

INTEGRATION OF ISLAMIC EDUCATION AND SCIENCE IN THE PERSPECTIVE OF 21ST CENTURY LEARNING: A CRITICAL LITERATURE REVIEW

Maya Agustina¹, Fasya Fassella², Indah Sumailisa³, Nadiaton Hikmah⁴

^{1,2,3,4} STAIN Teungku Dirundeng Meulaboh

Contributor Email: mayaagustn@staindirundeng.ac.id

Abstrak

Penelitian ini bertujuan untuk melakukan tinjauan literatur kritis dan komprehensif mengenai model integrasi Pendidikan Islam dan Sains dalam kerangka pendidikan abad ke-21. Metode yang digunakan adalah tinjauan literatur kritis dengan pendekatan kualitatif deskriptif terhadap artikel ilmiah yang diterbitkan antara tahun 2015 dan 2025, yang diperoleh dari Google Scholar, Garuda, DOAJ, serta jurnal yang terindeks SINTA dan jurnal internasional bereputasi. Analisis dilakukan melalui identifikasi paradigma integrasi, model pembelajaran, dimensi epistemologis, serta implikasinya terhadap literasi sains dan pembentukan karakter agama. Hasil penelitian menunjukkan bahwa integrasi Islam dan sains telah berkembang dari pendekatan aditif menjadi paradigma integratif transformatif yang menekankan keselarasan antara wahyu dan rasionalitas ilmiah. Secara epistemologis, integrasi dapat dipetakan dalam pendekatan bayani, burhani, dan 'irfani. Secara pedagogis, model seperti *Discovery Learning* terbukti efektif dalam meningkatkan literasi sains sambil mendukung refleksi nilai. Namun, implementasi integrasi masih menghadapi hambatan berupa rendahnya kompetensi guru, keterbatasan sumber daya pembelajaran integratif, serta dukungan institusional yang belum optimal. Studi ini menegaskan bahwa integrasi Islam dan sains merupakan proyek transformatif yang memerlukan rekonstruksi epistemologis, inovasi pedagogis, penguatan kapasitas pendidik, serta reformasi kurikulum secara sistematis.

Kata Kunci: Pendidikan Islam, Sains, Kompetensi abad ke-21

Abstract

This study aims to conduct a critical and comprehensive literature review regarding the integration model of Islamic Education and Science within the framework of 21st-century education. The method used is a critical literature review with a qualitative descriptive approach to scientific articles published between 2015 and 2025, obtained from Google Scholar, Garuda, DOAJ, as well as journals indexed in SINTA and reputable international journals. The analysis was carried out through identifying the integration paradigm, learning models, epistemological dimensions, and their implications for science literacy and character formation. The results indicate that the integration of Islam and science has evolved from an additive approach to a transformative integrative paradigm that emphasizes harmony between revelation and

scientific rationality. Epistemologically, the integration can be mapped within the approaches of bayani, burhani, and 'irfani. Pedagogically, models such as *Discovery Learning* have proven effective in enhancing science literacy while supporting value reflection. However, the implementation of integration still faces obstacles such as low teacher competence, limited resources for integrative learning, and insufficient institutional support. This study emphasizes that the integration of Islam and science is a transformative project that requires epistemological reconstruction, pedagogical innovation, capacity building for educators, and systematic curriculum reform.

Keywords: Islamic education, Science, 21st century competencies

A. INTRODUCTION

The transformation of 21st-century education is marked by a paradigm shift from rote learning to learning that is oriented towards the development of higher-order thinking skills, multidimensional literacy, and character building. Modern education no longer emphasizes content mastery alone, but must equip students with critical, creative, collaborative, and communicative thinking skills as formulated by the Partnership for 21st Century Skills through the 4C framework (critical thinking, creativity, collaboration, communication). In line with this, the report published by the World Economic Forum (2020) emphasizes that analytical thinking, complex problem solving, and active learning are the main competencies needed in the era of the Fourth Industrial Revolution.

