



Mapping Research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education: An R Biblioshiny Analysis

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Abstract: This study aims to map the development of research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education through bibliometric analysis using R Biblioshiny. The data were obtained from the Scopus database covering the 2015–2025 period and were selected using the PRISMA flow, resulting in 28 relevant articles. The analysis focused on publication productivity, citations, authors, institutional affiliations, keywords, and research collaboration networks. The findings indicate that publications on HOTS in Islamic Religious Education increased significantly, particularly during the 2021–2025 period, reflecting growing academic attention toward the development of higher-order thinking skills in Islamic education learning. Affiliation mapping revealed the dominance of universities in Malaysia and Indonesia as the main centers of HOTS research development. Keyword analysis showed that the studies mainly focused on active learning strategies, curriculum strengthening, and HOTS-based assessment. However, this study has several limitations, including the limited number of articles, the use of a single database, the absence of thematic map analysis, and limitations in the search keywords. Therefore, future studies are recommended to expand data sources and develop more comprehensive bibliometric analyses to provide broader and deeper insights into HOTS research in Islamic Religious Education.

Keyword : Higher Order Thinking Skills (HOTS), Islamic Religious Education, R Biblioshiny

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Introduction

The development of 21st-century education requires students to possess Higher Order Thinking Skills (HOTS), which include the abilities to analyze, evaluate, and create in the learning process (Gunartha, 2024). HOTS has become one of the important competencies that need to be developed in various fields of education, including Islamic Religious Education (Fadholi, 2022). The integration of HOTS in Islamic Religious Education learning is not only aimed at improving students' conceptual understanding of Islamic teachings, but also at encouraging critical, reflective, and contextual thinking skills in dealing with various life problems (Lilawati, 2024). Research shows that the development of Higher Order Thinking Skills (HOTS) in learning can improve the quality of the learning process as well as students' analytical abilities in understanding the material in depth (Fatonik et al., 2025).

However, the implementation of Higher Order Thinking Skills (HOTS) in Islamic Religious Education still faces various challenges. Several studies indicate that learning practices in Islamic Religious Education across various educational institutions are still largely oriented toward conventional methods such as memorization and lectures, thereby providing limited opportunities for students to develop critical and analytical thinking skills (Rohman et al., 2024). The research conducted by Hidayat, (2020) It shows that although teachers have an understanding of the HOTS concept, its implementation in Islamic Religious Education learning is still limited. This indicates a gap between the HOTS concept that has been developed in educational theory and its actual classroom practice. In addition, research developments on HOTS in Islamic Religious Education have also increased in recent years, particularly related to the integration of innovative learning models, 21st-century learning, and the use of technology in the learning process (Rudiyanto et al., 2021). Research Venkatraman et al., (2022) It shows that the implementation of 21st-century learning approaches, which emphasize collaboration and problem-solving, is able to significantly improve students' Higher Order Thinking Skills (HOTS).

However, most existing studies still focus on the implementation of HOTS in the learning process, while studies that comprehensively map the development of HOTS research in Islamic Religious Education remain relatively limited. In fact, research mapping is essential for identifying publication trends, author contributions, the development of research themes, as well as research opportunities that are still open for further exploration. Several previous bibliometric studies on HOTS have generally been conducted in the contexts of science education, mathematics, and general education, focusing on publication trends, author collaborations, and the development of research topics. Nevertheless, these studies have not specifically examined the development of HOTS within the context of Islamic Religious Education, nor have they utilized R Biblioshiny-based bibliometric analysis tools to visualize the structure and dynamics of research more comprehensively. Bibliometric analysis is one of the methods that can be used to map the development of scientific literature through the systematic and structured analysis of publication data (Öztürk et al., 2024). By using this approach, researchers can obtain a broader understanding of the knowledge structure and the dynamics of research development within a particular field of study.

Based on the background above, the problem formulation is as follows:

1. What is the trend in the development of research publications on Higher Order Thinking Skills (HOTS) in Islamic Religious Education?
2. How do the authors contribute and what are the patterns of collaboration in HOTS research in Islamic Religious Education?
3. How has the development of research themes and the research opportunities for Higher Order Thinking Skills (HOTS) in Islamic Religious Education evolved based on bibliometric analysis?

