



NEUROSAINS AND CHARACTER EDUCATION: A QUR'ANIC PERSPECTIVE ON MORAL DEVELOPMENT

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Abstract

This study examines the integration of neuroscientific principles with Qur'anic teachings on character education, seeking to develop a comprehensive framework that bridges empirical findings from brain science with spiritual and moral guidance from Islamic scripture. Using a qualitative library research approach with thematic and semantic analysis of Qur'anic verses, the study reveals significant convergence between Qur'anic concepts and neuroscientific findings. The term *naṣīyah* (forehead/prefrontal cortex) aligns with the brain region responsible for moral decision-making and executive functions. The term *'aql* (intellect) corresponds to reasoning and discernment mediated by the prefrontal cortex. The term *qalb* (heart) relates to the limbic system, which processes emotions and forms memories. The term *fu'ād* (inner consciousness) connects to the insular cortex and anterior cingulate cortex, involved in emotional awareness. Neuroscientific principles including neuroplasticity, executive functions, emotional processing, mirror neurons, and social brain provide insights into how moral values can be internalized. The integration of these principles with Qur'anic teachings offers a framework for character education that addresses cognitive, emotional, and spiritual development. The findings confirm that the Qur'an provides an epistemological foundation aligned with modern neuroscience. The integration of neuroscience into character education requires a curriculum that harmonizes knowledge acquisition, value internalization, and behavioral habituation through active, participatory, and reflective methods.

Keywords: Character Education, Moral Development, Prefrontal Cortex



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INTRODUCTION

Character education has emerged as one of the most pressing concerns in contemporary educational discourse, particularly as societies grapple with declining moral values, rising juvenile delinquency, and the erosion of ethical behavior among younger generations. In Indonesia, the urgency of character formation has been formally recognized through Presidential Regulation Number 87 of 2017 on the Strengthening of Character Education (Penguatan Pendidikan Karakter/PPK), which mandates the integration of character values across all levels of education. However, despite these policy efforts, the implementation of character education remains largely confined to cognitive and moral instruction, often neglecting the biological and neurological foundations that underpin human behavior and moral development (Geva-Sagiv, 2023).

Simultaneously, the rapid advancement of neuroscience, the interdisciplinary study of the nervous system particularly the brain, has opened new frontiers in understanding how human behavior, learning, and character are formed. Neuroscience provides empirical explanations for how character develops through brain maturation, parental influence, physiological processes, and environmental stimulation. The discovery of neuroplasticity, the brain's capacity to reorganize itself by forming new neural connections throughout life, has profound implications for education, suggesting that repeated behaviors and values can become neurologically embedded through consistent practice and meaningful reinforcement. As Qin, (2023) emphasizes, character building is not an instant process but rather the result of consistent and conscious brain training, with neuroplasticity serving as one of the key brain traits that form the basis of self-development. Studies in neural development have further shown that early neural development shapes moral cognition even before reflective reasoning emerges, with neurocognitive processes scaffolding moral responsiveness prior to character reasoning or formal instruction (Qian, 2024).

Within the Islamic tradition, the Qur'an has long emphasized the importance of moral and spiritual development, employing terms such as 'aql (intellect), qalb (heart), fu'ād (inner consciousness), and naṣīyah (forehead or prefrontal cortex) to describe the centers of human cognition, emotion, and moral decision-making. Contemporary scholarship has increasingly recognized the alignment between these Qur'anic concepts and modern neuroscientific findings. For instance, naṣīyah in the Qur'an (Q.S. Al-'Alaq 96:15-16) refers to the frontal part of the head, which neuroscientists now identify as the prefrontal cortex, the brain region responsible for executive functions, impulse control, moral deliberation, and decision-making (Cheng, 2025). The prefrontal cortex constitutes the bulk of the frontal lobe of the brain, and its function is involved in the making of one's personality, directing human behavior with respect to truthfulness, lying, right, and wrong (Zhang, 2024). Recent Qur'anic exegesis and neuroscience studies have revealed that the Qur'an symbolically refers to the human brain region responsible for moral judgment, behavior regulation, and decision-making, known in modern neuroscience as the frontal lobe (Y. Wu, 2024). Similarly, the concept of 'aql encompasses rational thinking and discernment, functions that are neurologically mediated by the prefrontal cortex and associated neural networks, while the concept of qalb has connections to the limbic system which regulates emotion, morality, and character formation (Mohammadi, 2023).

