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Zacky Khairul Umam

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Aziz Awaludin

Documenting the Half-Century Evolution of Islamic Education Research: A Probabilistic Topic Modeling Study of the Literature from 1970 to 2023

Abstract: *In this systematic literature review, I used Correlated Topic Modeling (CTM), a machine learning technique, to analyze 1,116 Scopus-indexed documents on Islamic education spanning 54 years (1970-2023). I identified 19 topics grouped into four thematic clusters: Foundational Concepts and Methods, Social Issues, Teaching and Learning, and Education Systems and Settings. My main argument is that Islamic education is inherently interdisciplinary, encompassing history, philosophy, leadership, policy, citizenship, gender, and technology. While some topics, like education history and values education, have seen consistent focus, others, such as citizenship, education policy, and student learning, remain underexplored. My analysis reveals the field's adaptability to societal and technological changes. Particularly, I discuss the implications for Southeast Asia's Islamic education, which has balanced modernization and national policies with global trends. By pioneering machine learning applications in this field, this review uncovers new research directions and demonstrates the potential of large-scale text analysis for Islamic education scholarship.*

Keywords: Islamic Education, Scopus Publication, Correlated Topic Modeling (CTM), Machine Learning, Systematic Literature Review.

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Abstrak: *Dalam kajian literatur sistematis ini, saya menggunakan* Correlated Topic Modeling (CTM)*, sebuah teknik* machine learning*, untuk menganalisis 1.116 dokumen riset tentang pendidikan Islam yang terindeks Scopus selama 54 tahun (1970-2023). Saya mengidentifikasi 19 topik yang dikelompokkan menjadi empat klaster tematik: Konsep dan Metode Dasar, Isu Sosial, Pengajaran dan Pembelajaran, serta Sistem dan Lingkungan Pendidikan. Argumen utama saya adalah bahwa pendidikan Islam secara inheren bersifat interdisipliner, mencakup sejarah, filsafat, kepemimpinan, kebijakan, kewarganegaraan, gender, dan teknologi. Beberapa topik, seperti sejarah pendidikan dan pendidikan nilai, telah mendapat perhatian konsisten, sementara topik lain, seperti kewarganegaraan, kebijakan pendidikan, dan pembelajaran siswa, masih kurang dieksplorasi. Analisis saya mengungkap kemampuan bidang ini beradaptasi dengan perubahan sosial dan teknologi. Secara khusus, saya membahas implikasi untuk pendidikan Islam di Asia Tenggara, yang menyeimbangkan modernisasi, kebijakan nasional, dan tren global. Dengan memelopori penggunaan machine learning, kajian ini membuka arah penelitian baru untuk analisis teks skala besar dalam penelitian pendidikan Islam.*

Kata kunci: Pendidikan Islam, Publikasi Scopus, Correlated Topic Modeling (CTM), Machine Learning, Kajian Sistematis Literatur.

ملخص: في هذا البحث الاستعراضي المنهجي، استخدمت نمذجة الموضوعات المرتبطة (Correlated Topic Modelling/CTM)، وهي تقنية من تقنيات التعلم الآلي، لتحليل ١١١٦ وثيقة بحثية حول التربية الإسلامية مفهرسة في سكوبوس (Scopus) خلال ٥٤ عامًا (١٩٧٠–٢٠٢٣). وقد تم التعرف على ١٩ موضوعًا تم تجميعها في أربعة مجالات مواضيعية رئيسية؛ المفاهيم والأساليب الأساسية، والقضايا الاجتماعية، والتعليم والتدريس، والنظم والبيئات التعليمية. وتتمثل الحجة الرئيسية في أن التربية الإسلامية هي في جوهرها متعددة التخصصات، حيث تشمل التاريخ والفلسفة والقيادة والسياسة والمواطنة والجندر والتكنولوجيا. وقد حظيت بعض الموضوعات، مثل تاريخ التربية والتربية القيمية، باهتمام ثابت، في حين أن موضوعات أخرى، مثل المواطنة والسياسات التعليمية وتعلم الطلاب، لا تزال بحاجة إلى مزيد من الاستكشاف. يكشف التحليل عن قدرة هذا المجال على التكيف مع التغيرات الاجتماعية والتكنولوجية. وبشكل خاص، تمت مناقشة الآثار المترتبة على التربية الإسلامية في جنوب شرق آسيا، والتي توازن بين التحديث والسياسات الوطنية والاتجاهات العالمية. من خلال الريادة في استخدام التعلم الآلي، يفتح هذا البحث آفاقًا جديدة للبحث في تحليل النصوص على نطاق واسع في مجال بحوث التربية الإسلامية.

الكلمات المفتاحية: التربية الإسلامية، منشورات سكوبوس (Scopus)، نمذجة المواضيع المترابطة، التعلم الآلي، المراجعة المنهجية للأدبيات.

Research in Islamic education explores various dimensions of education within Islamic cultural, historical, intellectual, and theological traditions. Sahin (2018) explained that the goal of Islamic education research is to generate knowledge for guiding professional practices and shaping policies in the field. It is vital for quality Islamic religious education by laying the groundwork for a better understanding of religious educational processes (Ulfat 2020). Looking at previous studies (e.g., Stone 1970), the historical challenges faced by Islamic education due to scholasticism[1]. The investigation found the impact on institutions like the Ottoman *medrese* (Islamic schools) and the debate between those emphasizing divine revelation and those committed to logical reasoning (Stone 1970). Through his research, Stone (1970) has stressed the influence of Averroes on European thought and contemporary approaches to reconcile faith and reason in Islamic education. Additionally, in more recent times, Sahin (2018) considers Islamic education studies as a unique academic framework. He accentuated the need for a transformative culture in Muslim education to encourage critical thinking and positive change. Further, Sahin (2018) has argued that the convergence and divergence between Islamic and Western education values have offered a new interdisciplinary research agenda for Islamic education.

While the two pieces provide a functional, in-depth literature review analysis, they do not fully capture the breadth and evolution of Islamic education research over time. I noticed even other past review studies on Islamic education have notable limitations regarding methodology, geography, context, and period examined. Specifically, many previous reviews relied primarily on qualitative methods (e.g., Yasin and Jani 2013), focused only on specific countries (e.g., Azra 2018; Jamhari 2009; Zaini 2022) or contexts like higher education (e.g., Sahin 2018), or were limited to looking at certain periods (e.g., Tolchah and Mu'ammar 2019). This results in that, as Sahin (2018) argued, current Islamic education research "remains unsystematic and often lacks conceptual depth and clarity" due to "fundamental methodological shortcomings" (Sahin 2018, 2). This systematic review study, therefore, aims at addressing these research gaps. By "systematic review," I mean a research review that synthesizes knowledge from numerous studies on a specific topic by

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using a structured, rigorous approach to minimize bias and offer a thorough understanding of the research area (Caldwell and Bennett 2020; González-Garay, Mayorga-Butrón, and Ochoa-Carrillo 2015).

What is needed is a review that overcomes the limitations of existing scholarship by taking a broad approach to examining Islamic education research globally, tracing its evolution from past to present, and using novel methods. This review could significantly advance understanding of the magnitude and topics addressed in Islamic education literature over time using a machine learning (ML) technique from the data science traditions—in simple terms, ML is a subset of artificial intelligence that enables computers to learn from data and make decisions or predictions without explicit programming (Sarker 2021). In this day and age, there is a clear need for a study that holistically maps the terrain of Islamic education knowledge production. Responding to those considerations, I have endeavored to document the topics discussed throughout the evolution of Islamic education research over time. Based on my search using the Scopus database (Scopus 2024a), the scholarly literature on Islamic education can be traced back half a century, from 1970 to 2023, with 1,116 documents. However, qualitatively reviewing this vast body of literature presents significant challenges regarding time, human resources, and funding.