This study is expected to identify publication trends, author productivity, research collaboration networks, and the development of HOTS (Higher Order Thinking Skills) research themes in Islamic Religious Education. In addition, this study is also expected to contribute academically in the form of a comprehensive literature

mapping, which can serve as a basis for the further development of research in the field of Islamic education.

Methodology

This study employed a quantitative approach using the bibliometric method (Budianti & Ritonga, 2023). to map the development of research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education. Bibliometric analysis is a method used to evaluate and map scientific literature through the analysis of publication data, such as the number of articles, authors, keywords, citations, and research collaboration networks (Yanto et al., 2024). This method enables researchers to identify research trends, the development of study themes, and the contributions of authors in a specific field of study in a systematic and measurable way. According to Aria & Cuccurullo, (2017) Bibliometric analysis using the Bibliometrix package in R can produce a comprehensive science mapping through visualization of research networks and statistical analysis of scientific literature.

The research data source was obtained from the Scopus database, which was selected due to its broad coverage of reputable international journals. The data retrieval process was carried out using keywords related to Higher Order Thinking Skills (HOTS) and Islamic Religious Education in the title, abstract, and keywords sections of the articles. The literature search was limited to the period 2015–2025 to obtain an overview of research developments over the past ten years, resulting in 28 articles. Furthermore, the obtained bibliographic data were exported in CSV format and analyzed using RStudio software with the Bibliometrix package and the Biblioshiny interface to produce bibliometric visualizations.

In the article selection process, this study employed a PRISMA-based selection flow (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure transparency and systematic literature selection (Sarkis-onofre et al., 2021). Based on the initial search results in the Scopus database, 46 documents were identified. Subsequently, 5 duplicate documents were removed, leaving 41 documents. During the relevance screening stage based on titles, abstracts, and topic suitability, 32 relevant articles were obtained. After the full-text eligibility assessment, 4 articles were excluded because they did not specifically discuss HOTS in the context of Islamic Religious Education. Therefore, the final number of articles analyzed in this study was 28 articles.

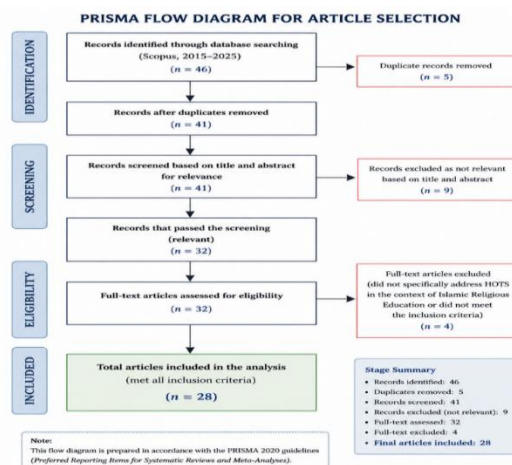


Figure 1. Article Selection Process Based on PRISMA

To ensure the quality and relevance of the data, this study established clear inclusion and exclusion criteria. The inclusion criteria consisted of: (1) articles discussing the implementation, development, or analysis of Higher Order Thinking Skills (HOTS) within the context of Islamic Religious Education; (2) articles indexed in the Scopus database; (3) articles published between 2015 and 2025; and (4) articles published in scientific journals. Meanwhile, the exclusion criteria included: (1) articles discussing HOTS only in a general context without reference to Islamic Religious Education; (2) conference proceedings, book chapters, and review articles; (3) articles without a complete abstract; and (4) articles whose bibliographic metadata could not be fully accessed.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Discussing HOTS in the context of Islamic Religious Education	Discussing HOTS in general without the context of PAI
Scopus indexed	Conference proceedings and book chapter
Publication year 2015–2025	Article without abstract
In the form of a scientific journal article	Incomplete metadata

After the data were obtained, a data cleaning process was conducted to ensure that the analyzed articles were truly relevant to the research topic. This stage included checking keyword relevance, verifying article metadata, author name normalization, and removing inconsistent data (Page et al., 2021). Furthermore, the data were analyzed using bibliometric analysis features in Biblioshiny to generate various research mapping indicators.

