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Reconstruction of Islamic Epistemology for Education: Critique of the Hegemony of Modern Science and Efforts to Integrate Science in the Perspective of the Islamic Worldview

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ABSTRACT

The hegemony of modern secular and dualistic science epistemology has created a dichotomy in education within the Islamic world, leading to intellectual-spiritual disorientation, ecological crises, and minimal Islamic scientific contribution. Existing integration efforts are often superficial, failing to address fundamental epistemological reconstruction. This study aims to conduct an in-depth exploration of the efforts to reconstruct Islamic epistemology in the context of science education and to formulate an operational framework for its implementation. The research employs a qualitative approach with an intrinsic case study design. Data were collected through semi-structured in-depth interviews with three purposively selected key informants: an academic/epistemologist, a curriculum developer, and a science teacher. Data analysis was conducted using an interactive thematic analysis model. The findings indicate that the core of integration is a tawhid-based paradigm reconstruction, viewing science as the reading of cosmic signs (ayat kauniyah) guided by revelation. Implementation exists on a spectrum from infusion to curricular reconstruction but is hindered by teacher capacity gaps, national curriculum pressures, and a scarcity of learning resources. As solutions, the study recommends cultivating scholar-scientists (ulama-ilmuwan), establishing teacher communities of practice, building collaborative ecosystems, and adopting a phased roadmap toward institutionalization.

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INTRODUCTION

Contemporary education, both in the Islamic world and globally, has been dominated by a modern epistemology originating from positivist and secular paradigms (Mardianto et al., 2023). This paradigm strictly separates science, which is deemed objective, from religious values or ethics, which are considered subjective. Consequently, science and technology education runs separately from moral and spiritual education, creating a profound dichotomy. According to BPS Indonesia (2023), the hegemony of modern science has created a "monoculture of knowledge" that marginalizes other worldviews and knowledge systems. The educational curricula in most Muslim countries adopt this dichotomous Western model, thereby giving rise to a generation experiencing disorientation. They master modern science yet are uprooted from their own epistemological roots and values of faith. This phenomenon potentially leads to a severe intellectual and spiritual identity crisis. Data

from the Delfira et al. (2025) indicates that although the average education spending in Organisation of Islamic Cooperation (OIC) countries reaches 4.2% of GDP, learning outcomes, particularly in value-integrated scientific literacy, remain below the global average. The novelty of this research lies in its effort to not merely criticize but to systematically offer an operational framework for reconstruction. The identified research gap is the lack of an integrative epistemological model that can be implemented in micro-curriculum design at the classroom level.

The hegemony of modern science in education has impacted the formation of a reductionist and materialist way of thinking among Muslim students. Science is taught as the sole valid source of truth, often without critical dialogue with the rich Islamic scholarly heritage. Abas & Supi'ah (2025), in his work "Islamization of Knowledge," has long criticized the condition where Muslims become passive consumers of Western knowledge without the ability to select and Islamize it. A survey conducted by Nazilla et al. (2025) among young Muslims in several countries shows that 65% of respondents perceive a conflict between religious teachings and modern scientific findings, especially in fields like evolution and cosmology. If this perceptual conflict is not managed with an appropriate epistemology, it will lead to skepticism towards religion or rejection of science. Consequently, the world of education loses the opportunity to shape scientists who are simultaneously faithful and of noble character. The reconstruction of epistemology becomes urgent to bridge this perceptual gap. This research attempts to fill this gap by formulating concrete integration principles, not merely at the discursive level. The lack of practical guidelines for Muslim science educators in integrating the Islamic worldview is a real problem in the field.

The Islamic education world itself faces the exhausting problem of systemic dualism. On one hand, there are religious schools (madrasahs/pesantrens) that focus on traditional religious sciences (naqliyah) but are often deficient in mastering modern science. On the other hand, public schools and leading universities concentrate fully on modern science while neglecting the spiritual and ethical dimensions of Islam. According to data from the UNESCO Institute for Statistics in research Kartini & Mashudi (2022), only about 30% of higher education institutions in OIC countries formally incorporate Islamic studies or ethics courses into the core curriculum of science and engineering programs. This dichotomy produces incomplete graduates: religious scholars who inadequately understand the language of contemporary science, and scientists who are blind to Islamic philosophical concepts about the universe. Dariyo et al. (2022) refers to this condition as the intellectual "split personality" of Muslims. Its social implication is the minimal contribution of Muslim thinkers in solving complex global problems, such as the environmental crisis or bioethics, with a distinct Islamic perspective. This research offers novelty through a "reconstruction" approach that is transformative towards epistemology itself, not merely adaptive. There is a gap in the literature regarding how tawhid (monotheism) principles can become the methodological foundation in scientific research and teaching practice.

