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Integrating Neuroscience Principles into Islamic Religious Education in Elementary Schools

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ABSTRACT

Islamic religious education in schools often faces challenges in fostering students' interest, engagement, and deep comprehension of abstract religious concepts. Responding to this issue, the present study investigates the development and implementation of a neuroscience learning model in Islamic religious education at SDN Wangiwisata Majalaya, Bandung Regency. The main objective was to examine how neuroscience-based approaches can enhance students' understanding, motivation, and appreciation of religious values while also identifying challenges and opportunities in its application.This research employed a qualitative case study design. Data were collected through classroom observations, in-depth interviews with teachers and students, and documentation analysis of curricula, teaching materials, and evaluation records. The data were analyzed using a descriptive qualitative approach involving reduction, categorization, presentation, and interpretation to uncover recurring themes and patterns related to the integration of neuroscience in learning. The findings demonstrate that the neuroscience learning model has a significant impact on both cognitive and affective domains of learning. About 85% of students reported increased interest in religious lessons, while classroom engagement levels rose by approximately 30%. Furthermore, students' average final exam scores increased by 25% compared to the previous year, indicating measurable academic improvement. Interviews revealed that students found it easier to relate religious concepts to daily life when taught through neuroscience-based strategies such as visualization, storytelling, and experiential learning. Teachers also acknowledged positive shifts in classroom dynamics, with students showing greater collaboration, confidence, and willingness to apply religious values in practice. However, challenges were identified, including limited teacher knowledge of neuroscience principles, inadequate availability of supporting teaching materials, and the need to align methods with diverse student learning styles. The study concludes that integrating neuroscience principles into Islamic religious education is highly relevant in modern schooling. It provides a scientifically grounded, innovative model that enriches religious instruction, supports deeper value internalization, and creates a more inclusive learning environment. To maximize its potential, professional development programs for teachers and systematic curriculum adjustments are essential.

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Introduction

1 Background and Previous Literature Review

Integrating science and practice is becoming increasingly important along with the development of education. One of the striking issues in the context of education in Indonesia is the need for a more innovative approach to learning Islam, especially at the primary school level(Anwar & Umam, 2020; Cipta et al., 2023) . So far, learning methods still rely on the teacher as the main focus. This phenomenon is further strengthened by the challenges faced by the younger generation in understanding and internalizing Islamic religious values amid the swift flow of information. Data shows that many students have difficulty in connecting religious teachings with everyday life, which has the potential to reduce the effectiveness of Islamic religious education in schools(Nasir et al., 2021; Wulansari et al., 2022) . According to Nasir et al. (2021) the Islamic religious education curriculum in Indonesia needs to be evaluated and adjusted to be more relevant to the needs of today's students. This opinion is in line with the views of Hasanah & Istiqomah (2023), who emphasize the importance of practical learning management in Islamic religious education.

The importance of a neuroscience-based approach in Islamic religious education is becoming increasingly relevant, given that research shows that understanding how the brain works can help design more effective learning methods (Chen, 2019; Sudarmiyatun, 2012). Research by Jailani et al. (2022), shows that understanding the relationship between the brain and religious teachings can provide new insights for developing more inclusive and effective learning models. This is in line with Suyadi (2020) view that emphasizes the importance of integrating neuroscience into education to improve the quality of learning. Thus, the development of neuroscience learning models in Islamic religious education is expected to answer the challenges faced by students and teachers in learning.

In this context, SDN Wangiwisata Majalaya is an interesting case study to research. This school has implemented various innovative learning methods, but faces challenges in integrating religious values into the curriculum. This research explores how the neuroscience learning model can be applied in Islamic religious education at SDN Wangiwisata Majalaya and its impact on students' understanding and appreciation of religious teachings. According to Khadijah et al. (2019) , the application of learning models based on the scientific approach can significantly improve students' experiences. Therefore, this research is expected to make a meaningful contribution in developing more effective and relevant Islamic religious education.

In addition, it is important to arouse readers' interest by presenting the idea that Islamic religious education is not just a transfer of knowledge but also a process that involves a deep understanding of spiritual and moral values. With the right approach, religious education can be a powerful tool to shape students' character and personality (Maideja, 2023; Tabroni et al., 2022) . In this context, the development of a neuroscience learning model is expected to provide a new perspective in Islamic religious education that focuses on the cognitive, emotional, and spiritual aspects of students.

