



Brain-Based Learning in Islamic Education: Integrating Neuroscience, Intellect, and Spirituality

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ABSTRACT

The advancement of neuroscience has contributed significantly to contemporary educational discourse, particularly in understanding how the brain processes information, regulates emotions, and supports learning activities. This study aims to examine the integration of neuroscience and Islamic educational perspectives in developing holistic learning strategies. Using a qualitative approach with a library research design, this study analyzes various classical and contemporary sources related to educational neuroscience, brain-based learning, and Islamic educational thought. The findings indicate that learning is a complex neurobiological process influenced by neuroplasticity, emotional conditions, memory systems, and environmental stimulation. Neuroscientific principles such as contextual learning, multisensory instruction, active participation, and emotionally supportive environments are highly relevant for improving educational effectiveness. Furthermore, Islamic educational concepts concerning *'aql* (intellect), *tafakkur* (reflection), and *insan kamil* (holistic human development) demonstrate substantial compatibility with modern neuroscience. The study also reveals that the integration of neuroscience and Islamic values can strengthen educational practices by combining cognitive, emotional, moral, and spiritual dimensions simultaneously. Therefore, neuroscience-informed Islamic education offers a holistic and humanistic educational framework capable of producing learners who are intellectually competent, emotionally resilient, spiritually grounded, and ethically responsible. This integration is expected to contribute to the development of adaptive and transformative educational models in addressing the challenges of twenty-first-century education.

INTRODUCTION

The rapid advancement of science and technology in the twenty-first century has significantly transformed various dimensions of human life, including the educational sector. One of the most influential developments in contemporary educational discourse is the emergence of educational neuroscience, an interdisciplinary field that integrates neuroscience, cognitive psychology, and pedagogy to understand how the human brain learns

and how learning processes can be optimized effectively (Tokuhama-Espinosa, 2011). This development has shifted educational paradigms from traditional teacher-centered approaches toward more scientific, learner-centered, and evidence-based educational practices.

The brain, as the central organ of the nervous system, is not merely a biological structure but a highly complex and dynamic system responsible for regulating cognitive, emotional, behavioral, and motor functions. In educational contexts, understanding brain function has become increasingly essential because every learning activity from perception, attention, and information processing to memory formation and decision-making involves intricate neural mechanisms. Neuroscientific studies have demonstrated that the brain possesses neuroplasticity, namely the ability to reorganize and adapt its neural connections in response to learning experiences and environmental stimulation (Sousa, 2011). This finding confirms that learning is not a static process but rather a dynamic interaction between cognition, emotion, experience, and environment.

The implications of neuroscience for education are substantial. Research in brain-based learning emphasizes that emotional engagement, meaningful repetition, multisensory stimulation, adequate rest, and supportive learning environments significantly influence students' cognitive performance and memory retention (Jensen, 2008). However, despite these scientific developments, many educational practices still rely heavily on rigid, uniform, and teacher-dominated instructional models that neglect students' neurological and psychological diversity. Such approaches often contribute to low learning motivation, cognitive overload, emotional stress, and reduced learning effectiveness. Consequently, there is an urgent need to reconstruct educational strategies based on scientific understandings of how the brain naturally learns.

From an Islamic perspective, the concepts of intellect, learning, and reflection have long occupied a central position within the educational tradition. The Qur'an repeatedly encourages human beings to think, reflect, reason, and contemplate through expressions such as *afala ta'qilun* (will you not reason?), *yatafakkarun* (those who reflect), and *ya'qilun* (those who understand). These expressions indicate that intellectual activity is regarded as both a cognitive and spiritual endeavor in Islam. The Qur'an also emphasizes that wisdom and knowledge are divine gifts granted to humanity, as stated in Surah Al-Baqarah (2:269): "He grants wisdom to whom He wills, and whoever has been granted wisdom has certainly been given abundant goodness." This verse illustrates that learning and intellectual development possess profound spiritual significance within the Islamic worldview.

Classical Muslim scholars such as Al-Ghazali, Ibn Sina (Avicenna), and Al-Farabi extensively discussed the nature of intellect, cognition, and learning centuries before the emergence of modern neuroscience. Ibn Sina, in *Kitab al-Najat*, elaborated stages of human cognition that closely resemble contemporary understandings of cognitive development and information processing. Likewise, Al-Ghazali in *Ihya' 'Ulum al-Din* emphasized the purification of the heart and intellect as essential foundations for meaningful learning. Although the terminology of neuroscience was unknown during their era, Islamic intellectual traditions had already demonstrated a holistic understanding of human cognition by integrating rational, emotional, moral, and spiritual dimensions simultaneously.

In the contemporary global era, the integration of neuroscience and Islamic education has become increasingly relevant. Modern educational systems are no longer expected merely to produce academically competent individuals; they are also challenged to cultivate emotionally resilient, morally grounded, and spiritually conscious human beings. In this regard, neuroscience offers a scientific framework for understanding learners' cognitive and emotional development, while Islamic education provides ethical and spiritual

foundations that guide the purpose and direction of learning. The integration of these two perspectives has the potential to strengthen the mission of Islamic education in developing *insan kamil* the holistic human being characterized by intellectual excellence, emotional maturity, moral integrity, and spiritual awareness.

