'anic recitation as Quran recitation. We applied standardization only to terms with equivalent meanings and did not use it to merge distinct concepts.

For keyword co-occurrence analysis, the unit of analysis was author keywords with a minimum threshold of three occurrences. The threshold values were determined based on the size of the final corpus and the objective of maintaining meaningful network relationships while minimizing isolated or insignificant connections in the visualization process. Eighteen keywords met this criterion and were used to construct the conceptual network. Country co-authorship analysis required at least two documents per country, using fractional counting. Bibliographic coupling was conducted at the document level using fractional counting without applying a minimum citation threshold. We made this decision to preserve recent publications that may have limited citation exposure but contribute to emerging research directions in the field. Documents not connected to any others were excluded from the final network. We performed co-citation analysis at the level of cited references, with a minimum of three citations; references lacking co-citation relationships were omitted from the network visualization.

We analyzed thematic evolution by dividing the corpus into three periods: 2020–2024, 2025, and 2026. This segmentation enabled us to observe thematic continuity and change between the initial phase of research development and

the period of accelerated publication volume. For 2026, we included only publications indexed up to 15 August 2026. This design focused the analysis on mapping publication trends, conceptual structures, collaboration patterns, research fronts, and the intellectual foundations of AI research in Islamic Education, while identifying areas that remain insufficiently mapped, including possible thematic shifts such as GenAI, without prematurely assuming the dominance of any particular theme.

RESULTS AND DISCUSSION

Publication Trends and Principal Contributors

A bibliometric analysis examined 102 documents published between 2020 and 15 August 2026, spanning 79 publication sources. The dataset comprised 386 authors, averaging four co-authors per document. International collaboration occurred in 27.45% of publications. The corpus contained 357 author keywords and 4,045 references, with an average of 3.725 citations per document. Table 1 summarizes these corpus characteristics.

Table 1. Main Information of the Bibliometric Dataset

Indicator	Value
Timespan	2020–2026
Documents	102
Sources	79
Authors	386
Co-authors per document	4
International co-authorship	27.45%
Author keywords	357
References	4,045
Average citations per document	3.725
Annual growth rate	58.74%

Table 1 demonstrates that research on artificial intelligence (AI) in Islamic education has expanded rapidly during the observation period. The annual growth rate reached 58.74%, indicating a substantial increase in publication activity in recent years. However, this growth rate must be considered alongside the annual distribution of publications, since the 2026 data include only

publications indexed up to 15 August 2026. Therefore, the number of 2026 publications does not represent scientific output for a full calendar year.

Yearly changes in publication volume offer deeper insight into the field's developmental phases. Figure 2 illustrates the annual scientific production on artificial intelligence in Islamic education during the study period.

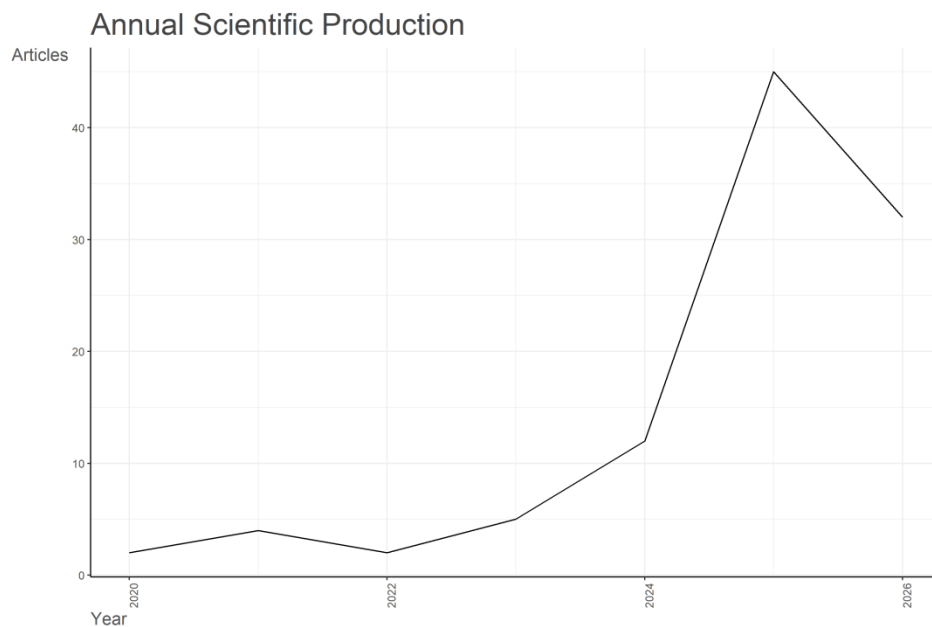


Figure 2. Annual Scientific Production on Artificial Intelligence in Islamic Education, 2020–2026

Figure 2 shows that publications remained limited from 2020 to 2023, with two documents in 2020, four in 2021, two in 2022, and five in 2023. Growth accelerated in 2024 with 12 publications and increased sharply to 45 in 2025. As of 15 August 2026, 32 documents have been identified. This figure should not be directly compared with 2025 as an indication of decline, since the 2026 data represent only a partial year. This pattern indicates that the surge in academic attention to AI in Islamic education has primarily occurred since 2024. This acceleration reflects a broader shift in educational research, where artificial intelligence is increasingly examined not only as a computational technology but also as a tool shaping teaching practices, learning support, and institutional transformation. The increase also coincides with growing global attention toward generative AI and large language models after 2023. However, the bibliometric evidence only demonstrates a temporal association and does not establish that a specific technological development directly caused the increase in publications.

