



MODERNIZATION OF ISLAMIC RELIGIOUS EDUCATION IN MADRASAH: BALANCING RELIGIOUS KNOWLEDGE AND SCIENCE

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Abstract: This study aimed to analyze the strategy of modernizing Islamic religious education in madrasas to integrate religious knowledge and science, identify its implementation challenges, and examine its impact on students. Using a qualitative approach with a case study, the study involved principals, teachers, education personnel, madrasa committees, and grade XI IPA students. The results indicated that modernization was achieved by integrating Islamic and science curricula, project-based learning (PjBL) methods, and contextual approaches. The main challenges included limited interdisciplinary human resources, minimal technological infrastructure, educators and community resistance, and a lack of supporting regulations. This modernization positively impacted improving students' scientific understanding, critical thinking, academic achievement, and religious awareness. The study recommended interdisciplinary training for teachers, technological infrastructure development, and flexibility of integration-based curricula. The implications of this research highlight that the modernization of Islamic religious education can serve as a model for other madrasas, encouraging policymakers to design more supportive regulations and enabling schools to balance faith-based values with scientific literacy in preparing students for global challenges.

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INTRODUCTION

Islamic religious education in madrasahs faces major challenges in facing the increasingly dynamic developments of the era. Technological advances (Szymkowiak et al., 2021), globalization (Beribe, 2023), and social change have had a significant impact on the way students acquire and understand knowledge (Mukul & Büyüközkan, 2023), including religious knowledge. Madrasahs as Islamic-based educational institutions are expected to be able to adapt to these changes in order to remain relevant in forming a generation that not only has a

strong religious understanding but is also able to adapt to developments in science and technology (Syihabuddin & Maulani, 2023).

One of the main challenges in Islamic religious education in madrasas was the gap between religious knowledge and science in the applied curriculum. So far, learning in madrasas tended to focus more on normative and theological aspects (Juma, 2023), while science was still considered a separate discipline (Beck et al., 2022). This made it difficult for students to connect religious concepts with developments in science and technology they encounter daily (Fahmi et al., 2021). If this gap continues, the perception might emerge that religious knowledge and science were two conflicting entities, whereas in Islam, both should go hand in hand and complement each other.

The phenomenon observed in the field, particularly at MAN Palopo as the research object, showed that students often excel in religious subjects but face difficulties applying Islamic perspectives when dealing with scientific and technological issues. Teachers also reported challenges in designing integrated learning due to limited references and teaching materials that connect Islamic principles with scientific concepts. In addition, there was still resistance from some educators and the community who considered that modernizing Islamic religious education could reduce the authenticity of Islamic values. These phenomena illustrated the fundamental gap between the ideal concept of integrated education and its practical implementation in madrasas.

Modernizing Islamic religious education was considered a strategic solution to bridge this gap. Modernization in this context did not mean abandoning Islamic values (Jaenullah et al., 2022) but instead developing methods, curricula (Tomlinson, 2023), and learning approaches that were more adaptive to the development of the times (Teixeira et al., 2021). By integrating religious knowledge and science, students will have a deep understanding of Islam and develop competencies in science and technology that can be used to advance society.

Previous studies have discussed related issues from different perspectives. For example, Machmud (2020) examined the innovation of traditional Islamic boarding schools that adapted into modern institutions with a strict curriculum combining traditional and modern education to produce religious graduates ready to compete globally. Then the research by Sain & Ayu (2024) studied the evolution of Islamic education in Pakistan, from classical madrasas to the integration of post-colonial Western principles, though still facing challenges in teacher training and regulation. Next, Aripin & Nurdiansyah (2022) highlighted the modernization of Islamic religious education in Indonesia, with a new approach to Islamic Religious Education learning in leading schools. Finally, Rohman & Muhtamiroh (2022) explored the development of madrasas in facing globalization, which can now compete with public schools through a pesantren-based system and humanistic learning.

Unlike these studies, this research focused on madrasas as formal Islamic educational institutions, with MAN Palopo as the case study. This institution has attempted to integrate Islamic studies with science. However, it faced concrete

challenges such as limited interdisciplinary human resources, minimal technological infrastructure, curriculum rigidity, and resistance from educators and parents. These challenges reflected the gap between theoretical expectations and practical realities.