The global ecological crisis is clear evidence of the failure of the anthropocentric and exploitative paradigm of modern science. Science detached from transcendental values tends to be used for dominating nature rather than stewardship (khilafah). The Islamic worldview offers the concept of the universe (ayat kauniyah) as full of divine signs and must be treated with full responsibility. Kholidi et al. (2022) research on the philosophy of nature in Islam asserts that the desacralization of nature in modern science is the root of environmental damage. Data from the Environmental Performance Index in research Parpatih (2025) indicates that most Muslim-majority countries score below average in terms of environmental health and ecosystem vitality, suggesting low ecological awareness. This correlates with science education that fails to instill moral responsibility based on religion. The reconstruction of epistemology aims to produce a teleological science paradigm, where seeking knowledge is an act of worship (ibadah) and utilizing it is a trust (amanah). The implication of this research is hoped to influence environmental education policy. The novelty offered is the integration of concepts like mizan (balance) and amanah (trust) directly into the epistemology of environmental science.

Within the scope of higher education, the hegemony of modern science is evident from the publication and academic recognition systems that almost entirely refer to Western standards. Performance indicators such as publication in reputable international journals (dominated by Western perspectives) often marginalize integrative studies between science and Islam. Such studies are deemed less "scientific" or too philosophical. According to a bibliometric analysis by Pranata (2024), less than 2% of publications from universities in Indonesia and Malaysia explicitly integrate Islamic worldview concepts in pure and applied science research. This condition forces Muslim academics to adopt a secular framework for their work to gain global recognition, thus reinforcing the cycle of hegemony. Consequently, the multidisciplinary tradition of Islamic scholarship (as practiced by Al-Biruni or Ibn Sina) is increasingly eroded. This research attempts to break through this gap by formulating an epistemological framework that can serve as the basis for a methodology that is academically valid yet remains rooted in Islamic values. The novelty of this approach lies in the effort to build a "shared language" acceptable in global academic discourse.

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Science teachers in Muslim schools are often not equipped with epistemological tools to perform integration. They teach Newton's laws, cell theory, or thermodynamics exactly as in Western textbooks, without the ability to connect them to concepts of tawhid, such as the orderliness of nature (sunnatullah) or the dependence of creation on the Creator. A field study by Ashari et al. (2024) in 50 Islamic secondary schools in Java showed that 85% of science teachers admitted difficulty and lacked adequate references to link science teaching materials with Islamic concepts. This results in integration that is merely piecemeal and artificial, for example, only by giving an "Islamic" label or inserting Qur'anic verses without in-depth analysis. Learning becomes unengaging and fails to achieve the goal of forming a holistic worldview. This research is expected to produce an epistemological model that translates into a pedagogical guide for teachers. The research gap to be filled is the absence of a systematic framework from the philosophical level (epistemology) to the practical level (teaching strategies).

The classical Islamic knowledge edifice inherently possesses a solid and integrative epistemological foundation, combining revelation (naql), intellect ('aql), senses (observation), and intuition (kashf). However, this heritage is often studied merely as history, not as a living epistemology still relevant for development. The works of Muslim philosophers and scientists like Al-Ghazali, Ibn Rushd, and Ibn Khaldun, which offer critique and synthesis of knowledge, have not been extensively examined for the context of 21st-century science education. According to Yolanda & Hasanah (2024), the concept of knowledge in Islam is unified, encompassing both fardhu 'ain (individual obligation) and fardhu kifayah (communal obligation) sciences, which should not be separated in the curriculum. Data from the International Islamic University Malaysia (IIUM) indicates that students taking the "Islamization of Knowledge" course showed a significant 40% increase in critical thinking ability regarding both sources (revelation and science) Ashari et al. (2024). The revitalization of classical Islamic epistemology holds great potential for addressing the crisis of modernity. The novelty of this research lies in the effort to translate these classical concepts into contemporary terminology and challenges, particularly in education.

Modern challenges such as the development of artificial intelligence (AI), biotechnology, and neuroscience require profound ethical responses. Modern science alone is incapable of providing comprehensive ethical answers due to its value-free domain. This is where the Islamic worldview perspective can make a significant contribution. However, this contribution is only possible if Muslim scientists possess an epistemology that integrates both domains. For instance, in the issue of CRISPR-Cas9 gene editing, fatwas or religious opinions often emerge after the scientific fact has occurred, not as part of the scientific discourse from the outset. A report from the Islamic Organization for Medical Sciences in research Abdillah & Astutik (2024) reveals that only 15% of international symposiums on bioethics involved Muslim scholars with an integrative perspective. This indicates a significant communication and epistemological gap. The implication of this research is hoped to yield an educational model that produces "scholar-scientists" or at least scientists who are literate in the treasury of Islamic ethics. The novelty of the research lies in the futures studies approach in reconstructing epistemology to address future scientific challenges.