This increase in publications spans various journals and conference proceedings, indicating that the field's development is not concentrated in a single type of publication source. Figure 3 identifies the ten sources with the most documents on this topic.

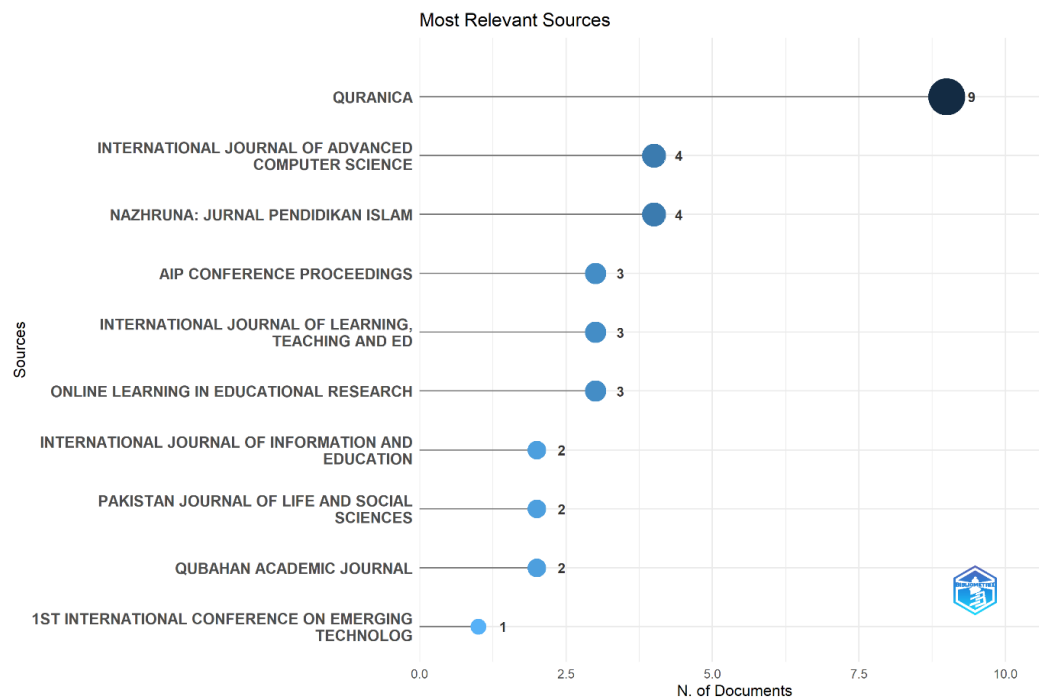


Figure 3. Most Relevant Sources Publishing Research on Artificial Intelligence in Islamic Education

Quranica published the most documents, totalling nine. The International Journal of Advanced Computer Science and Applications and Nazhruna: Jurnal Pendidikan Islam each published four documents. The AIP Conference Proceedings, International Journal of Learning, Teaching and Educational Research, and Online Learning in Educational Research each published three. This distribution underscores the interdisciplinary nature of research in this field. The presence of Quranica and Nazhruna highlights the role of outlets focused on Islamic studies and education, while computer science journals and conference proceedings demonstrate the influence of technological perspectives. Thus, research on AI in Islamic education is shaped by the intersection of Islamic educational studies and computing (Arif et al., 2026). This interdisciplinary distribution suggests that AI research in Islamic education has not yet developed within a single disciplinary boundary. Instead, the field is being constructed through interaction between technological innovation and educational and

religious contexts. This structure suggests that future development requires dialogue between technical expertise and perspectives on pedagogy, ethics, and Islamic knowledge systems.

This interdisciplinary character is also reflected in authorship patterns. No single author dominates the corpus, and knowledge production remains distributed among numerous researchers. Table 2 lists the ten most-productive authors.

Table 2. Most Productive Authors in Artificial Intelligence and Islamic Education Research

Author	Articles	Fractionalized Articles
Abubakari MS	4	2.50
Anggraini N	3	0.65
Hidayanto AN	3	0.65
Rahman Y	3	0.65
Sukmana HT	3	0.65
Abas H	2	0.42
Adam MZ	2	0.42
Afifi MY	2	0.31
Al-Qahtani RTM	2	0.31
Alawdi A	2	1.20

Abubakari MS is the most productive author, with four documents. Anggraini N, Hidayanto AN, Rahman Y, and Sukmana HT each produced three documents, while the remaining authors in the top ten contributed two each. Fractionalized article values reveal varying collaboration patterns; for instance, Abubakari MS's four publications correspond to a fractionalized count of 2.50, while Alawdi A's two publications yield 1.20. This pattern indicates that productivity in the field remains dispersed rather than concentrated among a small core group of authors. The author distribution aligns with institutional contributions from various countries. Table 3 presents the affiliations with the most publications.