Table 2. Research Data Search Strategy

Component	Deskription
Database	Scopus
Keywords	“Higher Order Thinking Skills”, “HOTS”, “Islamic Education”
Search Field	Title, Abstract, Keywords
Year Range	2015–2025
Document Type	Journal article
Data Export Format	CSV
Analysis Toolkit	RStudio and Biblioshiny

The stages of bibliometric analysis in this study consisted of data collection, data selection, bibliometric analysis, data visualization, and interpretation of results (Sarkis-onofre et al., 2021). The bibliometric analysis included annual publication

productivity analysis, authors' production over time, citation analysis, keyword co-occurrence analysis, and co-authorship network analysis (Rahmah, 2022). The results of the analysis were then visualized in the form of graphs and scientific maps generated by Biblioshiny to illustrate the knowledge structure and research development of Higher Order Thinking Skills (HOTS) in Islamic Religious Education.

Table 3. Stages of Bibliometric Analysis

Stages	Analysis Description
Data collection	Retrieving publication data from the Scopus database based on predetermined keywords
Data Selection	Filter relevant articles based on inclusion and exclusion criteria
Data Cleaning	Checking metadata conformity and data normalization
Bibliometric Analysis	Analysis of publication productivity, citations, keywords, and collaboration networks
Data Visualization	Create scientific charts and maps using Biblioshiny
Interpretation	Describes research trends, author contributions, and directions of research development.

Furthermore, the results of the bibliometric visualization were analyzed descriptively to identify research trends, author contributions, developments in study themes, and research opportunities that are still open to be developed in the future in the field of HOTS in Islamic Religious Education.

Result and Discussion

Average Citations per Year in HOTS Research in Islamic Religious Education Learning

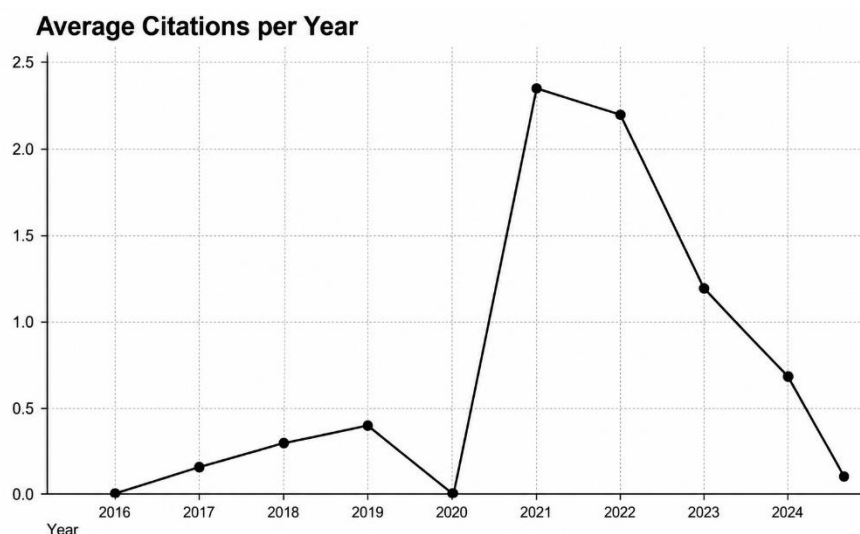


Figure 2. Publication and citation trends

Figure 2 The text above presents the trend of Average Citations per Year in publications related to Higher Order Thinking Skills (HOTS) in Islamic Religious Education over the period 2015–2025. Based on the visualization, it can be seen that the average citations fluctuate from year to year. In the early research period (2015–2019), the citation rate was still relatively low, indicating that studies on HOTS in Islamic Religious Education were still in the early stages of development and had not yet received widespread academic attention. A significant increase was observed in 2021, which marked the peak in average citations, indicating that publications from that period began to receive greater attention from the academic community. This phenomenon is consistent with the growing focus on the development of higher-order thinking skills in 21st-century education, which emphasizes learners' abilities in analysis, evaluation, and creativity. (Hajaroh, 2021)

This finding is also supported by several empirical pieces of evidence from previous studies, namely research Puspitasari & Nugroho, (2020) It shows that the integration of HOTS in Islamic Religious Education learning has begun to become an important focus in developing learning strategies to improve students' critical thinking skills. In line with research Indah & Maharani, (2020) It was found that the implementation of 21st-century learning approaches such as problem-based learning and collaborative learning is able to significantly improve students' Higher-Order Thinking Skills (HOTS). Thus, the increasing citation trend in recent years indicates that HOTS research in Islamic Religious Education has not only developed

quantitatively, but also has strong empirical relevance in supporting learning innovation and the development of higher-order thinking competencies.