Furthermore, Islam does not merely encourage the pursuit of knowledge but elevates learning as an act of worship. The Prophet Muhammad (peace be upon him) stated, “Seeking knowledge is obligatory upon every Muslim” (Sunan Ibn Majah). This perspective distinguishes Islamic education from purely secular paradigms because learning is understood not only as a cognitive process but also as a moral and transcendental responsibility. Consequently, understanding the brain as part of Allah’s perfect creation transforms learning into an effort to optimize human potential in accordance with divine guidance and the principle of *tawhid*.

Neuroscience also reveals that every human brain is unique. No two individuals process information in exactly the same manner, even among genetically identical twins. This scientific finding challenges standardized educational models that apply uniform instructional strategies to all learners regardless of their cognitive diversity. From both neuroscientific and Islamic perspectives, such uniformity contradicts the principles of justice, individuality, and human dignity. Therefore, personalized and differentiated learning approaches are increasingly recognized as essential components of effective education (Tokuhama-Espinosa, 2011).

Islamic education, which is fundamentally grounded in compassion, respect for human potential, and spiritual enlightenment, aligns closely with the principles of neuroscience that acknowledge the uniqueness of each learner’s brain. In this context, teachers are not merely transmitters of knowledge but facilitators of cognitive development, emotional growth, and character formation. They are required to understand how students learn, how emotions influence cognition, and how social-emotional environments can either support or hinder intellectual development. Educational processes that harmonize scientific insights with spiritual values are therefore more capable of addressing the complexities of contemporary learners.

Moreover, the growing global movement toward evidence-based education further reinforces the importance of integrating neuroscience into educational policy and practice. Educational institutions, including Islamic schools and universities, are increasingly expected to utilize scientific findings as the basis for curriculum development, instructional methods, and learning assessment. The integration of neuroscience and Islamic educational values offers a promising framework for constructing educational systems that are not only academically effective but also spiritually meaningful and humanistically oriented.

Based on these considerations, this article aims to examine the contribution of neuroscience to Islamic education by exploring how scientific understandings of brain function can enrich learning strategies and strengthen holistic Islamic pedagogical approaches. Specifically, this study seeks to analyze the relationship between brain function, learning processes, and Islamic educational values in order to formulate an integrative educational perspective that supports intellectual, emotional, and spiritual development simultaneously. Through this integration, Islamic education is expected to produce learners who are academically competent, emotionally resilient, morally responsible, and spiritually grounded in facing the challenges of contemporary society.

METHOD

This study employed a qualitative approach using a library research design to explore the integration of neuroscience and Islamic educational perspectives in learning processes

and instructional strategies. Library research was considered appropriate because the study focused on analyzing theoretical concepts, scientific findings, and scholarly interpretations related to educational neuroscience, brain-based learning, and Islamic educational thought (Creswell, 2014).

The data sources consisted of primary and secondary academic references relevant to the topic. Primary sources included classical Islamic works by prominent Muslim scholars such as Al-Ghazali and Ibn Sina, particularly those discussing intellect, cognition, ethics, and learning. In addition, contemporary literature in neuroscience and education was utilized, including works by Tokuhamma-Espinosa (2011), Jensen (2008), Sousa (2011), and Doidge (2007), which discuss neuroplasticity, emotional engagement, and brain-based learning. Secondary sources included peer-reviewed journal articles, books, conference proceedings, and scientific publications related to neuroscience, Islamic pedagogy, cognitive development, and holistic education.

Data collection was conducted through systematic literature review techniques involving identification, selection, classification, and evaluation of relevant scholarly materials (Snyder, 2019). The selected literature was limited to sources discussing the relationship between brain function, learning mechanisms, educational strategies, and Islamic perspectives on intellect and human development. To ensure conceptual depth and academic relevance, the study prioritized authoritative and recent references in neuroscience and educational studies while also incorporating foundational works from the Islamic intellectual tradition.

The data were analyzed using descriptive-analytical methods. The descriptive stage aimed to explain major concepts in neuroscience, including neuroplasticity, emotional regulation, memory systems, and brain-based learning principles. Subsequently, the analytical stage examined the compatibility and integration between neuroscientific findings and Islamic educational values such as *'aql* (intellect), *tafakkur* (reflection), *tadabbur* (contemplation), and the concept of *insan kamil* (holistic human development). Through this integrative analysis, the study sought to formulate a conceptual framework for holistic learning that combines scientific understandings of the brain with Islamic spiritual and ethical principles.

To strengthen the validity of the study, source triangulation was applied by comparing perspectives from neuroscience literature, educational theories, and Islamic scholarly works (Miles, Huberman, & Saldaña, 2014). This approach enabled the study to develop a comprehensive and interdisciplinary understanding of how neuroscience can contribute to the advancement of Islamic education in contemporary contexts.

RESULTS AND DISCUSSION

Brain Function in the Learning Process

Learning is a complex process that cannot be separated from the role of the brain as the central controller of the human nervous system. Every learning experience, whether consciously or unconsciously experienced, involves multiple regions of the brain working simultaneously in an integrated neural network. Consequently, understanding how the brain functions during learning has become a fundamental requirement for developing effective instructional strategies that align with the biological and psychological characteristics of learners. Contemporary educational neuroscience emphasizes that learning is not merely a cognitive activity but a neurobiological process involving perception, attention, emotion, memory, and behavior simultaneously (Tokuhamma-Espinosa, 2011).