Table 3. Most Productive Affiliations in Artificial Intelligence and Islamic Education Research

Affiliation	Articles
Universiti Islam Antarabangsa Tuanku Syed Sirajuddin	5
Universiti Malaya	4
Universitas Islam Negeri Syarif Hidayatullah Jakarta	3
Universitas Islam Negeri Walisongo Semarang	3
Universitas Muhammadiyah Surakarta	3
Universitas Nahdlatul Ulama Surabaya	3

Affiliation	Articles
Universiti Sains Islam Malaysia	3
Hassan II University of Casablanca	2
Islamic University in Medina	2
Jordan University of Science and Technology	2

Universiti Islam Antarabangsa Tuanku Syed Sirajuddin (UniSIRAJ) is the most productive affiliation, with five documents, followed by Universiti Malaya with four. UIN Syarif Hidayatullah Jakarta, UIN Walisongo Semarang, Universitas Muhammadiyah Surakarta, Universitas Nahdlatul Ulama Surabaya, and Universiti Sains Islam Malaysia each contributed three. Institutions from Morocco, Saudi Arabia, and Jordan are also among the most productive affiliations. This composition shows a strong concentration of research activity in Southeast Asia, particularly Indonesia and Malaysia, while also reflecting participation from other regions. This pattern becomes clearer when authors' country affiliations are analysed in publication contributions. Figure 4 illustrates the geographical distribution of scientific output within the corpus.

Country Scientific Production

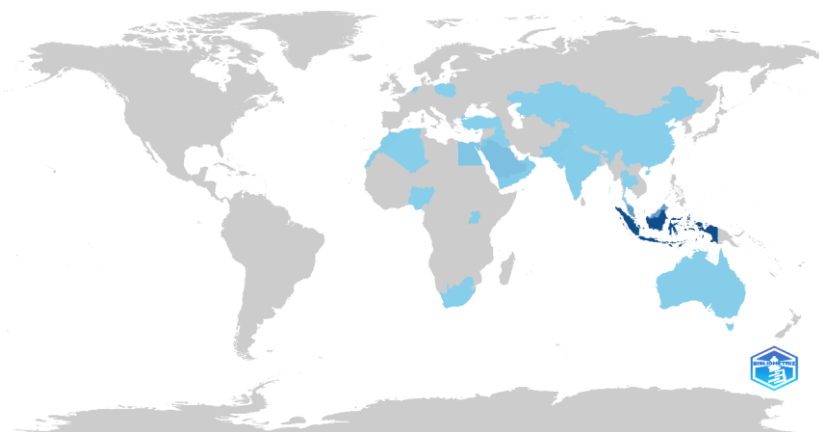


Figure 4. Geographic Distribution of Scientific Production in Artificial Intelligence and Islamic Education Research

Figure 4 shows that Indonesia and Malaysia are the primary centers of scientific output. Contributions also come from the Middle East, South Asia, North Africa, Africa, and Australia. This distribution indicates that research on AI in Islamic education has expanded internationally, although publication activity remains concentrated in a few countries. The concentration of research output in Indonesia and Malaysia may reflect the strong presence of Islamic educational

institutions, active higher education networks, and increasing engagement with educational technology initiatives in these countries. Nevertheless, this geographical concentration also suggests that research perspectives from other Islamic educational contexts remain comparatively limited within the current literature. Analysing country co-authorship will further clarify the pattern of geographical output, since a country's publication count does not always reflect the strength of collaborative relationships.

Beyond productivity, a publication's influence within the field can be assessed by its citation count. Table 4 lists the documents with the highest number of global citations, along with citation rate per year and normalised citation impact to contextualise publication age.

Table 4. Most Globally Cited Documents in Artificial Intelligence and Islamic Education Research

First Author	Year	Source	TC	TC/Year	Normalized TC
Abubakari MS	2024	AI-Enhanc Teach Methods	43	14.30	4.57
Alam S	2023	Int J Inf Educ Technol	40	10.00	2.38
Nahar KMO	2020.	Jordan J Computers Inf Tech	34	4.90	1.84
Achruh	2024	Int J Learn Teach Educ Res	28	9.30	2.97
Adiyono A	2025	Int J Learn Teach Educ Res	20	10.00	8.33
Nurhayati H	2023	Int J Adv Comput Sci Appl	15	3.80	0.89
Syukur F	2024	Nazhruna	15	5.00	1.59
Musolin MH	2025	Lect Notes Networks Syst	11	5.50	4.58
Al-Fadhli S	2023	Int J Adv Comput Sci Appl	11	2.80	0.65
Hijriyah U	2025	Int J Inf Educ Technol	10	5.00	4.17
Farooq J	2021	Int Conf Comput Electron Electr Eng	10	1.70	2.00
Nigar N	2023	Appl Comput Intell Soft Comput	10	2.50	0.60

The document by Abubakari MS (2024) received the most global citations, totalling 43, with an average of 14.30 citations per year. Alam S (2023) follows with 40 citations, Nahar KMO (2020) with 34, and Achruh (2024) with 28. Adiyono A (2025) has 20 citations and the highest normalised citation score (8.33). The difference between cumulative citation counts and normalised citation values highlights the importance of considering publication age when evaluating scientific visibility. Older articles have more time to accumulate citations, while several recent publications have achieved relatively high citation rates in a shorter period.

In summary, these findings reveal two principal characteristics in the development of research on AI in Islamic education. First, the field has experienced substantial publication growth, particularly since 2024, although the 2026 data are limited to 15 August. Second, knowledge production remains distributed among multiple authors, institutions, and outlets, with a clear

geographical concentration in Indonesia and Malaysia. Islamic education journals, technology journals, and computer science proceedings further underscore the field's interdisciplinary nature (Awaludin, 2024). This growth prompts further questions regarding the themes shaping the field, the development of inter-theme relationships, and the impact of generative AI on research trajectories. The following subsection examines these issues by analyzing conceptual structure and thematic development.

