

Neuroscience-Based Islamic Religious Education: Strengthening Students' Spiritual Intelligence and Meaningful Learning

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Abstract

This study examines how neuroscience can inform Islamic Religious Education (IRE) to strengthen students' spiritual intelligence and meaningful learning. The study employed library research with a qualitative-descriptive and integrative literature review approach, analyzing recent scholarly literature on educational neuroscience, brain-based learning, spiritual intelligence, meaningful learning, and Islamic education. The findings indicate that neuroscience-based IRE should not be understood as merely applying biological knowledge of the brain to religious instruction, but as an integrative pedagogical framework connecting cognition, emotion, attention, memory, motivation, reflection, spirituality, and moral action. The synthesis shows that meaningful religious learning becomes stronger when students connect new Islamic concepts with prior knowledge, emotionally relevant experiences, reflective activities, authentic problems, Qur'anic values, and real-life practices. Spiritual intelligence is strengthened through repeated opportunities for self-awareness, transcendental reflection, ethical decision-making, gratitude, empathy, worship, and meaning-making. The novelty of this study lies in proposing an integrative Neuroscience-Based Islamic Religious Education Framework that connects neurocognitive processes with Islamic spiritual formation rather than treating neuroscience and spirituality as separate domains. The framework emphasizes brain readiness, emotional engagement, meaningful construction, spiritual reflection, behavioral internalization, and continuous reflection as interconnected stages of IRE learning.

Keywords: Neuroscience-Based Education, Spiritual Intelligence, Meaningful Learning

Introduction

Contemporary education is increasingly challenged to move beyond the transmission of information toward the development of learners who can understand, interpret, internalize, and apply knowledge meaningfully. This challenge is particularly significant in Islamic Religious Education because religious learning is expected to develop not only cognitive competence but also faith, morality, spirituality, and responsible behavior. Educational neuroscience provides an important perspective because learning is fundamentally associated with changes in brain networks, attention, memory, emotion, motivation, and behavior. Goldberg (2022) explains that education interacts with experience-dependent neuroplasticity, while Jolles and Jolles (2021) emphasize that neuroscientific knowledge can help educators understand learning and development



more realistically. These findings indicate that Islamic Religious Education needs to consider how students' brains learn rather than focusing exclusively on what students are expected to memorize. In this context, neuroscience offers an opportunity to redesign IRE as a learning experience that is cognitively meaningful, emotionally engaging, spiritually reflective, and behaviorally transformative.

The conventional implementation of Islamic Religious Education in many educational settings has often emphasized memorization, conceptual understanding, and completion of curriculum content. Such approaches can provide students with religious information but do not automatically ensure that religious knowledge becomes internalized as personal meaning or moral behavior. Research on neuroeducation suggests that learning is influenced by attention, emotion, motivation, prior knowledge, and active engagement. Goldberg (2022) argues that educational practices should accommodate the mechanisms through which the developing brain learns, while van Duijvenvoorde et al. (2022) show that learning during childhood and adolescence is closely connected with developmental changes in brain structure and function. Therefore, the effectiveness of IRE cannot be evaluated only through students' ability to reproduce definitions, verses, or religious rules. A more comprehensive approach should examine whether learning produces understanding, reflection, personal meaning, and ethical action. This perspective creates a strong rationale for integrating neuroscience with Islamic pedagogy.

Neuroscience-based education does not mean reducing human beings to biological organisms or interpreting religious experience exclusively through neural mechanisms. Rather, it provides information about how cognitive and affective processes support educational experiences. Jolles and Jolles (2021) caution that neuroscientific findings need to be translated carefully into educational practice because the distance between laboratory findings and classroom application can be substantial. This caution is particularly important in Islamic education because spirituality contains theological and metaphysical dimensions that cannot be fully explained by brain activity. Islamic Religious Education therefore requires a complementary relationship between scientific knowledge and Islamic epistemology. Neuroscience can explain some mechanisms involved in attention, emotion, memory, and learning, while Islamic educational thought provides normative direction regarding why knowledge should be pursued and how it should influence human conduct. The integration of both perspectives can produce a more holistic educational paradigm.