Anatomically, the brain consists of several major structures, namely the cerebrum, cerebellum, and brain stem. The cerebrum, which represents the largest portion of the brain,

is divided into two hemispheres with distinct yet interconnected functions. The left hemisphere is generally associated with logical reasoning, language processing, analytical thinking, and sequential understanding, whereas the right hemisphere is more related to creativity, imagination, intuition, and visual-spatial processing (Sousa, 2011). Although recent neuroscientific studies suggest that cognitive activities involve integrated hemispheric collaboration rather than strict separation, understanding hemispheric specialization remains important in educational contexts. It encourages educators to design balanced learning experiences that stimulate both analytical and creative dimensions of learners' cognition.

Furthermore, each lobe within the cerebrum contributes uniquely to the learning process. The frontal lobe, particularly the prefrontal cortex, is responsible for executive functions such as decision-making, problem-solving, planning, concentration, self-regulation, and emotional control. This region plays a crucial role in higher-order thinking skills and metacognitive processes essential for academic achievement. The temporal lobe functions in auditory processing, language comprehension, and long-term memory storage, while the parietal lobe processes sensory information related to touch, movement, and spatial orientation. Meanwhile, the occipital lobe primarily handles visual information processing (Jensen, 2008). Understanding these functions enables teachers to develop learning activities capable of activating multiple brain regions simultaneously, thereby enhancing cognitive integration and deeper learning experiences.

One of the most significant concepts in educational neuroscience is neuroplasticity, namely the brain's ability to reorganize and modify its neural structure in response to learning experiences, environmental stimulation, and repeated practice. Contrary to earlier assumptions that the brain is relatively fixed after childhood, contemporary neuroscience demonstrates that the brain remains adaptable throughout life (Doidge, 2007). Every new learning experience forms and strengthens synaptic connections between neurons, while unused connections gradually weaken. This process indicates that learning literally reshapes the brain's neural architecture. Therefore, educational experiences characterized by repetition, reflection, meaningful engagement, and active participation are essential for strengthening neural pathways associated with memory and understanding.

Meaningful learning significantly influences the formation of long-term memory. Information initially enters the sensory memory system through external stimuli perceived by the senses. When the information receives adequate attention and is considered meaningful, it is transferred into working memory, which temporarily processes and organizes information. Through rehearsal, elaboration, contextualization, and repeated retrieval, information can eventually be consolidated into long-term memory (Sousa, 2011). This mechanism demonstrates that effective learning requires active cognitive engagement rather than passive reception of information. Consequently, instructional approaches relying solely on one-way lectures are insufficient for promoting durable learning outcomes.

In addition to cognition, emotions play a critical role in learning processes. Neuroscientific studies reveal that the limbic system, particularly the amygdala and hippocampus, significantly influences emotional regulation and memory formation. Positive emotional states such as motivation, curiosity, enthusiasm, and psychological safety enhance attention and facilitate memory consolidation. Conversely, negative emotions such as fear, anxiety, and chronic stress can impair learning by activating the brain's "fight-or-flight" response, which inhibits higher cognitive functions within the prefrontal cortex (Jensen, 2008). This finding highlights the importance of creating emotionally supportive and psychologically safe learning environments. Students learn more effectively when they feel respected, motivated, and emotionally secure within the classroom.

From the perspective of Islamic education, the concept of intellect (*'aql*) occupies a central role in human consciousness and behavior, comparable to the brain's cognitive functions in neuroscience. The Qur'an repeatedly encourages human beings to think, reflect, reason, and contemplate through terms such as *ya'qilun*, *yatafakkarun*, and *yadhdhakkarun*. These expressions indicate that intellectual activity is regarded not only as a rational process but also as a spiritual responsibility. Classical Muslim scholars such as Al-Ghazali considered intellect as the primary instrument for attaining truth alongside divine revelation. In *Ihya' Ulum al-Din*, Al-Ghazali argued that intellect encompasses moral and spiritual dimensions cultivated through knowledge, ethics, and disciplined character formation.

When viewed through the lens of neuroscience, the Islamic concept of intellect demonstrates significant parallels with the functions of the prefrontal cortex, particularly in ethical reasoning, impulse control, self-regulation, and long-term planning. This relationship suggests that education should not focus exclusively on intellectual intelligence (IQ) but must also cultivate emotional intelligence (EQ) and spiritual intelligence (SQ). These dimensions collectively contribute to holistic human development. In Islamic educational philosophy, this holistic balance is reflected in the concept of *insan kamil*, the ideal human being who harmonizes intellectual capability, emotional maturity, moral integrity, and spiritual awareness.

The educational implications of understanding brain function are extensive. Neuroscience emphasizes the importance of repetition, variation, and meaningful engagement in strengthening neural pathways. Teachers who understand that the brain learns through association and contextual experiences are more likely to employ experiential learning, simulations, collaborative activities, storytelling, and visual-auditory media to support cognitive development. The neuroscientific principle of "use it or lose it" further explains that neural connections weaken when they are not actively utilized (Tokuhama-Espinosa, 2011). Consequently, educators should design learning experiences that actively engage students' thinking skills and encourage continuous cognitive stimulation.

Another important implication concerns individual differences in learning styles and cognitive strengths. Each learner possesses unique neural patterns and preferences in processing information. Some students respond more effectively to visual stimuli, while others demonstrate stronger auditory, verbal, or kinesthetic learning tendencies. This diversity reflects differences in neural activation and cognitive processing across individuals. Therefore, multisensory learning approaches are highly recommended because they stimulate broader neural networks and accommodate diverse learner needs. In this context, teachers function not merely as transmitters of information but as architects of learning environments capable of activating students' full cognitive potential.

