

INTEGRATION OF NEUROSCIENCE IN ISLAMIC EDUCATION TO IMPROVE FAITH THROUGH WORSHIP AT SMAN 2 PARIAMAN


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Abstract

This study aims to evaluate the effectiveness of applying neuroscience in Islamic education to strengthen students' faith through worship practices at SMAN 2 Kota Pariaman. In the era of globalization and the 4.0 industrial revolution, Islamic education is required to combine contemporary scientific advances with original Islamic values. Neuroscience, as a discipline that studies the structure and function of the brain, presents a new perspective in understanding the learning process, character building, and human spiritual development. This study uses qualitative methods through field observations, in-depth interviews, and literature reviews. The findings show that the integration of neuroscience with Islamic education contributes significantly to strengthening students' faith and shaping their religious character. There was an increase in enthusiasm for spiritual activities, a deeper understanding of tawhid, and positive behavioral changes in daily life. Worship activities such as prayer, dhikr, and recitation of the Qur'an were proven to activate parts of the brain related to executive control, emotional regulation, and long-term memory. Through the concept of neuroplasticity, consistent worship can bring about structural changes in the brain, thereby strengthening religious behavior. These results are in line with the views of classical scholars such as Ibn Sina, Al-Ghazali, and Al-Farabi, who emphasized the importance of spiritual practice in character building. This research contributes to the development of a holistic, contextual, and innovative Islamic education methodology for the current generation.

Abstrak

Penelitian ini bertujuan untuk mengevaluasi efektivitas penerapan neurosains dalam pendidikan Islam terhadap penguatan iman siswa melalui praktik ibadah di SMAN 2 Kota Pariaman. Dalam era globalisasi dan revolusi industri 4.0, pendidikan Islam dituntut untuk menggabungkan kemajuan ilmu kontemporer dengan nilai-nilai Islam yang orisinal. Neurosains, sebagai disiplin ilmu yang mengkaji struktur dan fungsi otak, menghadirkan sudut pandang baru dalam memahami proses belajar, pembentukan akhlak, serta perkembangan spiritual manusia. Penelitian ini menggunakan metode kualitatif melalui observasi lapangan, wawancara mendalam. Temuan menunjukkan bahwa integrasi neurosains dengan pendidikan Islam berkontribusi signifikan terhadap penguatan iman dan pembentukan karakter religius siswa. Terlihat adanya peningkatan semangat dalam aktivitas spiritual, pemahaman tauhid yang lebih mendalam, serta perubahan perilaku positif dalam keseharian. Aktivitas ibadah seperti shalat, dzikir, dan tilawah Al-Qur'an terbukti mengaktifkan bagian-bagian otak yang berhubungan dengan pengendalian eksekutif, regulasi emosi, serta memori jangka panjang. Melalui konsep neuroplastisitas, ibadah yang konsisten dapat membentuk perubahan struktural otak sehingga memperkuat perilaku religius. Hasil ini sejalan dengan pandangan ulama klasik seperti Ibnu Sina, Al-Ghazali, dan Al-Farabi yang menekankan pentingnya latihan spiritual dalam pembentukan kepribadian. Penelitian ini memberikan kontribusi dalam pengembangan metodologi pendidikan Islam yang holistik, kontekstual, serta inovatif untuk generasi masa kini.

INTRODUCTION

In the era of globalization and the Fourth Industrial Revolution (4.0), the education system must be transformed to meet the moral and cognitive demands of students. Islamic education, a vital component of the national education system, faces challenges in integrating contemporary scientific advances with authentic Islamic values. Neuroscience is one rapidly developing field that holds great potential for integration into Islamic education.

Neuroscience is a field that investigates the structure and function of the brain. Thus, we now have a better understanding of how learning, character formation, and spiritual development occur in humans. According to recent research in neuroscience, worship activities such as prayer, dhikr (remembrance of God), and Quran recitation improve concentration, reduce stress, and strengthen neural connections associated with faith.

SMAN 2 Pariaman has demonstrated leadership in the use of neuroscience approaches in Islamic learning because the school is committed to incorporating Islamic values into its curriculum. Since 2023, the school has implemented a neuroscience integration program, which offers education that connects scientific findings on brain function with Islamic worship practices. Current programs include the use of dhikr-based mindfulness techniques, Quranic recitation techniques to improve concentration, and the use of neurofeedback to teach Islamic religion.

Although SMAN 2 Pariaman has implemented neuroscience integration in Islamic education, a comprehensive evaluation of the program's effectiveness in enhancing students' faith through worship remains necessary. Initial observations indicate increased student participation in religious activities and positive changes in student attitudes toward worship. However, there has been no systematic research measuring the program's impact on the quality of students' faith. Furthermore, a more comprehensive and organized approach is needed to optimally integrate neuroscience into the existing Islamic education curriculum.