The concept of neuroplasticity provides one of the strongest foundations for this integration. Neuroplasticity refers broadly to the capacity of the brain to change in response to experience, learning, and environmental interaction. Goldberg (2022) emphasizes that formal and informal learning can contribute to adaptive structural and functional changes in brain networks during childhood and adolescence. This principle has important implications for Islamic education because students' religious attitudes and habits should not be considered completely fixed. Repeated experiences involving worship, reflection, empathy, ethical decision-making, and meaningful religious practice may contribute to the development of stable behavioral patterns. Islamic pedagogy can therefore be designed around repeated positive experiences rather than relying solely on verbal instruction. The educational objective becomes the cultivation of knowledge and habits that gradually shape students' cognitive, emotional, spiritual, and behavioral responses.

Another central issue is the relationship between emotion and learning. Religious education frequently deals with themes such as gratitude, compassion, fear of wrongdoing, hope, forgiveness, justice, and responsibility, all of which contain strong emotional dimensions. Neuroscientific perspectives indicate that cognition and emotion are not independent systems operating separately during learning. Goldberg (2022) identifies motivation, attention, and meaning-making as important components of brain-friendly education, while contemporary research on learning emphasizes the importance of affective engagement. Consequently, an IRE lesson that merely presents theological concepts without emotional or experiential relevance may fail to activate students' deeper engagement with the material. Religious concepts become more meaningful when students are invited to connect them with personal experiences, social realities, and ethical dilemmas. Emotional engagement therefore becomes an important pathway toward meaningful religious learning.

Meaningful learning is another important foundation for neuroscience-based IRE. Meaningful learning occurs when new knowledge becomes connected to existing cognitive structures and is understood rather than merely memorized. Bryce and Blown (2024) revisit Ausubel's theory of meaningful learning in light of developments in cognitive science and neuroscience, emphasizing that learning involves dynamic processes of memory, questioning, conceptual understanding, and knowledge construction. This perspective is highly relevant to Islamic education because religious concepts often require students to connect textual knowledge with prior experiences and contemporary contexts. For example, learning about honesty becomes more meaningful when students analyze situations involving academic cheating, digital misinformation, or professional integrity. Such connections transform religious instruction from abstract knowledge into personally relevant understanding. Neuroscience-based pedagogy can therefore strengthen the cognitive conditions necessary for meaningful religious learning.

Spiritual intelligence constitutes another central dimension of this educational transformation. Spiritual intelligence can be understood in educational contexts as the capacity to interpret life through meaningful values, recognize transcendental dimensions, regulate conduct according to deeply held principles, and respond to problems with reflective awareness. Recent research indicates a positive relationship between spiritual intelligence and educational achievement, although the strength and mechanisms of that relationship vary across contexts. A systematic review and meta-analysis reported that spiritual intelligence was positively associated with students' educational achievement, suggesting that spiritual capacities can contribute to broader educational outcomes (Naseri et al., 2024). In Islamic education, spiritual intelligence should not be detached from faith, worship, morality, and responsibility toward God and other human beings. It should instead function as a bridge connecting religious knowledge with existential meaning and ethical action. Neuroscience-based IRE can provide pedagogical conditions that support this process through reflection, emotional engagement, and repeated value-based practice.

The relationship between spiritual intelligence and academic development is also supported by studies in Islamic educational settings. Muchtar et al. (2022), for example, found that prophetic learning through Qur'anic memorization could contribute to students' spiritual intelligence. Harahap et al. (2023) likewise described spiritual intelligence among students in Islamic senior high schools through characteristics such



as noble character, patience, sincerity, and problem-solving capacity. These findings demonstrate that spiritual intelligence is not merely a theoretical construct but can be cultivated through structured educational experiences. However, religious activities should not be reduced to routines performed without understanding. Neuroscience-based pedagogy requires that activities such as Qur'anic reflection, prayer, memorization, and moral practice be accompanied by attention, emotional engagement, personal meaning, and reflection. The integration therefore concerns not simply the quantity of religious activities but the quality of students' internal processing.