Moreover, neuroscience demonstrates that brain development occurs progressively according to age and experience. Children's brains, particularly the prefrontal cortex responsible for planning and self-regulation, are not fully mature during early developmental stages. This condition implies that instructional strategies for children should differ significantly from those designed for adults. Interestingly, Islamic educational traditions have long recognized developmental stages in learning. The Prophet Muhammad (peace be upon him) educated individuals gradually according to their intellectual and emotional capacities. Likewise, traditional Islamic pedagogy acknowledges the concept of *marhalah* (developmental stages), which aligns closely with contemporary neuroscientific understandings of cognitive maturation.

Brain function in learning is also strongly influenced by physiological factors such as sleep, nutrition, and physical activity. Neuroscientific research indicates that adequate sleep is essential for memory consolidation and cognitive restoration. Nutritional intake,

particularly omega-3 fatty acids, vitamins, and balanced nutrients, supports neural health and cognitive performance. Physical exercise stimulates the production of brain-derived neurotrophic factor (BDNF), a protein associated with neuronal growth, survival, and synaptic plasticity. These findings correspond closely with Islamic teachings promoting healthy lifestyles, including balanced nutrition, adequate rest, physical well-being, and moderation in daily habits.

Overall, understanding brain function in the learning process encourages educators to perceive education not merely as knowledge transmission but as a comprehensive biological, psychological, and spiritual process. Every educational activity directly influences the structure and function of learners' brains. Therefore, educational decisions including curriculum design, instructional methods, classroom management, and assessment practices should be grounded in scientific understandings of how the brain learns while simultaneously integrating Islamic values emphasizing intellect, ethics, spirituality, and human dignity. Through this integrative perspective, education can become more holistic, meaningful, and transformative for learners in contemporary society.

Neuroscience and Learning Strategies

1. The Integration of Neuroscience in Education

Recent advances in neuroscience have significantly transformed contemporary understandings of how the human brain processes information, constructs memory, regulates emotions, and responds to environmental stimuli. These developments have generated substantial implications for educational theory and instructional practice, particularly in designing learning strategies aligned with the brain's natural learning mechanisms. Educational neuroscience has emerged as an interdisciplinary field connecting neuroscience, cognitive psychology, and pedagogy to explain how students learn and how teaching methods can be optimized based on biological principles of brain functioning (Tokuhamma-Espinosa, 2011; Howard-Jones, 2014).

The integration of neuroscience into education has encouraged educators to move beyond traditional content-oriented instruction toward more learner-centered and evidence-based approaches. Contemporary studies demonstrate that effective learning is strongly influenced by neuropsychological conditions such as emotional states, stress levels, motivation, attention, and cognitive readiness (Immordino-Yang & Damasio, 2007). Consequently, successful instructional design should not merely focus on delivering information but must also consider learners' emotional well-being, cognitive diversity, and neurological development.

Furthermore, neuroscience emphasizes that the brain is highly adaptive and continuously shaped by learning experiences. Through neuroplasticity, neural connections can be strengthened, reorganized, or modified in response to meaningful stimulation and repeated practice (Doidge, 2007). Recent neuroscientific findings also indicate that enriched learning environments contribute positively to cognitive flexibility, memory consolidation, and long-term academic performance (Zull, 2021). Therefore, neuroscience provides a scientific foundation for developing educational practices that are more adaptive, personalized, and holistic.

2. Neuroscientific Principles in Learning Strategies

Several fundamental neuroscientific principles are particularly relevant for the development of effective learning strategies.

a. Neuroplasticity

Neuroplasticity refers to the brain's capacity to reorganize itself structurally and functionally in response to learning and experience. Research demonstrates that repeated, meaningful, and contextual learning experiences strengthen synaptic pathways and facilitate cognitive development (Mateos-Aparicio & Rodríguez-Moreno, 2019). This principle suggests that intelligence and learning abilities are not fixed but can develop continuously through appropriate educational stimulation.

b. Emotion Influences Learning

Emotions play a crucial role in cognitive performance and memory formation. The limbic system, particularly the amygdala and hippocampus, interacts closely with the prefrontal cortex in regulating attention, motivation, and information processing. Negative emotions such as fear and anxiety may inhibit learning processes, whereas positive emotional experiences enhance memory retention and cognitive engagement (Immordino-Yang, 2016). Consequently, emotionally supportive classrooms are essential for effective learning.

c. Multimodal Learning

The brain processes information more effectively when learning involves multiple sensory modalities, including visual, auditory, kinesthetic, and affective experiences. Multisensory learning activates broader neural networks and increases cognitive integration, thereby improving comprehension and retention (Shams & Seitz, 2008). This principle supports the use of interactive media, simulations, audiovisual resources, and experiential learning activities in contemporary classrooms.

d. Context and Meaning in Learning

Neuroscience also reveals that information connected to personal experiences and meaningful contexts is processed more deeply and retained more effectively in long-term memory. Learning becomes more durable when students can relate academic content to real-life situations and prior knowledge (Sousa, 2011). Therefore, brain-friendly learning strategies should emphasize contextual understanding rather than rote memorization.

3. Learning Strategies Based on Neuroscientific Principles

a. Contextual and Meaningful Learning

One of the most significant implications of neuroscience for education is the importance of contextual learning. The brain naturally seeks meaning and patterns; therefore, students understand and remember information more effectively when it is connected to authentic experiences and practical applications. Contextual learning stimulates simultaneous activation of emotional processing, language networks, and long-term memory systems.