Addressing these challenges, in this review study, I used probabilistic topic modeling methods, to analyze the collected 1,116 documents without manual hand coding. I provide a detailed description of topic modeling in the following section; topic modeling is an automated text mining method used to discover main themes emerging from an extensive collection of texts (Blei, Ng, and Jordan 2003). This inductive approach can enable, borrowing Wang, Bowers, and Fikis's words (2017, 306), "a panoramic view" of the scholarship's topics. To the best of my knowledge, this study is the first to utilize this machine learning technique to document the current state of research in Islamic education by identifying its topical and temporal dimensions. I specifically seek to answer two main research questions: 1) *What topics have been explored in the Islamic education research literature?* and 2) *How have these topics evolved?*

Islamic Education: Its Principles, Development, and Review Research

In this section, I clarify the critical themes used throughout this article: the principles of Islamic education, its development—including a special look into the Southeast Asia region—and past systematic review studies around Islamic education research. This review section also acts as a point of departure in framing, understanding, and discussing this study's findings and implications.

Islamic Education Principles

Several scholars (Bouzenita and Wood 2018; Hasyim 2016; Wahab, Ahmad, and Owoyemi 2019) have agreed that the primary goal of Islamic education is to transmit Islamic values, beliefs, and practices to students; this way, Muslim students can cultivate an Islamic identity and comprehend their relationships with Allah the Almighty, other people, and the natural environment. In doing so, having established institutions is needed to transmit these values. In this case, Islamic schools have played a pivotal role in the educational journey of Muslim students. These institutions have provided a supportive environment for learning about Islam and navigating challenges even within non-Islamic surroundings like Western countries (Clauss, Ahmed, and Salvaterra 2013; Nur-Awaleh and Mohammed 2022).

Furthermore, Islamic education adheres to foundational principles and teachings that influence its educational approach. It holds a crucial role in shaping the identity and perspectives of Muslim students to help them comprehend and engage with the swiftly changing world. This helps young Muslim individuals develop identities that offer a foundation in Islamic values (an Ghaill and Haywood 2017). The literature also pointed out that Islamic education strongly emphasizes authenticity and Islamic values; this urged the incorporation of genuine educational values rooted in the origins of Islam. Sachit and Nahi (2023) have argued that authentic Islamic principles are crucial to establishing a meaningful connection between education and its intellectual framework within Islamic society. This way, Islamic education can align with the fundamental principles of the faith.

Finally, current research on Islamic education also has touched upon the principles of inclusivity and multiculturalism. These issues have been crucial in modern society in promoting an understanding and appreciation of diversity. Sahin (2018) supports the inclusion of

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these modern values by arguing, "Islam itself was creatively interpreted and articulated within different historical, cultural, and geographical landscapes" (7). This perspective underlines the significance of unity and compassion to dispel misconceptions about Islam as exclusive or sectarian (Hasyim 2016), despite resistance from conservatives and far-right groups. In this review, however, I do not intend to present the debates, but rather to provide an overview of these principles as observed in practices within Islamic education. In short, the challenges presented by multiculturalism represent a reality faced by Muslim societies all over the globe (Hasyim 2016; Sahin 2018).

The Development of Islamic Education

Islamic education has changed to adjust to societal shifts and integrate new methods and technologies. In the early stages of Islam, Quranic education was considered foundational, with additional knowledge built upon it (Önder 2023). Quranic education has been integral to Islam through emphasizing its vital role in instilling beliefs in children. According to Hasyim (2016), "[in] accordance with [the Quran], Islam has the universality of values that becomes a dynamic and harmonious guideline in life, and it is in line with the ideals of Islam, namely *raḥmat li al-'ālamīn*[2]*"* (Hasyim 2016, 48). Rooted in the Golden Age, the Islamic tradition values knowledge acquired in early childhood as enduring and faced challenges in contemporary formal education (Önder 2023). In more modern periods, advancements in technology and science have influenced Islamic education. Integrating technological innovations, such as e-learning and mobile applications, has been considered beneficial for making subject concepts relatable to students. Research (e.g., Suhid et al. 2021) has found that digital teaching, for instance, has enabled flexibility allowing teachers to engage students anytime, anywhere, and fostering a more personal and informal interaction beneficial to student learning.

Islamic education must be connected to madrasa (Islamic schools), where it is nurtured and groomed. The establishment of madrasa institutional systems around the globe has contributed to the development of Islamic education. This establishment has manifested in several vital dimensions. First, madrasas have played a pivotal role in enhancing integration and cultural exchange and have served as places for different peoples and cultures to assimilate into Islam's unified

system of ideas. They have become places to facilitate the dissemination of Islamic knowledge and teachings (Khalfaoui 2014). Second, madrasas have undergone reforms to align with the evolving globalized landscape. They have faced challenges such as new knowledge, societal transformation, and technological advancements. In his introductory section of "Rethinking Madrasah Education in a Globalised World," Abu Bakar (2017, 1) writes,

> "[in] a globalised world where boundaries are blurred and ideologies are in transition, where science and modern technologies become ever more present and demographic changes bring on new societal pressures, we are confronted with new and emerging educational challenges".

These challenges have driven madrasas to implement reforms encompassing curricular and pedagogic innovations aimed at reconceptualizing education for Muslim children (Abu Bakar 2017).

The last dimension is related to the education system. Madrasas have been instrumental in shaping the Islamic education system. They have introduced administrative and curriculum reforms, established extracurricular activities, and expanded access to Islamic education by creating specific branches and sections for girls in West Asia (Muhamad 2023; Muhamad and Othman 2020). Together, the past literature has shown how this madrasa system has played a significant and multifaceted role in the adaptation and development of Islamic education.

Islamic Education in Southeast Asia

As much as I want to present this paper to a global audience, I also especially want to dedicate it to scholars and practitioners in Southeast Asia, where I am from. Therefore, in this space, I discuss the region's current state of Islamic education with a special attention to Indonesia, Malaysia, and the Philippines. The development of Islamic education in Southeast Asia has revealed a complex trajectory shaped by historical, cultural, and political forces across Indonesia, Malaysia, and the Philippines, as discussed by Azra (2018), Hamid (2018), and Milligan (2017), respectively. Across these contexts, a shared theme emerges: the continuous evolution from traditional forms of learning to more modern, integrated systems which reflect broader socio-political and cultural changes. Efforts to merge Islamic and secular sciences are evident in Indonesia and Malaysia, while the Philippines illustrates the persistent tension between secular authority and Islamic education.

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In specific, Azra (2018) underlines the evolution of Islamic education in Indonesia, from traditional institutions like pondok pesantren (Islamic boarding schools[3]) and surau[4] to more formalized madrasas that blend Islamic studies with general subjects. Over the last four decades, modernization has linked Islamic education more closely with the national system by enhancing its scope and quality. This integration has standardized curricula and promoted a broader socio-religious, cultural, and political framework that has accommodated both Islamic and secular subjects (Azra 2018). The transformation has reflected Indonesia's attempt to align Islamic education with national development goals by positioning it as a source of religious guidance and a contributor to socio-political progress (Azra 2018).

In Malaysian contexts, Hamid (2018) describes a similar transition, beginning with early pondok schools that later evolved into more structured madrasas influenced by Middle Eastern scholars. Post-independence, the Malaysian government centralized Islamic education under the Ministry of Education, which wanted to merge Islamic and secular sciences, particularly at the tertiary level. This initiative has sought to address the educational dualism between religious and secular subjects (Hamid 2018). However, while Malaysia's centralized approach has promoted a modernized, internationally recognized Islamic education, it also has emphasized national unity and political control. The author has argued that this dynamic often limits educational diversity, which balances modernization with efforts to maintain socio-political stability (Hamid 2018).

