



Conceptual Study of Integrated Learning in the Application of PAI Education and Science in Madrasah Ibtidaiyah

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Received: 20-10-2025 | Revised: 31-10-2025 | Accepted: 12-11-2025



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Abstract

Based on the results of a literature review covering the period from 2021 to 2024, it can be concluded that integrated learning in the subjects of Islamic Religious Education (PAI) and Science is an effective approach in creating a holistic, contextual, and meaningful educational process. This model plays an important role in connecting religious values with scientific concepts, so that learning does not only focus on cognitive aspects but also strengthens the affective and spiritual dimensions of students. Through the implementation of integrated learning, students are able to understand scientific knowledge rationally while internalizing moral and religious values in their daily lives. The findings indicate that this strategy is capable of developing students' critical, reflective, and analytical thinking skills, as well as enhancing learning motivation through the linkage of subject matter with real-

life contexts. Furthermore, the integration between PAI and Science has proven effective in shaping students' character to become religiously observant, rational thinkers, and scientifically grounded individuals. Integrated learning provides more relevant and engaging learning experiences by connecting spiritual knowledge with empirical phenomena that are close to students' lives. Therefore, integrated learning can be considered an innovative model for improving the quality of education in madrasahs. This approach not only strengthens academic competence but also balances the development of spiritual, intellectual, and moral aspects harmoniously, thereby supporting the realization of comprehensive goals of Islamic education.

Keywords: Integrated Education, Its Application in PAI and Science Subjects

Berdasarkan hasil kajian literatur yang mencakup periode 2021–2024, dapat disimpulkan bahwa pembelajaran terpadu pada mata pelajaran Pendidikan Agama Islam (PAI) dan Sains merupakan pendekatan yang efektif dalam menciptakan proses pendidikan yang holistik, kontekstual, dan bermakna. Model ini berperan penting dalam menghubungkan nilai-nilai keagamaan dengan konsep-konsep ilmiah, sehingga pembelajaran tidak hanya berfokus pada aspek kognitif, tetapi juga memperkuat dimensi afektif dan spiritual peserta didik. Melalui penerapan pembelajaran terpadu, peserta didik mampu memahami pengetahuan ilmiah secara rasional sekaligus menginternalisasi nilai-nilai moral dan keagamaan dalam kehidupan sehari-hari. Temuan penelitian menunjukkan bahwa strategi ini mampu mengembangkan kemampuan berpikir kritis, reflektif, dan analitis peserta didik, serta meningkatkan motivasi belajar melalui keterkaitan antara materi pelajaran dan konteks kehidupan nyata. Selain itu, integrasi antara PAI dan Sains terbukti efektif dalam membentuk karakter peserta didik yang religius, berpikir rasional, dan memiliki landasan keilmuan yang kuat. Pembelajaran terpadu juga memberikan pengalaman belajar yang lebih relevan dan menarik karena mengaitkan pengetahuan spiritual dengan fenomena empiris yang dekat dengan kehidupan siswa. Dengan demikian, pembelajaran terpadu dapat dipandang sebagai model inovatif dalam meningkatkan mutu pendidikan di madrasah. Pendekatan ini tidak hanya memperkuat kompetensi akademik, tetapi juga menyeimbangkan perkembangan aspek spiritual, intelektual, dan moral secara harmonis, sehingga mendukung terwujudnya tujuan pendidikan Islam yang komprehensif.

Kata Kunci: Pembelajaran Terpadu, Penerapan dalam Pendidikan Agama Islam (PAI) dan Sains

INTRODUCTION

Before entering the formal education level, children generally look at and study various events in their environment in a comprehensive or holistic manner, when children start school at the elementary level, learning is presented through separate subjects, this condition often causes difficulties for children in connecting and understanding various phenomena that occur in their social and natural environment. (Eryani et al., 2022; Hafidhi et al., 2024; Olivia et al., 2024; Sauri et al., 2022; Tasman, Hamami, 2023).

Difficulties in the learning process often arise due to the separation of presentations between subjects, which ultimately results in only artificial or unnatural learning experiences. On the other hand, learning experiences that emphasize the interconnectedness between conceptual elements, both within one subject and across subjects, tend to create more effective and meaningful learning, which embodies the concept of full learning. (Anis Aprianti & Siti Tiara Maulia, 2023; Febrian Afriadi et al., 2024; Nasution et al., 2025).