This approach is highly compatible with Islamic educational philosophy, particularly the concept of *tafaqquh fi al-din*, which emphasizes deep understanding and meaningful application of knowledge in daily life. In Islamic education, knowledge is not merely accumulated cognitively but should also shape ethical behavior and spiritual awareness.

b. Positive Emotional Learning

Emotionally safe and supportive learning environments significantly influence students' cognitive performance. Neuroscientific studies indicate that chronic stress and fear negatively affect hippocampal functioning and reduce students' capacity to process and store information effectively (Sousa, 2011). Conversely, positive emotions such as curiosity, confidence, and motivation enhance neural activation and facilitate deeper learning.

Educational strategies emphasizing collaborative learning, reflective discussion, empathy, and positive teacher-student relationships contribute to healthy emotional climates within classrooms. These principles resonate strongly with Islamic teachings that emphasize compassion (*rahmatan lil 'alamin*) as a central foundation of educational interaction.

c. Repetition and Elaboration Strategies

The brain learns through repetition and reinforcement. Synaptic connections become stronger when information is revisited, elaborated, and applied in meaningful contexts. However, repetition without understanding tends to produce superficial learning and rapid forgetting. Therefore, elaborative rehearsal strategies such as concept mapping, peer teaching, reflective questioning, and the SQ3R method (Survey, Question, Read, Recite, Review) are highly effective in supporting long-term memory formation.

In Islamic intellectual traditions, this principle aligns closely with the concept of *tadabbur*, which encourages deep contemplation and reflective engagement with knowledge rather than mechanical memorization alone.

d. Active and Participatory Learning

Neuroscience research demonstrates that passive learning activates relatively limited neural regions, whereas active learning engages broader cognitive and sensorimotor networks simultaneously (Tokuhama-Espinosa, 2011). Learning activities such as project-based learning, problem-solving, role-playing, collaborative discussion, and experiential tasks enhance neural connectivity and strengthen memory retention.

This principle parallels the Islamic educational emphasis on *'amal* (practice), where knowledge is expected to be implemented and experienced rather than merely understood theoretically. The educational practices of the Prophet Muhammad (peace be upon him) reflected participatory, experiential, and practice-oriented learning methods.

e. Multisensory and Differentiated Learning

Every learner possesses unique cognitive strengths and preferred modes of processing information. Some students demonstrate stronger visual processing abilities, while others respond more effectively to auditory, verbal, or kinesthetic stimuli. Neuroscience suggests that learning becomes more effective when multiple sensory systems are activated simultaneously (Shams & Seitz, 2008).

Therefore, differentiated instruction and multisensory teaching methods are strongly recommended in modern education. The integration of visual media, educational technology, movement-based activities, and simulations can significantly strengthen neural learning pathways and accommodate diverse learner needs.

4. The Relevance of Neuroscientific Strategies in Islamic Education

Islamic education views learning as an integral part of worship and spiritual development. The Qur'an repeatedly encourages reflection (*tafakkur*), contemplation (*tadabbur*), and intellectual inquiry (*'ibrab*) as pathways toward understanding divine truth. These cognitive activities require not only intellectual engagement but also emotional and spiritual readiness.

Neuroscience-based learning strategies can therefore support the realization of holistic Islamic education (*tarbiyah kaffah*) that integrates intellectual, emotional, moral, and spiritual dimensions simultaneously. The Islamic concept of *qalb* encompasses cognition, emotion, spirituality, and ethical awareness, which closely corresponds with contemporary

neuroscientific perspectives regarding the interconnectedness of cognitive and affective processes.

Moreover, neuroscience-informed Islamic pedagogy offers relevant solutions to twenty-first-century educational challenges, particularly the need to develop learners who are intellectually capable, emotionally resilient, empathetic, and ethically responsible. Through the integration of scientific and spiritual approaches, education can contribute to the formation of *insan kamil*, the balanced and holistic human being envisioned within Islamic educational philosophy.

5. Practical Implications for Teachers and Educational Institutions

The integration of neuroscience into educational practice carries several important implications for teachers and educational institutions.

First, educators need foundational understanding of brain function and cognitive development to select instructional strategies appropriate to learners' developmental stages and individual differences. Second, curriculum and instructional design should align with principles of neuroplasticity, emotional engagement, and active learning. Third, schools should create emotionally supportive, collaborative, and psychologically safe learning environments that enhance students' cognitive performance and well-being.

Additionally, educational institutions should expand the use of interactive and multisensory learning media to accommodate diverse learning preferences. Assessment practices should also move beyond purely outcome-oriented evaluation and consider students' cognitive processes, emotional involvement, creativity, and reflective capacities.

Overall, the integration of neuroscience and learning strategies offers significant opportunities for improving the quality of Islamic education. By understanding how the brain learns, educators can develop instructional practices that are more adaptive, meaningful, and humanistic. Neuroscience-based learning strategies not only strengthen cognitive development but also support emotional and spiritual growth, which are fundamental objectives of Islamic education. Thus, neuroscience should not be viewed merely as a technical scientific discipline but as a contemporary intellectual resource that can enrich Islamic educational philosophy in forming knowledgeable, ethical, and spiritually grounded individuals.