Conceptual Structure and Thematic Development

After examining publication growth and key contributors, the subsequent analysis focuses on the conceptual structure of research on artificial intelligence in Islamic education. This analysis utilises author keywords, thematic maps, thematic evolution, and keyword co-occurrence to identify dominant themes, inter-theme relationships, and shifts in research focus over time. Before conducting the analysis, we standardised variations of terms with equivalent meanings using a thesaurus to ensure spelling differences did not fragment the frequency of a given concept. For instance, we standardised AI and artificial intelligence as artificial intelligence; variants of machine learning as machine learning; tajwid as *tajweed*; and different renderings of Qur'anic recitation as Quran recitation.

The frequency of author keywords provides an initial overview of the most frequently utilised concepts within the corpus. Figure 5 presents the twenty keywords with the highest frequencies following the standardisation process.

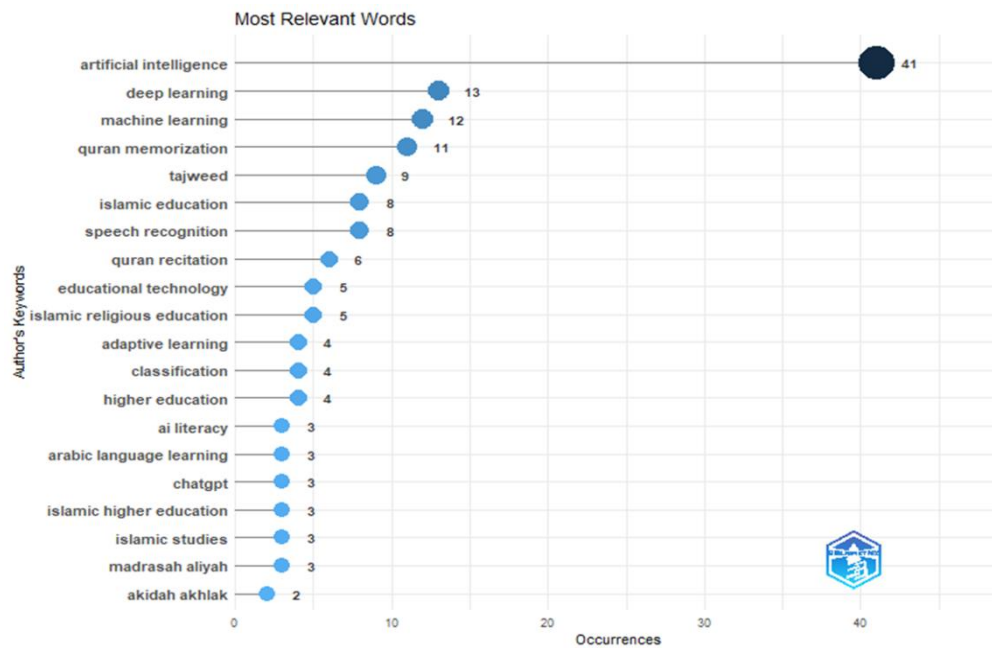


Figure 5. Most Frequent Author Keywords in Artificial Intelligence and Islamic Education Research

Figure 5 shows that artificial intelligence is the most dominant keyword, appearing 41 times, followed by deep learning (13 occurrences) and machine learning (12 occurrences). Beyond these general technological terms, several keywords are directly related to Islamic learning and the Qur'an. Quran memorisation appears eleven times, tajweed nine times, Islamic education and speech recognition eight times, and Quran recitation six times. Educational technology and Islamic religious education each occur five times. This composition indicates that two interrelated thematic groups shape the research structure: artificial intelligence technology and its applications in Islamic education.

The predominance of deep learning, speech recognition, Quran memorisation, *tajweed*, and Quran recitation suggests that Qur'anic learning constitutes one of the principal areas of artificial intelligence application. At the same time, the emergence of Islamic education, Islamic religious education, educational technology, and higher education suggests that research is extending beyond developing technical systems into broader pedagogical issues. AI literacy and ChatGPT each appear three times, indicating their presence in the literature, though they do not yet occupy as prominent a position as machine

learning and deep learning. This frequency pattern should be considered alongside each theme's position within the field's structure.