In contrast to previous two cases, Milligan (2017) notes a different historical context in the southern Philippines, where Islamic education has faced more direct resistance. Initially informal, Islamic education in this region was marginalized by Spanish and later American colonial forces, which imposed secular education aimed at assimilation. Islamic education saw a revival in the 1970s-1980s, spurred by international Islamic movements and the establishment of the Autonomous Region in Muslim Mindanao in 1986 (Milligan 2017). This region has facilitated local efforts to formalize madrasah education and to integrate Islamic subjects into public curricula. Yet, the balance between secular and Islamic learning has remained

fraught, given persistent tensions between secular governance and Islamic aspirations, alongside ongoing educational disparities (Milligan 2017).

The modernization of Islamic education in Southeast Asia thus illustrates a region-wide endeavor to balance religious tradition with national development imperatives shaped by each country's unique socio-political landscape. While Indonesia's approach has emphasized broader socio-political inclusivity, Malaysia's model has leaned toward national unity and political centralization. In the southern Philippines, integration has been more localized and challenged by historical marginalization; this reflects the enduring struggle between secular forces and Islamic education (Azra 2018; Hamid 2018; Milligan 2017). The diverse yet interconnected pathways reflect shared regional aspirations and specific national priorities.

Previous Systematic Reviews on Islamic Education Research

In terms of topical dimension, Islamic education research encompasses a wide range of topics exploring the intersection of Islam, education, and society. The topics range from management, leadership, and policy to gender and women studies. Islamic education has become a fertile ground where interdisciplinary studies thrive. Within studies published in highly ranked journals, to my knowledge, there are only two reviews addressing a large variety of topics, both of which are limited to the fields of Islamic educational leadership and management. Yet, no broad comprehensive reviews have been conducted to systematically look at what topics in Islamic education have been researched. In this section, to set the stage, I explore the research topics covered by the two aforementioned reviews within the spheres of leadership and management, published in 2022 and 2023, respectively.

In the first study to appear, Arar, Sawalhi, and Yilmaz (2022) in their review systematically explored international evidence on Islamic-based educational leadership models published between 1990 and 2021. They focus on themes such as policy, leadership models, gender, feminism, and social justice, which I used as a starting point for categorizing the literature in this review. Their findings highlight an increase in research post-9/11 (the attacks of the World Trade Center in the U.S. in 2001), primarily in Muslim-minority countries, and reveal gaps in empirical,

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mixed-methods, and comparative studies. The authors encourage "other researchers to re-explore and develop future research in terms of epistemology, and methodological approaches" (Arar, Sawalhi, and Yilmaz 2022, 21).

In addition, Ezzani et al. (2023) provide an international systematic review of the literature on Islamic school leadership by focusing on social justice as a fundamental component. Guided by a socio-religious conceptual framework, the review aimed to offer a counternarrative to hegemonic discourses that often portray Islamic school leaders in a negative light. It explores how Islamic school leaders understood and enacted social justice. These leaders addressed the complex dynamics they must navigate, such as manipulating formal and informal power (Ezzani et al. 2023). Ezzani et al. (2023) argue that these dynamics have supported diverse expressions of Muslim identity and that the leaders consider their roles as a moral calling. Additionally, this review connects the findings to broader discussions on educational leadership for social justice that aim to deepen the knowledge base in the field. In a similar spirit to Arar, Sawalhi, and Yilmaz's (2022, 24) review, they concluded the review by writing:

> "We argue that faith ought to be included in the epistemologies that recognize the existence of power, oppression, identity, and the need for social justice. To expand on this line of inquiry, we suggest future research to include faith-based leadership and differing forms of justice (restorative, gender, economic, distributive, commutative, and social); school leadership and critical spirituality; leader spirituality and professional relationships; school leader spirituality and critical reflexivity."

To sum up, exploring Islamic education through these systematic reviews have revealed a rich and diverse landscape that stresses the growing importance of interdisciplinary studies in this field. These studies collectively call for a deeper integration of spiritual and cultural dimensions in educational leadership and a broader inclusion of faith-based perspectives in scholarly discourse. As the field of Islamic education continues to evolve, it is imperative that future research not only builds on these foundational reviews but also explores new avenues to enrich the academic conversation further. To date, ample research has been conducted to understand and enhance Islamic education. As the publications on the scholarship have been massive, using traditional qualitative reading of the literature requires extensive time, funds, and human resources. However, it is pretty unfortunate

that we only have limited systematic reviews to explore the richness of Islamic education research. Given that, this study used an automated text mining technique of probabilistic topic modeling to handle a large number of documents to address the challenges.

Probabilistic Topic Modeling

A type of natural language processing, correlated topic modeling (CTM) is a probabilistic model within latent semantic analysis that automates the mining and analysis of text (Blei and Lafferty 2007). According to Blei (2012), this text data mining approach seeks to unveil topics, per-document topic distributions, and per-document per-word topic assignments without manual annotation or document labeling. Think of topic modeling as sorting an extensive collection of documents into different bags based on the words they contain. This model is called a "bag of words" in that it simplifies each document into a bag filled with all the words it contains without considering the order or grammar (Blei and Lafferty 2009, 10). This model assumes that the presence of words can define the document's content or topic in this case. In this context, CTM uses machine learning (ML) techniques to detect patterns and structures in large text datasets by identifying latent topics through probabilistic modeling. By leveraging ML, the model learns to classify and group documents based on their content (Sarker 2021).

The CTM builds upon the basic bag-of-words approach using the logistic normal distribution to better capture how topics vary and relate across documents. This mathematical tool allows CTM to account for variability in topic proportions and understand correlations between topics, such as recognizing that specific topics often appear together (Blei 2012). By doing so, CTM provides a more nuanced analysis of text collections and, thus, beyond simple word counts to reveal more profound insights into how topics are distributed and interconnected and how they evolve. This results in a more realistic representation of the underlying structure of hidden topics. CTM proves to be a valuable tool for statistical analysis when dealing with collections of documents and other discrete datasets (Blei 2012). It offers a natural method for visualizing and exploring unstructured datasets. For example, it can assist researchers in identifying related topics that may not be explicitly mentioned in each article and enabling a topic-guided exploration of the entire collection.

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Here, a topic is defined as a distribution over the words present in the corpus. The words are the only observable variables, and topic modeling identifies the most likely words associated with each topic based on high probabilities (Blei 2012). For instance, in a topic model applied to educational leadership and administration research (Wang, Bowers, and Fikis 2017), terms like "court," "supreme," "judicial," "amendment," "regulatory," and "board" describe the topic of legal perspectives and accountability, while terms like "candidate," "principal," "portfolio," "licensure," "internship," and "accreditation," depict the school leadership preparation and development topic (Wang, Bowers, and Fikis 2017, 304). This process is also known as 'the unsupervised, inductive learning' approach, where CTM users get such high-probability words, which are then used to determine the topic label. I used this approach to guide the analysis in this paper.

The growing application of topic modeling across social sciences in recent years underscores its potential in education. However, the scalable, algorithmic nature of topic modeling has received minimal attention among educational scholars (Wang, Bowers, and Fikis 2017) and researchers working on religious studies (Blaydes, Grimmer, and McQueen 2018), especially Islamic education. Hence, in my effort to respond to some recommendations for using advanced methods presented by and build upon past works of Islamic educational studies, I used this innovative machine-assisted approach to document the development of Islamic education scholarship to date.

Scopus as the Data Source and Topic Modeling as the Analysis Method

In this section, I elaborate on the document data collection and the application of topic modeling to the 1,116 Scopus-indexed Islamic education documents over five decades (1970-2023). I used the Scopus database, an internationally renowned research repository, to search for publications because it is considered the most extensive curated abstract and citation database. It has a diverse array of scientific journals, conference proceedings, and books from over 5,000 publishers worldwide (Baas et al. 2020; Schotten et al. 2017).