Reviewing the existing literature, various studies discuss the integration of neuroscience in education. However, there are still few that specifically discuss its application in the context of Islamic religious education. Research by Suyadi & Nuryana

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(2020), shows that the understanding of fiqh and neuroscience can complement each other in facing contemporary challenges. In addition, research by Hidayat (2023) shows that the application of neuroscience principles in education can increase learning effectiveness. Thus, this article seeks to fill the void of existing literature by presenting research that focuses on the development of a neuroscience learning model in Islamic religious education, especially at SDN Wangiwisata Majalaya.

Based on the existing literature, the development of a neuroscience learning model in Islamic religious education is an innovative step to improve students' understanding of religious teachings through a more brain-based approach. Research by Gkintoni et al. (2023) shows that understanding the cognitive processes that occur in the brain can help design more effective learning strategies. In Islamic religious education, this approach can provide new insights into how students can better understand and internalize religious values. In addition, research by Hidayat (2023) confirmed that the application of neuroscience principles in education can improve the quality of learning, especially in the context of learning that involves moral and spiritual aspects.

Furthermore, research by Miftachurrozaq (2023) shows that integrating neuroscience into Islamic religious education can create a learning environment that is more inclusive and responsive to students' needs. Educators can develop methods that are more in line with student characteristics by understanding how the brain works in learning. This is in line with the findings of Gkintoni et al. (2023) which emphasizes the importance of collaboration between education and neuroscience to create more effective and relevant educational practices. Therefore, the development of a neuroscience learning model in Islamic religious education will significantly improve students' understanding of spiritual teachings.

Then, the impact of the application of the neuroscience learning model in Islamic religious education can be seen from the increase in students' understanding and appreciation of spiritual teachings. Research (Huda & Widodo, 2022) shows that a neuroscience-based approach can improve student character, an important aspect in religious education. By using methods that consider how the brain works, students are expected to more easily understand and internalize religious values in everyday life. This is in line with the findings of Hachem et al. (2022) which states that an understanding of neuroscience can help educators design more effective teaching strategies.

In addition, research by Asman et al. (2021) revealed that the application of neuroscience principles in religious education can help students overcome the challenges they face in understanding religious teachings. Students can be more motivated to learn and live religious teachings with a more scientific and evidence-based approach. Therefore, the positive impact of applying the neuroscience learning model is expected to improve the quality of Islamic religious education in schools.

Challenges in implementing the neuroscience learning model in Islamic religious education include the resistance of educators and students to changes in existing learning methods. Research conducted by Hidayat (2023) shows that although there is great potential in the application of neuroscience, many educators still lack understanding of the basic concepts of neuroscience and how to apply them in an educational context. Therefore, providing adequate training and resources for educators to integrate neuroscience into Islamic teaching is essential.

 ISSN 2747-089X

However, despite these challenges, there are excellent opportunities to improve the quality of Islamic religious education through a neuroscience approach. Research by Hachem et al. (2022) shows that neuroscience-based education can provide a deeper understanding of how students learn, improving teaching effectiveness. By utilizing technology and innovative learning methods, educators can create more engaging and relevant learning experiences for students. Therefore, despite the challenges, the application of neuroscience learning models in Islamic religious education has the potential to bring significant positive changes.

2 Gap and Novelty statement

Although several studies have discussed the integration of neuroscience in education, there is still little literature that explicitly examines the application of the neuroscience learning model in Islamic religious education. Research by Suyadi (2020) emphasizes the importance of linking neuroscience concepts with religious education. However, there is no research that deeply explores how the model can be practically applied in schools.

These shortcomings indicate an urgent need for further research on the development and application of neuroscience learning models in Islamic religious education. Although previous research has provided a solid foundation, little has been done to explain how neuroscience concepts can be translated into concrete and effective educational practices in the context of religious education. Therefore, this study aims to fill the gap by exploring the implementation of the neuroscience learning model at SDN Wangiwisata Majalaya and its impact on students' understanding of Islamic teachings.

The main questions to be answered in this study are: How is the neuroscience learning model implemented in Islamic religious education at SDN Wangiwisata Majalaya? In addition, this study also aims to determine the impact of the implementation of the learning model on students' understanding and appreciation of religious teachings. By answering these questions, this research can make a significant contribution in developing Islamic religious education that is more effective and relevant in this modern era.

The novelty of this research lies in being the first empirical study that explores the practical implementation of the neuroscience learning model in Islamic religious education at the elementary school level. Unlike previous studies that only discussed conceptual integration, this study investigates its real impact on students' understanding of Islamic teachings

3 Study purpose

The main purpose of this research is to develop and implement a neuroscience learning model in Islamic religious education and to examine its impact on students' understanding of Islamic teachings. By aligning instructional strategies with how the brain processes and retains information, this model is expected to enhance the effectiveness of Islamic learning at the elementary school level.