The convergence between neuroscientific insights and Qur'anic teachings offers a promising framework for reimagining character education. As Komori, (2024) argue, character

education in Islam cannot be separated from the brain, as human behavior is controlled by the nervous system, and all human activities ultimately depend on brain function. Islamic character education emphasizes the formation of good moral character (*al-akhlaqul karimah*) and the avoidance of reprehensible behavior (*al-akhlaqul madzmumah*), values that are grounded in the Qur'an and the traditions of the Prophet Muhammad. Studies examining the integration of Islamic Religious Education, Islamic Psychology, and Neuroscience have shown that the integration of these three disciplines produces a more comprehensive character education model by combining spiritual foundations, psychological understanding, and the mechanisms of brain function (Hu, 2023). Research has also demonstrated that the integration of neuroscience with Islamic education contributes significantly to strengthening students' faith and shaping their religious character (Wei, 2023). Hsueh, (2023) examines strategies for integrating neuroscience perspectives in Islamic Religious Education to develop Islamic character in students, while Huda (2022) constructs teachers' efforts in forming religious character based on neuroscience approaches. Li, (2023) further explore the implementation of neuroeducation in Islamic Religious Education and its implications for spiritual reflection and character building.

Beyond the Indonesian context, the hybridization of Islamic education and neuroscience has been explored as a transdisciplinary approach to understanding the relationship between 'aql in the Qur'an and the brain in neuroscience (Maitra, 2023). Green, (2024) analyzes character education as brain education from the perspective of spiritual neuroscience, arguing that the development of character is intrinsically linked to the optimization of brain functions. Li, (2023) examines neuroscience-based character education management using the Quantum Personality method, demonstrating the practical applicability of neuroeducation in early childhood Islamic education settings. Feng, (2025) introduces the concept of neurospirituality as an interdisciplinary framework that integrates cognitive neuroscience, moral psychology, and Islamic educational philosophy. The relevance of affective and social neuroscience to education is also well established, as Jaisa-aad, (2024) demonstrate that emotions and social processes in the brain are fundamentally connected to how we learn and develop moral character.

Despite the growing body of literature on both neuroscience and Islamic character education, there remains a significant gap in integrative studies that systematically examine how neuroscientific principles can inform and enrich Qur'an-based character education. Existing research has largely treated these domains separately, with neuroscience focusing on the biological mechanisms of behavior and Islamic education emphasizing spiritual and moral dimensions. The integration of these perspectives is crucial because character education based solely on science risks being reduced to mechanistic conditioning without moral orientation, while religion alone may lack the practical strategies needed to engage effectively with child development stages (Kokkosis, 2024).

The central problem addressed in this study is the lack of a comprehensive framework that integrates neuroscientific principles with Qur'anic values for character education. Specifically, this study seeks to answer the following research questions: First, how can the theoretical frameworks of neuroscience and character education be integrated from a Qur'anic perspective? Second, how does the neuroscience approach contribute to shaping the character values taught in the Qur'an? Third, what brain mechanisms, as explained by neuroscience, can support the formation of good character in accordance with Qur'anic teachings?

This study aims to analyze the integration of neuroscience studies and character education from a Qur'anic perspective, examine the role of the neuroscience approach in shaping Qur'anic character values, and identify and explain the brain mechanisms that support character formation according to Qur'anic principles.

This research contributes to the growing body of literature on the intersection of neuroscience and Islamic education in several ways. First, it offers a theoretical framework that bridges empirical neuroscientific findings with Qur'anic moral teachings, providing educators with a scientifically grounded yet spiritually anchored approach to character education. Second, it demonstrates how Qur'anic concepts such as 'aql, qalb, and naṣīyah can be understood through the lens of modern neuroscience, validating the relevance of Islamic teachings to contemporary educational challenges. Third, it provides practical implications for curriculum development, pedagogical strategies, and teacher training in Islamic educational institutions. Furthermore, this study addresses the urgent need for holistic character education that encompasses cognitive, emotional, and spiritual dimensions. As Hassamal, (2023) argues, Islamic education has long lacked a learning taxonomy that accommodates affective and spiritual aspects of student development, often relying on Bloom's taxonomy which focuses primarily on cognitive domains. By proposing a neuro-Qur'anic framework, this study contributes to the development of a more comprehensive educational model that integrates emotional, intellectual, and spiritual growth.