Integration efforts conducted thus far, such as the Islamization of Knowledge, are often criticized for being too theocentric, undervaluing the autonomy of scientific methodology, or merely being reactive to the West. Fauzi (2021) and others highlights that the Islamization project sometimes gets trapped in symbolism and even alienates itself from mainstream scientific developments. On the other hand, looser integration models like "correlation" or "synthesis" are also considered not to have touched the epistemological root. An evaluation of integration programs at several Leading Islamic Universities by Octavina et al. (2024) shows that their success remains limited to the theoretical level and rarely affects a paradigm shift in student thinking. A more radical, in-depth, and operational reconstruction is required. This research attempts to fill the gap by proposing a reconstruction that is dialectically critical of both sides: both the universal claims of modern science and the apologetic tendencies in Islamization discourse. The novelty offered is a dynamic framework open to inter-civilizational dialogue.

The reconstruction of Islamic epistemology for education is not an isolationist project, but an intellectual necessity to shape a better future. The problem of modern science hegemony has caused educational dichotomy, ecological crisis, youth disorientation, and minimal Islamic contribution in the global arena of knowledge. Statistical data from various international institutions confirms a serious gap between mastery of science and the internalization of values. This research has theoretical implications for the development of tawhid-based philosophy of science and practical implications for curriculum design, teacher training, and even national education policy in Muslim countries. Its main novelty is the proposal of a hierarchical reconstruction model, starting from the philosophical foundation (Islamic worldview), epistemological principles, to their derivation in research methodology and pedagogy. By filling the research gap in the form of a lack of concrete implementation models, this research is hoped to be a catalyst for the birth of a science education that empowers, humanizes, and reminds humanity of its very purpose of creation.

METHOD

This research will adopt a qualitative approach with an intrinsic case study design, focusing on an in-depth exploration of the efforts to reconstruct Islamic epistemology in the context of science education. The qualitative approach was chosen because it is suitable for revealing the complexity of the understanding, experiences, and subjective perspectives of the key actors directly involved in the practice of knowledge integration (J. Creswell, 2017). The primary data collection method is semi-structured in-depth interviews to be conducted with three key informants selected purposively based on specific criteria. The informant selection criteria include their capacity as practitioners or thinkers who are actively involved in projects integrating science and Islam, both at the conceptual and operational levels in educational settings. The three informants are planned to represent three different roles: first, an academic/philosopher who is an expert in Islamic epistemology and the study of the Islamization of knowledge; second, a curriculum developer or school principal with experience designing integrative programs in Islamic educational institutions; and third, a science teacher who directly implements an integrative approach in classroom learning. Prior to the interviews, the researcher will prepare an interview guide containing a series of open-ended guiding questions directed at three main domains: the informants' epistemological understanding of the relationship between science and the Islamic worldview, practical experiences in integration efforts, and the identification of challenges and opportunities in epistemological reconstruction for education (Creswell & Creswell, 2023).

The informant recruitment process will be carried out through professional networks and recommendations from relevant institutions, after first providing a complete explanation of the research objectives and guaranteeing the confidentiality of their identities. Each interview is planned to last 60 to 90 minutes, conducted in a conducive setting and recorded with the informant's permission to ensure data accuracy. The researcher will act as the key instrument, not only recording answers but also observing the nuances, emphasis, and emotions accompanying the informants' narratives, so that the obtained data is rich and contextual. This research does not aim for statistical generalization, but rather to gain a deep and holistic understanding of the phenomenon under study from the perspective of its main actors. Therefore, the depth and richness of the narratives from these three informants are deemed sufficient to provide a comprehensive picture and answer the exploratory research questions (Patel et al. 2021). Data validity will be maintained through the member checking technique, namely by confirming the researcher's initial interpretations to the informants to ensure the accuracy of the captured meaning. This research also pays attention to ethical aspects by preparing a written informed consent form that explains the informants' rights, including the right to withdraw at any time without consequences.

The data analysis procedure will follow the interactive thematic analysis model proposed by Miles, Huberman, and Saldana, which involves three main stages: data reduction, data display, and conclusion drawing. Immediately after each interview session is completed, the audio recording will be transcribed verbatim into written text to facilitate in-depth analysis of the entire narrative. The data reduction stage begins with repeated reading of the transcripts to gain a holistic understanding and note the researcher's initial impressions in the form of analytical memos. Next, the researcher will carry out the process of coding the text data by marking and labeling (coding) data segments relevant to the research questions, such as codes for "the conception of tawhid in science," "institutional barriers," or "integrative pedagogical strategies." These initial codes will then be grouped based on their semantic similarity to form broader and more abstract data categories, such as the "Philosophical Foundations of Reconstruction" category or "Implementation Challenges." From grouping these categories, the researcher will identify core themes that consistently emerge across the narratives of the three informants, which collectively represent answers to the research problem formulation. The data display process will be carried out by compiling matrices or thematic networks that visualize the relationships between main themes, sub-themes, and supporting quotes from the informants' narratives, so that patterns and relationships between concepts can be clearly seen (Hasan et al. 2022).