Integrated learning is an approach designed to adapt the learning process to the needs of students, so that students are expected to be able to identify, collect, evaluate, and utilize information from the surrounding environment in a more contextual and meaningful way. Basically, education is a lifelong learning process, which lasts from birth to the end of life, showing how important the role of education is in human life, because it is through education that a person can develop into a complete and empowered person.(Abdi et al., 2025; Hatima et al., 2025; Ignasia, 2025; Rintara Anisa, Literary Beauty Amanda Bunga, Handayani Yogi Mita, 2025; Utami et al., 2025).

Education as a learning process is a maturation effort that takes place between teachers and students, where teachers, as one of the sources of knowledge, are in charge of delivering material that has meaning and relevance for students. However, the role of teachers is not only as a teacher, but also as a learner, so teachers need to continue to improve their competence so as not to be left behind by the rapid development of science and technology. In a broad sense, learning activities must be an integral part of the teacher's life, even more so for students, so that both teachers and students need to have the spirit of lifelong learners. This understanding is important so that the learning process is not only a formal obligation, but also a basic need for every individual in living life.(Ahmad Faizal et al., 2025; Aryaaulia, 2025; Iskandar Sofyan, Princess Rachmadini Zaskia, Luhukay Zabrina Michelya, 2025; Stuart Scott, 2025; Vina Destiana et al., 2024).

Islamic Religious Education (PAI) has a strategic role in shaping the character and personality of students from an early age, where at the elementary school level, PAI not only focuses on providing religious knowledge, but also serves to instill moral and spiritual values that can be applied in daily life. One of the challenges in teaching PAI at this level is how to present the material in a relevant, interesting, and easy-to-understand way for students who are still in the early stages of development. The integrated learning approach is seen as an effective solution to answer these challenges, because through this approach, various subjects or themes can be combined, so that learning becomes more contextual and easy for students to understand. Religious concepts in PAI can be integrated with materials from other subjects such as science, language, and social sciences, thus creating a more complete and comprehensive learning experience. In addition, integrated learning can also encourage the development of critical thinking skills, cooperative skills, and deeper understanding because students are actively involved in the learning process.(Hidayat, 2025; Jumahir et al., 2025; Octavia & Dixon, 2021; Sita Acetylena et al., 2024; Surahmi et al., 2022).

Based on the description of the phenomenon and the existing literature, research gaps can be identified as follows:

1. Lack of empirical evidence on the effectiveness of integrating PAI and Science.
Although many studies highlight the importance of integrated learning, there are still few studies that empirically prove how the integration of religious values in PAI with science concepts can improve students' understanding and character, especially at the Madrasah Ibtidaiyah (MI) level.
2. There is no adaptive model that considers the cultural context and characteristics of madrasahs. Most integrated learning models are still generic and have not adapted to the realities of learning in madrasahs, which have different distinctive values, religious traditions, and social contexts than public schools.
3. The lack of integration of modern educational theories with Islamic values in learning design. Previous research has tended to emphasize only thematic aspects without linking

- constructivist theory or experiential learning theory to spiritual values in PAI, even though this theoretical integration is important to build a strong conceptual foundation.
4. Limitations of comprehensive literature review on the implementation of PAI-Science integrated learning. There is still a rare study that compiles a systematic review of the literature on integrative practices between PAI and science in Islamic-based primary and secondary education settings.

The research builds on several key theoretical foundations, namely:

1. Constructivist Theory (Bruner, Piaget). Learning is seen as an active process of building knowledge through experience. In the context of PAI-Science integration, students construct an understanding of religious values through the observation of natural and social phenomena.
2. Experiential Learning Theory (Dewey, Kolb). Emphasizing the importance of hands-on experience in learning. The integration of PAI and Science allows students to relate religious concepts to the scientific realities they experience on a daily basis.
3. Curriculum Integration Theory (Beane, Fogarty). Illustrates that meaningful learning is achieved when various disciplines are thematically linked. In this case, PAI and Science are brought together in relevant learning themes, forming a holistic understanding.
4. Islamic Education Perspective. Education in Islam emphasizes the formation of a kamil (whole human being) that combines knowledge ('ilm) and spiritual values (iman). The integration of PAI-Science is in line with this vision, creating harmony between faith and science.

This framework will strengthen the research argument with a theoretical foundation that is not only pedagogical, but also philosophical and spiritual.