METHODS

The methods used in this research included observation and interviews at SMA 2 Pariaman. Observation is a method of collecting data through direct observation. This technique is typically used to obtain information about behavior, activities, and real-world situations. The advantage of the observation method is that researchers can witness events directly without having to rely on the explanations of others (Ramdhan, 2021). Furthermore, the interview method is equally important. Interviews are a direct question-and-answer process between researchers and informants to gather more in-depth information. Through

interviews, researchers can gain insights into a person's perspectives, experiences, and feelings that cannot be directly observed. For example, in research related to learning motivation, researchers can interview students to determine factors that drive learning enthusiasm or causes laziness. These two methods are complementary (Arianto, 2024).

Observation provides a factual picture of real-world conditions, while interviews uncover the meaning and reasons behind observed behaviors or events. By combining observation and interviews, the collected data will be more comprehensive, accurate, and accountable. Qualitative research does not use quantitative data support at all. The emphasis is not on hypothesis analysis, but rather on answering research questions through formal thinking. This research was conducted using a qualitative approach, namely research whose data consists of words derived from interviews, documentation, and so on. A qualitative approach is a method that emphasizes data interpretation, subjective meaning, and social context (Abubakar, 2021). Researchers used data collection through interviews, participant observation, and text or image analysis to answer exploratory questions.

RESULT AND DISCUSSION

RESULT

Research at SMAN 2 Kota Pariaman shows that the integration of neuroscience into Islamic education has a significant impact on strengthening students' faith and developing their religious character. Observations showed that students were more enthusiastic about participating in spiritual activities, were able to understand the values of monotheism through reflective discussions, and demonstrated positive behavioral changes in their daily lives. Teachers reported that students began to demonstrate greater devotion in prayer, regularity in dhikr, and improved Islamic morals when interacting with friends and teachers. Parents also expressed positive feedback, as their children demonstrated consistent worship practices at home. These impacts demonstrate that neuroscience-based learning can connect brain experiences with the values of faith in students' real lives (Sari et al., 2024). Ari Pradinata, a PAI teacher at SMAN 2 Pariaman, emphasized the importance of integrating and interconnecting neuroscience in Islamic religious education. This is to maintain the purity of students' minds and intellects, ensuring they remain on track with obedience. Students actively engage in Islamic activities such as congregational prayer, Duha prayer, and Quran recitation, thus producing perfect human beings, in line with the goals of Islamic education, which are to produce people who are faithful, pious, and possess noble morals.

In addition to empirical findings in the field, evaluations using neuroeducational instruments also corroborate these findings. The majority of students reported an increase in spiritual well-being, a state of spiritual well-being encompassing inner peace, a sense of meaning in life, and a connection with God. Teachers believe this approach offers an alternative, more innovative and relevant model for religious learning, as it relies not solely on lectures but directly engages students' minds and emotions. Practically, this learning model can be routinely integrated into the Islamic education curriculum, making it not merely an additional program but a permanent part of the school's educational process. The implementation of neuroscience-based Islamic learning at SMAN 2 Kota Pariaman is realized through routine and focused worship practices. Students are involved in congregational prayer, collective dhikr (remembrance of God), and Quran recitation, all presented using a multisensory and interactive approach. These activities are not only intended as religious routines but also as strategies for healthy brain learning. Prayer, for example, engages the prefrontal cortex, which is associated with executive control, decision-making, and concentration. Dhikr stimulates the limbic system, which regulates emotions, thus promoting inner calm (Khalisah, 2023).

Meanwhile, Quran recitation activates the temporal lobe, which functions in long-term memory storage, so that the spiritual values read and heard are firmly embedded in students' minds. Moreover, the physical movements of prayer also involve the motor cortex and cerebellum, contributing to body coordination and neurochemical balance (Anira, 2020). Neuroscience is the scientific study of the nervous system, specifically the brain, and its relationship to behavior, learning, and decision-making. The integration of neuroscience with Islamic education is based on the understanding that education focuses not only on cognitive aspects but also encompasses spiritual and affective dimensions. By combining the two, the learning process can be more comprehensive, touching all aspects of humanity, both physical and spiritual, both intellect and heart, and both logic and spirituality. (Arfizi, 2025)

Several classical Islamic figures, such as Ibn Sina, Al-Ghazali, and Al-Farabi, have long been concerned with the relationship between the mind, the soul, and the learning process. Ibn Sina's concept of levels of reason, for example, serves as the epistemological basis for the notion that human intellectual abilities develop gradually in accordance with the influence of spiritual and divine aspects. In the modern era, this view has gained scientific legitimacy through neuroscience findings that demonstrate that the learning process is closely related to brain structure and activity (Damayanti *et al.*, 2024).

DISCUSSION

In the development of modern science, neuroscience has provided new insights into how the human brain works, particularly in relation to spiritual experiences and religious practices. Neuroscience proves that the human brain is not a static organ, but rather a dynamic and plastic one (Suyadi, 2020). Every experience a person undergoes, whether cognitive, emotional, or spiritual, leaves a specific imprint on the brain. This imprint is reflected in the formation of new connections between neurons or the strengthening of existing connections. Thus, life experiences, including religious experiences such as prayer, dhikr, and reading the Quran, directly contribute to the development of brain structure and function. This demonstrates that Islamic education, based on worship practices, can be enriched with a neuroscientific approach to provide a more comprehensive understanding of the brain's role in internalizing the values of faith (Nurlayly, 2025).