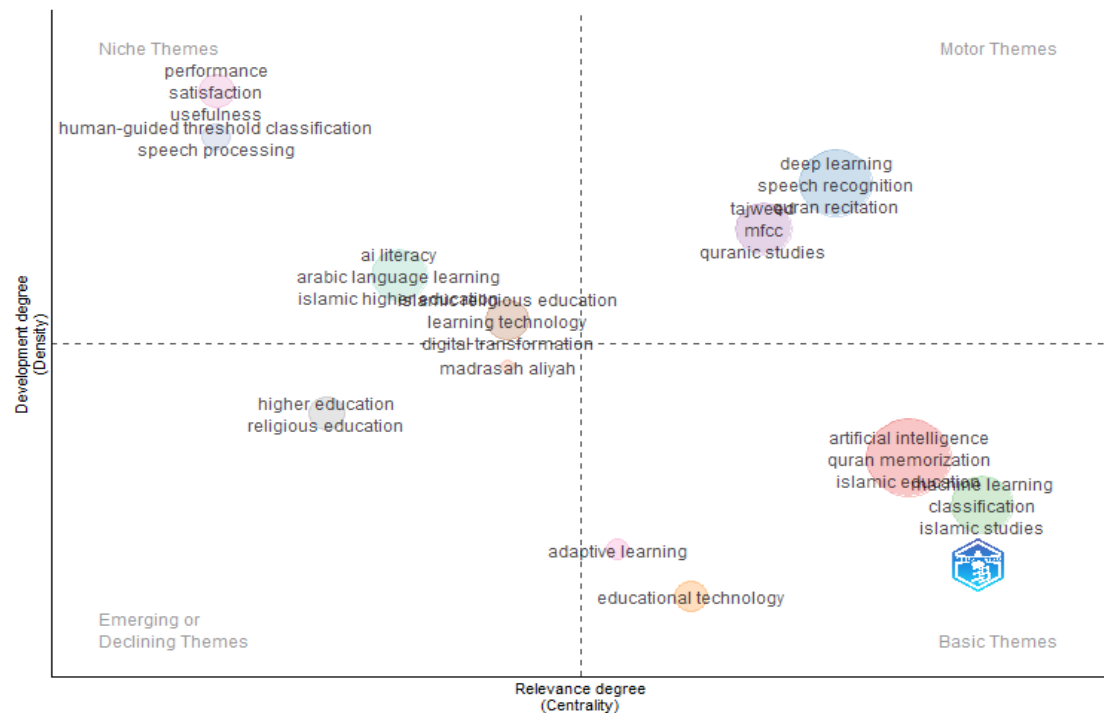


Figure 6. Thematic Map of Artificial Intelligence in Islamic Education Research

Figure 6 maps the themes according to centrality and density. Deep learning and *tajweed* are situated within the 'motor themes' area, indicating that these two themes possess well-developed internal relationships and are simultaneously connected to other segments within the research domain. This position aligns with the high frequency of speech recognition and Qur'an recitation, supporting the view that technologies for recognising and evaluating Qur'anic recitation have developed into a robust research theme.

Conversely, artificial intelligence, machine learning, educational technology, and adaptive learning fall primarily under basic themes. These themes connect broadly with other topics and form the foundation for many artificial intelligence applications in Islamic education. More specific themes, such as AI literacy, Islamic religious education, and madrasah aliyah, tend to occupy a more specialised domain and have not yet established as strong interconnections as the basic themes. Meanwhile, higher education is positioned more peripherally. The placement on the thematic map alone is insufficient to

determine whether peripheral themes are developing or declining; thematic evolution must be examined to determine the direction of change.

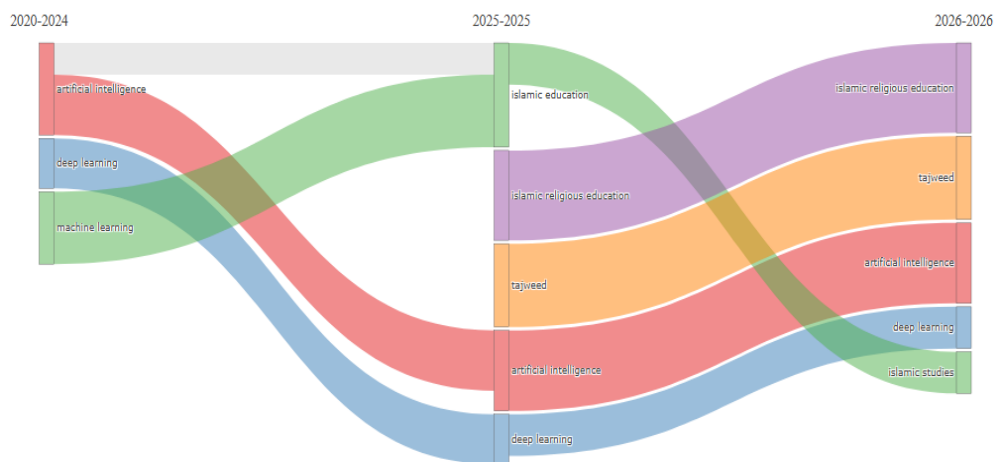


Figure 7. Thematic Evolution of Artificial Intelligence in Islamic Education Research, 2020–2026

Thematic evolution divides the corpus into three periods: 2020–2024, 2025, and 2026. The 2026 period represents partial-year data, as it includes only publications indexed up to 15 August 2026. In 2020–2024, the thematic structure was primarily shaped by artificial intelligence, deep learning, and machine learning. This pattern suggests that the field's early development relied largely on technological approaches and capabilities.

In 2025, thematic relationships diversified. Artificial intelligence and deep learning persisted, but increasingly connected with Islamic education, Islamic religious education, and *tajweed*. By 2026, Islamic religious education, *tajweed*, and Islamic studies became more prominent alongside previously established technological themes. This interpretation is supported by changes in keyword relationships across periods, where later thematic structures show stronger connections between AI technologies and educational, linguistic, and institutional contexts. Therefore, the observed development reflects changes in thematic associations rather than a replacement of earlier technological research areas. This change does not suggest that new themes have replaced older technologies. Rather, the field has evolved as artificial intelligence applications

group links adaptive learning, educational technology, Islamic education, Quran memorisation, and *tajweed*, indicating the use of artificial intelligence to support Islamic pedagogy and Qur'anic learning. Another technical stream connects deep learning, Quran recitation, and speech recognition, reinforcing the thematic map's findings on the importance of speech processing technology in Qur'anic research.