In addition, this study seeks to provide new insights into how Islamic religious education can be integrated with modern scientific approaches. By adopting a neuroscience perspective, religious education is not merely a transfer of knowledge

 ISSN 2747-089X

but also a process that fosters students' spiritual, moral, and cognitive growth. This research also emphasizes that the development of neuroscience-based learning models must consider students' needs and characteristics while promoting collaboration among educators, researchers, and practitioners. Such collaboration is essential to create an inclusive, responsive, and holistic approach to Islamic education that is both scientifically grounded and contextually relevant.

Method

This study employed a qualitative approach with a case study design, focusing on the development and implementation of a neuroscience learning model in Islamic religious education at SDN Wangiwisata Majalaya, Bandung Regency. The case study design was chosen because it allows for a deep and contextual exploration of how the model is applied in real classroom settings, how students and teachers experience it, and what outcomes emerge from its use (Yin, 2018).

Data collection was carried out through three main techniques, namely observation, in-depth interviews, and documentation. Observation was conducted to capture the dynamics of the classroom, including student participation, engagement, and interaction patterns when neuroscience-based methods were introduced (Spradley, 2011). In-depth interviews were conducted with teachers, students, and other relevant stakeholders to gain insights into their perceptions, experiences, and reflections regarding the implementation of the neuroscience learning model (Creswell, 2018). Documentation was also analyzed, including curriculum materials, lesson plans, teaching resources, and evaluation records such as student exam scores and attendance data. Using multiple sources of data allowed the study to apply triangulation, thereby increasing the validity and reliability of findings (Denzin, 2012). This combination of techniques provided a comprehensive set of data that reflected both the qualitative richness of classroom experiences and the quantitative evidence of learning improvement.

The data analysis process followed a descriptive qualitative approach as suggested by Miles et al. (1994). All information obtained from observations, interviews, and documentation was reduced, categorized, and interpreted systematically to identify recurring themes and patterns. These themes were then presented in narrative form to illustrate the key findings related to student engagement, understanding of abstract concepts, development of religious values, teacher experiences, and challenges in implementation. Quantitative information, such as percentages of student responses and improvements in exam scores, was not treated as statistical analysis but rather as supporting evidence to strengthen the interpretation of qualitative findings (Creswell, 2013).

Result

1 Development of Neuroscience Learning Model in Islamic Religious Education

The implementation of the neuroscience learning model at SDN Wangiwisata Majalaya produced several notable outcomes. A total of 85% of students reported greater interest in Islamic subject matter, compared to 60% before the model was

 ISSN 2747-089X

introduced. Observations confirmed higher student participation, attendance, and engagement. Interviews revealed that visualization, storytelling, and interactive methods helped students connect abstract religious concepts with daily life. Curriculum analysis indicated that integrating cognitive and emotional dimensions enriched the learning process, while evaluation data showed that students' average exam scores improved by 20%. Feedback highlighted increased confidence in applying religious teachings and more collaborative group work. Teachers also expressed greater confidence and effectiveness in designing lessons based on neuroscience principles.

2 Impact of Neuroscience Learning Model Implementation

The overall impact of this model was reflected in improved comprehension and appreciation of religious teachings. Seventy-eight percent of students reported a better understanding of Islamic material, while classroom engagement rose by 30%. Final exam scores increased by 25%, with more than 85% of students achieving scores above the passing grade. Students expressed stronger motivation to apply religious values in daily life, while group collaboration and inclusivity also improved. Teachers reported observable benefits and increased professional confidence in employing neuroscience-based strategies.

3 Challenges and Opportunities

Despite these positive outcomes, challenges remained. About 65% of teachers admitted limited knowledge of neuroscience principles, and 40% of students experienced confusion when methods were overly complex or not suited to their learning style. Curriculum materials also remained largely conventional, lacking alignment with neuroscience approaches. Nevertheless, 75% of students reported stronger engagement when brain-based methods were applied, and 80% of teachers felt more prepared after training sessions. A shortage of appropriate neuroscience-based resources continued to be a pressing issue.

Discussion

The results of this study indicate that neuroscience-informed approaches in Islamic religious education have a transformative potential for both teaching and learning. The most evident effect was the increase in student engagement and motivation. When the learning process was designed with attention to how the brain processes information, students found the lessons more meaningful and enjoyable. The jump in interest levels from 60% to 85% illustrates that religious education, often perceived as abstract, can become more dynamic and relevant when coupled with methods such as visualization, storytelling, and experiential activities. These techniques not only captured attention but also fostered emotional involvement, an essential factor for deeper learning.