Islamic Perspectives on Intellect and the Learning Process

1. Intellect in the Perspective of the Qur'an and Hadith

In Islamic thought, intellect (*'aql*) occupies a highly honorable and central position in human existence. It is not merely regarded as a tool for reasoning but as the primary means through which human beings acquire knowledge, distinguish truth from falsehood, and understand divine guidance. The Qur'an repeatedly emphasizes the importance of intellectual engagement through various expressions such as *'aql* (reason), *tafakkur* (reflection), *tadhakkur* (remembrance), and *tafaqquh* (deep understanding). Interestingly, the term *'aql* does not appear in the Qur'an in noun form but predominantly as a verb, indicating that intellect is understood as an active process of thinking and reflecting rather than a static entity (Mulyadhi, 2020).

One of the Qur'anic verses highlighting the importance of intellect states:

“Indeed, in that are signs for people who give thought” (Qur'an, Ar-Rum 30:21).

This verse illustrates that understanding natural, social, and existential realities requires active intellectual engagement. From an educational perspective, the use of reason becomes the foundation for developing rationality, critical thinking, openness to truth, and reflective awareness. The Qur'anic approach to intellect demonstrates that learning is not

restricted to memorization but involves contemplation, interpretation, and meaningful understanding.

The significance of intellect is also emphasized in the traditions of the Prophet Muhammad (peace be upon him). One narration states:

“A person’s religion is not perfected until his intellect is perfected” (Reported by Ahmad).

This narration indicates that intellect and religion are complementary dimensions within Islam. Religion without intellect may lead to blind fanaticism and rigid dogmatism, while intellect without spiritual guidance may produce moral relativism and ethical confusion. Consequently, Islamic education views learning as a harmonious interaction between rational inquiry and divine revelation.

Recent scholarship in Islamic educational philosophy also emphasizes that the Qur’anic conception of intellect aligns closely with contemporary educational ideals that promote reflective thinking, ethical reasoning, and lifelong learning (Sahin, 2018). In this sense, the Islamic intellectual tradition presents a holistic framework in which cognition, morality, and spirituality are inseparable dimensions of human development.

2. Intellect as a Means of Knowing God

One of the most profound functions of intellect in Islam is its role as a means of recognizing and understanding Allah SWT. Human intellect is not limited to analyzing empirical phenomena; it also serves as an instrument for contemplating existential meaning and discovering divine signs within creation. Therefore, learning in Islam is inherently spiritual rather than purely secular. The ultimate purpose of knowledge is to strengthen faith, deepen awareness of God, and guide humanity toward moral and spiritual excellence.

The Qur’an states:

“Indeed, in the creation of the heavens and the earth and the alternation of the night and the day are signs for those of understanding” (Qur’an, Ali ‘Imran 3:190).

This verse demonstrates that the pursuit of knowledge is simultaneously an intellectual and contemplative activity leading toward *tawhid* (awareness of divine unity). Learning is therefore not only cognitive acquisition but also spiritual transformation. Every field of knowledge ultimately directs human beings toward recognition of God’s greatness and awareness of human limitations.

Classical Muslim scholars consistently viewed intellect as a bridge leading to faith. Al-Ghazali argued that the primary function of intellect is to recognize ultimate truth (*al-haqq*) and that authentic knowledge inevitably deepens spiritual conviction. Similarly, contemporary scholars note that Islamic epistemology integrates revelation, rationality, and empirical observation into a unified framework of knowledge (Halstead, 2004). Consequently, Islamic education seeks to cultivate intellect not merely for technical competence but as a pathway toward guidance (*hidayah*) and moral responsibility.

3. Al-Ghazali’s Perspective on Intellect, the Brain, and Learning

Al-Ghazali (1058–1111 CE), one of the most influential Muslim scholars in theology, philosophy, Sufism, and education, offered profound insights into the nature of intellect and learning. In *Ihya’ ‘Ulum al-Din*, he distinguished between innate intellect (*al-‘aql al-jibilli*) and acquired intellect (*al-‘aql al-muktasab*), which develops through experience, reflection, and education. This distinction remarkably parallels contemporary neuroscientific understandings of neuroplasticity, which suggest that cognitive capacities evolve through continuous learning and environmental interaction.

Al-Ghazali emphasized that human intellect is guided by two principal sources: sensory experience and divine revelation. Sensory perception allows humans to understand empirical realities, while revelation provides moral orientation and ultimate meaning. He

strongly criticized educational systems that focused exclusively on technical or rational dimensions while neglecting ethical and spiritual development. According to Al-Ghazali, true education is not merely the accumulation of information but the cultivation of the heart and the purification of the soul.

Furthermore, Al-Ghazali stressed the importance of intention (*niyyah*), sincerity (*ikhlās*), and moral conduct (*akhlāq*) in the learning process. He argued that knowledge pursued solely for worldly status or material gain would ultimately be spiritually harmful, whereas knowledge pursued for the sake of Allah would become beneficial knowledge (*'ilm nafi*). This perspective highlights that intellect in Islam is not value-neutral but must be exercised ethically and spiritually.

Recent discussions in Islamic educational studies indicate that Al-Ghazali's pedagogical ideas remain highly relevant in addressing contemporary educational crises characterized by excessive materialism, emotional disconnection, and moral decline (Boyle, 2004). His emphasis on integrating cognition, ethics, and spirituality corresponds closely with current calls for holistic education in the twenty-first century.

4. Ibn Sina's Perspective on the Brain, Intellect, and Education

Unlike Al-Ghazali's spiritually oriented approach, Ibn Sina (980–1037 CE) approached intellect and learning from a more philosophical and scientific perspective. In his major works *Al-Shifa'* and *Al-Najat*, Ibn Sina systematically explained theories of the soul, cognition, and intellectual development. He classified intellect into several stages: potential intellect (*al-'aql bi al-quwwah*), actual intellect (*al-'aql bi al-fi'l*), and acquired intellect (*al-'aql al-mustafad*). Learning, according to Ibn Sina, represents a gradual transformation from intellectual potentiality to intellectual actuality through observation, reasoning, and contemplation.