Beyond these two streams, the network also reveals connections among artificial intelligence, higher education, and Islamic religious education, as well as among AI literacy, Arabic language learning, and Islamic higher education. This pattern suggests that research attention is shifting from system development to AI applications in educational institutions, user competencies, and language learning. ChatGPT appears in the network alongside machine learning, classification, and Islamic studies. This position indicates that generative AI is present within the conceptual structure, though it has not yet become a central node in the network.

Taken together, Figures 5 through 8 show the gradual development of the conceptual structure of artificial intelligence research in Islamic education. Technical applications, particularly machine learning, deep learning, and speech recognition, remain essential components of the field and have established clear research streams within Qur'anic learning. However, these themes are now evolving alongside more pedagogical and institutional issues, such as Islamic religious education, higher education, AI literacy, Arabic language learning, and personalised learning. This shift suggests that research attention is moving from questions about technology's functionality to how such technologies are used in educational processes.

Generative AI should be interpreted within this broader transformation. The emergence of ChatGPT and generative AI signals a new direction, yet bibliometric evidence does not support the claim that generative AI has become a dominant theme. Instead, the field is diversifying: what was once concentrated on technical applications now encompasses pedagogical issues, user competence, technological acceptance, and increasingly specific uses of artificial intelligence in Islamic educational contexts (Sahar & Munawaroh, 2025). These

findings address RQ3 and show that the field's conceptual development does not occur through replacing one technology with another, but through expanding the functions and contexts in which artificial intelligence is employed. This expansion subsequently raises questions regarding who forges these research connections, how research fronts emerge, and which literature constitutes their intellectual foundations. The following subsection focuses on these questions.

Collaboration, Research Fronts, and Intellectual Foundations in Artificial Intelligence and Islamic Education

The growing diversity of research themes in artificial intelligence and Islamic education must be analyzed alongside the social and intellectual structures that support this field. Country co-authorship analysis identifies patterns of international collaboration, while bibliographic coupling detects research fronts by examining similarities in the references cited within documents. Co-citation analysis reveals references that collectively form the field's intellectual foundations. Together, these three analytical approaches offer distinct yet complementary perspectives on the development of artificial intelligence research in Islamic education as an interconnected knowledge network.

The country co-authorship analysis applies a minimum threshold of two documents per country using fractional counting. The resulting network comprises 13 countries, four clusters, 16 links, and a total link strength of 24.50. The patterns of international collaboration are presented in Figure 9.



Figure 9. Country Co-authorship Network in Artificial Intelligence and Islamic Education Research

Figure 9 demonstrates that Indonesia and Malaysia occupy the most prominent positions within the collaboration network. Indonesia is represented in 58 documents with a total link strength of 14, while Malaysia appears in 21 documents with a total link strength of 10. Both countries are not only active in producing publications but also maintain relatively strong collaborative ties with other nations. The network connects Indonesia and Malaysia with Australia and Morocco, while additional collaborations exist among Arab countries such as Egypt, Jordan, the United Arab Emirates, and Yemen. Further connections are observed between India, Pakistan, and Saudi Arabia, as well as between Brunei Darussalam and Uganda.

This pattern demonstrates that international collaboration exists but remains unevenly distributed. Indonesia and Malaysia serve as central hubs, while other countries connect primarily through regional groups or limited partnerships. These results align with the geographical distribution shown in Figure 4, which underscores the significant contributions from Southeast Asia. However, high publication output does not always translate into strong collaborative ties; countries with many publications may not show correspondingly high total link strength. Therefore, advancing this field relies not only on increasing publication volume but also on expanding cross-national and interdisciplinary collaborations.

This collaborative structure is related to the types of research currently developing in this field. To identify research groups that use similar bodies of literature, the analysis uses bibliographic coupling. Documents with no connections are excluded from the network. Bibliographic coupling links 70 documents, while the principal network component visualized by VOSviewer includes 65 documents, eight clusters, 203 links, and a total link strength of 185.50.

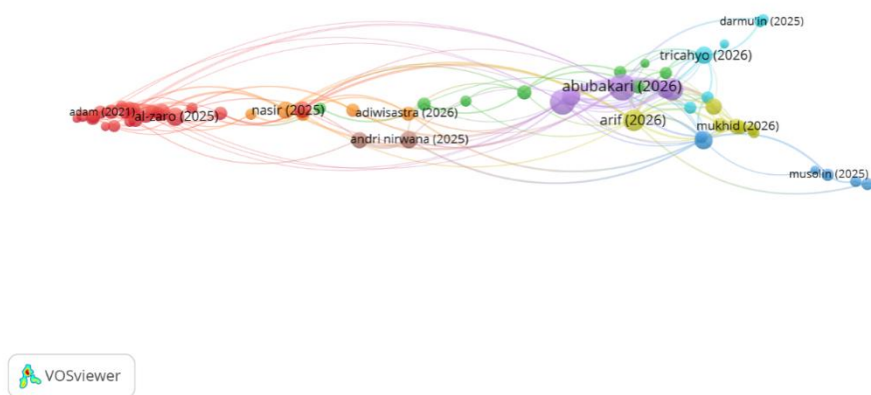


Figure 10. Bibliographic Coupling Network of Documents in Artificial Intelligence and Islamic Education Research

Figure 10 shows that research fronts in this field have developed as multiple distinct clusters rather than a single homogeneous group. The most prominent research streams focus on deep learning, speech recognition, and classification methods for Qur'anic recitation recognition, pronunciation error detection, and *tajweed* evaluation. The prominence of these research groups supports findings from the thematic map and keyword co-occurrence analyses, indicating that technology-enhanced Qur'anic learning using speech technology represents one of the more mature areas within the literature.