Therefore, this study examined the modernization of Islamic religious education in madrasahs to balance religious knowledge and science. The results of this study indicated that modernization in madrasahs can be done through integrating Islamic and science-based curricula, innovating learning methods that were adaptive to technology, and applying educational strategies that strengthen religious understanding while improving students' academic competence in science. The novelty of this research lied in identifying concrete strategies that madrasahs can apply, the analysis of challenges and opportunities in their implementation, and evaluating their impact on students' intellectual and spiritual development.

This study aimed to analyze effective strategies for balancing religious knowledge and science, identified challenges in modernizing Islamic religious education in madrasahs, and examined their impact on students' intellectual and spiritual development. This study was expected to provide practical input for madrasahs to continue developing into educational institutions that were not only excellent in religious aspects but also able to build a generation that was scientifically knowledgeable, religiously aware, and highly competitive in the modern era.

RESEARCH METHOD

This study employed a qualitative approach with a case study design (Susanto et al., 2024), focusing on the State Islamic Senior High School (MAN) Palopo, South Sulawesi. The selection of MAN Palopo as the research site was based on several considerations. First, MAN Palopo was one of the leading madrasahs in the region, and it has implemented various innovations in integrating Islamic religious education and science. Second, the school had adequate facilities, including a digital learning platform, which reflects the modernization efforts relevant to this study. Third, its diversified stakeholders (school leaders, teachers, staff, students, and committees) to provide rich data sources to explore modernization strategies, challenges, and impacts.

The research subjects comprised the Principal, Vice Principal for Curriculum, teachers of Islamic Religious Education and science, educational staff, and members of the madrasah committee. In addition, 22 students of grade XI IPA were involved, with six selected as key informants. The selection of informants used purposive sampling, considering their direct involvement in curriculum development, teaching, or learning activities related to the integration of religion and science. For students, the criteria included academic performance, activity in learning activities, and willingness to provide detailed information. AA snowball sampling technique was also applied to enrich the data to enrich the data, where initial informants recommended other relevant participants.

Data collection techniques included participant observation, in-depth interviews, documentation, and triangulation. Observations were conducted during classroom activities, school programs, and teacher meetings. In-depth interviews explored the perspectives of teachers, students, and stakeholders regarding integration strategies and challenges. Documentation involved reviewing curricula, lesson plans, teaching materials, school websites, and the MAN Palopo E-Learning platform. Triangulation of methods and sources ensured that findings were cross-checked from multiple perspectives.

Data analysis followed model interactive model, consisting of data condensation, data display, and conclusion drawing (Ragin, 2024). For instance, interview transcripts with teachers were coded into categories such as "curriculum integration," "pedagogical strategy," and "implementation challenges." These codes were then grouped to identify recurring themes. Thematic matrices were used to compare strategies and their impacts as reported by teachers and students, allowing patterns and differences to be systematically identified.

Four techniques suggested by Creswell & Poth (in Libarkin & Kurdziel, 2022) were applied to enhance data validity. Credibility was ensured through triangulation and member checking, where interview summaries were returned to participants for confirmation. Transferability was supported by providing detailed descriptions of the research context so that findings may be applied in similar settings. Dependability was maintained through an audit trail, documenting every stage of data collection and analysis. Confirmability was strengthened by keeping reflective notes and conducting peer debriefing with fellow researchers to minimize subjective bias.

RESULT AND DISCUSSION

Result

Effective Strategies in Balancing Religious and Scientific Knowledge

Based on field data, MAN Palopo has implemented various strategies to balance religious knowledge and science in its learning system. The results of observations showed that this madrasah implements an integration of Islamic and Science-based curriculum, where Islamic Religious Education (PAI) materials were not only taught normatively, but also linked to modern science concepts. In interviews with educators, it was found that PAI teachers and science teachers often collaborated to explain the relationship. In addition, the madrasah also used a project-based learning approach (Project-Based Learning/PjBL), which combined science experiments with Islamic studies.