Structurally, the human brain consists of billions of neurons interconnected by synapses. When a person engages in an activity, these neurons communicate with each other through electrical and chemical impulses (Nasrullah, 2021). Dendrites, which function as signal-receiving branches, can extend their branches or strengthen connections with other neurons if the activity is repeated. This is the basis of the concept of neuroplasticity, namely the brain's ability to change, adapt, and form new connection patterns based on experience (Andayani, 2023). This concept explains why repeated practice, including religious practice, can have a profound impact on a person, not only psychologically but also biologically, strengthening the neural networks that support religious behavior.

According to Listiana (2020), the involvement of various brain regions in religious practices proves that worship has two dimensions: spiritual and neurobiological. When worship is performed repeatedly, the synapses between neurons in the involved brain areas become stronger, making it easier for learners to achieve devotion, consistency, and deeper spiritual understanding. For example, repeated practice in prayer helps train the prefrontal cortex to be more focused and disciplined. Likewise, daily dhikr (remembrance of God) further trains the limbic system to respond to life's stresses with calm. Consistent recitation of the Quran strengthens spiritual memory in the temporal lobe (Santoso et al., 2025). This suggests that consistent worship can produce more permanent structural changes in the brain, thus forming stable and sustainable religious behavior.

This concept also aligns with the views of classical Islamic scholars. Ibn Sina, for example, through his theory of the hierarchical mind, asserted that the human mind develops gradually in accordance with spiritual and divine influences (Chaidir, 2025). Al-Ghazali also emphasized the importance of spiritual practice and habituation in developing a healthy soul. Al-Farabi, on the other hand, emphasized the integration of reason and morality in education. These views, although born long before the development of modern neuroscience, are essentially similar to the principle of neuroplasticity. They emphasize that repeated habits, especially in a spiritual context, will shape human personality and intelligence (Rusydiyah, 2019). Thus, the integration of neuroscience in Islamic education can be seen as a scientific continuation of these classical ideas.

The integration of neuroscience in Islamic education supports a holistic learning paradigm, one that combines cognitive, affective, and psychomotor aspects. Students are not merely objects of learning receiving religious information, but also active subjects experiencing, feeling, and internalizing the values of faith through practical practice (Arfizi, 2025). Reflection after performing religious observances provides a space for students to connect spiritual experiences with abstract Islamic concepts, such as monotheism, faith, and piety. In this way, worship is not merely a ritual, but a transformative experience that leaves a deep imprint on the brain structure and personality of students (Zubaidi et al., 2022).

From a practical perspective, the results of this research also make a significant contribution to the development of Islamic education methodology. Neuroscience-based learning models can enrich teachers' approaches to teaching religion, making them more contextual, innovative, and tailored to the needs of the modern generation. Schools, as educational institutions, can utilize supporting technologies, such as interactive laboratories, multimedia, and even monitoring tools.

Conculusion

Based on the research results, it can be concluded that the application of neuroscience in Islamic education at SMAN 2 Kota Pariaman has a significant positive influence on strengthening students' faith. This integration has been proven to increase students' enthusiasm in participating in worship, deepen their understanding of the value of monotheism, and encourage changes in Islamic behavior in daily life. Students appear more devout in prayer, consistent in dhikr, and show improved morals in social interactions. Regular worship provides neurological stimuli that are beneficial for brain development.

Prayer activates the prefrontal cortex which plays a role in concentration and self-control, dhikr stimulates the limbic system to regulate emotions, while recitation of the Qur'an activates the temporal lobe which supports long-term memory function. The multisensory combination in worship practices creates a comprehensive and transformative learning experience. The concept of neuroplasticity provides a scientific basis in explaining how worship routines can form stronger inter-neuron connections, resulting in stable religious behavior. This shows that neuroscience-based Islamic education does not only have a short-term impact, but also contributes to long-term character formation. This view aligns with the ideas of classical scholars such as Ibn Sina, Al-Ghazali, and Al-Farabi, who emphasized the importance of spiritual practice and habituation in developing personality.

The application of neuroscience in Islamic education does not contradict Islamic intellectual tradition; rather, it enriches it by providing a scientific foundation for classical concepts. This neuroscience-based learning model provides an alternative methodology for Islamic education that is innovative, relevant, and in keeping with current developments. Research also shows that this integration can be implemented permanently in the school curriculum, not simply as an add-on program. Moreover, technological support such as interactive laboratories and multimedia can enhance students' learning experiences. Thus, the integration of neuroscience in Islamic education has proven to be theoretically and practically relevant in fostering the faith and character of the younger generation, presenting a new paradigm that combines classical wisdom with modern scientific advances.

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