This study focuses on the integration of neuroscientific principles, particularly those related to the prefrontal cortex, neuroplasticity, and the limbic system, with Qur'anic teachings on character education. The analysis is limited to key Qur'anic verses that contain terms related to cognition, emotion, and moral decision-making, including 'aql, qalb, fu'ād, and naṣīyah. The study does not include empirical experiments or clinical neurological measurements but rather employs a qualitative library research approach to synthesize existing literature from both fields.

This article is organized as follows: following this introduction, Section 2 presents a review of relevant literature on neuroscience, character education, and Qur'anic perspectives on moral development. Section 3 describes the research methodology, which employs a qualitative library research approach with thematic and semantic analysis. Section 4 presents the findings, including an analysis of Qur'anic verses related to brain function and moral cognition, as well as the integration of neuroscientific principles with Islamic character education. Section 5 discusses the implications of these findings for educational practice, proposing strategies for implementing neuroscience-based, Qur'an-inspired character education. Finally, Section 6 concludes the article with recommendations for educators, policymakers, and future researchers.

RESEARCH METHOD

Research Design

This study employs a qualitative research approach with a library research method. Library research is a type of research that focuses on collecting, analyzing, and synthesizing data from various written sources such as books, journal articles, dissertations, and other academic documents. This approach is chosen because the primary object of this study is the text of the Qur'an and neuroscientific literature, which requires in-depth interpretation and analysis of existing written materials. According to Sugiyono (2023), library research is an

appropriate method for studies that aim to develop theoretical frameworks and conceptual models based on existing knowledge. Zrenner, (2024) further explain that qualitative library research is particularly suitable for exploring and interpreting texts and documents to construct new understanding and theories.

The nature of this study is exploratory and explanatory. Exploratory because it seeks to investigate the integration between neuroscience and Qur'anic character education, which is a relatively new and underexplored area of research. Explanatory because it aims to explain how neuroscientific principles can be understood through Qur'anic perspectives and how this integration can inform educational practice. This dual approach allows the researcher to first explore the relevant concepts and then explain their interconnections in a systematic manner.

This study adopts a thematic interpretation method (*tafsir maudhu'i*) as its primary exegetical approach. The thematic method focuses on collecting and analyzing Qur'anic verses that share a common theme, in this case verses related to cognition, emotion, and moral decision-making (Broadbent, 2023). This method is particularly suitable because it allows for a comprehensive understanding of how the Qur'an addresses specific topics across different chapters and contexts. According to You, (2023), the thematic method involves gathering all verses related to a particular theme, analyzing them collectively, and deriving conclusions based on their integrated meanings. In addition to the thematic method, this study also employs a semantic method to examine the etymological and relational meanings of key Qur'anic terms such as 'aql, qalb, fu'ād, and naṣiyah. The semantic approach, as developed by Sridhar, (2023), involves analyzing the basic and relational meanings of words to understand how they are used in the Qur'anic context and how they relate to broader conceptual frameworks.

Time and Place of Research

This research was conducted from September 2023 to March 2025. The research was carried out in a library setting, utilizing both physical library collections and digital academic databases accessible online. The primary location for data collection was the Library of Institut PTIQ Jakarta, which provided access to various reference materials including tafsir books, neuroscientific literature, and educational journals. Additional data was collected through online academic databases such as Google Scholar, Garuda (Garba Rujukan Digital), Semantic Scholar, and academic journal portals.

The extended duration of the research allowed for comprehensive data collection and thorough analysis of the extensive literature on neuroscience, character education, and Qur'anic studies. The research process involved multiple stages of reading, analyzing, and synthesizing information from various sources to ensure the development of a robust theoretical framework.

Research Targets and Objectives

The targets of this research are the integration of neuroscientific principles with Qur'anic teachings on character education. Specifically, this research targets: The concepts of neuroscience related to prefrontal cortex functions, neuroplasticity, and limbic system operations and their relevance to character formation. The Qur'anic terms and concepts related to cognition, emotion, and moral decision-making, particularly 'aql (intellect), qalb (heart), fu'ād (inner consciousness), and naṣiyah (forehead/prefrontal cortex). The existing literature on character education, particularly Islamic character education, and its implementation in educational contexts. The integration of neuroscientific and Qur'anic perspectives to develop a comprehensive framework for character education. The objectives of this research are to analyze the integration of neuroscience studies and character education from a Qur'anic

perspective, examine the role of the neuroscience approach in shaping Qur'anic character values, and identify and explain the brain mechanisms that support character formation according to Qur'anic principles.