In the context of science education, these demands intersect directly with the strengthening of science literacy. Science literacy is not only related to mastery of concepts, but also the ability to reason scientifically, evaluate evidence-based information, and solve contextual problems reflectively. However, the results of the Programme for International Student Assessment (PISA) conducted by the Organisation for Economic Co-operation and Development show that the science literacy achievements of Indonesian students are still below the OECD average (Alfaruqi & Nurwahidah, 2025). The PISA findings show that students' ability to explain scientific phenomena, interpret data, and design scientific investigations still needs to be significantly improved. This condition indicates that science education in Indonesia has not been fully able to develop scientific reasoning and higher-order thinking skills as required in 21st-century education (Farida, 2019, p. 21; Handayani, 2025a).

The national education policy through the Merdeka Curriculum initiated by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia emphasizes strengthening the Pancasila Student Profile. This profile includes the dimensions of faith and devotion to God Almighty, critical thinking, creativity, independence, cooperation, and global diversity. In this context, science education is not only required to develop scientific literacy but also to shape the character and moral integrity of students (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia, 2022).

For Islamic educational institutions, these challenges are particularly complex. Historically, modern education systems have tended to inherit a dichotomy between religious and general knowledge, so that science is often positioned separately from spiritual and theological values. In fact, in Islamic epistemology, revelation and reason are not two

conflicting entities, but rather complement each other. The Qur'an views natural phenomena as signs of God's greatness that can be studied through a scientific approach. Therefore, science education in the context of Islamic education should not only develop scientific inquiry but also build transcendental awareness, scientific ethics, and moral responsibility in the use of science (A Rusdiana, 2018; Adawiyah, 2016).

A number of studies in the last decade have shown that an integrative approach between science and Islamic values has the potential to increase student motivation, science literacy, and religious attitudes. Learning models such as the integration of Qur'anic verses into science materials, a contextual approach based on tauhid, and religion-based project learning have begun to be widely developed. However, most of these studies are still partial and implementative in nature, and have not been critically analyzed within the framework of 21st-century competencies.

The gap in research lies in the absence of a systematic synthesis that maps the integration paradigm used, the learning models developed, and their relevance to strengthening 4C competencies, PISA-based science literacy, and religious character building simultaneously. In addition, the epistemological dimension of integration, namely, how the relationship between revelation and reason is conceptually formulated in science learning design, is still rarely studied in depth. The integration that is carried out is often additive (insertion of verses) and has not reached the integrative-transformative stage that systematically unites the scientific approach and the value of monotheism.

As a concrete example in science education, students learn that the universe began with a single point that exploded approximately 13.8 billion years ago (the Big Bang Theory). In Islamic education, teachers guide students to read Surah Al-Anbiya: 30, which states that the heavens and the earth were once a single, unified whole that Allah then separated. Teachers can initiate a discussion: "Does what scientists mean by 'singularity' align with what the Qur'an describes regarding the separation of the heavens and the earth?" This encourages students to think critically while strengthening their faith.

This study aims to conduct a critical and comprehensive literature review of models for integrating Islamic education and science within the framework of 21st-century education. Specifically, this study seeks to analyze the development of paradigms for the integration of Islam and science in educational practice, ranging from additive approaches to integrative-transformative paradigms that emphasize harmony between divine revelation and scientific rationality. Furthermore, this study aims to map the epistemological dimensions of integration through the *bayani*, *burhani*, and *'irfani* approaches as developed in academic literature, as well as to evaluate their relevance to the design of science education in Islamic educational institutions.

Furthermore, this study aims to examine the implementation of the integration of Islamic values in science education at the madrasah and university levels, including identifying the obstacles encountered in real-world practice. In addition, this study also aims to analyze the effectiveness of various integrative learning models in enhancing students' science literacy and fostering their religious character based on empirical evidence available in the literature. Ultimately, this study aims to formulate the pedagogical and institutional implications necessary to support the sustainability of the integration of Islam and science within the context

of the Merdeka Curriculum and the strengthening of the Pancasila Student Profile. This study is expected to contribute theoretically to the development of an integrative paradigm of science and Islam, while also offering a conceptual foundation for contextual, reflective, and transformative science learning practices in madrasahs and Islamic schools. This integration aims not only to improve science literacy but also to shape a generation that possesses intellectual intelligence, spiritual depth, and ethical responsibility in facing the global challenges of the 21st century.