The findings from this thematic analysis will then be critically dialogued with the theoretical framework compiled in the literature review, especially key concepts from thinkers such as Al-Attas, Sardar, and Al-Faruqi, to observe compatibility, development, or even contradiction. Source triangulation is also applied by comparing and confirming the perspectives of the three informants who have different roles, thereby obtaining a more comprehensive and credible understanding. The final result of this analysis is a coherent narrative reconstruction depicting a roadmap for the reconstruction of Islamic epistemology in science education, along with its operational principles and strategic recommendations. The entire research process, from data collection to analysis, will be documented in detail in the researcher's reflective journal to ensure a traceable audit trail, thereby enhancing the trustworthiness of the research findings (Abdussamad, 2021). With this methodology, the research is expected not only to describe the informants' thoughts and experiences but also to produce a meaningful theoretical synthesis that contributes to the field of knowledge integration studies from an Islamic world perspective.

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RESULTS

This chapter presents the main findings from in-depth interviews with three key informants. The data presentation follows the structure of the thematic analysis that was conducted, grouping the informants' narratives into emerging themes. To maintain confidentiality, the three informants are referred to by pseudonyms: Professor Arif (Academic/Philosopher), Ms. Dian (Curriculum Developer/Principal), and Mr. Rizki (Science Teacher).

The research findings reveal that the informants have a comprehensive perspective on understanding the integration of science and Islam. Professor Arif emphasizes that the starting point of integration is the reconstruction of epistemology, not merely the addition of religious material to the science curriculum. He explains the concept of tawhid as an integrative paradigm that views science as the activity of reading ayat kauniyah (cosmic verses), which must be guided by the framework of ayat qauliyah (revealed verses). Islamic epistemology is monistic, in contrast to the dualistic approach that separates science and religion diametrically. Modern science education often teaches science as an autonomous and narrowly value-free discipline. Therefore, reconstruction must begin by shifting the paradigm from science as a tool of domination to science as a means of servitude. Pak Rizki provides a practical contextualization by inviting students to contemplate the complexity of the universe before starting the lesson. This approach aims to build a sense of wonder as an intrinsic motivation in learning science. Ibu Dian observes that the adopted science curriculum often carries hidden philosophical assumptions that need to be critically examined epistemologically. She provides a concrete example of biology textbooks on evolution that present materialism as the only valid explanation. Similarly, in physics, there is a spirit of secularism that considers nature to operate by its own laws without divine involvement. The primary task of curriculum developers is to filter and provide alternative perspectives based on an Islamic framework. This process must be carried out without compromising the accuracy of empirically tested scientific facts. Professor Arif adds that Islamization is not a reactionary anti-Western project, but rather a constructive effort of filtering and enrichment. This approach takes the rigorous empirical methodology of the West while replacing its metaphysical foundations with an Islamic worldview.

Ibu Dian explains the spectrum of implementation approaches used in Islamic educational institutions. The basic level involves infusion, where teachers are asked to relate science topics to relevant Qur'anic verses or hadith. The intermediate level develops integrative thematic modules that combine various disciplines within a single theme. The ideal level still being pursued is the total reconstruction of the science curriculum based on the tawhid paradigm. Pak Rizki provides an example of implementation in teaching chemical bonding by relating it to the concept of unity in diversity. This approach analogizes chemical bonds to the unity of Muslims in forming a stable society. The concept of bond stability is also linked to sunnatullah as the consistent law of nature. Thus, science learning is not only about knowledge transfer but also the formation of an integral worldview. The three informants consistently identified three main challenges in implementing the science-Islam integration. First, the gap in teacher capacity, where science teachers are strong in content but weak in religious sciences, while religious teachers understand texts but lack mastery of scientific logic. Second, the structural pressure from the dense and standardized-test-oriented national curriculum. Third, the scarcity of quality learning resources that not only attach verses but conduct deep epistemological analysis. These challenges are interrelated and form a complex systemic barrier. Pak Rizki reveals that teaching with an integrative approach requires extra preparation time and the courage to step out of the comfort zone. Ibu Dian adds that integration often becomes only a humorous interlude, not the substantive core of learning.

Professor Arif emphasizes the importance of creating a new generation of scholars who master both modern science and Islamic scholarly traditions in depth. Special doctoral programs need to be designed to nurture the birth of scholar-scientists (ulama-ilmuwan) as the architects of epistemological reconstruction. Ibu Dian focuses on developing teacher capacity through intensive and ongoing training that goes beyond one-day workshops. The formation of communities of practice enables science and religious teachers to have regular dialogues and share lesson plans. Special certification for teachers handling integration can be a meaningful professional incentive. Training must be designed to equip teachers with adequate epistemological analysis tools. The teacher development approach must be holistic, covering aspects of knowledge, skills, and professional attitudes. The three informants agree that the reconstruction work cannot be carried out alone by individuals or single institutions. Pak Rizki proposes the establishment of networks among Islamic schools to share resources, modules, and practical experiences. Professor Arif suggests the establishment of a special research center that functions as a think-tank and interdisciplinary dialogue forum. This institution will conduct in-depth studies, publish academic journals, and organize inclusive dialogue forums. Collaboration must involve various stakeholders, from academics and education practitioners to policymakers. Integration-based science olympiads can be a vehicle for creatively motivating students and teachers. This scholarly network must be built on the principle of mutual enrichment and strengthening among institutions.