I retrieved text data from the 1,116 document titles, abstracts, and keywords. The emphasis on using titles, abstracts, and keywords aligns with prior research (e.g., Daenekindt and Huisman 2020) and was guided by two criteria: open accessibility on Scopus and, particularly,

abstracts serving as a brief overview of the document; these reduce the likelihood of detecting peripheral or minor topics. Of all the documents, 828 or 74% of them are article type, 35 (3%) are books, 132 (12%) are book chapters, 68 (6%) are conference papers, and 53 (5%) are review documents (see Table 1). This shows the significant contribution of article type in the collected data.

No	Document Type	Count	Percentage
1	Article	828	74%
2	Book	35	3%
3	Book chapter	132	12%
4	Conference paper	68	6%
5	Review	53	5%

Table 1. Document Proportion by Type.

I collected the data on December 31, 2023, using only one keyword search: "islamic education" (with quotation marks). The keyword was applied to the article title, abstract, and keywords (in the "Search within" field in Scopus). Furthermore, I included the five document types: "Article," "Book chapter," "Book," "Conference paper," and "Review" (see Table 2). Consequently, I excluded other types such as "Note," "Erratum," "Editorial," and "Letter" for retaining a more consistent quality (Hallinger and Kovačević 2019). Lastly, there were no specific restrictions regarding the period or language of the documents; all years and languages were included in the data retrieval process. Note that even though the keyword is in English, it can retrieve any documents in any language because all Scopus-indexed documents initially written in whatever language "have English language abstracts and titles" (Scopus 2024b).

Field	Set-up
Database	Scopus
Keyword	"Islamic education"
Search within	Title, Abstract, Keyword
Document type	Article, Book, Book chapter, Conference paper, Review
Date	All years
Language	All languages

Table 2. Inclusion Criteria.

These inclusion and exclusion steps resulted in me having 1,116 documents originally written in nine different languages including

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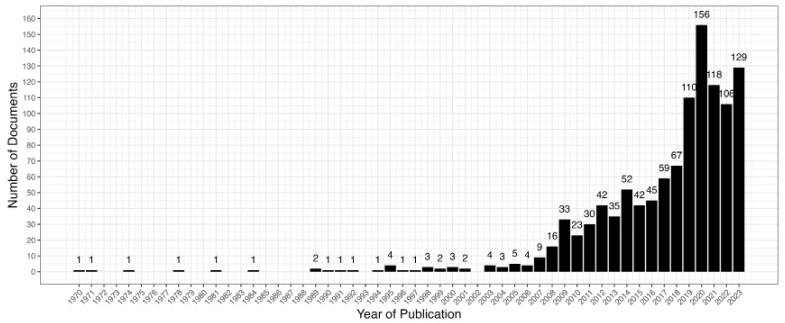
Arabic, English, French, German, Indonesian, Malay, Persian, Russian, and Turkish and ranging from 1970 to 2023 (see Figure 1). For the last touch, I cleaned the data by completing some missing texts in the abstracts. The collected text data then were analyzed using the probabilistic correlated topic modeling techniques.


Number of Documents
Year of Publication
156
129
118
110
106
67
59
52
45
42
42
35
33
30
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16
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1

the nuanced relationship between word usage and importance in a particular context for each topic. When interpreting a topic, I followed a series of inductive steps. Initially, CTM produced FREX words within a topic. For example, Topic 15 has FREX words such as "teacher," "teaching," "profession," "assessment, "classroom," and "strategy." Considering those words, I labeled this topic "Teacher & Instruction." To validate the topic, I manually and randomly reviewed 5-7 abstracts from the topic to confirm that the assigned topic label accurately represented the content. This demonstrates the inductive, data-driven nature of the CTM topic modeling approach.

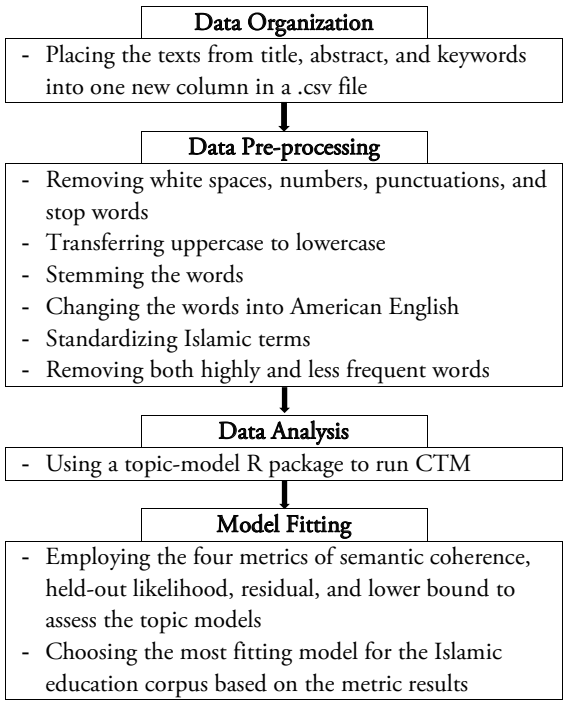

Figure 2. Steps in Topic Modeling.

In the model fitting stage, I also followed the guidance from Roberts, Stewart, and Tingley (2019) using four key metrics: semantic coherence, held-out likelihood, residuals, and the lower bound. Semantic coherence checks how well words within a topic relate, with higher values indicating more consistent topics (e.g., the words kyai and leader usually co-occur in a theme about pesantren or Islamic education leadership). Held-out likelihood assesses the model's

predictive power, where higher values suggest better generalizability, such as predicting the madrasa word in Islamic education texts. Residuals measure the difference between observed and expected word counts, with lower values indicating a better fit. The lower bound evaluates the trade-off between model fit and complexity, where higher values reflect more robust topic identification. When determining the topic number for this study, I initially generated candidate models with varying numbers (10, 20, and 30). Then, I identified the ideal granularity between 15 and 20. Finally, the 19-topic model achieved the best balance across metrics: high semantic coherence (-81.03), good held-out likelihood (-5.7489), low residual (1.2107), and a solid lower bound (-523578.8) within 19 iterations—see the detailed model fit results in the Appendix. While the 20-topic model slightly improved in likelihood and residuals, it fell short in coherence and convergence, thereby making the 19-topic model the optimal choice. However, this does not mean there are only 19 topics in the corpus; instead, this 19-topic model is the most fit based on the metrics and topic interpretability.

Main Topics

In this section, I provide a topical analysis of the Islamic education literature by estimating 19 main topics: *Education System, Global Citizenship, Education Philosophy, Education Management & Leadership, Quantitative Inquiry, Gender & Class Issues, Education Technology, International Perspective, Online & Digital Media, Muslim Youth & Community, Character Education, Values Education, Higher Education, Politics & Nation-State, Teacher & Instruction, Islamic Schooling, Education History, Student Learning,* and *Education Policy & Reform* (see Tables 3-6). I grouped these 19 topics into four broader clusters based on their conceptual and thematic similarities: 1) Foundational Concepts and Methods, 2) Social Issues, 3) Teaching and Learning, and 4) Education Systems and Settings. In discussing each topic, I feature one research publication sample to describe what the topic is about.

Firstly, the Foundational Concepts and Methods cluster with four topics collectively has the highest proportion among all clusters accounting for 33.2% of the total documents (see Table 3). The first topic, Education Philosophy (Topic 3, 8.9%), discusses philosophical foundations in Islamic education. Studies, such as research by Aktan

(2018), looked at the development of education in Islamic civilization which focused on its foundations in Quranic principles, teachings of Prophet Mohammad, and contributions of key theoreticians in the Ottoman Empire. The Quantitative Inquiry topic (Topic 5, 5.2%) includes research employing a quantitative approach in its methods. For example, using factor analysis methods, Abdul Rahim, Aminurraasyid, and Mohd Farihal (2018) found high self-efficacy, self-confidence, and leadership among Tahfiz Science School students, but noted variations due to differences in resources, curricula, and teaching. Furthermore, Education Value (Topic 12, 9.1%) involves works such as Gross's (2023) book discussing the contested nature of religious education. The author has urged the reconceptualization of religious education in response to secularization, technological change, and transformative potential, especially in the context of in-faith education. The last topic in the cluster, Education History (Topic 17, 10%), has research like Syafruddin's article (1995) tracing Mahmud Yunus's life history. Yunus was an influential Indonesian figure who significantly contributed to the development of Indonesian Arabic education post-independence.