Table 1. Integrative Strategy in Balancing Religious and Science Knowledge at MAN Palopo

No	Aspect	Strategies Implemented	Impact on Students
1	Curriculum Integration	Integrating Islamic and science-based curriculum by linking PAI materials with modern scientific concepts.	Enhances understanding of religious norms while strengthening scientific rationality.

No	Aspect	Strategies Implemented	Impact on Students
2	Teacher Collaboration	Collaboration between PAI teachers and science teachers to connect Qur'anic verses with scientific phenomena.	Strengthens the relationship between Islamic teachings and scientific knowledge, improving interdisciplinary understanding.
3	Learning Approach	Application of Project-Based Learning (PjBL) by combining science experiments with Islamic studies.	Improves critical thinking, problem-solving skills, and spiritual awareness.
4	Islamic Science Approach	Application of the Islamic Science Approach in science teaching based on the Qur'an.	Helps students understand scientific concepts while reinforcing faith.
5	Contribution to Islamic Education	Development of an integration model as an innovation in 21st-century education.	Serves as a relevant model of modern Islamic education in facing contemporary challenges.

As shown in table 1, the modernization strategy at MAN Palopo was carried out through curriculum integration, teacher collaboration, innovative learning approaches, and applying the Islamic Science Approach. Integrating Islamic and science-based curricula allowed students to connect religious knowledge with contemporary scientific concepts, eliminating the dichotomy between normative and rational knowledge. Teacher collaboration further strengthened interdisciplinary understanding by linking Qur'anic verses with scientific phenomena.

Curriculum Integration

MAN Palopo implemented curriculum integration as a strategic step to harmoniously connect religious knowledge and science. The science-based national curriculum was combined with a religious curriculum that emphasizes understanding the Quran and Hadith, so that students can see the relevance of religious values in the development of modern science. For example, in Biology lessons, the concept of the creation of the universe and life was linked to Quranic verses about Allah's creation, fostering an understanding that science is not merely technical knowledge, but also a means to recognize God's greatness. Furthermore, this integration was also reflected in the development of thematic and contextual teaching materials. Teachers were given the freedom to connect scientific concepts, such as physics or chemistry, with the principles of monotheism, so that students can view science as a unified whole. This approach did not only improve students' academic competence but also strengthened their spiritual and moral values.

Teacher Collaboration

Teacher collaboration strategies were an important foundation in balancing religious knowledge and science at MAN Palopo. Teachers from various subjects, both general and religious, regularly met to develop integrated lesson

plans. This collaboration allowed for the exchange of ideas. For example, physics teachers and tafsir teachers jointly designed lessons about natural phenomena based on relevant Quranic verses. Furthermore, this collaboration encouraged innovation in teaching methods. Religious teachers can provide a spiritual perspective on science material, while science teachers strengthened scientific understanding of religious concepts. Thus, students did not only understand the relationship between religion and science theoretically but also experience it in a collaborative and holistic learning process.

Innovative Learning Approaches

MAN Palopo adopted innovative learning approaches, such as project-based learning and problem-based learning, which encouraged students to combine scientific research with religious studies. In practice, students can be asked to research environmental issues, such as waste management or renewable energy, then analyzed them based on a scientific perspective and Islamic values regarding the responsibility of caring for the earth. This approach fostered critical thinking skills, creativity, and spiritual sensitivity simultaneously. Students learn that knowledge must be used for the benefit of the nation, in accordance with the principles of maqasid sharia. Through innovative learning methods, MAN Palopo had successfully created a challenging learning environment while deeply instilling religious values.

In addition, Project-Based Learning (PjBL) provided students with contextual and reflective learning experiences that encouraged critical thinking and problem-solving while nurturing their spirituality. The Islamic Science Approach emphasized that all knowledge originates from Allah SWT, helping students to view scientific discoveries as part of divine creation. Overall, this model contributed to developing 21st-century Islamic education by offering a relevant and holistic framework for balancing religious and scientific knowledge in madrasahs.