The dynamics of authors' productivity in Higher Order Thinking Skills (HOTS) research in Islamic Religious Education.

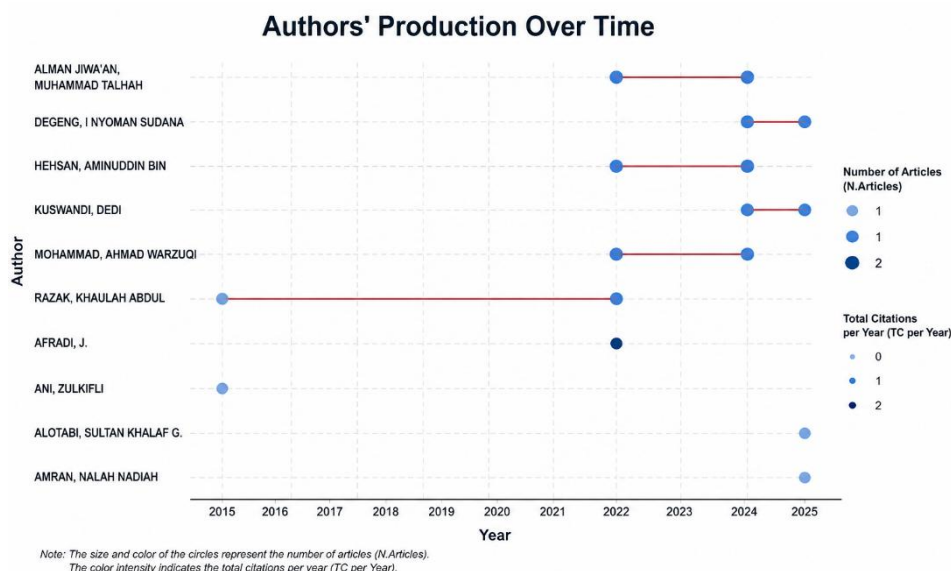


Figure 3. Trends in Authors' Scientific Production Over Time

Figure 3 The graph shows the dynamics of author productivity in the study of Higher Order Thinking Skills (HOTS) in Islamic Religious Education. Most publications appeared in the period 2021–2025, indicating increasing academic attention to the integration of HOTS in Islamic education. Several authors such as Muhammad Talhah, Nyoman Sudana, and Ahmad Marzuki contributed during this period, showing that HOTS studies are still relatively new but continuously developing. Meanwhile, Razak Khadijah Abou has a longer publication span, indicating a sustained contribution to the development of higher-order thinking research. This trend reflects the growing research on HOTS along with the development of 21st-century learning paradigms that emphasize critical, analytical, and creative thinking skills (Wakifah et al., 2023)

In line with research Handayani & Anam, (2024) It reveals that HOTS also develops within the context of digital and innovative learning. This is evident from the increasing number of studies integrating HOTS with 21st-century learning models, reflective approaches, and problem-based learning. Thus, the Biblioshiny analysis shows that HOTS research in Islamic Religious Education continues to grow and aligns

with the demands of 21st-century learning, which is more critical, collaborative, and problem-solving oriented.

Institutional Affiliation Mapping in Research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education