Topic[5]	Label	Proportion	FREX Words
3	Education Philosophy	8.9% (n=99)	concept, science, principle, prophet, philosophy, scientific, theory, hadith, human, thought.
5	Quantitative Inquiry	5.2% (n=58)	capacity, variable, motivation, questionnaire, sample, relationship, performance, psychological, level, survey.
12	Values Education	9.1% (n=102)	religion, pedagogy, secularism, critical, theology, liberalism, issue, society, democracy, discourse.
17	Education History	10% (n=112)	Africa, Arab, scholar, western, history, intellectual, tradition, colonial, contemporary, classic.

Table 3. The First Cluster: Foundational Concepts and Methods.

Secondly, the Social Issues cluster, having six topics, constitutes 28.3% (Table 4). First, the Global Citizenship topic (Topic 2, 2.6%) addresses globalization in Islamic schooling like a study by Adly Gamal (2023). The research examined how an international school in Qatar integrated global citizenship with Islamic values, using Bernstein's sociology. The

Gender & Class Issue topic (Topic 6, 4.4%) is characterized with studies such as Barazangi's research (1998) on the challenges in Muslim women's education in the United States. This study has questioned women's perceived role in contributing to Islamic education in a pluralistic society.

Topic	Label	Proportion	FREX Words
2	Global Citizenship	2.3% (n=26)	tolerance, global, multicultural, peace, modern, citizenship, inclusive, international, diverse, challenge.
6	Gender & Class Issue	4.4% (n=49)	identity, women, gender, culture, space, ethnography, life, class, female, status.
8	International Perspective	4.1% (n=46)	country, region, number, north, minority, comparative, population, area, majority, century.
9	Online & Digital Media	3.7% (n=41)	media, radical, violence, social, online, prevention, knowledge, action, content, awareness.
10	Muslim Youth & Community	7% (n=78)	Muslim, young, community, mosque, parent, family, children, youth, British, life.
14	Politics & Nation-State	6.5% (n=73)	politics, power, movement, state, ideology, government, nation, Asia, unity, terrorism.

Table 4. The Second Cluster: Social Issues.

Next, International Perspective (Topic 8, 4.1%) has documents like a book chapter authored by Daun and Arjmand (2021). The chapter explored Islamic education in 40 countries by emphasizing commonalities and differences and concluding that Islam's permanent presence in Europe, North America, and Australia required governments to balance integration and cultural preservation. The third topic, Online & Digital Media (Topic 9, 3.7%), discusses the use of new media in the Islamic education world. On this, Hamzah, Zainol, and Othman's study (2019) explored the growing need for online *talaqqi* in Malaysia and put forward its potential to expand Islamic education

and *da'wah* without time or place limitations. Furthermore, Muslim Youth & Community (Topic 10, 7%) explored issues around Muslim youth and larger communities. Relatedly, Ahmed's exploration (2012) looked at a British Muslim homeschooling project that promoted "Holistic Islamic Education" blending classical Islamic and modern pedagogy to nurture identity and resist secular culture. In the Politics & Nation-State topic (Topic 14, 6.5%), McKenna and Abdula's piece (2009) examined the armed separatist conflict in the Muslim Philippines; it focused on events such as President Joseph Estrada's 2000 offensive, the U.S. involvement post-9/11 and the debate on the role of Islamic education in radicalization.

Thirdly, Teaching and Learning has four topics with a total proportion of 20.7% of all documents (Table 5). In this cluster, the Education Technology topic (Topic 7, 6.6%) includes technology-related studies. For example, Lubis (2009) examined the implementation of educational technology in a Bruneian Islamic school and revealed the need for increased awareness and broader application in teaching methodology, media use, and school management. Furthermore, Character Education (Topic 11, 5.9%) involves works such as Izfanna and Hisyam's (2012) study on a character education model based on Islamic values with the case of Pondok Pesantren Darunnajah in Indonesia.

The third topic, the Teacher & Instruction (Topic 15, 5%) is characterized by, among others, research by Zulkifli, Tamuri, and Azman (2022). They explored the creative teaching abilities of Islamic education teachers during the Coronavirus 2019 (COVID-19) pandemic. Finally, Student Learning topic (Topic 18, 3.2%) discusses important issues on student learning and how they succeed academically at school. One of the research on the topic is a study by Alshabibi, Al-Ayasra, and Almehrzi (2019) who found that the flipped classroom strategy improved participation in Islamic education, particularly among high-achieving students, and recommended its use in teaching.

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Topic	Label	Proportion	FREX Words
7	Education Technology	6.6% (n=74)	learning, design, application, model, technology, outcome, evaluation, process, technique, instruction.
11	Character Education	5.9% (n=66)	value, character, moral, implementation, data, quality, good, building, environment, attitude.
15	Teacher & Instruction	5% (n=56)	teacher, teaching, perception, profession, communication, assessment, classroom, creativity, strategy, standard.
18	Student Learning	3.2% (n=36)	skill, thinking, reading, student, Quran, critical, reflection, academic, writing, improvement.

Table 5. The Third Cluster: Teaching and Learning.

Lastly, there are five topics in the Education Systems and Settings cluster (17.9%) (Table 6). Included in the cluster is the Education System topic (Topic 1, 3.3%). One of the studies on this topic is Idriss and Hamzah's research (2021) which examined the positive effects of the Tsangaya System of Education, a traditional Quranic school in Potiskum, Yobe State, Nigeria; this study highlighted several benefits, such as proficiency in Quranic studies and the development of good behavioral habits. Meanwhile, Education Management & Leadership (Topic 4, 4.7%) has research such as a paper by Jamhari (2009). He explored the influence of Kyai Imam Zarkasyi's modern *pesantren* concept on a second-generation *pesantren* established by his students across Indonesia. Another topic to be featured, Higher Education (Topic 13, 3.7%), made of studies like Ismail and Makhsin's (2023) investigation on the effects of Islamic peer mentoring module on enhancing religious personality in Malaysian university students. The fourth topic, Islamic Schooling (Topic 16, 3.2%), is very well illustrated by a study by Brifkani (2021) who interviewed U.S. Islamic school principals and revealed a need for a unified Islamic whole-child education framework based on the *tarbiyah* conception. Lastly, the Education Policy & Reform topic (Topic 19, 3%) discusses systemic issues of policy and reform in Islamic education contexts. Relatedly, Muhamad and Othman (2020) explored the reform of the Islamic

education system in Penang, Malaya (1916–1957); they tinted the role of Mudir Madrasah al-Mashoor al-Islamiah in modernizing Islamic education through improvements in administration, curriculum, and the establishment of women's madrasas.

Topic	Label	Proportion	FREX Words
1	Education System	3.3% (n=37)	system, education, formal, children, informal, early, policy, age, problem, future.
4	Education Management & Leadership	4.7% (n=53)	Indonesia, pesantren, management, era, innovation, quality, institution, leadership, Java, transformation.
13	Higher Education	3.7% (n=41)	language, integration, higher, material, program, curriculum, university, faculty, training, development.
16	Islamic Schooling	3.2% (n=36)	school, boarding, leadership, private, primary, administration, Islam, secondary, parent, participation.
19	Education Policy & Reform	3% (n=33)	madrasa, reform, graduation, establishment, ministry, policy, local, period, institution, transformation, system.

Table 6. The Fourth Cluster: Education Systems and Settings.

