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Article

Synergy of Faith and Science in Learning at Madrasah Ibtidaiyah: Sustainability Based Education

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ABSTRACT

This study aims to systematically examine the integration of faith and science in Natural Science (IPA) learning at Madrasah Ibtidaiyah (Islamic elementary schools) and its implications for developing students' scientific literacy, spirituality, and ecological awareness. The research background arises from the fact that science education in Islamic schools often focuses solely on empirical content, thus losing its spiritual meaning and ecological relevance. The method employed was a Systematic Literature Review (SLR) of 28 articles indexed in Scopus and SINTA 2–4 published between 2018 and 2024. The analysis was conducted through thematic coding to identify research focuses, pedagogical models, and integrative conceptual frameworks. The findings reveal four main tendencies: (1) integration of faith and science concepts within the science curriculum (35.7%), (2) integrative pedagogical strategies of teachers (28.6%), (3) implementation of Education for Sustainable Development (ESD) grounded in Islamic values (21.4%), and (4) impacts on students' scientific literacy and ecological character (14.3%). Four dominant learning models were identified: CORE, Inquiry Spiritual-Based, Contextual Islamic Learning (CIL), and Islamic STEAM. This review produces a three-dimensional conceptual framework epistemological, pedagogical, and ecological that shapes the paradigm of "tauhidic pedagogy" as a foundation for developing Islamic science education. In conclusion, science learning in Islamic elementary schools functions not merely as knowledge transmission but as a transformative process that cultivates learners into knowledgeable, faithful, and ecologically responsible individuals.

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INTRODUCTION

Education in Madrasah Ibtidaiyah (Islamic elementary schools) serves not only as a medium for transmitting scientific knowledge but also as a means of shaping faith, character, and ecological awareness grounded in worship values (Sutiana & Nugraha, 2025). Amid the rapid tide of modern scientific secularization, Islamic education faces a profound challenge maintaining harmony between faith and science so that both domains do not fall into a meaningless dichotomy (Imran et al., 2024). Natural Science (IPA) learning in MI often

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follows a positivistic pattern that emphasizes empirical aspects while neglecting spiritual values (Treagust & Won, 2023). In Islamic epistemology, however, science is not merely the pursuit of causal laws but an endeavor to recognize the divine signs (ayat kauniyah) manifested throughout the universe (Ahmed, 2022). Therefore, the synergy between faith and science becomes a crucial epistemological approach to uniting spiritual and rational dimensions in education (Rodriguez & Stokke, 2019).

Entering the 21st century an era marked by accelerated globalization and technological transformation elementary education faces increasingly complex challenges (Rahimi & Oh, 2024). Its role now extends beyond the transfer of scientific knowledge to include the cultivation of character grounded in faith and sustainability values (Bencze et al., 2020). The Indonesian National Education Vision underscores the importance of providing "quality basic education" that ensures every child receives learning experiences that are meaningful and relevant to real life ("Harmony in Education," 2024). However, empirical realities reveal a gap between ideal aspirations and practice the quality of science instruction remains suboptimal (Yonai et al., 2024). Recent studies have indicated that Indonesian students' scientific literacy levels remain low, with most performing at the basic level and still unprepared to confront issues related to science, technology, and sustainability (Suroso et al., 2021).

In the context of Madrasah Ibtidaiyah the Islamic-based primary education system in Indonesia there lies great potential to integrate two domains that have long been treated as separate faith, which encompasses values, creed, and Islamic ethics and science, particularly the natural sciences (Badrun, 2024). Recent data show that there are approximately 26,503 MIs across Indonesia, the majority managed by private or community-based organizations (Hosaini et al., 2024). This indicates that MIs have extensive reach and serve as a strategic arena for implementing the integration of faith and science in science learning (Efe & Akcan, 2024). Nevertheless, classroom practices still largely emphasize empirical content, often disconnected from spiritual and sustainability values (Mu'min & Nugraha, 2024). Consequently, learning tends to become superficial and less relevant to the lived experiences of students rooted in Islamic principles (Hendawi et al., 2024).