Ibn Sina was also among the earliest Muslim thinkers to distinguish between the functions of the brain and the soul. He argued that the brain governs sensory perception and motor activity, whereas intellect belongs to a higher spiritual dimension. Nevertheless, these dimensions remain interconnected and mutually influential. Therefore, education should address all aspects of human personality, including physical, intellectual, emotional, and spiritual development (Nasr, 2006).

In pedagogical matters, Ibn Sina emphasized developmental appropriateness in education. He proposed that teaching methods should correspond to learners' ages and cognitive maturity. For children, learning should begin through educational play (*ta'lim la'ibi*) and gradually progress toward logic, reasoning, and philosophical inquiry during adolescence. This perspective closely resembles modern neuroscientific understandings of cognitive development and age-related learning capacities (Sousa, 2011).

Contemporary educational theorists increasingly recognize the relevance of Ibn Sina's ideas in supporting learner-centered and developmentally appropriate education. His educational philosophy demonstrates that effective learning requires attention to both cognitive readiness and emotional development, principles strongly supported by modern neuroscience (Ahmed, 2012).

5. Theological Reflection and Contemporary Education

Islamic perspectives on intellect and learning provide a strong theological foundation for the development of educational neuroscience within Islamic education. While neuroscience explains how the brain functions biologically, Islam provides ethical and spiritual direction concerning the purpose for which intellect should be used. In Islamic thought, intellect is not merely an instrument of reasoning but also a means of understanding revelation, pursuing truth, and cultivating piety.

In the context of contemporary education, integrating neuroscience with Islamic educational philosophy enables the development of holistic learning models that nurture intellectual, emotional, moral, and spiritual dimensions simultaneously. Thinking itself is considered an act of worship in Islam because reflection upon creation leads to deeper awareness of divine wisdom.

The relationship between intellect and the brain in Islam should therefore not be understood as two separate realities but as interconnected dimensions of human existence as rational and spiritual beings. The Qur'an and Hadith consistently encourage humanity to use intellect as a pathway toward understanding life and recognizing Allah. Classical Muslim scholars such as Al-Ghazali and Ibn Sina established rich intellectual foundations bridging rational inquiry and divine revelation. Consequently, Islamic education informed by neuroscience possesses the potential to cultivate individuals who are intellectually capable, spiritually grounded, emotionally balanced, and ethically responsible in responding to contemporary challenges.

Implications of Neuroscience in Islamic Education

The rapid development of neuroscience over the last several decades has generated significant implications for educational theory and practice. Neuroscience, as the scientific study of the brain, nervous system, and their influence on human behavior and learning, provides educators with deeper insights into how students think, process information, regulate emotions, and develop cognitively. Within the context of Islamic education, neuroscience should not merely be viewed as a technical scientific discipline; rather, it can be integrated with Islamic spiritual and ethical values to construct an educational system that is holistic, humanistic, and transformative. Such integration enables Islamic education to address contemporary educational challenges while maintaining its spiritual and moral foundations.

1. The Importance of Teachers Understanding Students' Brain Functions

In the learning process, teachers serve as the primary facilitators who determine instructional strategies, learning environments, and pedagogical approaches. Therefore, it is essential for educators to understand how the brain functions during learning, including how it processes information, stores memory, regulates emotions, and influences attention and concentration. Knowledge of neuroscientific principles enables teachers to design learning experiences that are more effective, personalized, and developmentally appropriate (Sousa, 2011).

Contemporary neuroscience demonstrates that the brain does not learn uniformly across individuals. Learners differ in cognitive styles, neural processing speeds, emotional responses, and attentional capacities. While some students process information more analytically, others demonstrate stronger creative, visual, or affective tendencies. Understanding these neurological differences allows teachers to construct balanced instructional activities that stimulate multiple dimensions of cognition and creativity (Howard-Jones, 2014).

In addition, understanding neurodevelopmental stages is particularly important in educational settings. During childhood, especially in early developmental phases, the brain undergoes intensive synaptic growth and myelination processes that significantly influence cognitive capacity and behavioral regulation. At this stage, children learn more effectively through repetitive, concrete, multisensory, and emotionally engaging experiences. Teachers who understand these developmental characteristics are less likely to employ excessively

abstract or cognitively overwhelming instructional methods for young learners (Jensen, 2008).

From an Islamic perspective, education is regarded as a divine trust (*amanah*), and teachers bear moral responsibility for delivering knowledge with wisdom, compassion, and sensitivity toward students' intellectual capacities. The Prophet Muhammad (peace be upon him) stated:

“Speak to people according to the level of their understanding.”
(Reported by Muslim)

This prophetic guidance implicitly emphasizes the importance of recognizing learners' cognitive readiness and psychological conditions. Consequently, integrating neuroscientific understanding into educational practice reflects the application of prophetic educational principles within contemporary Islamic pedagogy.

2. Developing Learning Methods Based on Neuroscience and Islamic Values

Educational neuroscience has introduced various instructional strategies capable of improving learning effectiveness, including multisensory learning, experiential learning, collaborative learning, and emotionally supportive teaching approaches. These methods are highly compatible with Islamic educational values because they emphasize meaningful engagement, reflection, and character development rather than rote memorization alone.