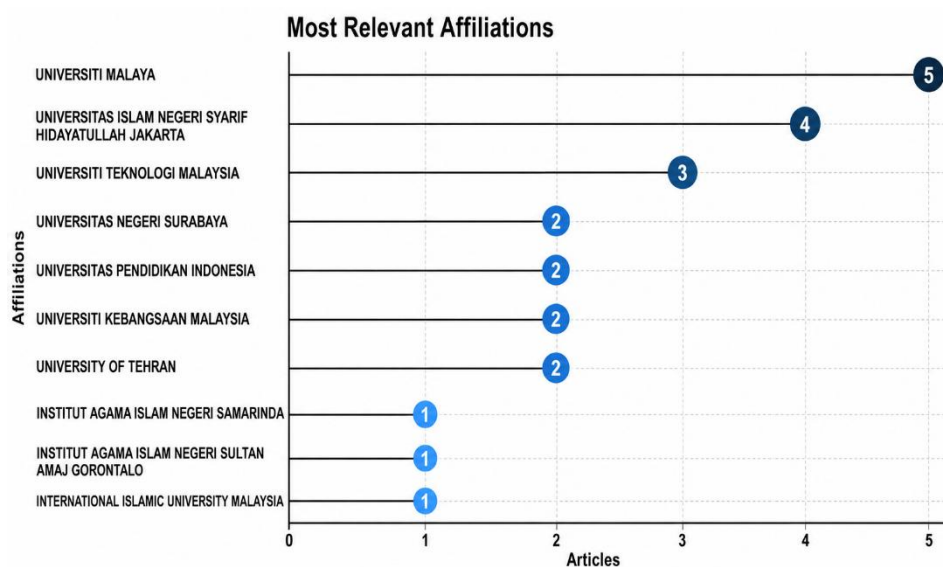


Figure 4. Distribution of Publications by Institutional Affiliations

Figure 4 The visualization of the Most Relevant Affiliations in the Biblioshiny R analysis shows that institutional contributions to research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education are dominated by universities in Malaysia and Indonesia. Universiti Malaya ranks first with five publications, followed by Syarif Hidayatullah State Islamic University Jakarta (four articles) and Universiti Teknologi Malaysia (three articles). Several other institutions, such as Universitas Negeri Surabaya, Universitas Pendidikan Indonesia, Universiti Kebangsaan Malaysia, and the University of Tehran, each contributed two articles. Meanwhile, the State Islamic Institute of Samarinda, the State Islamic Institute of Sultan Amai Gorontalo, and the International Islamic University Malaysia were each recorded with one publication. This distribution confirms that the Southeast Asian region, particularly Malaysia and Indonesia, has become an epicenter for the development of HOTS research within the context of Islamic education.

The dominance of these institutions is in line with research trends over the past 10 years, which emphasize the urgency of strengthening Higher-Order Thinking Skills (HOTS) in competency-based curricula for the 21st century. study Adawiyah, (2022) It shows that the development of HOTS (Higher Order Thinking Skills) requires strong institutional support through instructional design, teacher training, and innovation in cognitive taxonomy-based assessment. In the context of Islamic Religious Education

(PAI), the implementation of HOTS is increasingly relevant for developing students' analytical and reflective abilities toward Islamic values (Lestari, 2021). Thus, this affiliation map shows that the development of HOTS research in Islamic Religious Education (PAI) is not only individual in nature, but is also driven by institutional strength that has an academic commitment to learning innovation and the transformation of the Islamic education curriculum.

Thematic Clusters and Research Focus on Higher Order Thinking Skills (HOTS) in Islamic Religious Education

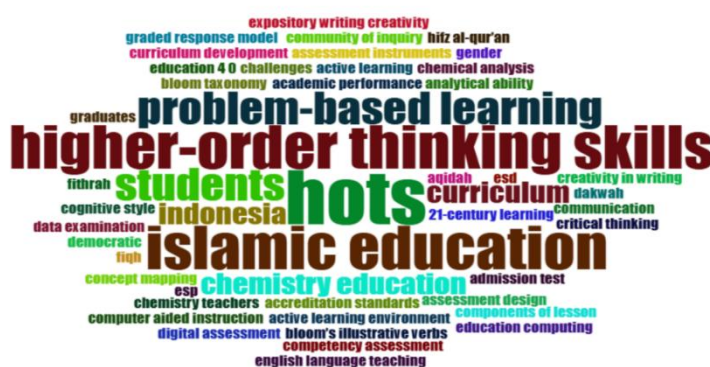


Figure 5. Word Cloud of Frequently Used Keywords

Figure 5 The word cloud-based thematic mapping using Biblioshiny R analysis shows that research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education is dominated by the keywords higher-order thinking skills, Islamic education, problem-based learning, students, and curriculum. These findings indicate that the development of HOTS in Islamic Religious Education is largely directed toward active and contextual learning strategies, particularly through problem-based learning and curriculum strengthening. The focus on students emphasizes a research orientation that positions Higher Order Thinking Skills (HOTS) as a primary cognitive competence to develop critical, analytical, and reflective thinking abilities in Islamic Religious Education learning. In line with this Sholeh et al., (2025) It emphasizes that the integration of HOTS in Islamic Religious Education significantly contributes to improving the quality of religious understanding, which is not only normative but also rational and applicable.