Previous studies (Goshu & Ridwan, 2024; Rahayu et al., 2025) have emphasized that integrative approaches combining science and faith can enhance students' spiritual scientific reasoning and strengthen their ecological responsibility. However, few comprehensive studies have systematically examined how this synergy is realized conceptually, pedagogically, and in classroom practice at the MI level (Yun et al., 2023). Therefore, this research aims to fill that gap by systematically reviewing forms, strategies, and implications of faith science integration in science learning at Islamic elementary schools.

The integration of faith and science in science education at Madrasah Ibtidaiyah is increasingly relevant not only from a spiritual perspective but also within the broader framework of Education for Sustainable Development (ESD) (Hajar, 2024). The latest United Nations report reveals that only about 35% of the Sustainable Development Goals (SDGs) are progressing adequately, while nearly half are moving too slowly and around 18% have regressed (Leal Filho et al., 2023). This condition underscores that education systems must go beyond transferring scientific knowledge to fostering ecological awareness, social responsibility, and theological understanding that humankind was created as stewards (khalifah) of the earth a concept deeply rooted in Islamic educational philosophy.

Accordingly, this study seeks to explore more deeply the synergy between faith and science in science learning at MI as a strategic effort toward sustainability-based education. Science learning is expected not to stop at cognitive mastery or conceptual understanding but to cultivate spiritual and moral sensitivity toward life and the environment. Through a systematic review of relevant literature, this research aims to construct a conceptual and practical framework capable of integrating faith and science holistically, ensuring that science

education in MI nurtures not only intellectual competence but also spirituality and ecological responsibility among students.

METHOD

Research Design

This study employs a Systematic Literature Review (SLR) approach, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol (Agrawal et al., 2024). This approach was chosen to obtain a comprehensive understanding of the integration of faith and science in Natural Science (IPA) learning at Madrasah Ibtidaiyah Islamic elementary schools, particularly within the framework of sustainability-based education. The SLR method enables the researcher to systematically and transparently identify, evaluate, and synthesize previous research findings, thereby producing credible and replicable results (Cabrera & Cabrera, 2023).

Data Sources

The data sources in this study consist of scientific articles published in reputable national and international journals, including those indexed in Scopus, DOAJ, Garuda, SINTA (levels 2–4), and Google Scholar. The main focus of the search was directed toward articles discussing: 1) The integration of faith and science in the context of Islamic education; 2) Science learning in Madrasah Ibtidaiyah or Islamic elementary schools; and 3) Education for Sustainable Development (ESD) within an Islamic perspective. The publication period reviewed was limited to 2018–2024 to ensure data currency and relevance to contemporary educational contexts.

Article searches were conducted using combinations of the following keywords in both Indonesian and English: "integrasi iman dan ilmu, pendidikan IPA Islam, madrasah ibtidaiyah, Islamic science education, faith and science integration, education for sustainable development, and Islamic pedagogy." These keywords were applied across multiple databases using Boolean logical operators (AND, OR) to efficiently broaden or narrow the search scope. All retrieved articles were compiled in a bibliographic database using Zotero software to facilitate reference management and the elimination of duplicate records.

Table 1. Inclusion and Exclusion Criteria for Article Relevance to the Research Focus

Inclusion Criteria	Exclusion Criteria
Artikel terbit tahun 2018–2024	Artikel tanpa akses penuh (*non-open access*) yang tidak dapat ditinjau secara utuh
Ditulis dalam bahasa Indonesia atau Inggris	Publikasi berupa opini, *conference abstract*, atau editorial tanpa data empiris
Memiliki fokus utama pada pendidikan IPA di MI atau lembaga Islam setara	Artikel yang hanya membahas pendidikan IPA secara umum tanpa konteks nilai Islam atau keberlanjutan.
Mengandung unsur integrasi nilai iman atau spiritual dalam pembelajaran sains	
Artikel berbentuk *empirical research* atau *conceptual study*	

The literature selection process follows four main stages in the PRISMA flow:

Table 2. Article Selection Procedure

Article Selection	*f*
Identification	214 Article
Screening	87 Article
Credentials	49 Article
Inclusion	32 Article

All stages of the selection process were systematically documented through a PRISMA Flow Diagram to ensure process transparency.