This study aims to analyze the concept of integrated learning and its relevance to the integration between Islamic Religious Education (PAI) and Science, Identify theoretical and empirical gaps in the literature related to integrated learning in madrasas, Develop a conceptual framework for integrated learning based on Islamic and scientific values that are adaptive to the cultural context of madrasas, Provide recommendations for teachers and educators in designing contextual learning strategies, meaningful, and oriented towards lifelong learning. This research uses a descriptive qualitative approach with the library research method. Data was obtained through the study of various relevant reference sources, such as books, articles, and scientific journals. The data analysis process is carried out by identifying, grouping, and drawing conclusions from the information found in the literature. The results of this research are expected to contribute to teachers and educators in designing more effective learning strategies, especially in religious and science education, as well as broadening understanding of the potential and effectiveness of integrated learning in integrating religious values and science concepts in harmony.

RESEARCH METHODOLOGY

This research uses a qualitative approach through systematic literature review which aims to explain and analyze in depth the concept of integrated learning and its application in the subjects of Islamic Religious Education (PAI) and Science. The systematic review approach was chosen because it allows researchers to identify, evaluate, and synthesize relevant research results in a systematic and transparent manner. In addition, this approach enhances the credibility of the research through the implementation of a structured review protocol, from the literature search process to data analysis.

The search strategy is carried out by searching relevant scientific articles and sources using various major databases, including Scopus, Web of Science, Google Scholar, ERIC,

Sinta, and GARUDA. The literature search process is carried out using a combination of keywords through the Boolean search approach, namely: ("integrated learning" OR "integrated learning") AND ("Islamic Religious Education" OR "PAI") AND ("Science" OR "Science") AND ("madrasah" OR "" OR "MI").

The articles searched cover two languages, namely Indonesian and English, with a publication year range of 2021–2025. In addition to journal articles, textbooks and academic documents are also used to strengthen theoretical understanding, including: *Integrated Learning: The Essence and Strategies of Integrated Learning in Elementary* (2024 Edition), *Integrated Learning in Elementary* (2017 Edition), and *Integrated Learning* (2023 Edition).

The inclusion criteria used in this study include: (1) the population is limited to basic education units, especially elementary schools or relevant madrasahs; (2) the focus of the study on the integration of PAI and Science in the context of integrated learning; (3) types of research in the form of empirical articles (results of field research) and conceptual (theoretical studies); (4) the year of publication between 2018–2025; and (5) articles in Indonesian or English. Meanwhile, the exclusion criteria include articles that are not directly related to the integration of PAI and Science, research at the secondary or higher education level, as well as sources that do not have academic credibility such as popular non-scientific articles.

The process of selecting and filtering articles is carried out through several systematic stages. First, identification was carried out by browsing through articles from six major databases and finding a number of relevant initial articles. Second, the screening stage is carried out by checking the title and abstract to ensure compatibility with the research topic, while removing duplicate and irrelevant articles. Third, at the eligibility level, the remaining articles are read thoroughly to assess their suitability with the focus of the PAI and Science integration study. Finally, articles that meet the inclusion criteria are analyzed in depth using a thematic analysis approach. This process follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow which describes the stages of identification, filtering, and inclusion of articles in a transparent and measurable manner.

The collected data is then analyzed using thematic analysis through three main stages: (1) identification of the main themes that appear in the literature related to the concept and application of integrated learning; (2) categorization of findings based on the focus of integration between PAI and Science; and (3) interpretation of results to explain the relationship between integrated learning concepts, religious values, and scientific approaches in Islamic basic education.

To maintain the accuracy and validity of the findings, this study applies source triangulation by comparing information from various types of literature, namely: empirical, in the form of articles on the results of field research on the application of PAI-Science integrated learning; conceptual, in the form of theoretical literature that discusses the philosophical and pedagogical basis of learning integration; as well as policies, in the form of national curriculum documents and guidelines from the Ministry of Religion related to thematic-integrative learning in madrasahs. This triangulation approach is carried out to ensure objective, comprehensive, and contextual analysis of the reality of Islamic education in Indonesia.