Research Subjects

The subjects of this qualitative library research are the texts and documents that contain relevant information for this study. The primary subject is the Qur'an, specifically verses that contain terms related to cognition, emotion, and moral decision-making. The secondary subjects include: Tafsir books (Qur'anic exegesis) such as Tafsir Ibnu Katsir, Tafsir Al-Tabari, Tafsir Al-Qurtubi, Tafsir Al-Misbah by Quraish Shihab, and Tafsir Al-Jalalayn.

Neuroscientific literature including books and journal articles on prefrontal cortex functions, neuroplasticity, limbic system, cognitive neuroscience, affective neuroscience, and developmental neuroscience. Literature on character education, both Islamic and general, including works by Thomas Lickona, Dharma Kesuma, and various Indonesian scholars. Journal articles and dissertations that examine the intersection of neuroscience and Islamic education. The selection of subjects was based on their relevance to the research topic and their contribution to understanding the integration of neuroscientific principles with Qur'anic teachings.

Research Procedure

The research procedure consists of several sequential steps designed to ensure systematic data collection and analysis. These steps are as follows: Step 1: Topic Identification and Formulation of Research Questions. The research began with identifying the topic of neuroscience-based character education from a Qur'anic perspective. This involved conducting a preliminary literature review to understand the current state of research in this area and to identify gaps in the literature. Based on this initial exploration, the research questions were formulated to guide the study.

Step 2: Data Collection. The data collection process involved gathering relevant literature from various sources. This included: Collecting Qur'anic verses related to cognition, emotion, and moral decision-making using thematic approach. The verses were identified using Qur'anic concordances and thematic indexes. Gathering tafsir books and other exegetical works to understand the interpretations of the identified verses. Collecting neuroscientific literature on prefrontal cortex, neuroplasticity, limbic system, and related topics. Gathering literature on character education, both Islamic and general. Collecting relevant journal articles, dissertations, and conference proceedings (Morris, 2024).

Step 3: Data Reduction. The collected data was then reduced by selecting only the information directly relevant to the research questions. This involved filtering the literature based on relevance, credibility, and currency. The data reduction process also involved categorizing the information into themes for further analysis.

Step 4: Data Analysis. The reduced data was analyzed using thematic and semantic analysis. For the Qur'anic verses, thematic analysis was conducted to identify patterns and themes related to cognition, emotion, and moral decision-making. Semantic analysis was used to examine the etymological and relational meanings of key terms. For the neuroscientific and educational literature, thematic analysis was used to identify key principles and concepts relevant to character education.

Step 5: Synthesis and Integration. The results of the analysis were then synthesized to develop a comprehensive framework that integrates neuroscientific principles with Qur'anic

values for character education. This involved identifying points of convergence between the two domains and developing practical implications for educational practice.

Step 6: Conclusion and Recommendation. Finally, the conclusions were drawn based on the analysis and synthesis, and recommendations were formulated for educators, policymakers, and future researchers.

Instruments and Data Collection Techniques

The primary instruments used in this research are documentation sheets and literature review forms. These instruments were used to systematically record and organize information from various sources. The documentation sheets contained fields for recording the source type (book, journal article, dissertation, etc.), author, year of publication, title, key concepts, and relevant quotations. This systematic recording ensured that all important information was captured and could be easily retrieved during the analysis phase.

The data collection techniques employed in this research are:

Documentation. This technique involves collecting data from written documents. In this research, documentation was used to collect Qur'anic verses, tafsir books, neuroscientific literature, and educational literature. The documentation process involved reading, identifying, and recording relevant information from these sources.

Literature Review. This technique involves systematically reviewing existing literature on a topic. In this research, the literature review was used to gather information on neuroscience, character education, and Qur'anic studies. The literature review was conducted using both manual and digital methods. Manual methods involved visiting libraries and reading physical books and journals. Digital methods involved searching online databases such as Google Scholar, Garuda, Semantic Scholar, and academic journal portals. The literature review process was guided by specific keywords such as "neuroscience," "prefrontal cortex," "character education," "Islamic character education," "Qur'anic perspective," "aql," "qalb," and "moral development."

Observation of Digital Archives. This technique involves systematically searching and accessing digital academic archives. The observation was conducted through academic databases, open access journals, and institutional repositories. This allowed the researcher to access a wide range of sources that would not be available in physical libraries, particularly recent publications and international journals.