Data Analysis Technique

Data were analyzed using the thematic synthesis approach Thomas & Harden, 2008 in Lauzon-Schnittka et al., (2022), which consists of three main stages: 1) Data extraction: Researchers identified key information from each article, including author, year, research objectives, methods, and main findings. 2) Coding and thematic grouping: Conducted inductively by examining similarities and variations in emerging concepts, particularly those related to faith–science integration, pedagogical approaches, and sustainability values. 3) Thematic synthesis: The coding results were organized into several major themes illustrating the conceptual patterns and practical synergy between faith and science in science education.

To maintain the validity of findings, the analysis process was carried out iteratively and cross-verified with sources employing similar methodologies. Furthermore, the synthesis results were validated through peer debriefing with experts in Islamic education and elementary science pedagogy. Each article that passed the inclusion stage was assessed for quality using the Critical Appraisal Skills Programme (CASP) instrument, which includes nine assessment aspects such as research clarity, methodological appropriateness, analytical rigor, and contribution to knowledge development. Articles scoring below 60% were considered to fall short of scientific standards and were excluded from the final synthesis.

Although this study did not involve direct human participants, all processes of literature collection and citation adhered to academic ethics, including principles of transparency, originality, and proper citation in accordance with APA 7th Edition standards. Every source used was explicitly acknowledged to avoid copyright infringement and plagiarism.

Using a Systematic Literature Review design, this study traced various empirical and conceptual findings related to the integration of faith and science in Natural Science learning at Madrasah Ibtidaiyah. The systematic and multilayered approach in selection, analysis, and validation ensured that the results obtained were not merely descriptive but also analytical providing both theoretical and practical foundations for developing a spirituality- and sustainability-based science education model in Islamic elementary schools.

RESULT AND DISCUSSION

Results of the Review

General Description of the Reviewed Articles

The selection process yielded 28 articles that met the inclusion criteria published between 2018 and 2024, primarily drawn from journals indexed in Google Scholar, Garuda, SINTA 2-4, DOAJ, and Scopus Q3. Most of these articles focus on the integration of Islamic values in science education, as well as contextual and transdisciplinary approaches implemented in Madrasah Ibtidaiyah Islamic elementary schools.

Table 3. Distribution of Articles Based on Research Focus

Research Focus	Number of Articles	Percentage (%)
Integration of faith and science in curriculum design	10	35.7
Integrative pedagogical strategies of MI teachers	8	28.6
Implementation of Islamic-based Education for Sustainable Development (ESD)	6	21.4
Impact on students' scientific literacy and ecological character	4	14.3
Total	**28**	**100**

Based on Table 3, the majority of studies (35.7%) highlight the need for an epistemological reorientation of the science curriculum so that it does not merely convey empirical knowledge but also incorporates the values of tawhid (oneness of God), amanah *trustworthiness*, and khalifah *stewardship*. Articles such as Abdurrahman (2019) and Zaini (2023) emphasize that science, within the Islamic worldview, should be understood as ayat kauniyah signs of God's greatness manifested in the universe. Eight articles (28.6%) underscore the crucial role of teachers as the key agents in integrating faith and science. Studies

by Mulyadi (2021) and Arifin & Nurul (2022) reveal that the most effective pedagogical approach is one that embeds Islamic values within scientific inquiry activities.

Meanwhile, the integration of Islamic values into Education for Sustainable Development (ESD) (21.4%) has been shown to strengthen students' moral orientation toward environmental issues. For instance, green school projects linked to the concept of khalifah fil ardh not only shape ecological behavior but also deepen students' spiritual connection to nature. In other words, ESD within the Islamic perspective is not merely a global agenda but an inherent part of faith-based ethics. Although the theme of science literacy and ecological character represents the smallest proportion (14.3%), it serves as the most concrete indicator of the effectiveness of faith–science integration. Research by Rahmawati (2020) and Aminah (2022) demonstrates an improvement in scientific literacy accompanied by enhanced ecological and spiritual awareness.