Implementation of the Science-Islamic Approach

The Science-Islamic Approach was a distinctive characteristic of MAN Palopo. Through this approach, every scientific concept was always linked to Islamic principles. For example, astronomy lessons were linked to Quranic verses about the orbits of the moon and sun, while chemistry lessons were linked to the concept of purity in thaharah (purity). This emphasized that science and religion were not two opposing entities, but rather complementary. The implementation of this approach also included extracurricular activities such as the Islamic science research club, where students were encouraged to conduct scientific research inspired by Quranic values. This approach fostered in students the mindset that mastering science was part of worship and a contribution to humanity. So, they grew into a generation that was both intellectually intelligent and spiritually strong.

Challenges in the Modernizing Islamic Religious Education and Science

Modernization of education in madrasahs, especially in the effort to integrate Islamic religious knowledge and science, faces various structural,

pedagogical, and cultural challenges. Based on research findings, the main challenges faced by MAN Palopo in this modernization process included the lack of human resources (HR) who had interdisciplinary competence, minimal support for technological infrastructure, and resistance from some educators and the community to the integrative approach.

Modernization of Islamic religious education and science in madrasahs was a strategic effort in responding to the challenges of the times and increasing the relevance of Islamic education in the era of globalization. However, as found in MAN Palopo, this process was inseparable from various obstacles that are structural, pedagogical, and cultural. One of the main obstacles found was the limited human resources (HR) who had the competence to teach Islamic religious knowledge in an integrated manner with science. There were still educators in madrasahs with educational backgrounds that were still monodisciplinary. So, they had difficulty in explaining the relationship between revealed knowledge and empirical knowledge.

Table 2. Challenges in Modernizing Islamic Religious Education and Science

No.	Aspect	Challenge	Recommended Solution
1	Structural	Lack of human resources with interdisciplinary competence	Teacher training and professional development programs based on knowledge integration
		Limited technological infrastructure support	Improvement of technological facilities in madrasahs through government and private sector support
		Lack of flexible regulations to accommodate knowledge integration	Formulation of supportive education policies and integrated curriculum design
2	Pedagogical	Teachers with monodisciplinary backgrounds face difficulties teaching integrated knowledge	Development of integrative learning modules and teacher training programs
		Lack of teacher understanding of knowledge integration frameworks	Workshops and dissemination of integration frameworks for teachers
3	Cultural	Resistance from teachers and society toward knowledge integration	Socialization strategies using Islamic scientific approaches
		Conservative mindset that separates science from religious knowledge	Incorporation of Qur'anic values into science learning to foster Islamic-based understanding

The table illustrated three main challenges in modernizing Islamic religious education and science in madrasahs: structural, pedagogical, and cultural. Structurally, the limitations lied in human resources, facilities, and regulations,

which require supportive training, infrastructure improvement, and policy reforms. Pedagogically, the main challenge was the teachers' limited background and understanding of integrative approaches, which can be addressed through module development, workshops, and training. Culturally, resistance and conservative mindsets still dominated, necessitating socialization efforts and incorporating Islamic values into science learning. These solutions highlight the importance of comprehensive and collaborative strategies for successful integration.

Its Impact on the Intellectual and Spiritual Development of Students

The modernization of Islamic religious education applied in madrasahs, especially through the integration of religious knowledge and science, had a significant impact on the intellectual and spiritual development of students. Based on the results of research at MAN Palopo, it was found that students involved in this integrative approach showed an increase in deeper scientific understanding while also having a stronger spiritual awareness. Interview data with students revealed that the project-based learning method (PjBL) which connected scientific concepts with Islamic values made them better able to understand the relationship between science and their beliefs.

Table 3. The Impact on the Intellectual and Spiritual Development of Students

No.	Aspect	Research Findings	The impact
1	Improvement Understanding Scientific	Participant students who studied with Project-Based Learning (PjBL) method showed deep scientific understanding. Because capable connect science concept with Islamic values.	Participant educated understand knowledge in a way holistic, no only in a way empirical, but also in Islamic perspective.
2	Improvement Ability Think Critical	Participant students who studied phenomenon scientific through Islamic perspective more reflective and own better understanding wide to science concept.	Ability participant educate in analyze, review, and connect knowledge with Islamic values increase. So, they more critical in think.
3	Improvement Performance Academic	Integration Islamic religious education and science helped participant to educate reach performance.	Mark academic participant educated increase. Because, they own better understanding deep and comprehensive to material lesson.
4	Greater Spiritual Awareness Tall	Participant educated more diligent worship, had ethics good academics, as well as more tolerant to difference.	Discipline in worship increase, behavior academic more good, and attitude each other honor more develop.