The Indonesian Islamic education context provides a particularly important setting for this discussion. Islamic Religious Education is expected to respond simultaneously to technological transformation, moral challenges, adolescent development, and the need for religious moderation. Students increasingly encounter religious information through digital media, social networks, short videos, and algorithmically selected content. (Nurhidayah & Handayani, 2025) Such environments may provide valuable religious resources but may also encourage superficial consumption, emotional polarization, and fragmented understanding. Neuroscience-based IRE can respond by strengthening attention, critical evaluation, metacognition, and reflective meaning-making. Students should not merely receive religious information but learn how to process, evaluate, internalize, and apply it responsibly. This makes neuroscience relevant not only to classroom learning but also to the development of religious literacy in digital environments.

Research specifically connecting neuroscience and Islamic education has begun to develop in Indonesia. Suyadi (2022) proposed a learning taxonomy for Islamic education by connecting the Qur'anic concept of '*aql*' with brain development and hierarchical thinking. Jailani et al. (2021) similarly examined the relationship between the brain, '*aql*', the Qur'an, and Islamic education from a neuroscience perspective. These studies indicate that Islamic education possesses conceptual resources that can be placed in dialogue with contemporary neuroscience. However, much of the existing discussion remains conceptual and fragmented across issues such as character education, brain development, religious learning, and neurotheology. A more integrated framework connecting neuroscience, spiritual intelligence, and meaningful learning is therefore necessary. The present study addresses this conceptual gap through an integrative literature synthesis.

Previous studies have also investigated neuroscience as a foundation for religious character formation. Asman et al. (2021) conceptualized character education as brain education and argued that Islamic education should consider students' potential to influence their environments rather than viewing learners only as passive recipients of environmental conditioning. Huda (2022) examined the construction of religious character through neuroscience-informed Islamic Religious Education and emphasized the importance of developing love for Allah and the Prophet alongside religious character values. These studies strengthen the argument that religious education should address internal processes rather than simply prescribe external behavior. The implication is that character formation requires repeated cognitive and emotional experiences that support internalization. Neuroscience-based IRE therefore has the potential to move character education from behavioral compliance toward deeper moral and spiritual development.

The physical and environmental dimensions of learning should also be considered. Classroom lighting, spatial organization, sensory stimulation, music, movement, and environmental comfort may influence students' attention and engagement. Akbar and Suyadi (2021) examined Islamic learning design from a neuroscience perspective by discussing music, lighting, and classroom space. Although such environmental variables should not be exaggerated as universal neurological prescriptions, they demonstrate that learning does not occur independently of context. A brain-aware IRE classroom should therefore provide conditions that minimize unnecessary distraction and support attention and emotional safety. Teachers also need to recognize that students differ in developmental readiness, cognitive style, emotional condition, and learning history. Neuroscience thus supports differentiated rather than purely standardized religious pedagogy.

Adolescent development further strengthens the case for neuroscience-informed Islamic education. Students in secondary education experience significant changes in cognitive control, social sensitivity, emotional regulation, and identity development. Van Duijvenvoorde et al. (2022) explain that adolescence involves substantial changes in brain structure, function, and connectivity, and that individual developmental trajectories differ. Religious education during this period therefore cannot rely solely on authoritative instruction without dialogue and opportunities for reflection. Adolescents need spaces where religious concepts can be questioned, interpreted, connected with experience, and translated into personal values. Meaningful dialogue can stimulate metacognition and encourage students to become aware of their own reasoning processes. Such an approach is consistent with Islamic educational traditions that value reflection, reasoning, and the development of *'aql*.

Metacognition is particularly important because spiritual intelligence involves awareness of one's own thoughts, emotions, intentions, and values. Fleur et al. (2021) describe metacognition as involving awareness of cognitive processes and the capacity to regulate them. In IRE, this can be translated into reflective questions such as why a student believes something, how a religious value influences behavior, and what changes after learning a particular Qur'anic teaching. Such reflection allows students to move from passive reception toward self-regulated learning. It also supports the development of *muhasabah*, an Islamic tradition of self-evaluation and moral reflection. The connection between metacognition and *muhasabah* offers a promising conceptual bridge between educational neuroscience and Islamic pedagogy.