These findings indicate a growing academic interest in the synergy between faith and science since 2020, coinciding with the discourse of the Merdeka Belajar (Freedom to Learn) curriculum, which promotes flexibility and contextual values in education.

The Concept of Faith–Science Integration in Science Learning

From the analysis, it was found that the integration of faith (*iman*) and science (*ilmu*) in *Madrasah Ibtidaiyah* (MI) generally occurs through three main conceptual approaches: 1) The Tauhidic Approach, which links every natural phenomenon to the greatness of Allah SWT, positioning science as a medium for *tafakkur* spiritual reflection and contemplation. 2) The Holistic Approach, which perceives science not merely as a collection of empirical facts but as a means of character formation, moral development, and ecological responsibility. 3) The Islamic Transdisciplinary Approach, which combines sources of knowledge from the Qur'an, Hadith, and modern scientific findings. Most of the reviewed articles emphasize that faith-based science education does not hinder rationality; rather, it broadens students' horizons of thought. As Mulyadi (2021) notes, *"the integration of tauhid within science purifies scientific logic from anthropocentric bias."*

Teachers' Pedagogical Strategies in Implementing the Faith–Science Synergy

Teachers in *Madrasah Ibtidaiyah* play a central role in transforming faith-based values into meaningful scientific learning experiences. Based on the literature analysis, four main pedagogical models were identified:

Table 4. Integrative Learning Models in Islamic Science Education

Learning Model	Distinct Characteristics	Example of Implementation	Impact on Students
CORE Model (Connecting, Owning, Responding, Empowering)	Connects scientific concepts with Qur'anic *ayat kauniyah* (signs in nature).	Students investigate the water cycle and relate it to *Q.S. Al-Mu'minūn: 18*.	Enhances spiritual engagement and conceptual understanding.
Spiritual-Based Inquiry Model	Integrates scientific investigation with faith reflection.	Conducting photosynthesis experiments accompanied by *tafakkur* (contemplation) on the meaning of life in plants.	Develops spiritual scientific reasoning.
Contextual Islamic Learning (CIL)	Implements science learning based on social context and local Islamic values.	Studying river ecosystems while linking them to the Islamic duty of *amanah* (trust) in environmental stewardship.	Strengthens ecological responsibility.
Islamic STEAM Model (Science, Technology, Engineering, Art, and Math)	Aligns technological creativity with moral and ethical values.	Creating eco-friendly water filters framed with the concept of *khalifah fil ardh* (steward of the Earth).	Improves technological literacy and environmental ethics.

Based on Table 4, the CORE Model represents a concrete form of faith–science integration that emphasizes the process of connecting scientific concepts with values of tawhid (divine unity). The "Connecting" stage serves as a crucial starting point, where teachers guide students to discover the relationship between natural phenomena and ayat kauniyah (signs of

God in nature). For instance, a study of the water cycle is linked to Q.S. Al-Mu'minūn: 18, which emphasizes the divine order of creation.

Second, the Spiritual-Based Inquiry Model proves effective in cultivating spiritual scientific reasoning the ability to think scientifically while grounded in divine values. Students not only reason about cause-and-effect relationships but also connect the natural order with divine wisdom. Pedagogically, this model fosters a learning atmosphere that is both contemplative and rational, combining scientific curiosity with faith-based awareness. As a result, students become more reflective and develop spiritual sensitivity toward scientific subjects.Overall, these integrative learning models have been shown to enhance both scientific literacy and students' spiritual awareness in madrasah ibtidaiyah (Islamic elementary schools), as reflected in the increased indicators of "religious curiosity" and "responsibility toward creation." These models collectively illustrate that teachers function not merely as transmitters of scientific content but as *spiritual facilitators* who bridge rational inquiry with transcendental meaning, fostering students who are both scientifically literate and spiritually grounded.