These results clearly show some important insights. First of all, I argue that Islamic education is interdisciplinary in nature, as indicated by the CTM results. While this argument is not new, aligning with prior assertions by scholars such as Sahin (2018), this study *exactly demonstrates* how the field is interdisciplinary. Specifically, it discovers the diverse, multifaceted topics examined in this field, spanning values education, policy, leadership, politics, higher education, technology, and more. In a similar vein, Sahin (2018) has argued that Islamic education studies have long utilized interdisciplinary empirical and scholarly approaches by integrating methods from both the social sciences and humanities. This stresses how Islamic education research encompasses a rich, cross-disciplinary academic landscape. In particular, he stated,

> "The formation of Islamic education studies as an interdisciplinary field of empirical research, scholarly inquiry and professional development in both

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> Islamic and wider Western higher education would facilitate such a much-needed, critical/reflective dialogue between Islamic and diverse Western educational traditions" (Sahin 2018, 24).

This approach provides a reservoir of knowledge and comprehension that can inform professional, educational practices and shapes the development of policies within the field.

Additionally, the prevalence of research around Foundational Concepts and Methods, with the three highly ranked topics of Education History, Education Philosophy, and Vaules Education, indicates sustained efforts to theorize Islamic education since the 1970s. These three topics have the most significant proportions, ranging from 8% to 10%. Historical research, for instance, shows that Islamic education in countries like India and Indonesia has modernized considerably, as Muslim intellectuals incorporated secular sciences and teaching methods from reformist institutions (Zaini 2022). On this, Sahin (2018) critiques the tendency in Islamic education to engage in reactionary adaptation, where concepts from Western secular education are often borrowed without sufficient critical evaluation or authentic integration with Islamic values; this can lead to, in his words, "foreclosed mindsets" within Muslim communities and Islamic education often being constrained by theological orthodoxy (Sahin 2018, 4).

However, I have a different view; Islamic education scholarship is far from these mindsets and orthodoxy. My findings provide empirical evidence that showcases a more nuanced adaptation process. For instance, the topics of Education Technology, Online & Digital Media and Gender & Class Issue indicate not merely an uncritical adoption but rather an evolving integration of Western methodologies with core Islamic principles. The presence of studies in these topics (e.g., Barazangi 1998; Lubis 2009) that meaningfully blend Islamic values with modern educational methods, such as the flipped or online classroom's positive impact in Islamic education settings, has suggested that adaptation can be both intentional and transformative rather than merely reactionary. Additionally, Islamic education is characterized by significant diversity, as seen in the topics of, among others, Global Citizenship, Gender & Class Issue, and Education Policy & Reform. The results show that Islamic education systems in different countries (e.g., Indonesia, Qatar, and the UK) are not monolithic but reflect diverse approaches to integrating global educational standards while

accommodating local cultural and religious norms. This aligns with Sachit and Nahi's call (2023) which suggests that Muslim intellectuals enhance Islamic studies by redefining core concepts and purposefully assimilating modern sciences.

Finally, I want to draw special attention to several concerns regarding the topics that exhibit lower proportions of attention (2%-4%). These topics include Global Citizenship, Education Policy & Reform, Islamic Schooling, Student Learning, and Education System. The relatively low focus on these areas suggests they may not receive the scholarly attention they deserve. I think this disparity points to potential research gaps in the existing literature, which may hinder the development of informed discussions on these subjects. Consequently, there is a need for Islamic education scholars to direct more attention toward these pressing issues, particularly in areas related to citizenship education, instructional methods, and ongoing changes within educational systems. I argue that addressing these gaps could contribute to a deeper understanding and promote more comprehensive approaches in the field.

Topic Evolution

As this study seeks to answer the question: *How have these topics evolved?,* in this section, I provide an overview of the development of the 19 topics over the past five decades. Figure 3 depicts the trends for each topic during this period. It is important to note that the growth of these topics should be assessed considering the overall increase in the published literature on Islamic education over time, as shown in Figure 1; due to the skewed distribution toward more recent years, most topics exhibit a general upward trend. For conciseness, I will analyze the notable patterns demonstrated by a subset of critical topics.

Overall, most topics in the corpus have experienced growth in research output over the past 54 years, which indicates rising scholarly interest. In the first three decades (1970-1999), the research primarily focused on tracing Education History, with limited publications initially, but expanded significantly over time. Also, the studies on Values Education and Education Philosophy saw noteworthy increases starting in the 2000s, in line with the consistent rise in the total publications. Unsurprisingly, early Islamic education research centered on establishing guiding principles and values, given the nascent state of

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this field. Furthermore, in the past two decades (2000-2023), Islamic education scholarship diversified and explored various emerging topics. It seems that Islamic education scholars began to pay more attention to topics on Quantitative Inquiry, Education Technology, Muslim Youth & Community, and Character Education. While increasing, growths in these topics had been gradual.

On the other hand, CTM also reveals topics with limited research activities. These minor topics comprise those with 2-4% proportions, such as Education System, Global Citizenship, Higher Education, Islamic Schooling, Student Learning, and Education Policy & Reform. Regarding their trend trajectories, Global Citizenship, Islamic Schooling, and Student Learning topics have seen slight upticks. Meanwhile, topics like Education System and Education Policy & Reform, particularly, fluctuated wildly, even as the publications continued rising. Taken collectively, this granular analysis of topic prevalence and trajectories has provided valuable insights into the evolution of Islamic education research.

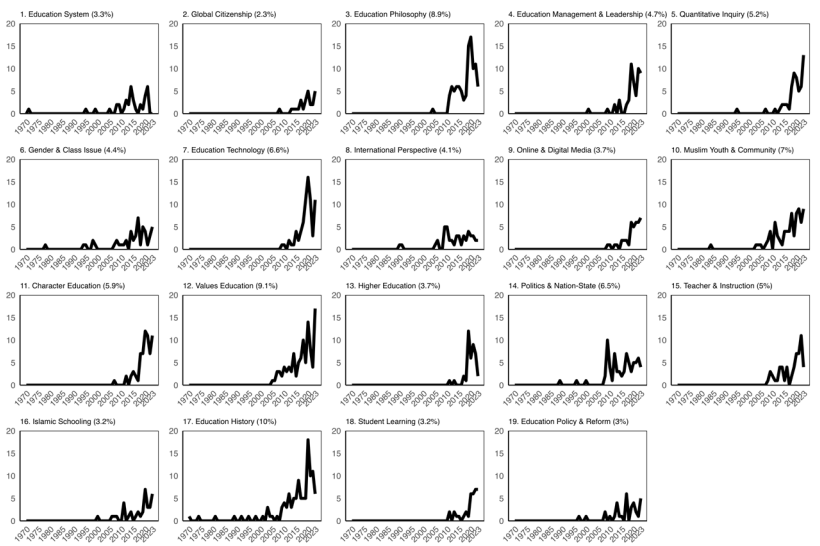

Figure 3. The Evolution of the 19 Topics in the Islamic Education Corpus from 1970 to 2023. Note: The y-axis represents the count of documents, and the x-axis is year of publication.

Understanding this topic evolution, I provide some insights here.

Firstly, in response to Sahin's (2018) advocacy for a paradigm shift toward a more transformative educational culture that nurtures critical Muslim religiosities, this study's longitudinal analysis of topic evolution proves that such shifts are already underway. With topics like Gender & Class Issue, Education Technology, Politics & Nation-State, Global Citizenship, and International Perspective, the CTM results show steady growth and adaptation to modern needs. Even the Gender & Class Issue topic already occurred since the 1970s (see Figure 3). On this, I argue that Sahin's (2018) call for transformation, while insightful, may not be as urgent or groundbreaking as it initially seems, given that Islamic education is already evolving in ways consistent with his vision—this also can be understood as Sahin's (2018) review sources came from higher education contexts only.