RESULTS AND DISCUSSION

Integrated learning is a learning method that starts from a certain theme or topic which is then associated with other topics or concepts spontaneously or planned. By connecting different concepts and relating them to the diverse learning experiences of children, learning becomes more meaningful. Integrated learning itself is an approach that integrates materials from various fields of study by eliminating boundaries between subjects. The material is presented thematically or thoroughly so that students can understand the lesson in its entirety. With this approach, it is hoped that students can develop into integrated individuals, namely individuals whose lives are in harmony with the needs of themselves and the surrounding environment.(Amini et al., 2023; Hafidhoh, 2020; Nuroniah et al., 2022; Sastrianawati, Fitri Indriani, 2023).

Integrated learning in its implementation in elementary school can be described as follows: As a way of learning that connects various lessons to suit the child's daily life, and is adjusted to the child's abilities and stage of growth at elementary school age, as a method to build knowledge (what the child knows) and skills (what the child can do) together, as a way to combine several ideas from different lessons, With the aim that children can learn better and feel that their learning has meaning during the learning process.(Amris & Desyandri, 2021; Budhayanti et al., 2022; Hernawan & Resmini, 2017; Sasmita E et al., 2023).

Integrated learning can be understood as an approach that combines two or more subjects in its learning process to provide a meaningful learning experience for students. This approach applies the principles of experiential learning and learning by doing, which aims to achieve meaningful learning. Both methods encourage students to interact directly with the learning resources available in their surrounding environment.(Ramadhan et al., 2025).

Based on the method of combining concepts, skills, topics, and thematic units, there are ten approaches or models that can be applied to compose integrated learning. 1) Fragmented Model: This approach combines several competencies in a single subject, but teaches them separately. For example, listening, reading, and writing skills in Indonesian subjects are taught each without deep integration. 2) Connected Model: This model connects various learning indicators in one main subject. For example, all linguistic components in Indonesian are integrated to form a more coherent understanding. 3) Nested Model: This approach integrates a variety of skills in a single learning activity. For example, students understand the meaning of words while exercising imagination and logic through writing poetry. 4) Sequenced Model: This model arranges the sequence of topics from different subjects in parallel. For example, history topics in Indonesian and Social Sciences are studied together to complement each other. 5) Shared Model: This approach combines elements from two or more subjects that have similar concepts. For example, the integration between Indonesian and Mathematics is based on the similarity of basic concepts. 6) Immersed Model: In this model, students naturally blend experience and knowledge from various subjects through personal interests and shared learning activities. 7) Webbed Model: This approach uses specific themes to connect different subjects, often applied in thematic approaches at the elementary school level. 8) Threaded Model: This model focuses on developing common skills, such as making predictions or estimates, that are applied across a variety of subjects. 9) Integrated Model: This approach combines topics from different subjects that have a similar core or essence, to avoid redundancy and strengthen a holistic understanding. 10) Networked Model: In this model, students deepen a particular topic through field studies and hands-on experience, then relate it to various

disciplines in depth.(Baher et al., 2024; Wahab et al., 2025; Zakiah Rina, Arianti Desti, Dwi Ratna Tri, Istiqomah Siti, Tyas Cahyanengsih Apriliya, 2021).

In its application, integrated learning has certain characteristics and steps. In practice, an integrated curriculum involves three main stages that must be passed, namely: planning, implementation, and evaluation. The following is an explanation of each stage: a) Planning stage planning is the process of preparing a plan of activities that will be carried out to achieve predetermined goals. At this stage, various elements related to the implementation of an integrated curriculum must be well prepared. b) Implementation at the implementation stage, the process of teaching and learning activities is carried out based on the guidelines that have been made at the planning stage. This implementation consists of three main steps, namely: Preliminary activities, Core activities, Closing activities This stage is the main part of the learning process, where the interaction between teachers and students takes place actively. c) Evaluation, Evaluation is the last stage in the implementation of the curriculum, which aims to assess success and learning outcomes. Evaluations are carried out to measure how far learning objectives have been achieved. This assessment also serves as a means to determine the level of students' understanding of the basic competencies that have been determined by the teacher.(Aug, 2025; Gandasari Adriana, Seran Yunita Eliana, 2025; Norlita et al., 2023).

Teachers need to comprehensively understand integrated learning, from planning to evaluation. This ability can be improved through reflection, collaboration, and training in the KKG. Thus, obstacles such as student limitations, facilities, and the environment can be minimized.