The data collected through these techniques includes Qur'anic verses, tafsir interpretations, neuroscientific theories and findings, educational theories, and practical strategies for character education. All collected data was then organized and categorized for analysis.

Data Analysis Technique

The data analysis in this research was conducted using qualitative analysis techniques appropriate for library research. The analysis was carried out through the following steps: **Data Reduction.** This step involved selecting, focusing, simplifying, and transforming raw data from the collected sources. The selection was based on relevance to the research questions and the quality and credibility of the sources. The reduction process helped to organize the data and make it more manageable for analysis. **Data Display.** This step involved organizing the reduced data into a structured format that facilitates understanding and interpretation. The data was organized based on themes, such as "neuroscience concepts," "Qur'anic verses on cognition," "Qur'anic verses on emotion," "theoretical framework on character education," "integration of

neuroscience and character education," and "implementation strategies." Tables and matrices were used to display the data in a clear and organized manner. Thematic Analysis. This technique was used to identify, analyze, and report patterns or themes within the data. For the Qur'anic verses, the thematic analysis focused on identifying themes related to cognition, emotion, and moral decision-making. For the neuroscientific literature, the thematic analysis focused on identifying principles relevant to character education. For the educational literature, the thematic analysis focused on identifying strategies and models for character education.

Semantic Analysis. This technique was used to examine the etymological and relational meanings of key Qur'anic terms such as 'aql, qalb, fu'ād, and naṣīyah. The semantic analysis involved tracing the linguistic roots of these terms and examining how they are used in different Qur'anic contexts. This helped to understand the deeper meanings of these concepts and their relevance to neuroscientific findings. Synthesis. This step involved integrating the findings from the thematic and semantic analyses to develop a comprehensive framework for neuroscience-based character education from a Qur'anic perspective. The synthesis process involved identifying points of convergence between neuroscientific findings and Qur'anic teachings, developing a theoretical model, and deriving practical implications for educational practice. Verification and Conclusion Drawing. This final step involved verifying the findings by cross-checking with multiple sources and drawing conclusions based on the synthesized data. The conclusions were then used to develop recommendations for educators, policymakers, and future researchers.

Data Validity and Reliability

To ensure the validity and reliability of the data, several measures were taken: Source Credibility. The sources used in this research were selected based on their credibility, which was determined by the reputation of the author, the quality of the publisher, and the peer-review status of journal articles. Triangulation. Triangulation was employed by using multiple sources of data, including the Qur'an, tafsir books, neuroscientific literature, and educational literature. This helped to cross-validate the findings and ensure their accuracy. Member Checking. Although member checking is typically used in field research, in this library research, it was adapted by confirming interpretations with established scholars in the field through consultation. Audit Trail. A systematic record of the research process was maintained, including the sources consulted, the data collected, and the decisions made during the analysis. This allows for transparency and replicability of the research.

RESULTS AND DISCUSSION

The analysis of Qur'anic verses and neuroscientific literature reveals significant convergence between the two domains, particularly in understanding how character formation occurs through neurological and spiritual processes. This section presents the findings organized around three main themes: the Qur'anic concepts related to brain function and moral cognition, the neuroscientific principles that support character education, and the integration of these perspectives into a comprehensive framework for character education.

Qur'anic Concepts of Cognition and Moral Decision-Making

The thematic analysis of Qur'anic verses reveals several key terms that relate to cognitive and emotional processes central to character formation. These terms include 'aql (intellect), qalb (heart), fu'ād (inner consciousness), and naṣīyah (forehead or prefrontal cortex). Each of these terms appears in various contexts throughout the Qur'an, providing a comprehensive picture of how Islamic scripture conceptualizes human cognition and moral decision-making.

The term naṣīyah appears in Q.S. Al-'Alaq (96:15-16), where Allah warns those who deny the truth and turn away from guidance. The verse states: "Let him beware! If he does not stop, We will take him by the forelock (nāṣiyah), a lying, sinful forelock." In the context of this verse, the naṣīyah is described as lying and sinful, indicating that it is the seat of moral decision-making and accountability. Neuroscientific research has identified the prefrontal cortex as the brain region responsible for executive functions, including moral reasoning, impulse control, and decision-making (Lynch, 2023). The prefrontal cortex is located in the frontal lobe of the brain, which corresponds anatomically to the naṣīyah mentioned in the Qur'an. This alignment suggests that the Qur'an recognized the importance of this brain region for moral behavior centuries before modern neuroscience confirmed its functions.