Another important finding was that students demonstrated a better ability to comprehend abstract religious concepts by linking them with their daily experiences. This aligns with neuroscientific insights that memory and understanding are strengthened when learning is connected to lived reality. By incorporating multisensory approaches and opportunities for reflection, teachers enabled students to internalize religious values more meaningfully. Consequently, religious education

 ISSN 2747-089X

shifted from being a purely cognitive exercise to becoming a holistic experience that nurtures both intellectual and spiritual growth.

The improvement in learning outcomes further reinforces the argument for adopting neuroscience-based models. The increase of 20–25% in exam scores provide quantitative evidence that such methods are not only engaging but also academically effective. Yet, the benefits extended beyond academic achievement. Students reported greater confidence in applying Islamic teachings in daily life, and their willingness to collaborate in groups increased. This dual impact suggests that neuroscience-based strategies help develop not only knowledge but also character and interpersonal skills, which are central aims of religious education.

From the perspective of teachers, the study highlights both progress and challenges. On the one hand, teachers who applied neuroscience-informed techniques reported a sense of empowerment and satisfaction as they observed positive changes in their students. On the other hand, the fact that 65% of teachers admitted limited knowledge in this field underscores the urgent need for professional development. Without systematic training, the integration of neuroscience into religious education will remain uneven and dependent on individual initiative. Thus, teacher capacity-building emerges as a critical component for sustaining innovation.

Curriculum and resource gaps present another challenge. Although initial steps to integrate neuroscience principles into lesson design were evident, most teaching materials remained conventional and did not fully reflect brain-based learning. This mismatch can hinder consistency in application, making it necessary to rethink curriculum frameworks to ensure alignment with neuroscience-informed pedagogy. Collaboration among educators, researchers, and curriculum developers would be instrumental in producing high-quality, contextually relevant resources.

While some students reported difficulty when faced with overly complex approaches, this finding should be interpreted as an opportunity rather than a setback. Neuroscience emphasizes the uniqueness of each learner, and therefore personalization and adaptability are essential. Teachers must be equipped to differentiate instruction according to students' cognitive styles and capacities. A flexible application of neuroscience principles will help avoid student confusion while maximizing engagement and inclusivity.

Taken together, these findings suggest that neuroscience-based religious education offers a strategic pathway for enhancing the relevance, effectiveness, and transformative impact of Islamic teaching. By fostering both cognitive understanding and spiritual appreciation, this model bridges the gap between abstract doctrine and lived practice. It also demonstrates that religious education can be enriched by contemporary scientific insights without losing its moral and spiritual essence.

For future practice, it becomes increasingly important to institutionalize teacher training programs, update curricula, and provide adequate learning resources that reflect neuroscience principles. In doing so, Islamic religious education will not only respond to the challenges of modern pedagogy but also contribute to shaping learners who are intellectually competent, morally grounded, and emotionally resilient. The

 ISSN 2747-089X

integration of neuroscience thus stands as both a challenge and an opportunity - a call to reimagine religious education in ways that honor tradition while embracing innovation.

Conclussion

The findings of this study demonstrate that the implementation of a neuroscience learning model in Islamic religious education at SDN Wangiwisata Majalaya has had a significant and positive impact on the learning process. The application of this model was proven to enhance students' comprehension of religious teachings, as reflected in the fact that 85% of students reported greater interest and engagement during lessons. In addition, the integration of neuroscience principles contributed to the improvement of learning outcomes, with the average final exam scores of students increasing by 25% after the approach was applied. Beyond cognitive outcomes, the model also fostered affective engagement, with 75% of students expressing that they felt more motivated and involved in the learning process.

Despite these promising results, the study also identified challenges, particularly regarding teachers' limited understanding of neuroscience principles and the difficulty of translating them into practical classroom strategies. However, this challenge can be addressed through targeted training and the development of teaching materials that are tailored to both the subject matter and students' characteristics. With such support, educators will be better equipped to implement neuroscience-based learning in ways that are effective and sustainable.

Overall, this research confirms that integrating neuroscience into Islamic religious education is not only relevant but also offers a practical and innovative solution to improve the quality of learning in schools. By bridging the gap between scientific insights into how the brain learns and the pedagogical goals of religious education, the neuroscience learning model provides an avenue for fostering deeper understanding, greater motivation, and a more inclusive learning environment that meets the diverse needs of students in contemporary classrooms.

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