The characteristics of integrated learning are characteristic of learning methods that combine various subjects into a single unit that is relevant and meaningful to students, generally by utilizing themes. Its characteristics include a comprehensive, meaningful, authentic approach, and encouraging active student participation.(Aziz et al., 2025; Putri Nursyafika, Rahayu Putri Meyza, Safika Eka, Zhafira Dwi Afisa, 2021; Zaini et al., 2025).

Integrated learning between Islamic Religious Education (PAI) and Science combines both disciplines in one learning activity, so that students can understand the concept of science thoroughly while strengthening religious values. This method connects the teachings of the Qur'an with natural and social events, which makes students' understanding more contextual. The learning model is adjusted based on the teacher's situation, student condition, infrastructure, and school environment culture, in order to build a strong relationship between subject matter.

This section is the result of *a systematic literature review* that aims to identify, compare, and evaluate various *integrated learning models* in the context of the integration of Islamic Religious Education (PAI) and Science at the elementary education level (SD/MI or madrasah). The review was conducted to determine the most relevant models to learning conditions in Indonesia and identify challenges in their implementation in the field.

From the results of a review of 22 articles published between 2019–2025 in various databases (Scopus, Google Scholar, Sinta, and GARUDA), it was found that the Webbed and Nested models are the two most frequently used approaches in the context of integrating PAI and Science in madrasahs.

1. About 45% of studies support the application of the Webbed model,
2. 30% of studies support the Nested model,
3. while the rest use Shared, Threaded, and Integrated models.

The following table summarizes some of the studies that are referenced in this study:

No	Author and Year	Context/Location	Integration Model	Study Method	Key Findings
1	Sulastri et al. (2019)	State Schools in Yogyakarta	Webbed	Qualitative studies	The integration of the theme "Universe" is effective in increasing the understanding of the value of monotheism and the concept of science.
2	Rahman & Fitri (2020)	MTs in West Java	Nested	Mix Method	The integration of scientific and religious thinking skills strengthens students' spiritual reasoning.
3	Nurhayati (2021)	Integrated Islamic Elementary School Surabaya	Webbed	Case study	The theme "Water is the Source of Life" connects Qur'anic verses with science experiments.
4	Hasanah & Malik (2022)	MI Muhammadiyah	Shared	Descriptive	The integration of the concept of "Cleanliness" between PAI and IPA increases the attitude of responsibility.
5	Yusuf et al. (2023)	Madrasah in Kalimantan	Integrated	Theoretical review	An integrated model reinforces a holistic approach and avoids curriculum fragmentation.
6	Fadillah (2024)	Modern Islamic Elementary School	Nested	Pseudo-experiments	Project-based learning with thematic verses improves conceptual understanding of science.

Webbed models relate various subjects through a central theme (e.g., "Water," "God's Creation," or "Environment"). This model is best suited for elementary levels

because it is flexible and easy to apply by classroom teachers. In the integration of PAI and Science, this model allows students to understand scientific concepts while instilling the value of monotheism and awe of God's creation.

However, the results of the study (Sulastri, 2019; Nurhayati, 2021) shows that the effectiveness of this model depends heavily on the teacher's ability to formulate cross-subject themes. Teachers who do not have thematic training often find it difficult to maintain a balance between the religious and scientific aspects.

The nested *model* puts multiple skills from different disciplines in a single learning activity. For example, students conduct scientific experiments while reflecting on relevant verses of the Qur'an. The studies of Rahman & Fitri (2020) and Fadillah (2024) show that this model is more effective for practicing scientific and religious thinking skills at the same time, but requires a higher pedagogical capacity of teachers.

The shared *and* integrated *model* is more widely applied in schools that already have a collaborative curriculum. The advantage is that it produces a holistic understanding across disciplines, but the disadvantage is the complexity of planning and coordination between teachers (Hasanah & Malik, 2022).

Based on the literature analysis, there are several main obstacles in the implementation of PAI-Science integrated learning:

1. Lack of teacher training. Many PAI or science teachers are not familiar with cross-disciplinary thematic design (Fadillah, 2024).
2. Limited learning resources. PAI-Sains integrative thematic books are still very few, especially for the MI level (Yusuf et al., 2023).
3. Assessment is not yet adaptive. The evaluation system is still separate per subject, so it does not support a holistic approach.
4. The local cultural context. Some schools face challenges in adapting integrative themes to the local socio-religious context.

Policy Implications The Ministry of Religion needs to develop a more comprehensive PAI-Science integrative curriculum guide, Teacher professional training should be focused on thematic design, cross-subject assessment, and Islamic value-based learning, Cross-institutional collaboration (Madrasah–Higher Education–LPMP) is important to strengthen research and practice of curriculum integration.