Implications of Faith–Science Synergy for Sustainable Education

The integration of faith and science demonstrates a direct impact on Education for Sustainable Development (ESD), particularly across three key dimensions: 1) Ecological Dimension, Students exhibit heightened awareness of environmental issues and increased participation in school-based green initiatives. Learning activities such as waste reduction, water conservation, and school gardening are interpreted not merely as ecological actions but as expressions of ibadah (acts of worship). 2) Social Dimension, Faith-oriented science education cultivates ethical sensitivity, empathy, and social responsibility. Scientific inquiry is no longer limited to intellectual exercises but becomes a moral practice rooted in ukhuwah insaniyah (human solidarity). 3) Spiritual Dimension, Science is reframed not as a "neutral discipline," but as a path toward recognizing divine greatness and human moral responsibility as khalifah fil ardh (stewards of the earth). Several studies (Fadhilah, 2024; Suryadi, 2023) affirm that students engaged in integrative approaches display more consistent eco-friendly behaviors and possess a sustainable worldview (ru'yah istiqamah al-tanmiyah), which bridges faith-based ethics with modern sustainability principles.

Table 5. The Three-Pillar Framework of Faith–Science–Sustainability Synergy

Pillar	Description	Pedagogical Implication	Expected Student Outcome
Epistemological Dimension	Science is perceived as the manifestation of *ayat kauniyah* (divine signs) that reveal the wisdom and order of God's creation. Knowledge acquisition thus becomes an act of faith-based reflection (*tafakkur*).	Teachers guide students to interpret natural phenomena through Qur'anic perspectives, integrating scientific observation with spiritual contemplation.	Development of *scientific spirituality*—students understand that studying nature equals recognizing divine order.
Pedagogical Dimension	Learning emphasizes the unity between inquiry and worship, merging empirical investigation with ethical and spiritual awareness.	Implementation of inquiry-based and reflective learning models (e.g., CORE, Inquiry Spiritual-Based) that invite students to reason scientifically while deepening faith.	Strengthened critical thinking, curiosity, and faith-oriented scientific reasoning.
Ecological Dimension	Humans are viewed as *khalifah fil ardh* (stewards of the Earth), responsible for preserving environmental balance as part of divine mandate.	Teachers incorporate ESD (Education for Sustainable Development) principles within Islamic values—projects on green schools, ecosystem studies, and environmental ethics.	Cultivation of ecological literacy, moral responsibility, and sustainable behavior rooted in Islamic ethics.

Based on Table 5, the epistemological implications of the faith–science synergy reveal that students are guided to perceive the natural order as empirical evidence of God's greatness and wisdom. This approach repositions science to its ontological essence as a pathway to *ma'rifatullah* (the recognition of the Divine). Consequently, science education in *Madrasah Ibtidaiyah* should nurture an awareness that every scientific phenomenon, from planetary

motion to photosynthesis, embodies divine signs (*ayat kauniyah*) that warrant reflection rather than mere explanation. Models such as Inquiry Spiritual-Based Learning and CORE (Connecting, Owning, Responding, Empowering) exemplify the practical embodiment of this paradigm. These models promote a holistic form of learning that integrates cognitive (scientific reasoning), affective (faith and spiritual admiration), and psychomotor (value-oriented action) domains. Within this framework, science is no longer treated as value-neutral but as a transformative learning experience that cultivates both intellectual and moral sensitivity toward creation.

The ecological dimension represents the tangible outcome of a successful epistemological and pedagogical synthesis. Students who perceive nature as divine revelation and engage with it through spiritual inquiry demonstrate stronger environmental awareness and responsibility, viewing ecological stewardship as a form of worship. This transforms science learning into faith-based ecological education, in which scientific literacy leads to moral consciousness and sustainable behavior.

The practical manifestations of this paradigm are evident in initiatives such as green school projects, Islamic-based waste management systems, and the development of simple technological innovations (e.g., water filtration devices) that align with the concept of *khalifah fil ardh* (human stewardship of the Earth). Accordingly, science education serves as a medium for both spiritual and ecological transformation. This conceptual framework provides a foundation for faith-integrated and sustainability-oriented science education in Islamic elementary schools, supporting the broader vision of *"Merdeka Belajar yang Islami dan Ekologis"*an educational philosophy that unites intellectual inquiry, spiritual awareness, and ecological responsibility.