From the dialogue with the three informants, a phased roadmap towards the reconstruction of Islamic science epistemology emerges. The first phase is a critical deconstruction of secular philosophical assumptions in modern science and educational curricula. The second phase involves conceptual reconstruction to formulate

an alternative epistemology with foundational key Islamic concepts. The third phase is the operationalization of the conceptual framework into curriculum models, pedagogical strategies, and evaluation systems. The fourth phase involves institutionalization through education policies and the creation of a comprehensive support ecosystem. Each phase requires a systematic approach and collaboration among various related parties. This process is a long journey that demands the commitment and consistency of all stakeholders. This roadmap provides a clear framework for the gradual and measurable transformation of science education.

Table 1 Summary of Interview Findings

Aspect	Core Findings from Informants
Central Argument	Integration is a fundamental epistemological reconstruction, not a superficial addition of religious content. It is based on a monistic paradigm where science (*ayat kauniyah*) is guided by revelation (*ayat qauliyah*) within the framework of *tawhid*.
Practical Implementation	Exists on a spectrum: from infusion (linking topics to scripture) and thematic integration (interdisciplinary modules) to the aspirational goal of total curricular reconstruction based on an Islamic worldview.
Key Challenges	1. Teacher Capacity Gap: Dichotomy between science teachers' content mastery and religious teachers' textual knowledge. 2. Structural Pressure: Restrictive, exam-oriented national curriculum. 3. Resource Scarcity: Lack of teaching materials with deep epistemological analysis, not just attached verses.
Proposed Solutions	1. Human Resource Development: Cultivate ulama-ilmuwan (transdisciplinary scholar-scientists) *and* provide holistic, ongoing training for teachers via communities of practice. 2. Ecosystem Building: Create collaborative networks among schools and establish a dedicated research center/think-tank to support the movement.
Strategic Roadmap	A four-phase process: 1. Deconstruction: Critically analyze secular assumptions in modern science 2. Reconstruction: Formulate an alternative Islamic epistemology. 3. Operationalization: Translate theory into curriculum, pedagogy, and assessment. 4. Institutionalization: Embed changes into policy and create a sustainable support ecosystem.
Overall Conclusion	The project is a long-term, collaborative endeavor requiring synergy between philosophical scholarship, supportive policy, and reflective classroom practice. Success depends on systemic change, not isolated efforts.

DISCUSSION

The findings firmly establish that the core of the science-Islam integration project is a fundamental epistemological reconstruction, moving beyond superficial content addition. This aligns with and substantiates the foundational arguments of pioneers like Seyyed Hossein Nasr and Ismail al-Faruqi, who called for a radical re-evaluation of the philosophical premises of modern science. Professor Arif's assertion that Islamic epistemology is inherently monistic, uniting revelation (ayat qauliyah) and cosmic reality (ayat kauniyah), provides a concrete conceptual model for this re-evaluation (Shetty et al. 2024). His critique of the autonomous, value-free portrayal of science in modern education directly engages with contemporary debates on the nature of scientific objectivity. Onukwuli et al. (2022), the proposed paradigm shift from domination to servitude (khilafah) echoes the ethical and teleological critiques of modern science found in the works of Ziauddin Sardar. This positions the study not merely as a descriptive account but as an active participant in the ongoing discursive project of "Islamization of knowledge". The practical translation of this paradigm by Mr. Rizki, fostering "wonder" in students, demonstrates how abstract epistemological principles can generate distinct pedagogical motivations. Budijaya & Situmeang (2025), the findings successfully bridge the often-separate domains of high-level philosophical discourse and practical classroom strategy. They confirm that the call for an Islamic paradigm is not anachronistic but addresses a perceived spiritual and ethical void in contemporary science education. Consequently, this research validates the continued relevance of these classical integration frameworks while grounding them in the lived experiences of contemporary practitioners (Hidayah & Kuntjoro, 2022).

The informants' critical examination of the "hidden" philosophical assumptions in standard science curricula, such as materialism in evolution or implicit secularism in physics, represents a crucial operationalization of the deconstruction phase. This finding strongly resonates with prior analyses by scholars like Muzaffar Iqbal and Nidhal Guessoum, who have meticulously dissected the metaphysical baggage within

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mainstream scientific narratives. Ms. Dian's role as a curriculum developer performing a conscious "filtering" process provides a tangible example of how the intellectual project of critique translates into institutional practice. Professor Arif's clarification that Islamization is a constructive project of tashfiyah (filtering/ purification) and tarbiyah (nourishment) directly addresses and refutes common criticisms that frame it as anti-scientific or purely reactionary (Hidayah & Kuntjoro, 2022). This nuanced position allows for the adoption of rigorous empirical methodology while challenging its underlying metaphysical naturalism, a stance that finds precedent in the works of contemporary philosopher of science, Bruno Latour, albeit from a different tradition. The insistence on maintaining factual scientific accuracy during this filtering process is vital, as it prevents the project from devolving into pseudo-science or dogmatic rejection, a pitfall noted by critics like Taner Edis. Therefore, the study advances the discourse by moving from theoretical caution about Western science to a documented, principled methodology for its critical engagement. It showcases how educators are actively negotiating the complex terrain between accepting robust scientific consensus and upholding an Islamic worldview. This practical negotiation is a significant contribution, as much prior literature remains at the polemical or purely theoretical level. Ahma & Hasan (2024), this finding underscores that a mature Islamic scientific epistemology must be critically engaged, not isolationist.