Furthermore, the emergence of keywords such as assessment, critical thinking, and active learning indicates that HOTS research in Islamic Religious Education is not only focused on the learning process but also on the evaluation and measurement of

higher-order thinking skills. This reflects a paradigm shift from rote-based learning toward learning that demands analysis, synthesis, and evaluation. Study Adzidzah & Yudiawan, (2024) emphasizes the importance of HOTS-based assessment to ensure the achievement of 21st-century learning objectives. Thus, this thematic map shows that HOTS research in Islamic Religious Education develops in a multidimensional manner, encompassing pedagogical, curricular, and assessment aspects; however, it still requires deeper theoretical exploration and more consistent research in order to establish a more solid scholarly framework.

Collaboration Map of Authors in Research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education

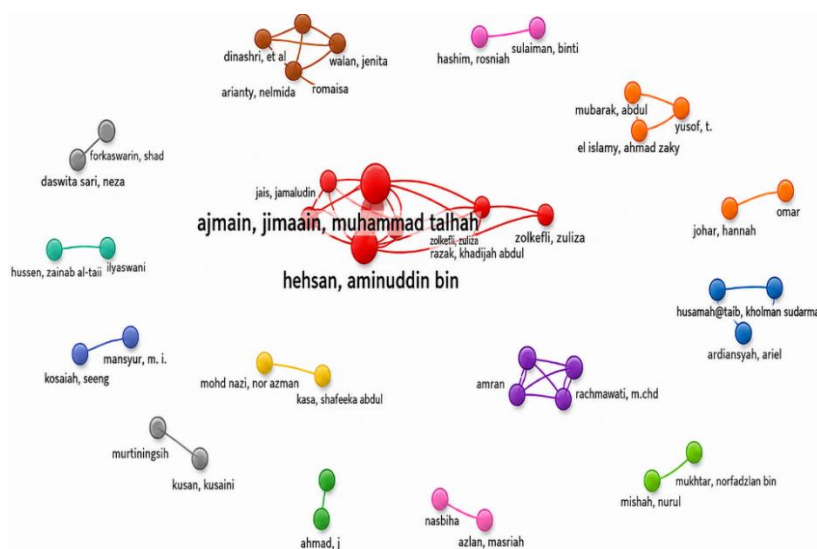


Figure 6 Visualization of Collaboration between Researchers

Figure 6 The visualization of the author collaboration network in the image shows that there is one dominant main cluster compared to other clusters, namely a group of authors centered on Ajmain, Jimaain Muhammad Talhah, and Hehsan, Aminuddin Bin. The larger node sizes and denser connections indicate that these authors have relatively high levels of productivity and collaboration in publications related to HOTS in Islamic education. This pattern indicates that research on this topic is still driven by several core groups of researchers who serve as central nodes within the academic network. In bibliometric studies, large nodes and dense connections typically represent significant contributions to the development of a particular research theme, as well as a higher level of scientific collaboration intensity compared to other authors (Rahman & Rohman, 2025)

On the other hand, the visualization also shows several small clusters that are scattered and relatively separated from the main network. These clusters indicate the presence of groups of researchers who work collaboratively on a small scale or even

individually in studying HOTS in Islamic Religious Education. This condition suggests that this field of research is still developing and has not yet been fully integrated into a broad global collaborative network. This finding is consistent with several studies which state that HOTS research in Islamic education is still at the stage of strengthening concepts and pedagogical implementation. Therefore, cross-institutional and cross-country collaboration still needs to be enhanced in order to enrich perspectives and broaden its impact (Hidayah & Husna, 2024). Therefore, this collaboration map not only illustrates the structure of the researchers' network but also highlights opportunities for research development through the expansion of broader academic cooperation in the future.