More specifically, I discuss how Islamic education research has long been critical and responsive to significant world events. Firstly, the technology-related topics such as Education Technology and Online & Digital Media emerged in 2009 and have grown steadily. In this case, their appearances followed innovations like MOOCs introduced in 2008 (Massive open online course 2023) and the launch of Facebook, the most popular social networking site, in 2004 (History of Facebook 2024). The 2020 spike in Education Technology also aligned with the COVID-19 pandemic, forcing global online schooling. As Maemonah et al. (2022) noted, the pandemic has accelerated the shift from conventional to online religious education and, hence, has disrupted norms and created new learning avenues in the virtual world. These findings indicate how Islamic education scholars have critically and consistently engaged in global technological development and health crisis issues since their first emergence.

Furthermore, the social issues of Global Citizenship, which first emerged in 2008, International Perspective in 1990, and Politics and nation-state in 1989, also intersected with some global phenomena. Take globalization as an example. The third wave of globalization, beginning around 1989, profoundly impacted Islamic education. This globalization caused varied Muslim community responses (Baytiyeh 2018). While this event opened the teaching of diversity and inclusion, some conservative groups saw integrating Western cultural values through modern education methods as potentially hazardous to Islamic principles.

"Due to the influences of globalisation, education has undeniably become

> an interactive process and a powerful tool for social change and cultural evolution. In fact, modern globalisation has broadened the role and scope of education while revolutionising educational content, styles, and delivery. However, its influences on education and culture in the Muslim world have been perceived by extremist and conservative Muslims as a Westernisation scheme threatening Islamic values and aiming to corrupt Muslim societies." (Baytiyeh 2018, 10)

Moreover, in the aftermath of the 9/11 attacks in 2001, there have been demands for educational changes in Muslim nations to address violent extremism (Abu-Nimer and Nasser 2017). With this, globalization and violent extremism events have likely shaped Islamic education research practices. However, thoroughly examining this requires more space than this paper allows and falls outside the scope of the current review study. I suggest future research investigating how such world events have impacted the field.

Finally, further avenues for research exploration can also touch upon mapping the geographical dispersion of publications to reflect the diverse origins identified in this study. The topic modeling results show the diversity of the literature spanning from Indonesia and Nigeria to Bosnia and the United States. As Sahin (2018) recorded, Islam has been creatively expressed across cultural and geographical contexts. Documenting which countries contribute most to Islamic education scholarship and where it has flourished would offer valuable insights into the field. Moreover, examining how these countries collaborate in research publications could further enhance our understanding. This study hints at the popularity of research on Indonesian Islamic education, where the FREX words of *Indonesia* and *pesantren* are used in the topic modeling results. I hypothesize that Indonesia is one of the central contributors to Islamic education knowledge globally, but this requires confirmation through future studies.

Implications for Islamic Education in Southeast Asia

Because this study highlights the popularity of research on Southeast Asian Islamic education, I discuss the implications of this research, which hold particular relevance for understanding the evolution of Islamic education in the region, specifically focusing on Indonesia, Malaysia, and the Philippines. This review has informed the way we see how modernization, integration into national systems, and socio-

political dynamics shape educational practices. In Indonesia, traditional institutions like *pesantren* have transformed over the past 40 years into madrasas with formal curricula and grading systems (Azra 2018). This shift reflects a broader trend: Islamic education adapts to modern educational frameworks while retaining its foundational values. The study's topic modeling results further support this observation, particularly in topics like Foundational Concepts and Methods and Teaching and Learning. These clusters show how Islamic education actively incorporates Western pedagogical methods while maintaining core Quranic principles and local traditions.

Moreover, my analysis aligns with Hamid's (2018) observations of Malaysia's efforts to integrate Islamic and secular sciences, particularly at the tertiary level. This mirrors the trends captured in my study, where topics like Values Education and Education Philosophy indicate theoretical discussions and practical efforts to bridge educational dualism. The thematic clustering around Education Systems and Settings in this review also reflects the structured efforts in Malaysia to centralize Islamic education under the Ministry of Education, which aims for a unified approach that meets national unity goals and international standards. These parallels highlight the broader relevance of this review in examining how regional Islamic education systems strategically adapt Western methodologies and are still trying to maintain their Islamic identity.

In the case of the southern Philippines, the evolution of Islamic education has been shaped by historical resistance and later efforts to formalize it within public curricula (Milligan 2017). My analysis of Education Policy & Reform and Global Citizenship resonates with this context in that they emphasize the complex interaction between secular and Islamic education. While Milligan (2017) noted challenges in governance and educational disparities, this study on lower-attention topics like Global Citizenship and Education System suggests that similar gaps may exist in the current scholarship on Islamic education in other places. This points to potential areas for further research, particularly regarding how Islamic education adapts to national policies and responds to local cultural needs while participating in global educational trends.

Focusing on regional adaptations and responses to socio-political dynamics, this study contributes to a more nuanced understanding of how Southeast Asian Islamic education intersects with or diverges

from global trends. This can enrich scholarly discourse and informs policymakers, educators, and scholars within the region about effective strategies for integrating Islamic principles with contemporary educational demands.

Topic Modeling: Strengths and Weaknesses

By overcoming the limitations of labor-intensive manual coding (Wang, Bowers, and Fikis 2017), I have demonstrated the value of leveraging text mining and machine learning techniques for scholarly field analysis through this study. For example, the panoramic views (Tables 3-6 and Figure 3) can aid early career researchers and graduate students navigate the current Islamic education landscape. This can inform the research gaps in the field, in particular. Additionally, I have introduced the alternative text analysis approach with scalable topic modeling algorithms that hold promise for broader applications in the field. Many Islamic texts such as prophetic hadith, manuscripts, and so on can be data for doing the topic modeling.

Furthermore, by exploring future directions, I want to prompt important questions about Islamic education's vision, gaps, settled versus emerging topics, and indications of progress or stagnancy. For example, how can Islamic education scholars respond to the less attractive topics like Global Citizenship? How can they maintain the progress of the scholarship in general? Lastly, considering the continued topic diversification observed in the 1,116-document corpus, I have presented the importance of dialogue and exchange between Islamic and Western worldviews, as Sahin (2018) argued. Because this analysis captures interactions between Islamic education and various fields (see Tables 3-6), it serves as strong evidence that Islamic education research is interdisciplinary.

On the other hand, critics have raised several concerns about the applicability of this use of topic modeling methods. Firstly, I am aware that this review may not capture the in-depth analysis of the publications, as it primarily focuses on quantitative indicators and may overlook qualitative aspects (Gumpenberger, Wieland, and Gorraiz 2014). The traditional close reading review of Islamic education (e.g., Ezzani et al. 2023) allows researchers to create a more detailed representation of the field. I also want to highlight that another limitation of this study is using certain document types (e.g., article, book) and a single

Scopus database only. There is a need to include other document types like theses, dissertations, and other databases, such as ERIC and Web of Science, to explore more publications. Finally, this study is limited to using one keyword approach ("islamic education") to collect the documents. This approach excludes documents that do not mention the keyword in their titles, abstracts, or keywords, even though they are about Islamic education. I would suggest that future research may address this limitation by including more keywords such as "muslim student," "islamic school," "madrasa," "pesantren," and the likes.

Concluding Remarks

This study documents the half-century journey of Islamic education research. It presents the first application of text mining and machine learning methods, specifically correlated topic modeling (CTM), to analyze topics and their evolution in the Islamic education research literature from 1970 to 2023. The findings reveal 19 salient topics categorized into four clusters related to foundational concepts, social issues, teaching and learning, and educational systems. Through this study, I argue that Islamic education research is interdisciplinary, with topic modeling results identifying the specific areas the scholarship has covered, ranging from history and philosophy to leadership, policy, citizenship, gender, and technology, among others. The findings also highlight the field's dynamic yet contentious development, marked by gradual publication growth that reflects responses to societal and technological shifts. By integrating data science methods into Islamic education research, this review not only serves as a step toward innovative methodologies but also invites further machine learning applications to support the field's growth. Additionally, the analysis contributes to understanding Southeast Asia's evolving Islamic education systems, where modernization, integration into national policies, and adaptation to local cultural needs showed both alignment with and divergence from global trends. This study demonstrates the feasibility of employing probabilistic topic modeling to analyze latent topics in large text corpora by opening new avenues for mining insights and addressing gaps in the scholarship. Overall, this work illustrates the potential of computational text analysis methods to chart the evolution of Islamic education research by informing its vision, emerging directions, and interdisciplinary interactions.