B. RESEARCH METHOD

This study employs a critical literature review method with a descriptive qualitative approach. Unlike a conventional literature review that merely summarizes previous findings, a critical literature review systematically analyzes, compares, and evaluates various conceptual perspectives regarding the integration of Islamic Education and Science within the framework of 21st-century learning. To ensure transparency and methodological rigor in the process of searching, selecting, and excluding literature, this study adopts the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework as an operational guide.

The literature search process was carried out through four national and international academic databases, namely Google Scholar, Garuda, DOAJ, and SINTA-indexed journals, as well as reputable international journals. The search used keywords including "integration of Islamic education and science," "Islam and science integration," "Islamic values in science learning," "science literacy in Islamic education," and "21st-century competencies in madrasah." The search was conducted systematically to ensure the comprehensiveness of the literature obtained.

After the initial search, the identification stage produced a number of articles that were then screened based on predetermined eligibility criteria. The inclusion criteria applied were: (1) articles published between 2015 and 2025; (2) articles that specifically discussed the integration of science and Islamic values or the integration of Islamic Education and Science in a learning context; (3) articles published in accredited scientific journals (at minimum SINTA 3) or trusted international publishers indexed by Scopus or Web of Science. Meanwhile, the exclusion criteria included: (1) articles that discussed science or Islamic education in isolation without an integrative dimension; (2) non-peer-reviewed publications such as theses, dissertations, or opinion articles; and (3) articles that did not meet the minimum quality standards of academic writing.

The screening process was carried out in two stages. The first stage involved screening based on title and abstract to filter out articles that were clearly irrelevant to the research topic. The second stage involved a full-text review of the remaining articles to assess their eligibility based on the inclusion and exclusion criteria described above. Articles that met all criteria were then included in the final analysis. The overall selection process following the PRISMA flow resulted in 17 articles that were eligible and used as the primary data sources in this study.

Data analysis was conducted by systematically reviewing each selected article and summarizing the findings in an analysis result table that covered the aspects of integration paradigm, epistemological approach, learning model, research findings, and methodological

limitations. The results of this tabulation were then synthesized and presented in an in-depth critical discussion organized thematically, covering: (1) the trend toward integration in learning practices, (2) the implementation of integration at the madrasah and higher education levels, and (3) the effectiveness of integrative learning models on science literacy and religious character building.

C. RESEARCH RESULTS

This study identified and reviewed 17 scientific articles published between 2015 and 2025 that met the inclusion criteria established in the research method. Of these, 10 articles were designated as primary studies directly analyzed as the main sources of findings regarding the integration of Islamic Education and Science, while the remaining 7 articles served as supporting literature to enrich the conceptual and theoretical discussion. The following table presents a synthesis of the primary articles reviewed in this study.

Table 1. Synthesis of Primary Articles Reviewed

No	Author(year)	Title	Method	Key Findings
1	Handayani (2025)	Konsep Integrasi Pendidikan Islam dan Literasi Sains sebagai Jawaban Krisis Nilai Abad 21	Qualitative literature study	Integration of Islam and science is a harmonization between revelation and scientific rationality; faith and science are complementary, not dichotomous
2	Alfaruqi & Nurwahidah (2025)	Reflection on Indonesia's PISA Scores and the 2024 Madrasah Teacher Competency Assessment Results	Descriptive quantitative	Low teacher competence significantly correlates with student academic achievement; weaknesses in HOTS mastery and technology use
3	Arizona et al. (2025)	Integrating Islamic Values and Local Wisdom into Science Education	Quantitative (SEM)	Value integration variable (X3) most significantly contributes to character building (Y); CR > 0.7; AVE > 0.5
4	Zulkarnain et al. (2025)	Integrasi Nilai-Nilai Islam dalam Pembelajaran Sains di Madrasah Ibtidaiyah	Qualitative descriptive	Linking Qur'anic verses, spiritual reflection, and contextual projects improves conceptual understanding and religious attitudes