Beyond technical applications, research fronts have expanded into pedagogical and institutional domains. Several studies address AI literacy, user readiness, technology acceptance, governance, and the transformation of AI-based learning in Islamic educational institutions. Other clusters connect

personalized learning, Qur'anic memorization, and adaptive learning, while emerging research trajectories focus on natural language processing, Arabic language learning, and generative AI (GenAI). The structure of bibliographic coupling thus demonstrates that AI research in Islamic education increasingly addresses the acceptance, utilization, and management of technology within educational processes, rather than focusing solely on system development.

GenAI is present in several segments of the research network, particularly in studies on Islamic higher education, natural language processing, language learning, and personalized learning. However, its role remains peripheral compared to earlier-developed research fronts. This observation supports the previous subsection's conclusion that GenAI has not yet become a central focus in the field; instead, it is evolving alongside topics such as AI literacy, technology acceptance, ethics, and governance. Recent developments are thus shaped both by the emergence of new technologies and by the need to understand their application within the context of Islamic education.

The difference between the total references reported in the dataset description and the cited references identified during co-citation analysis reflects the reference-processing procedure. The dataset description reports the total number of references extracted from the bibliographic metadata, whereas VOSviewer identifies cited reference records after parsing, normalization, and network construction procedures. These developments highlight the knowledge base researchers use. We conducted co-citation analysis at the level of cited references to identify sources frequently cited together. Of the 4,112 citations identified by VOSviewer, a minimum threshold of three citations produced 15 references. One reference lacking co-citation links was excluded from the network, resulting in a final visualisation comprising 14 references, four clusters, 54 links, and a total link strength of 19.50.

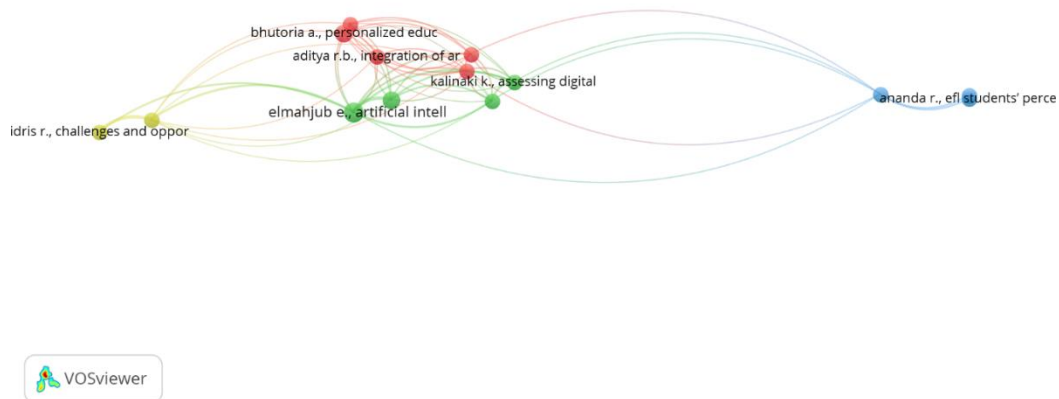


Figure 11. Co-citation Network of Cited References in Artificial Intelligence and Islamic Education Research

Figure 11 shows that this field's intellectual foundation draws on multiple literary traditions. Some references focus on personalised learning, AI-based educational systems, and digital learning frameworks. Others focus more closely on AI ethics, digital competence, technology acceptance, and technology use that reflects Islamic education values. Literature addressing perceptions of AI, the integration of technology in Islamic learning, and the opportunities and challenges of AI in education also forms an important component of the network. Among the selected references, Elmahjub's work, with six citations and a total link strength of six, stands out as one of the most prominent in the co-citation network.

This diversity demonstrates that AI research in Islamic education has not yet converged on a single dominant theoretical framework. Researchers continue to draw on concepts from related fields, including artificial intelligence, educational technology, digital competence, technology acceptance, personalized learning, and ethics. This reflects the field's developmental stage. This finding extends previous observations in AI education research by showing that Islamic education introduces additional dimensions beyond technological adoption, including religious knowledge authority, ethical considerations, and

contextualized pedagogical practices. Therefore, the field's intellectual development requires theoretical integration across artificial intelligence research, educational technology, and the distinctive characteristics of Islamic education. While the diversity of references enables broader approaches, the lack of a robust theoretical foundation highlights the need for a framework that systematically integrates technological, pedagogical, value-based, and character dimensions of Islamic education.

Taken together, these three analyses show that the field is evolving across three interrelated levels. At the social level, international collaboration networks have emerged but remain concentrated primarily in Indonesia and Malaysia. At the level of contemporary research, bibliographic coupling reveals several research fronts, including technology for Qur'anic learning, AI literacy, technology acceptance, personalized learning, governance, and GenAI. At the intellectual level, co-citation analysis shows that the knowledge base still draws on several traditions that have not yet consolidated into a unified theoretical foundation.

These findings address Research Question 4 and indicate that AI research in Islamic education is advancing more rapidly in application and thematic development than in consolidating its intellectual foundations. The field has produced multiple research fronts and initiated international collaboration networks, yet cross-national relationships remain uneven, and theoretical frameworks remain fragmented. This situation creates opportunities to develop new AI applications, strengthen cross-country collaboration, evaluate AI use in diverse educational contexts, and construct conceptual frameworks that align more closely with the characteristics of Islamic education. These implications inform the synthesis and research agenda outlined in the following subsection.