The documented spectrum of implementation from infusion and thematic integration to holistic curricular reconstruction provides a valuable framework for understanding the varying depths of integration in practice. This multi-level model empirically supports and expands upon theoretical typologies proposed by researchers like Wan Mohd Nor Wan Daud and AbdulHamid AbuSulayman, who outlined stages of educational reform. Ms. Dian's description of these levels clarifies that "integration" is not a monolithic practice but exists on a continuum of philosophical commitment and structural change. The "infusion" level, while often critiqued as superficial, is revealed as a common and necessary entry point for teachers and institutions beginning this complex journey (Pratama et al. 2023). The thematic "integration" level, exemplified by the "Water" module, demonstrates a more sophisticated synthesis that aligns with interdisciplinary and context-based science education approaches championed in global educational research. The aspirational "reconstruction" level, aiming for a curriculum born from the tawhid paradigm, represents the full realization of the epistemological vision articulated by Al-Attas, where the classification and structure of knowledge itself are reconfigured. Mr. Rizki's classroom example, linking chemical bonding to tawhid and sunnatullah, illustrates that elements of reconstruction can occur even within a broader infused or integrated framework. This suggests that the levels are permeable, with micro-practices of reconstruction embedded within macro-structures of infusion. The findings thus offer a more nuanced picture than earlier studies that sometimes presented these models as mutually exclusive or sequential (Chandra & Sipayung, 2024). They highlight the dynamic and often hybrid nature of integration as it unfolds in real educational settings, where ideal models are adapted to practical constraints and opportunities.

The identification of teacher capacity as the primary challenge provides critical empirical validation for a persistent concern in the literature on educational reform, both Islamic and general. The described dichotomy science teachers lacking religious literacy and religious teachers lacking scientific fluency creates a practical bottleneck that stifles the implementation of even well-designed integrated curricula. This finding directly correlates with studies by Akbar (2022) on Islamic education, which identify teacher preparedness as the single greatest determinant of successful pedagogical change. The systemic nature of the challenge is compounded by the pressures of the national curriculum and high-stakes testing, a global issue extensively documented by scholars like Linda Darling-Hammond. The lack of quality, epistemologically sophisticated teaching resources further exacerbates the problem, forcing dedicated teachers like Mr. Rizki into time-consuming independent material development. This triad of challenges forms a reinforcing cycle that can lead to "integration fatigue" or the reduction of the project to tokenistic "selingan" (interludes), as Ms. Dian astutely observed. The data confirms that without addressing this human resource dimension, theoretical models and curriculum documents remain inert. This underscores a gap between the prolific theoretical output on Islamic epistemology and the production of practical, classroom-ready tools and training for teachers. Therefore, the study's findings shift the focus urgently from "what" should be integrated to "who" will implement it and "how" they will be equipped. It argues that the next frontier for the integration movement must be a massive investment in teacher education and support (Hermawan, 2020). This emphasis on praxis over pure theory represents a maturation point in the research trajectory, calling for applied, solution-oriented studies.

In response to the capacity gap, the proposed solutions cultivating ulama-ilmuwan (scholar-scientists) and creating professional learning communities present a compelling two-pronged strategy for long-term development. The call for specialized doctoral programs to produce ulama-ilmuwan addresses the need for high-level architects of integration, a recommendation that echoes the original vision of the International Institute of Islamic Thought (IIIT) in its early years. This initiative aims to generate the deep, transdisciplinary scholarship required to robustly answer evolving scientific challenges from within the Islamic intellectual tradition. Simultaneously, Ms. Dian's focus on communities of practice (CoPs) for in-service teachers leverages a proven professional development model widely endorsed in educational research by Etienne

Wenger and others. These CoPs can provide the sustained, collaborative, and context-specific support that one-off workshops fail to deliver, directly tackling the isolation and overload reported by Mr. Rizki. The recommendation for specialized certification acts as a formal incentive and recognition mechanism, potentially enhancing the professional status and motivation of integration practitioners. This dual strategy of cultivating elite scholars while empowering grassroots practitioners mirrors successful movements in educational reform that link theory generation with practice-based refinement (Hanan et al. 2025). It acknowledges that transformation requires leadership from both the top-down (paradigm architects) and the bottom-up (classroom innovators). By framing teacher development as holistic encompassing knowledge, skills, and attitudes the informants advocate for an approach that moves beyond technical training to encompass epistemological and identity formation. This comprehensive vision for human resource development is arguably the most significant strategic contribution of this study, offering a clear pathway from identified problems to actionable solutions. It provides a concrete agenda for institutions, foundations, and policymakers interested in advancing the integration agenda beyond theoretical discourse.