5	Annur Fajar et al. (2025)	Effective Learning to Build Science Literacy: A Meta-Analysis Study	Meta-analysis	Discovery Learning has the greatest effect size (4.14) in improving science literacy
6	Arifuddin Jalil et al. (2025)	Integration of Islamic Education with Science in the National Education System	Qualitative normative	Importance of integrative curriculum development, educator capacity building, and strengthening tauhid as character foundation
7	Marvavilha & Suparlan (2019)	Model Integrasi Nilai Islam dalam Pembelajaran Sains	Qualitative conceptual	Three epistemological integration models: <i>bayani</i> (textual), <i>burhani</i> (rational-contextual), <i>'irfani</i> (spiritual-intuitive)
8	Ramadhani et al. (2020)	Upaya Integrasi Nilai-Nilai Islam dalam Pembelajaran IPA di Madrasah Ibtidaiyah	Qualitative descriptive	Madrasah Ibtidaiyah teachers integrate Islamic values through materials, methods, activities, and evaluation
9	Setiaji et al. (2023)	Using Multilevel Modeling to Evaluate Science Literacy of Indonesian Non-Science Students	Quantitative (ANOVA & ICC)	Institutional factors (department and faculty) significantly affect science literacy scores ($p < 0.05$)
10	Mahmudi et al. (2022)	Integration of Science and Religion: Implications for Islamic Education	Qualitative literature review	Integration implies research-based curriculum, creative learning, and formation of holistic and tolerant mindset

Supporting literature used to enrich the discussion includes (Cabral, 2026), (Putra et al., 2023), (Suciati et al., 2022), (Adyaksa, 2025), (Ahmad et al., 2020), (Naja et al., 2021), and (Masithah, 2025). These sources are not analyzed as primary data but serve to deepen the epistemological, theological, and paradigmatic dimensions of the discussion.

D. DISCUSSION

Based on the synthesis of the 10 primary articles above, the discussion is organized thematically into three main dimensions: (a) the trend toward integration in learning practices, (b) the implementation of integration and its challenges, and (c) the effectiveness of integrative learning models on science literacy and character building.

1. The Trend Toward Integration in Learning Practices

The findings across the reviewed studies consistently indicate that the integration of Islam and science in learning practices is moving in an increasingly systematic and paradigmatic direction. Integration is no longer understood as merely inserting Qur'anic verses into science materials, but as a deeper epistemological process that unites revelation and scientific rationality. Handayani, (2025b) confirms that integration represents a harmonization between revelation and reason, placing faith and science in a genuinely complementary relationship rather than a hierarchical or dichotomous one.

This integrative tendency is further elaborated through the epistemological classification proposed by Marvavilha & Suparlan, (2019), who identify three complementary approaches: bayani (text-based), burhani (rational-contextual), and 'irfani (spiritual-intuitive). This spectrum shows that integration is not a single, uniform model but a range of approaches that can be adapted to different educational contexts and student characteristics. Supporting this view, Naja et al., (2021) emphasizes that the Qur'an positions the pursuit of knowledge as an act of worship and affirms that all knowledge ultimately originates from Allah SWT, leaving no theological basis for a dichotomy between religion and science. Paradigmatically, Masithah (2025) asserts that the integrative approach eliminates the dichotomy of knowledge and gives birth to a holistic educational model oriented toward shaping a generation with noble character and excellence in science and technology simultaneously.