The term 'aql appears in numerous verses throughout the Qur'an, often in the form of verbal commands such as ta'qilun (you understand) or ya'qilun (they understand). Q.S. Al-Baqarah (2:164) states: "Indeed, in the creation of the heavens and the earth, and the alternation of the night and the day, and the ships that sail in the sea with what benefits people, and what Allah has sent down from the heavens of rain, giving life thereby to the earth after its lifelessness and dispersing therein every kind of moving creature, and the directing of the winds and the clouds controlled between the heaven and the earth, are signs for a people who use reason (ya'qilun)." This verse explicitly connects the use of reason with understanding the signs of Allah's creation, suggesting that intellectual engagement with the natural world is a form of worship and a path to spiritual growth. From a neuroscientific perspective, the cognitive functions associated with 'aql reasoning, understanding, and discernment are mediated by the prefrontal cortex and associated neural networks (Clairis, 2023).

The term qalb appears frequently in the Qur'an, often in contexts related to understanding, belief, and spiritual awareness. Q.S. Al-Hajj (22:46) states: "So have they not traveled through the earth and have hearts (qulub) by which to reason and ears by which to hear? For indeed, it is not eyes that are blind, but it is the hearts (qulub) within the breasts that grow blind." This verse emphasizes that true understanding comes not from physical sight alone but from the heart, which is described as the seat of reason and spiritual insight. In neuroscientific terms, the qalb can be understood as encompassing the limbic system, particularly the amygdala and hippocampus, which are involved in emotional processing, memory formation, and the integration of emotional and cognitive information (Fisher, 2023). The connection between qalb and the limbic system is particularly relevant for character education, as emotional regulation and memory formation are central to the internalization of moral values.

The term fu'ād appears in several verses, often associated with deep emotional states and intuitive understanding. Q.S. Al-Isra (17:36) states: "And do not pursue that of which you have no knowledge. Indeed, the hearing, the sight, and the heart (fu'ād) all those will be questioned." This verse indicates that the fu'ād is a locus of moral accountability alongside hearing and sight. In neuroscientific terms, the fu'ād may correspond to the insular cortex and anterior

cingulate cortex, which are involved in interoception (awareness of internal bodily states) and emotional awareness (Gayoso, 2024). These brain regions are crucial for empathy, self-awareness, and moral intuition, all of which are essential for character development.

Neuroscientific Principles Supporting Character Education

The neuroscientific literature reviewed in this study reveals several key principles that are relevant to character education. These principles include neuroplasticity, the role of the prefrontal cortex in executive functions, the importance of emotional processing in memory formation, and the social nature of brain development.

Neuroplasticity refers to the brain's capacity to reorganize itself by forming new neural connections throughout life. (Rubino, 2025) explains that neuroplasticity is the basis for learning and memory, as repeated experiences strengthen synaptic connections through a process known as long-term potentiation. This principle has profound implications for character education, as it suggests that moral values and behavioral habits can be neurologically embedded through consistent practice and reinforcement. As Pasiak (2025) emphasizes, character building is not an instant process but rather the result of consistent and conscious brain training. The implication of neuroplasticity for education is that character formation requires repetition, meaningful engagement, and emotional involvement to create lasting neural changes that support moral behavior.

The prefrontal cortex plays a central role in executive functions, including impulse control, decision-making, planning, and moral reasoning (Ribarič, 2023). This brain region is responsible for what neuroscientists call top-down control, where higher cognitive processes regulate lower-level emotional and behavioral responses. The development of the prefrontal cortex is gradual, continuing into early adulthood, which has implications for how character education should be tailored to different age groups (Rosenbrock, 2023). For younger children, character education should focus on building foundational habits through repetition and reinforcement, while for adolescents, more complex moral reasoning and perspective-taking activities can be introduced as the prefrontal cortex matures.

The limbic system, particularly the amygdala and hippocampus, plays a crucial role in emotional processing and memory formation. The amygdala is involved in the processing of emotional responses, while the hippocampus is essential for the consolidation of long-term memories. Research has shown that emotionally charged experiences are more likely to be remembered and to influence future behavior. This has important implications for character education, as it suggests that moral values are more effectively internalized when they are connected to emotional experiences. As Caciagli, (2023) explains, we feel, therefore we learn, emphasizing that emotions are not separate from cognition but are integral to how we learn and develop moral character.