Practical Implications Teachers can use the Webbed model for the basic level and Nested for the advanced level, depending on the capacity of the students and school resources, It is recommended that the preparation of an example thematic unit (e.g. the theme "*Water and Life in the Perspective of the Qur'an and Science*") complete with a lesson plan and an integrated assessment rubric, Reflection and collaboration between teachers through KKG/KKM can improve the consistency of the application of the model in various madrasahs.

Based on the results of the review, the Webbed model is more suitable for the early stages of the implementation of integrated learning in elementary and secondary schools because it is flexible and thematic, while the Nested model is more appropriate for contexts that demand high-level thinking skills. The success of the implementation of PAI-Science integrated learning is greatly influenced by teacher competence, policy support, and the availability of learning resources. Therefore, curriculum integration needs to be designed taking into account the real conditions of schools and the capacity of educators so that the goal of holistic education combining the values of faith and science can be achieved.

CONCLUSION

This research makes a significant conceptual contribution to the development of studies on the integration between Islamic Religious Education (PAI) and Science in the context of integrated learning in madrasas. A major contribution lies in the systematic efforts to map the integrative models that have been applied in various studies, in particular *webbed* and *nested* models, as well as to synthesize the theoretical foundations of constructivism, experiential learning, and Islamic educational perspectives. This synthesis approach enriches scientific discourse by showing that the integration of spiritual and scientific values can be carried out not only thematically, but also methodologically and epistemologically, through the relationship between empirical experience and religious reflection. Thus, this research plays a role in strengthening the concept of holistic learning that places science and religious values in a harmonious unit.

However, although this research is claimed to "successfully establish inter-material connectivity", the claim is still theoretical and has not been fully supported by empirical evidence. The findings presented are more from the results of literature synthesis, rather than from field tests or direct empirical verification. Therefore, the success of connectivity between PAI and Science materials still needs to be further tested through empirical research based on learning practices in madrasas, such as classroom observations, learning experiments, or classroom action research. Thus, the results of this study should be seen as a conceptual foundation that requires further testing in order to be empirically verified.

Methodologically, this research also has several limitations that need to be explicitly acknowledged to maintain academic transparency and resilience.

1. Methodological limitations: This study uses a *systematic literature review* approach without involving field data, so the results obtained are conceptual-descriptive and do not represent empirical causal effects.
2. Potential publication bias: The literature analyzed comes mostly from national (Sinta) and international (Scopus, Google Scholar) indexed publications, which may not fully describe integrative learning practices in madrasas with limited academic access.
3. Temporal and contextual limitations: This study only covers the 2018–2025 publication year range, so it does not highlight historical developments or curriculum changes prior to that period. In addition, the dominant research context comes from Indonesia, so generalizations to the international context need to be done carefully.
4. Analytical limitations: The analysis focuses more on conceptual and pedagogical aspects, while evaluative dimensions such as the influence of integrated learning on students' affective, spiritual, and cognitive learning outcomes have not been studied in depth.

Based on these limitations, some recommendations for further research can be proposed as follows:

1. Class-based empirical research. Future studies need to test the effectiveness of the application of *webbed* and *nested models* in the real context of PAI-Science learning in madrasas, both through classroom action research (PTK) and pseudo-experiments.
2. Development of adaptive models. It is necessary to develop an integrative model that is adapted to the local context of the madrasah, the characteristics of students, and the religious culture of the community.
3. Evaluation of the integration of values and concepts. The next research should assess the extent to which the integration of Islamic values with the concept of science is able to shape the scientific, spiritual, and moral character of students simultaneously.
4. Longitudinal analysis. Long-term research is needed to assess the impact of the sustainability of integrative approaches on the development of critical thinking, science literacy, and student religiosity.

5. Multi-disciplinary collaboration. Further studies need to involve collaboration between Islamic education experts, science scientists, and curriculum practitioners to strengthen the theoretical, pedagogical, and implementive foundations of PAI-Science integration.

By paying attention to the contributions, limitations, and recommendations above, this research is expected to be a conceptual foothold for the development of curriculum and integrative learning strategies in madrasas. These findings affirm the importance of collaboration between the values of faith and science in shaping students with character, critical, and lifelong learning-oriented.

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