2. Implementation of Integration and Its Challenges

At the implementation level, the reviewed studies demonstrate that integration has been applied across various aspects of learning, including materials, methods, activities, and evaluation. Ramadhani et al., (n.d.) found that Madrasah Ibtidaiyah teachers were able to integrate Islamic values into science learning through the insertion of Qur'anic verses, spiritual reflection, and value-based evaluation. This finding is reinforced by Zulkarnain et al., (2025), who showed that linking scientific concepts with Qur'anic verses, habitual spiritual reflection, and contextual projects can meaningfully improve students' conceptual understanding and religious attitudes. Empirically, Arizona et al., (2025) quantitative evidence was provided that the integration of Islamic values and local wisdom is positively accepted by students, with the value integration variable (X3) contributing most significantly to character formation (Y), supported by high validity indicators ($CR > 0.7$; $AVE > 0.5$; $p < 0.05$).

However, implementation still faces significant challenges. (Achmad Zukhruf Alfaruqi & Nurwahidah Nurwahidah, 2025) found that low teacher competence, particularly weak mastery of Higher Order Thinking Skills (HOTS), limited methodological innovation, and suboptimal use of technology, correlate significantly with lower student academic achievement. These findings confirm that the success of integration is highly dependent on the professional

readiness of educators. Arifuddin Jalil et al., (2025) Further emphasizes the need for developing an integrative curriculum, strengthening educator capacity, and reinforcing the value of tauhid as the foundation of character education. At the higher education level, Setiaji et al., (2023) demonstrated through ANOVA and ICC analysis that institutional structural factors, specifically department and faculty affiliation, significantly affect students' science literacy scores ($p < 0.05$), indicating that the success of integration extends beyond the classroom and is also shaped by broader institutional policies and structures.

3. Effectiveness of Integrative Learning Models on Science Literacy and Character Building

From the perspective of learning model effectiveness, the reviewed studies provide evidence that integrative approaches contribute significantly to both science literacy improvement and character formation. Fajar et al., (2025), through a meta-analysis, found that the Discovery Learning model yielded the greatest effect size (4.14) in improving science literacy. This model aligns naturally with the integrative paradigm, particularly the Burhani approach, because it encourages students to explore, observe, analyze data, and draw reflective conclusions, without requiring explicit textual integration. Mahmudi et al., (2022) further concluded that the integration of science and religion in Islamic education implies three key dimensions: a research-oriented curriculum, creative and imaginative teaching processes, and the formation of a holistic and tolerant mindset. This shows that the effectiveness of integrative learning models should be measured not only by improvements in academic scores but also by transformations in student mindset and moral character.

Taken together, these findings affirm that the integration of Islam and science has evolved beyond normative-conceptual discourse into a substantive academic field with complex epistemological, pedagogical, sociological, and institutional dimensions. Its sustainability requires a synergy of epistemological reconstruction, pedagogical innovation, teacher capacity building, curriculum reform, and institutional commitment, making it a genuinely civilizational project in the context of 21st-century Islamic education.

D. CONCLUSION

This study concludes that the integration of Islamic Education and Science has evolved from a merely additive approach toward an integrative-transformative paradigm that systematically harmonizes revelation and scientific rationality. Epistemologically, this integration operates through three complementary pathways: *bayani*, *burhani*, and *'irfani*, each offering distinct yet mutually reinforcing approaches to unifying religious and scientific knowledge. Pedagogically, models such as Discovery Learning, contextual instruction, and reflective-based learning have demonstrated meaningful contributions to the simultaneous strengthening of science literacy and religious character formation. However, persistent challenges, including low teacher competence in HOTS-based integrative pedagogy, limited instructional resources, and insufficient institutional support, continue to hinder the full realization of this paradigm in practice.

On the basis of these findings, two levels of recommendation are proposed. Theoretically, future research should prioritize developing an empirically testable conceptual

framework for science-Islam integration, including longitudinal studies that examine its sustained impact on students' scientific reasoning and spiritual development. Practically, curriculum developers are encouraged to embed integrative principles systematically within the Merdeka Curriculum, while educational institutions should invest in sustained professional development for educators and establish model madrasahs as laboratories for integrative learning. The success of this integration ultimately depends on the synergy between epistemological consistency, pedagogical innovation, and institutional commitment to building a holistic and transformative educational ecosystem.

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