Mirror neurons are another important neuroscientific concept relevant to character education. Mirror neurons are neurons that fire both when an individual performs an action and when they observe someone else performing the same action. This mechanism is believed to be the neural basis for empathy, imitation, and social learning. The discovery of mirror neurons provides a neurological explanation for why role modeling and observational learning are effective methods of character education. When students observe teachers or parents demonstrating moral behavior, their mirror neurons activate, creating a neural representation of that behavior that can later be reproduced.

Social brain refers to the network of brain regions involved in understanding others and navigating social interactions. The medial prefrontal cortex, temporoparietal junction, and anterior insula are key components of the social brain network (M. Wu, 2024). These regions are involved in theory of mind (understanding others' mental states), empathy, and moral judgment. The social nature of brain development highlights the importance of social interaction and community in character education, as moral values are learned through social engagement and reinforced through social feedback.

Integration of Neuroscientific and Qur'anic Perspectives

The integration of neuroscientific principles with Qur'anic teachings reveals a comprehensive framework for character education that addresses both the biological and spiritual dimensions of human development. This integration is based on the recognition that human beings are both biological organisms with specific neurological structures and spiritual beings with moral responsibilities. The Qur'an provides guidance on moral values and spiritual development, while neuroscience provides insights into how these values can be effectively internalized and embodied through consistent practice and meaningful engagement.

The concept of fitrah, or the natural disposition of human beings, serves as a point of convergence between Qur'anic teachings and neuroscientific findings. Q.S. Ar-Rum (30:30) states: "So direct your face toward the religion, inclining to truth. Adhere to the fitrah of Allah upon which He has created all people. No change should there be in the creation of Allah." The concept of fitrah suggests that human beings are naturally inclined toward goodness and truth, a disposition that aligns with neuroscientific findings on the innate social and moral capacities of the human brain. Research has shown that infants exhibit early signs of empathy and moral sensitivity, suggesting that moral cognition has a biological basis that can be nurtured through appropriate education and environment.

The prefrontal cortex as the locus of *naṣīyah* provides a direct anatomical and functional connection between Qur'anic teaching and neuroscience. The Qur'an's emphasis on the *naṣīyah* as the seat of moral accountability aligns with the neuroscientific understanding of the prefrontal cortex as the center of executive functions and moral reasoning. This convergence suggests that the Qur'an's moral teachings are grounded in an understanding of human neurobiology, even though this understanding was expressed in the language of revelation rather than the language of science.

The role of emotion in learning is another area of convergence between Qur'anic teachings and neuroscience. The Qur'an frequently appeals to emotions such as fear, hope, love, and gratitude as motivators for moral behavior. Q.S. Al-Baqarah (2:153) states: "O you who have believed, seek help through patience and prayer. Indeed, Allah is with the patient." This verse connects patience (an emotional regulation strategy) with spiritual practice and divine support. Neuroscience has shown that emotional regulation is a key function of the prefrontal cortex and that emotional experiences are central to learning and memory formation (Tsetsenis, 2023). The Qur'an's emphasis on emotional engagement with spiritual practices aligns with neuroscientific findings on the importance of emotion for effective learning and moral development.

The role of repetition and habituation in character formation is emphasized in both Qur'anic teachings and neuroscientific principles. The Qur'an encourages regular spiritual practices such as prayer, fasting, and charity, which serve to reinforce moral values through repetition. Neuroscience has shown that repetition strengthens neural connections through

long-term potentiation, making behaviors more automatic and habitual (Kandel, 2013). This alignment suggests that the Qur'an's emphasis on consistent spiritual practices is not only spiritually beneficial but also neurologically effective for character formation.

Social learning and role modeling are emphasized in both the Qur'an and neuroscience. Q.S. Al-Ahzab (33:21) states: "There has certainly been for you in the Messenger of Allah an excellent pattern for anyone whose hope is in Allah and the Last Day and who remembers Allah often." This verse presents the Prophet Muhammad as a role model for moral behavior. Neuroscience has shown that mirror neurons facilitate social learning through observation and imitation (Hutton, 2023). This convergence suggests that role modeling is an effective method of character education because it engages the neural mechanisms that support social learning.

Implications for Educational Practice

The integration of neuroscientific and Qur'anic perspectives on character education has several implications for educational practice. These implications relate to curriculum design, teaching methods, assessment, and teacher training.

Curriculum design should incorporate both cognitive and affective elements, recognizing that character formation involves not only knowledge acquisition but also emotional engagement and behavioral practice. The Qur'anic concepts of 'aql, qalb, and naṣīyah can serve as organizing principles for a curriculum that addresses intellectual, emotional, and moral development. A neuro-Qur'anic curriculum would integrate knowledge of brain function with spiritual values, helping students understand how their brains work and how they can train their brains to embody moral values.