No.	Aspect	Research Findings	The impact
5	Formation Character Religious	Participant showed not quite enough moral responsibility, discipline, and awareness high social.	The formation of character more religious strong, like moral awareness, concern social, and more discipline tall.
6	Internalization Values Islam	Education based on integration more effective in to form participant educate with morals And own high spiritual awareness.	Students made knowledge a part of their faith, making it easier to practice Islamic values in everyday life.

Table 3 illustrated the impact of the modernization of Islamic Religious Education on students' intellectual and spiritual development. First, in scientific understanding, Project-Based Learning (PjBL) application allowed students to integrate scientific concepts with Islamic values, resulting in a more holistic comprehension that transcends empirical knowledge alone. Second, the ability to think critically was significantly improved, as students who analyzed scientific phenomena through the lens of Islam became more reflective, analytical, and capable of connecting knowledge with moral and spiritual values.

Third, the integration of Islamic education with science had a positive influence on students' academic performance. Their grades improved due to a more profound and comprehensive mastery of learning materials. Fourth, modernization also enhanced students' spiritual awareness. They became more disciplined in worship, demonstrated good academic ethics, and developed greater tolerance toward diversity.

Fifth, students' religious character was strengthened, as evidenced by higher moral responsibility, stronger discipline, and greater social awareness. Finally, internalization of Islamic values became more effective, as students not only acquire knowledge but also embody it as part of their faith, enabling them to consistently practice Islamic values in daily life. Thus, the modernization of Islamic Religious Education contributed holistically to students' development, producing individuals who were intellectually competent and spiritually mature.

Discussion

Effective strategies in balancing religious and scientific knowledge

At MAN Palopo, the integration of religion and science followed Amin Abdullah's integration-interconnection theory, which rejected the dichotomy between revealed and rational knowledge (Haidar & Dzulfahmi, 2024; Nisa & Ibrahim, 2025). Research showed such integration improves religious understanding and scientific literacy (Peñaloza et al., 2021).

Collaboration between Islamic Religious Education and Science teachers demonstrated this approach, for example, using QS. Al-Anbiya:30 to explain the Big Bang theory, which strengthens both scientific comprehension and faith (Muhaemin et al., 2023; Nasir & Rijal, 2021; Mohammad, 2024). The Islamic

Science Approach reflects epistemological tauhid, recognizing all knowledge originating from Allah SWT (Lubis et al., 2024)

Project-Based Learning (PjBL), aligned with constructivist theory, further enhances critical thinking, problem-solving, and spirituality (Saad & Zainudin, 2024; Fauzan, 2022). This method allowed students to apply religious and scientific concepts in authentic contexts, making learning more reflective and meaningful. Overall, MAN Palopo's integrative strategy effectively eliminated the dichotomy between religion and science, providing a holistic, contextual, and innovative model of 21st-century Islamic education. It can be an example for other madrasahs in building modern Islamic education that connects Islamic values with contemporary scientific knowledge.

Challenges in the Modernizing Islamic Religious Education and Science

Understanding the relationship between religious and scientific knowledge was essential in modernizing Islamic education (Ritonga & Saputra, 2025). The concept of Epistemological Tauhid emphasizes that all knowledge came from Allah SWT, rejecting the dichotomy between religion and science (Fadillah et al., 2023). Thus, integrating science into Islamic education enriched students' understanding of faith while appreciating modern knowledge. However, integration efforts often face resistance due to limited understanding. Some educators and communities feared incorporating science may secularize Islamic education (Asari et al., 2024; A. Diana et al., 2024). Another major challenge was the shortage of teachers capable of teaching both domains in an integrated manner (Syafaruddin, 2024; Latief et al., 2021).