Discussion

The analysis reveals that the four Islamic value–based learning models CORE (Connecting, Owning, Responding, Empowering), Inquiry Spiritual-Based, Contextual Islamic Learning (CIL), and Islamic STEAM represent integrative efforts to bridge the dichotomy between science and spirituality within Islamic elementary education (Buckingham et al., 2023). Each model embodies distinctive epistemological foundations, pedagogical strategies, and ecological orientations that complement one another.

From an epistemological perspective, all models are grounded in the assumption that nature is a set of ayat kauniyah signs of God's greatness that can be interpreted through scientific inquiry (Hasan et al., 2024). This reflects a paradigm shift from secular science toward tauhidic science, where scientific activity is not merely the pursuit of objective knowledge but also a means to cultivate spiritual consciousness (Obiedat, 2022). Students are no longer positioned as passive observers of natural phenomena but as khalifah fil ardh moral stewards of God's creation (Ghofururrohim et al., 2024).

Pedagogically, these models share a common orientation: learning that is exploratory, reflective, and participatory (Arnesson & Albinsson, 2019). The CORE model emphasizes conceptual and spiritual connections between science and revelation; the Inquiry Spiritual-Based model nurtures scientific reasoning accompanied by faith-based reflection; CIL contextualizes science within social and local Islamic values; while Islamic STEAM integrates technological creativity with tauhidic morality (Wilson, 2024).

Collectively, these approaches demonstrate that spirituality does not diminish scientific objectivity but rather broadens its epistemological horizon by adding ethical and meaningful dimensions (Ažđajić, 2024). The ecological dimension emerges as the practical implication of the epistemological and pedagogical integration (Ortiz-Revilla et al., 2020). The synergy between scientific understanding and spiritual awareness generates authentic ecological responsibility (Gough, 2018). Students not only comprehend the mechanisms of ecosystems or

the water cycle but also internalize the belief that environmental stewardship is an act of worship (Khamrang Varah et al., 2021). Thus, Islamic science education extends beyond conceptual mastery toward theologically conscious ecological action.

Theoretically, the epistemological, pedagogical, ecological integration can be conceptualized as a reflective spiral pattern: (1) Knowing scientific understanding arises from the exploration of ayat kauniyah; (2) Believing spiritual reflection imbues knowledge with faith-based meaning; and (3) Doing ecological action manifests as the embodiment of faith and knowledge (Eom & Ng, 2023). This spiral reflects a transformative Islamic educational process not merely instructive. Teachers function not only as conveyors of knowledge but as murabbi (spiritual mentors) who guide students to uncover the divine meaning behind science (Siregar, 2025). Meanwhile, students become active agents who construct the relationship between rationality and faith in the learning process (Busti et al., 2024).

From a theoretical standpoint, these findings enrich the discourse of Islamic Science Education by proposing an axiological integration framework one that connects revelation and science not only at the conceptual level but also within pedagogical praxis (Mahmudulhassan et al., 2024). Consequently, this study provides a foundation for developing a tauhidic pedagogy as a new paradigm of science education in madrasah, aligning with the vision of Freedom to Learn while remaining rooted in Islamic values.

CONCLUSION

This study affirms that science education in *Madrasah Ibtidaiyah* can serve as a medium for the integration of faith (*iman*), knowledge (*ilmu*), and practice (*amal*) through epistemological, pedagogical, and ecological synergy. Models such as CORE, Inquiry Spiritual-Based, CIL, and Islamic STEAM demonstrate that science not only cultivates cognitive intelligence but also fosters spiritual awareness and ecological responsibility.

Thus, Islamic value-based science education is not merely a methodological alternative but a new paradigm that asserts: learning science means reading the divine signs (*ayat-ayat Tuhan*) in nature, interpreting their meaning through scientific inquiry, and translating them into real actions that sustain the Earth. This paradigm repositions the *madrasah* as a true *laboratory of tauhid* a space where knowledge, faith, and action converge in liberating and enlightening harmony.

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