Synthesis of Findings, Implications, and Research Agenda

Overall, the research findings show that the study of AI in Islamic education is developing rapidly, though progress remains uneven across different dimensions of the field. Publication growth has accelerated, especially since 2024, and the conceptual structure indicates that machine learning, deep learning, and speech recognition remain central to ongoing research. At the same

time, the scope has expanded to include Islamic religious education, AI literacy, personalized learning, technology acceptance, ethics, and governance. This trend shows that the field is increasingly concerned with applying AI technologies in the specific context of Islamic education, rather than focusing solely on technical capabilities.

These findings further clarify GenAI's role in the field's development. ChatGPT and generative AI appear in author keywords, keyword co-occurrence analyses, and several research fronts, but they have not yet achieved sufficient prominence to be considered dominant themes. Consequently, research evolution should not be described as a simple transition from conventional AI to GenAI. Instead, bibliometric evidence points to diversification, where established technical applications persist, and GenAI develops alongside new topics such as AI literacy, Arabic language learning, personalized learning, and responsible AI use. In this context, GenAI is best understood as an emerging research trajectory shaping a new domain within Islamic education.

These developments have important implications for research in Islamic education. Evaluating AI systems should extend beyond algorithmic capability, accuracy, or technical achievement. (Li et al., 2023). When AI is applied to Qur'anic learning, religious education, Arabic language learning, or the dissemination of religious information, research must also address learning quality, user competence, information accuracy, educational values, and teachers' role in the pedagogical process. (Mainuddin et al., 2025). This consideration is particularly critical in the context of GenAI, as such systems may produce responses that appear convincing but are not necessarily accurate or consistent with relevant religious sources.

At the field development level, country co-authorship and co-citation analyses reveal two key challenges. First, research activity and collaboration are highly concentrated in a few countries, especially Indonesia and Malaysia. While this concentration shows Southeast Asia's strength in AI and Islamic education research, it also highlights the need for broader collaboration to ensure research outcomes reflect diverse educational contexts. Second, the field's intellectual foundations remain varied and have not yet produced a dominant theoretical

framework. Future research should foster dialogue among AI studies, educational technology, pedagogy, ethics, and the character of Islamic education to ensure that theoretical development keeps pace with applied advances.

These findings suggest several research agendas. Research on GenAI should progress from exploring potential uses to empirically evaluating its effectiveness within Islamic learning processes. (Qian, 2025). Future studies should assess AI's impact on learning outcomes, student engagement, user experience, and implementation sustainability. Further investigation into AI literacy is needed, particularly regarding the preparedness of teachers, students, and Islamic educational institutions to understand AI's capabilities and limitations. (Almatrafi et al., 2024). Additionally, ethical and governance issues require more systematic development to address content accuracy, algorithmic bias, academic integrity, protection of religious knowledge authority, and mechanisms for responsible AI usage.

Another important agenda involves expanding research contexts. Comparative cross-national studies can examine how variations in educational systems, cultures, languages, and institutions affect the acceptance and use of AI in Islamic education. Research should also promote interdisciplinary collaboration, as emerging challenges cannot be fully addressed from computer science or education alone. Collaboration among experts in technology, education, Islamic studies, linguistics, and ethics can provide a more comprehensive approach to evaluating both the benefits and risks of AI adoption.

Accordingly, this research not only documents the increase in publication volume but also maps the evolving structure of the AI field in Islamic education. The field appears to be developing from a strong emphasis on technical applications toward broader attention to pedagogy, user competence, governance, and GenAI-related issues. However, this evolution remains marked by geographic concentration, uneven international collaboration, and an intellectual foundation that is not yet fully consolidated. These findings suggest that the next stage of research development requires not only more advanced technology but also more robust empirical research, a more integrated

conceptual framework, and broader collaboration to ensure that AI use effectively addresses the needs and character of Islamic education.

CONCLUSION

This study shows that artificial intelligence (AI) research in Islamic education has shifted from predominantly technology-oriented investigations to broader educational, institutional, ethical, and governance concerns. Based on bibliometric analysis of 102 Scopus-indexed documents published between 2020 and 15 August 2026, the field demonstrates rapid publication growth, particularly since 2024, while research activity remains concentrated in several countries, especially Indonesia and Malaysia. AI, machine learning, and deep learning applications in Qur'anic learning, including speech recognition, tajweed assessment, and memorization support, primarily shape the conceptual structure. However, thematic evolution indicates an emerging expansion toward pedagogical integration, AI literacy, technology acceptance, personalized learning, and responsible adoption of generative AI (GenAI).

This study contributes an integrated understanding of how AI research in Islamic education is developing across publication trends, thematic structures, collaboration patterns, research fronts, and intellectual foundations. The findings indicate that GenAI is an emerging research trajectory rather than a dominant thematic core. At the same time, co-citation patterns show that the field's intellectual structure spans multiple research traditions, suggesting opportunities for stronger theoretical integration across AI, educational technology, and Islamic education.

Future research should move beyond technological development by empirically examining the educational effectiveness, ethical implications, governance requirements, and contextual suitability of AI applications in Islamic education. Further investigation is also needed to strengthen interdisciplinary collaboration, expand research representation beyond currently dominant regions, and develop frameworks that integrate technological innovation with pedagogical, ethical, and religious considerations.

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