Table 4. Top 4 trending articles globally

Citation	Author	Title	Results	Recommendation
27	muhamad nasir	curriculum development and accreditation standards in the traditional islamic schools in indonesia	The study shows that curriculum development in traditional Islamic schools is still oriented toward classical learning and has not fully aligned with modern accreditation standards. The integration between the traditional curriculum and the national curriculum remains a challenge.	There is a need for curriculum development that integrates traditional Islamic values with national standards, as well as the improvement of the accreditation system to ensure the quality of Islamic educational institutions is more guaranteed.
26	aceng kosasih, tedi supriyadi, mokh iman firmansyah, nan rahminawati	higher-order thinking skills in primary school: teachers' perceptions of	The research results indicate that teachers have a sufficient understanding of HOTS (Higher Order Thinking	Training is needed for teachers to integrate HOTS (Higher Order Thinking Skills) into the learning process, as well as to develop

	islamic education		Skills), but its implementation in Islamic Education learning at the elementary school level is still limited. Many teachers still use memorization-oriented teaching methods.	learning strategies that encourage students' analysis, evaluation, and creativity.
8	indah wigati mardeli , mardiah astuti and yuniar	perception of religious lecturers of higher order thinking skills and students' academic performance in online learning	The study found that the implementation of HOTS in online learning can improve students' academic performance. However, its effectiveness is highly influenced by the teaching methods used by lecturers and students' engagement in online discussions.	It is recommended to use interactive online learning methods such as critical discussions, problem-based learning, and analytical assignments in order to optimally develop students' Higher-Order Thinking Skills (HOTS).
8	su hailah hussien, mohd. kaziman abd. wahab rosnani hashim	improving students' inquiry skills in islamic education through hikmah pedagogy and	The <i>hikmah</i> (wisdom) approach in Islamic Education learning has been shown to enhance students' inquiry skills, such as asking questions,	Islamic Education teachers are recommended to use a <i>hikmah</i> (wisdom) approach in the learning process to develop students' critical

community of analyzing, and thinking and inquiry critical thinking. inquiry skills. This method makes the learning process more reflective and dialogical.

Table 4 It shows that the development of Higher Order Thinking Skills (HOTS) in Islamic Religious Education still faces several challenges in terms of curriculum aspects, educators' competencies, and learning strategies. Research conducted by Nasir, (2021) It shows that the curriculum in traditional Islamic schools is still oriented toward a classical learning approach, so it is not yet fully aligned with modern education accreditation standards. This indicates the need for integration between traditional Islamic educational values and the demands of contemporary education, which emphasize critical and analytical thinking skills. Meanwhile, research Kosasih et al., (2022) It reveals that teachers actually already have a sufficient understanding of the HOTS concept; however, its implementation in Islamic Religious Education learning at the elementary school level is still limited because the teaching methods used tend to be oriented toward memorization.

In addition, several studies also show that the development of Higher Order Thinking Skills (HOTS) can be enhanced through innovative and contextual learning approaches. Among them is research Wigati & Astuti, (2023) which found that the implementation of HOTS in online learning can improve students' academic performance, especially when lecturers use interactive learning methods such as critical discussions and analytical assignments. On the other hand, Hussien et al., (2021) It shows that the Hikmah pedagogy approach in Islamic Education learning is able to enhance students' inquiry skills such as asking questions, analyzing, and engaging in reflective thinking. Thus, this research mapping indicates that strengthening Higher Order Thinking Skills (HOTS) in Islamic Religious Education requires an adaptive curriculum integration, improved competencies of teachers and lecturers, as well as the use of innovative learning models that encourage active participation and critical thinking among students.

Conclusion

Based on a bibliometric analysis using the R Biblioshiny tool, research on Higher Order Thinking Skills (HOTS) in Islamic Religious Education has shown a significant increase over the last decade, particularly since 2021. Existing studies generally focus on the development of innovative learning strategies, the integration

of 21st-century curricula, and the strengthening of assessment practices to improve students' critical thinking skills. Research contributions are still dominated by institutions in Southeast Asia, especially Malaysia and Indonesia, indicating growing academic attention toward the implementation of HOTS in Islamic Religious Education learning. However, this study has several limitations, including the limited number of analyzed articles, the use of only a single database, and the limited scope of search keywords, which may have resulted in some relevant articles remaining unidentified. In addition, the bibliometric analysis did not include an in-depth thematic mapping, so the dynamics of research topic development could not be comprehensively illustrated. Therefore, future studies are recommended to expand database sources, increase cross-institutional and international collaborations, enrich search keyword variations, and develop empirical studies based on learning technology in order to provide a broader and more comprehensive understanding of HOTS implementation in Islamic Religious Education.

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