One learning approach strongly supported by neuroscience is contextual teaching and learning. This strategy facilitates the brain's ability to connect new information with prior experiences and existing knowledge structures, thereby strengthening long-term memory formation (Sprenger, 2005). Within Islamic education, this principle corresponds closely with the concept of *tadabbur*, which encourages learners to relate knowledge to real-life experiences and derive wisdom from reflection upon reality.

Furthermore, neuroscience emphasizes the importance of emotional and spiritual conditions in learning processes. The brain performs optimally under positive emotional states because excessive activation of the amygdala due to fear or anxiety can inhibit hippocampal functioning and disrupt memory formation (LeDoux, 2002). Contemporary research in affective neuroscience similarly demonstrates that emotional well-being significantly influences motivation, attention, and academic performance (Immordino-Yang & Damasio, 2007).

Islamic educational traditions have long advocated compassionate and emotionally supportive learning environments. Classical Muslim scholars such as Al-Zarnuji, in *Ta'lim al-Muta'allim*, emphasized gentleness, respect, and ethical interaction in educational relationships. Thus, neuroscience and Islamic educational philosophy converge in recognizing that meaningful learning requires emotional security, moral support, and positive interpersonal relationships.

These principles can be implemented through several practical approaches:

- a. Value-based cooperative learning, which develops collaboration, empathy, social responsibility, and moral character in accordance with Islamic ethics.
- b. Reflective learning (*muhasabah learning*), which encourages students to contemplate knowledge as a means of understanding themselves, society, and their relationship with Allah.
- c. Integrative thematic learning, which connects scientific subjects with Qur'anic values and Islamic ethical principles so that learning engages cognitive, emotional, and spiritual dimensions simultaneously.

Learning approaches that consider both brain functioning and Islamic values contribute to the development of learners who are intellectually capable, emotionally mature,

and spiritually grounded. In this sense, neuroscience-informed Islamic education represents a comprehensive educational model that nurtures the mind, heart, and behavior of students holistically.

3. The Integration of Knowledge and Faith as a Holistic Educational Approach

Islamic education fundamentally aims not only to produce intellectually competent individuals but also to cultivate faith (*iman*), piety (*taqwa*), and noble character (*akhlak al-karimah*). Therefore, educational systems that focus exclusively on cognitive achievement risk losing their spiritual and ethical essence. This reality highlights the importance of holistic education that integrates knowledge and faith simultaneously.

The integration of knowledge and faith becomes increasingly relevant when viewed through neuroscientific perspectives. Contemporary studies in neurotheology and spiritual neuroscience indicate that spiritual practices such as prayer, meditation, remembrance (*dhikr*), and contemplation positively influence emotional regulation, concentration, psychological well-being, and neural activity associated with inner peace (Newberg & Waldman, 2009). These findings suggest that spiritual experiences are not disconnected from cognitive functioning but are deeply interconnected with emotional and neurological processes.

Consequently, Islamic education informed by neuroscience can create learning systems that harmonize intellect and spirituality, logic and transcendence, scientific inquiry and divine consciousness. For example, integrating scientific lessons with Qur'anic verses concerning creation may cultivate wonder (*ta'ajjub*), reflection, and awareness of divine wisdom. Learning experiences associated with emotional and spiritual meaning are generally retained more deeply in long-term memory and contribute significantly to character formation.

This holistic educational perspective is consistent with the educational philosophy of Syed Muhammad Naquib al-Attas (1980), who defined Islamic education as:

“The process of instilling recognition and acknowledgment of the proper places of things in the order of creation, leading toward justice within the self.”

This definition implies the necessity of balancing rational, emotional, ethical, and spiritual dimensions within educational processes. Therefore, neuroscience-inspired Islamic education should not merely facilitate cognitive development but should also contribute to the formation of *insan kamil*, the holistic and balanced human being envisioned within Islamic philosophy.

Overall, the implications of neuroscience for Islamic education present significant opportunities for improving educational quality and relevance. Teachers who understand how the brain functions are better equipped to develop instructional strategies aligned with learners' developmental needs and psychological conditions. Similarly, integrating neuroscientific principles with Islamic values contributes to educational models that nurture not only intellectual growth but also emotional health and spiritual awareness.

More importantly, the integration of knowledge and faith serves as the foundational principle for constructing Islamic education that develops holistic human personality. Neuroscience, therefore, should not be regarded merely as a technical educational tool but as part of an integrated Islamic epistemology that values reason, spirituality, ethics, and revelation as interconnected dimensions of human learning and development.

CONCLUSION

This study demonstrates that neuroscience provides important scientific insights into how the brain functions in the learning process, particularly regarding neuroplasticity, emotional regulation, memory formation, and cognitive development. These findings confirm that effective learning requires strategies aligned with the brain's natural

mechanisms, including contextual, multisensory, active, and emotionally supportive learning approaches. From the perspective of Islamic education, the concepts of intellect (*'aql*), reflection (*tafakkur*), and holistic human development (*insan kamil*) show strong compatibility with contemporary neuroscientific principles. Islamic educational thought views learning not merely as cognitive activity but also as a spiritual and moral process aimed at strengthening faith, character, and human dignity. The integration of neuroscience and Islamic educational values offers a holistic educational framework that combines intellectual, emotional, and spiritual dimensions simultaneously. Therefore, neuroscience-informed Islamic education has significant potential to develop learning systems that are more adaptive, humanistic, and transformative in responding to the educational challenges of the twenty-first century.

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