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Endnotes

1. Scholasticism is a method of learning that was dominant in medieval Christian civilization, which combined religious dogma with philosophical analysis and dialectical reasoning (Scholasticism 2023).
2. Rahmatan lil 'alamin, meaning "mercy to the worlds," describes Prophet Muhammad as the final messenger and a model for humanity. It comes from the Quran: "And We have not sent you, [O Muhammad], except as a mercy to the worlds" (The Qur'an (M.A.S Abdel Haleem, Trans.) 2004, 21:107).
3. Pondok pesantren or, in short, pesantren or pondok is traditional educational institutions originally from Indonesia consisting of dormitories, a mosque, students (santri), classical Islamic texts (kitab kuning), and a head (kyai). They focus on Quranic studies, Arabic, Islamic law, and, in modern versions, also cover social and natural sciences (Pesantren 2023).
4. A surau is a small Islamic gathering place in the Malay Peninsula and Sumatra, Indonesia, used for worship and community activities. It is usually established by local support and respected in Minangkabau culture as a male residence (Surau 2024).
5. The numbering of the topics in each table comes automatically from the CTM results; originally, CTM listed all the 19 topics in order, from 1 to 19 and then I recategorized the topics by putting them into the four larger clusters.

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Appendix

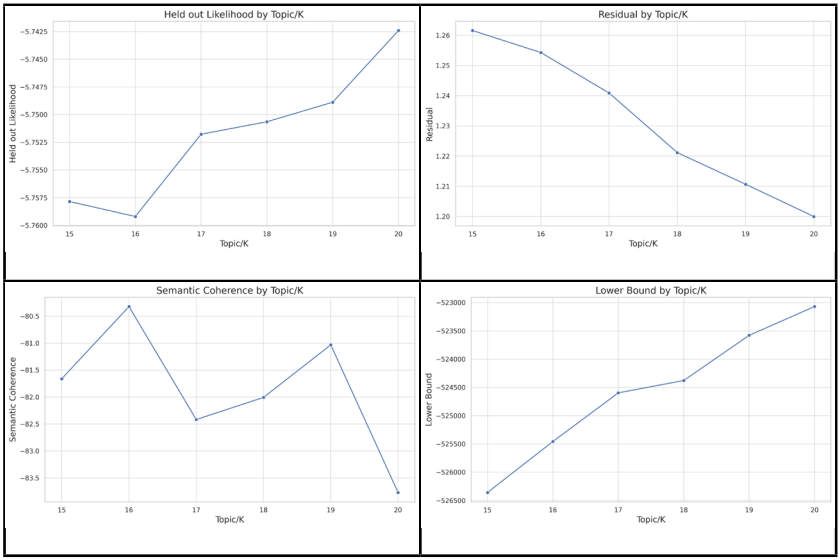
Topic models are evaluated on how well they discover coherent topics (K) in a document collection (Roberts, Stewart, and Tingley 2019). Key metrics used in this review include:

1. Semantic coherence: How frequently the most probable words co-occur. Higher values mean more meaningful, consistent topics.
2. Held out likelihood: How well topics predict unseen documents. Higher values mean more generalizable, predictive topics.
3. Residual: Difference between observed and expected word counts. Lower values mean better fit.
4. Lower bound: Penalizes models with more topics. Higher values mean better fit-complexity tradeoff.

In this study, the decision of choosing the 19-topic model considers the tradeoffs between the metric results. See the table below.

Topic/K	Semantic Coherence	Held out Likelihood	Residual	Lower Bound	Iterations
15	-81.6611	-5.757847	1.261549	-526358.2	21
16	-80.32197	-5.7592	1.254271	-525456.2	20
17	-82.41665	-5.751767	1.240881	-524595.9	27
18	-82.00628	-5.750642	1.221138	-524377.3	20
19	-81.03246	-5.748878	1.210674	-523578.8	19
20	-83.76877	-5.742402	1.19999	-523069.2	18

Semantic coherence is pretty high at -81.03246 (second best), held-out likelihood is at -5.748878, residual is at 1.210674, and lower bound is quite low at -523578.8. Also, a fairly low expectation-maximization iteration at 19 (second best) supports this choice. The values in the table are visualized in the graph below.



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Studia Islamika, published three times a year since 1994, is a bilingual (English and Arabic), peer-reviewed journal, and specializes in Indonesian Islamic studies in particular and Southeast Asian Islamic studies in general. The aim is to provide readers with a better understanding of Indonesia and Southeast Asia's Muslim history and present developments through the publication of articles, research reports, and book reviews.

The journal invites scholars and experts working in all disciplines in the humanities and social sciences pertaining to Islam or Muslim societies. Articles should be original, research-based, unpublished and not under review for possible publication in other journals. All submitted papers are subject to review of the editors, editorial board, and blind reviewers. Submissions that violate our guidelines on formatting or length will be rejected without review.

Articles should be written in American English between approximately 10.000-15.000 words including text, all tables and figures, notes, references, and appendices intended for publication. All submission must include 150 words abstract and 5 keywords. Quotations, passages, and words in local or foreign languages should

be translated into English. *Studia Islamika* accepts only electronic submissions. All manuscripts should be sent in Ms. Word to: http://journal.uinjkt.ac.id/index.php/studia-islamika.

All notes must appear in the text as citations. A citation usually requires only the last name of the author(s), year of publication, and (sometimes) page numbers. For example: (Hefner 2009a, 45; Geertz 1966, 114). Explanatory footnotes may be included but should not be used for simple citations. All works cited must appear in the reference list at the end of the article. In matter of bibliographical style, *Studia Islamika* follows the American Political Science Association (APSA) manual style, such as below:

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3. Feener, Michael R., and Mark E. Cammack, eds. 2007. *Islamic Law in Contemporary Indonesia: Ideas and Institutions*. Cambridge: Islamic Legal Studies Program.
4. Wahid, Din. 2014. *Nurturing Salafi Manhaj: A Study of Salafi Pesantrens in Contemporary Indonesia*. PhD dissertation. Utrecht University.
5. Utriza, Ayang. 2008. "Mencari Model Kerukunan Antaragama." *Kompas*. March 19: 59.
6. Ms. *Undhang-Undhang Banten*, L.Or.5598, Leiden University.
7. Interview with K.H. Sahal Mahfudz, Kajen, Pati, June 11th, 2007.

Arabic romanization should be written as follows:

Letters: *'*, *b*, *t*, *th*, *j*, *ḥ*, *kh*, *d*, *dh*, *r*, *z*, *s*, *sh*, *ṣ*, *ḍ*, *ṭ*, *ẓ*, *'*, *gh*, *f*, *q*, *l*, *m*, *n*, *h*, *w*, *y*. Short vowels: *a*, *i*, *u*. long vowels: *ā*, ī, ū. Diphthongs: *aw*, *ay*. *Tā marbūṭā*: *t*. Article: *al-*. For detail information on Arabic Romanization, please refer the transliteration system of the Library of Congress (LC) Guidelines.

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تم اعتماد ستوديا إسلاميكا من قبل وزارة البحوث والتكنولوجيا والتعليم العالي بجمهورية إندونيسيا باعتبارها دورية علمية (رقم القرار: 32a/E/KPT/2017).

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