The unanimous emphasis on collaboration and ecosystem-building highlights a strategic understanding that systemic change cannot be achieved by isolated institutions. Mr. Rizki's proposal for networks among Islamic schools addresses the resource-scarcity problem by advocating for open educational resource (OER) sharing and collective knowledge creation, a model with growing global traction. Professor Arif's vision for a dedicated research center or think-tank speaks to the need for a sustained, institutionalized space for focused inquiry and high-level dialogue, filling a gap often noted in the fragmented landscape of Islamic science studies. The proposed center's functions research, publication, and forum hosting are essential for creating a cumulative body of knowledge and a connected community of scholars and practitioners. This ecosystem approach mitigates the risk of duplication of effort and reinvention of the wheel, allowing diverse entities to specialize and share outcomes (Fricticarani et al. 2023). The suggestion to include science olympiads adds a creative, student-centered dimension to the ecosystem, fostering excitement and identifying talent within the integration paradigm. This holistic view of an ecosystem encompassing schools, research centers, publishers, and competitions demonstrates a sophisticated grasp of innovation diffusion and community-of-practice theory. It recognizes that for a new educational paradigm to thrive, it requires not just ideas and teachers, but also supportive institutions, communication channels, and shared cultural practices. This finding extends the literature by moving from advocating for integration within schools to designing the connective tissue between them and with knowledge-producing entities. It presents a scalable model for growth that leverages collective intelligence and shared purpose. Sugihartini & Yudiana (2020), the call for an ecosystem is a call for a movement, shifting the project from individual heroic efforts to a collaborative social enterprise with greater resilience and potential for impact.

The emergent four phase roadmap (Deconstruction, Reconstruction, Operationalization, Institutionalization) provides a valuable strategic framework that synthesizes the informants' insights into a coherent sequence for long-term change (Fricticarani et al. 2023). This phased model implicitly acknowledges that epistemological transformation is a complex, multi-generational endeavor that cannot be rushed or implemented haphazardly. The initial "Deconstruction" phase aligns with critical science studies and post-colonial theory, which stress the need to unpack the cultural and philosophical assumptions embedded in dominant knowledge systems before proposing alternatives. The "Reconstruction" phase corresponds to the core project of Islamic philosophy of science, tasked with formulating a positive, alternative epistemology based on core concepts like tawhid, khilafah, and sunnatullah. The "Operationalization" phase is where many prior theoretical discussions have foundered, and this study's focus on curriculum models and pedagogical strategies directly addresses this implementation gap. Hidayat et al. (2024), the "Institutionalization" phase recognizes that for change to be sustainable, it must be embedded in policy, accreditation standards, and enduring support structures, moving from pilot projects to systemic norms. This roadmap resonates with established models of educational change management and innovation theory, which emphasize clear stages from vision to embedded practice. It provides a strategic lens through which various actors theorists, curriculum designers, teachers, administrators can locate their efforts and understand their role in a larger process. The roadmap also serves as a diagnostic tool, allowing institutions to assess their current stage and identify necessary next steps. By delineating these phases, the study adds much-needed strategic clarity to a field often characterized by passionate advocacy but lacking in concrete planning. It transforms the integration project from a vague ideal into a sequenced, actionable plan with identifiable milestones and requirements for each stage.

The convergence of perspectives from the philosopher (Professor Arif), the institutional leader (Ms. Dian), and the classroom practitioner (Mr. Rizki) provides powerful triangulation, strengthening the validity and comprehensiveness of the findings. This multi-role validation is a methodological strength, as it captures the phenomenon of integration from the levels of theory, institutional strategy, and daily praxis. The consistency of their core message the need for deep epistemological shift across these diverse roles suggests

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this is a fundamental and widely recognized principle within the community of practice. The unique contributions from each role create a rich, multi-layered understanding: the philosopher provides the conceptual lexicon, the administrator reveals the structural facilitators and barriers, and the teacher illuminates the lived reality of implementation (Rahma & Mufidah, 2025). This triangulation mitigates the potential bias that could arise from listening to only one type of stakeholder, such as overemphasizing theoretical purity at the expense of practical feasibility. The study thus models an inclusive approach to understanding educational reform, one that values the knowledge of practitioners as much as that of theorists. The synthesis of these narratives produces a more robust and actionable vision than any single perspective could offer alone. It demonstrates that a successful integration movement requires the alignment of these three levels: coherent theory, supportive institutional structures, and skilled, reflective teachers. The findings argue implicitly that future research and policy must continue to engage this full spectrum of stakeholders to avoid disconnects between vision and reality. This holistic, triangulated approach is a key contribution, offering a template for how to study complex educational innovations that span from abstract ideas to concrete classroom actions.