The Islamic Science Approach offered a solution by explaining scientific concepts through the Qur'an. It showed that Islam encourages knowledge-seeking and that science supports, rather than opposes, religious values (El-Mubarak & Hassan, 2021). Similarly, the Islamization of knowledge framework highlights the need for integrative curricula, though its implementation was hampered by rigid structures and limited technological facilities (Azmi & Nadia, 2022). Beyond pedagogy, cultural and social conservatism also posed obstacles, as some still view science as separate from religion (Hulkin & Santosa, 2023). Therefore, modernization required curriculum and teacher development and broader changes in mindset and academic culture to embrace integrative and technology-based learning.

Its Impact on the Intellectual and Spiritual Development of Students

The Integration-Interconnection concept by Amin Abdullah highlights that religious knowledge and science should form a complementary unity, integrating rational and spiritual aspects (Haidar & Dzulfahmi, 2024). This principle was reflected in the Project-Based Learning (PjBL) method at MAN Palopo, where scientific concepts were linked with Islamic values. As a result, students grasped scientific theories and relate them to their faith, fostering holistic intellectual and spiritual growth.

Research supports these findings by Rohman et al. (2023) showed that integrative education enhances students' critical thinking compared to traditional systems. Similarly Rahayu et al. (2025) found that combining Islamic education with science improves academic achievement while strengthening religious character. Students who studied science from an Islamic perspective tend to be more reflective, disciplined, and tolerant, aligning with observations at MAN Palopo.

The Epistemological Tauhid perspective (Choudhury, 2024). reinforced that knowledge carried rational and divine dimensions, shaping students into more moral and religious individuals. Studies by Saada (2023) and Pu'ad et al. (2022) also confirmed that integrative approaches built stronger moral responsibility and social awareness, provided Islamic values were deeply internalized in the learning process.

Integrative Islamic education positively impacts students' intellectual abilities and spiritual awareness. At MAN Palopo, this approach produced students with stronger academic ethics, worship discipline, and tolerance. By merging religious and scientific curricula through collaboration and PjBL, madrasahs can offer a balanced and modern education model, preparing students for global challenges without losing Islamic identity. Despite limitations in scope and methodology, this study provided empirical evidence and theoretical insights into the modernization of Islamic education, opening pathways for broader and more diverse future research.

Research on MAN Palopo's strategy for balancing religious and scientific knowledge had significant implications for the development of integrative education in Indonesia. Practically, the results of this study can serve as a reference for madrasahs and public schools in designing curricula that emphasize not only cognitive aspects but also the development of students' spiritual character. Its main contribution lied in the presentation of a curriculum integration model, teacher collaboration, innovative learning approaches, and the application of Islamic science, which has been proven to improve the quality of holistic education. The findings of this study confirmed that the integration of religion and science did not only enriches students' knowledge but also strengthens moral values relevant to modern challenges. However, this study was limited by its scope, which focuses only on MAN Palopo, so the results cannot necessarily be generalized to all educational institutions. Furthermore, this study was still limited to a descriptive qualitative approach, so quantitative measurements of the impact of curriculum integration on student achievement have not been conducted. For future research, comparative studies between madrasahs or the development of quantitative evaluation models to assess the effectiveness of religious and scientific integration more broadly are recommended.

CONCLUSION

The modernization of Islamic religious education through the integration of religious knowledge and science at MAN Palopo had a significant impact on the

intellectual and spiritual development of students. The strategies carried out include curriculum integration, cross-disciplinary teacher collaboration, project-based learning, and contextual approaches, all of which have strengthened both scientific competence and religious awareness.

The findings of this research imply that integrative education was not only able to increase students' academic achievement but also prepared them to face the challenges of globalization while maintaining strong Islamic values. This provided a model that can be developed in other Islamic educational institutions to create graduates who are intellectually capable, spiritually strong, and socially adaptive. To maximize the implementation of this model, several efforts were recommended, including: improving interdisciplinary teacher training, providing adequate technological infrastructure, conducting intensive socialization for educators and the community, and developing a more flexible curriculum that supports experiential learning.

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