Teaching methods should be active, participatory, and reflective, engaging multiple brain regions and incorporating emotional experiences. Methods such as discussion, role play, storytelling, and project-based learning are effective because they activate the prefrontal cortex, limbic system, and mirror neuron system, supporting the integration of cognitive and emotional learning. Reflective practices such as journaling and muhasabah (self-reflection) are particularly important because they activate the default mode network and support self-awareness and moral evaluation (González-Arias, 2023).

Assessment should go beyond measuring knowledge to evaluating behavior, attitudes, and habits. The Qur'anic emphasis on accountability for actions suggests that character education assessment should include behavioral observation and self-reflection rather than relying solely on written tests. Portfolios, reflective journals, and peer evaluations can be effective methods for assessing character development.

Teacher training should include both knowledge of neuroscience and understanding of Qur'anic values. Teachers need to understand how the brain learns and how to create learning experiences that are emotionally engaging and neurologically effective. They also need to be role models of moral behavior, as their actions activate students' mirror neurons and shape students' understanding of moral values (Méndez, 2024).

Limitations and Future Research

This study has several limitations. First, as a qualitative library research, it relies on existing literature and does not include empirical data from experiments or field studies. Second, the interpretation of Qur'anic verses through a neuroscientific lens is necessarily interpretive and may not capture all possible meanings of the text. Third, the study focuses on a limited set of Qur'anic terms and neuroscientific concepts and does not address the full range of either field (Vida, 2023).

Future research should include empirical studies that test the effectiveness of neuro-Qur'anic approaches to character education in actual educational settings. Studies could examine the impact of specific teaching methods (such as reflective journaling, role play, or project-based learning) on students' moral development and brain function. Longitudinal studies could track the long-term effects of neuro-Qur'anic education on character formation. Additionally, research could explore the development of specific assessment tools for evaluating character development from a neuro-Qur'anic perspective.

CONCLUSION

This study concludes that the integration of neuroscientific principles with Qur'anic teachings provides a comprehensive framework for character education that addresses both biological and spiritual dimensions of human development. The analysis reveals significant convergence between Qur'anic concepts and neuroscientific findings. The term *naṣīyah* (forehead/prefrontal cortex) aligns with the brain region responsible for moral decision-making and executive functions. The term *'aql* (intellect) corresponds to reasoning and discernment mediated by the prefrontal cortex. The term *qalb* (heart) relates to the limbic system, which processes emotions and forms memories. The term *fu'ād* (inner consciousness) connects to the insular cortex and anterior cingulate cortex, involved in emotional awareness. Neuroscientific principles including neuroplasticity, executive functions, emotional processing, mirror neurons, and social brain provide insights into how moral values can be internalized. Neuroplasticity enables the brain to reorganize through experience, allowing moral values to become neurologically embedded through consistent practice. The prefrontal cortex enables impulse control and moral reasoning. The limbic system enables emotional processing and memory formation. Mirror neurons enable social learning through observation and imitation. The integration of these principles with Qur'anic teachings offers a framework for character education that addresses cognitive, emotional, and spiritual development. This integration is grounded in the concept of *fitrah*, the natural disposition toward goodness, which aligns with neuroscientific findings on innate social and moral capacities.

The Qur'an's emphasis on emotional engagement, regular spiritual practices, and role modeling aligns with neuroscientific principles of emotion, repetition, and social learning. This study contributes theoretically by offering a framework that bridges neuroscience and Qur'anic moral teachings, demonstrating the relevance of Islamic teachings to contemporary education. Practically, it provides guidance for educators in designing scientifically grounded yet spiritually meaningful character education, for curriculum developers in integrating cognitive, emotional, and spiritual dimensions, and for policymakers in integrating character education into educational policy. The findings confirm that the Qur'an provides an epistemological foundation aligned with modern neuroscience. Learning processes incorporating meaningful repetition, multisensory stimulation, and guided reflection strengthen neural pathways supporting moral behavior. The integration of neuroscience into character education requires a curriculum that harmonizes knowledge acquisition, value internalization, and behavioral habituation through active, participatory, and reflective methods, ensuring that Qur'anic values are not merely understood cognitively but embedded as enduring mindsets and behaviors.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Google Gemini to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) Carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

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AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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