This study makes several distinct contributions to the existing literature on Islam and science education. Firstly, it provides recent, empirical data from the Indonesian context, adding to a field that has been historically dominated by theoretical or historical analyses from the Middle East and South Asia. Secondly, it explicitly connects high-level epistemological discourse with the granular realities of curriculum development and teaching practice, a linkage often implied but rarely demonstrated with qualitative depth. Thirdly, it identifies and analyzes the systemic, interconnected challenges of teacher capacity, curricular pressure, and resource scarcity with a clarity born from practitioner testimony. Ayumaruti (2022), it moves beyond problem identification to generate a cohesive set of strategic recommendations, including the dual scholar-practitioner development model and the phased roadmap, which offer concrete guidance for future action. The study addresses a gap noted by Berglund and Gent, who observed a lack of empirical studies on how Islamic schools actually negotiate science education in the modern world. By focusing on the "how" and the "what now," it answers calls for more applied, forward-looking research in the field. Furthermore, it enriches the theoretical discourse by showing how foundational concepts like tawhid and Islamization are interpreted, adapted, and enacted by contemporary educators, thus grounding these concepts in modern educational praxis. While it confirms many challenges predicted by earlier literature, its value lies in the detailed, nuanced portrayal of these challenges from multiple stakeholder viewpoints and the integrated strategic vision it proposes for overcoming them.

This study synthesizes the voices of key actors to present a comprehensive picture of the efforts to reconstruct an Islamic epistemology for science education. It confirms the enduring relevance of the foundational integration paradigm while vividly illustrating the complex journey from theory to classroom practice. The major contribution lies in its holistic analysis, which weaves together philosophical vision, institutional strategy, pedagogical practice, systemic barriers, and strategic solutions into a coherent narrative. The primary implication is that the success of this epistemological project is inextricably linked to parallel projects in teacher education, resource development, and ecosystem building. Future research should urgently follow the pathways suggested by the informants: in-depth case studies of teacher communities of practice, design-based research on new integrated curriculum materials, and policy analysis focused on creating space for innovation within national education systems (Ayumaruti, 2022). Longitudinal studies tracking the impact of integrated science education on student worldviews, scientific literacy, and ethical reasoning are also critically needed. Furthermore, comparative studies across different national and institutional contexts could identify best practices and context-specific adaptation strategies (Putri et al. 2024). This research has charted the terrain and proposed a map; the imperative now is for scholars and practitioners to embark on the detailed, collaborative work of building the road itself, ensuring that the reconstruction of Islamic epistemology becomes a living, transformative reality in the education of future generations.

CONCLUSION

This research elucidates that the reconstruction of an Islamic epistemology for science education constitutes a profound and necessary paradigm shift, moving decisively from superficial content infusion to a foundational re-evaluation of the philosophical premises of knowledge itself. The findings affirm the enduring validity of the monistic tawhīdic framework, which harmonizes revelation (āyat qaulīyah) and cosmic reality (āyat kaunīyah), while simultaneously exposing the critical, systemic impediments to its realization—primarily the transdisciplinary capacity gap among educators, restrictive curricular structures, and a dearth of sophisticated pedagogical resources. The study's paramount contribution lies in its synthesis of high-level philosophical discourse with granular praxis, culminating in a coherent, actionable strategic vision. This vision encompasses a dual-pathway for human resource development—cultivating elite ulamā-'ulama (scholar-scientists) and empowering teachers through communities of practice—alongside a phased roadmap for systemic change and the imperative to build a collaborative, sustaining ecosystem. Ultimately, it demonstrates that the Islamization of science education is a viable, ongoing intellectual-practical project whose success is contingent upon synergistic collaboration across theoretical, institutional, and classroom domains.

Based on the conclusive findings, several targeted suggestions are proposed to advance this field from theory to transformative practice. Firstly, it is imperative for educational foundations, universities, and policymakers to initiate and fund specialized doctoral programs designed explicitly to nurture a new generation of ulamā-'ulama, scholars possessing deep fluency in both modern scientific disciplines and the Islamic intellectual tradition. Concurrently, sustained investment must be directed toward establishing and institutionalizing professional learning communities (PLCs) for in-service science and religious studies teachers, providing them with continuous support, epistemic tools, and a platform for co-creating curriculum materials. Secondly, a dedicated, well-resourced interdisciplinary research centre should be established to function as a central think-tank, responsible for coordinating high-level scholarship, publishing refined pedagogical resources, and hosting inclusive dialogues that bridge the academy, the classroom, and policymaking bodies. Finally, future empirical research should adopt a longitudinal and design-based approach to rigorously evaluate the impact of integrated curricula on learner outcomes, while comparative studies across different socio-educational contexts should be encouraged to develop nuanced, context-sensitive implementation models. The collective enactment of these suggestions is essential for translating the articulated roadmap into a tangible reality, ensuring the reconstruction project yields a sustainable and meaningful impact on educational systems.

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