Authentic learning provides another important connection. Nachtigall et al. (2022), through a review of research on authentic learning, show that authentic learning environments can influence cognitive and motivational outcomes. In Islamic Religious Education, authenticity can be created by connecting religious principles with actual problems encountered by students and communities. Topics such as environmental responsibility, online ethics, social justice, honesty, tolerance, and family relationships can become contexts for applying Qur'anic and prophetic teachings. Students then experience religion as a framework for understanding and responding to life rather than as an isolated school subject. This approach also increases the possibility that learning will become personally meaningful. Neuroscience-based IRE should therefore prioritize authentic tasks and real-world problem solving.

Despite growing interest, the literature still contains several limitations. First, educational neuroscience is sometimes translated into classroom practice without



sufficient attention to methodological limitations and the risk of neuromyths. Jolles and Jolles (2021) emphasize the need to strengthen neuroscientific literacy among educational professionals. Second, research specifically integrating neuroscience and Islamic Religious Education remains less developed than research on general educational neuroscience. Third, spiritual intelligence is often investigated through psychological or religious frameworks without being systematically connected to learning mechanisms such as attention, memory, emotion, and neuroplasticity. These limitations indicate the need for an integrative conceptual synthesis rather than another isolated discussion of brain-based education. The present study is designed to address this gap through library research.

Accordingly, this study aims to analyze the theoretical and empirical literature concerning neuroscience-based Islamic Religious Education and its potential contribution to students' spiritual intelligence and meaningful learning. The study specifically examines the relationships among neuroplasticity, attention, emotion, memory, motivation, metacognition, spirituality, and meaningful learning. It also identifies pedagogical principles that can translate these concepts into Islamic Religious Education practices. The study further synthesizes previous Islamic education research on neuroscience, religious character, Qur'anic learning, spiritual intelligence, and brain-based learning. The expected contribution is a conceptual framework that positions spiritual intelligence and meaningful learning as mutually reinforcing outcomes rather than separate educational objectives. The novelty lies in integrating neurocognitive processes and Islamic spiritual formation into one coherent pedagogical framework.

Theoretical Foundation

Educational Neuroscience and the Nature of Learning

Educational neuroscience has increasingly developed as an interdisciplinary field that brings together neuroscience, cognitive psychology, developmental science, and educational research to examine the mechanisms underlying learning and development. Rather than functioning as an autonomous educational paradigm, the field offers complementary evidence concerning cognitive processes such as attention, memory, motivation, emotion, executive functioning, and neuroplasticity. Goldberg (2022) argues that neuroscientific perspectives can contribute to educational design by clarifying how these processes influence the acquisition and consolidation of knowledge, whereas Jolles and Jolles (2021) emphasize the importance of neuroscientific literacy among educators to ensure that scientific findings are interpreted within appropriate methodological and conceptual boundaries. These considerations are particularly significant in Islamic Religious Education (IRE), where learning encompasses not only cognitive achievement but also moral development, spiritual formation, religious identity, and behavioral transformation. Consequently, educational neuroscience should be positioned as a complementary scientific perspective that informs pedagogical practice without displacing the philosophical, theological, and ethical foundations of Islamic education. Such positioning establishes an interdisciplinary framework in which empirical knowledge about learning processes contributes to the effectiveness of IRE while Islamic educational philosophy continues to determine its normative aims.

The concept of neuroplasticity provides a scientifically relevant explanation for the potential of educational experiences to influence cognitive and behavioral



development. Neuroplasticity refers to the capacity of the nervous system to modify its structure and function in response to experience, learning, environmental stimulation, and developmental processes. Goldberg (2022) highlights experience-dependent neuroplasticity as particularly relevant to childhood and adolescence, periods characterized by substantial cognitive and neural development. From an educational perspective, this principle suggests that repeated, meaningful, and appropriately structured experiences may contribute to the development and refinement of cognitive and behavioral patterns. In IRE, sustained engagement with Qur'anic recitation, religious reflection, ethical reasoning, worship practices, and prosocial activities may therefore contribute to the gradual development of cognitive habits and behavioral dispositions. However, the concept of neuroplasticity should not be interpreted deterministically, because evidence of neural adaptability does not establish a direct causal relationship between a particular instructional activity and a specific neural modification. Its principal educational implication is more appropriately understood as evidence that consistent and meaningful learning experiences can contribute to developmental change over time.

The developmental heterogeneity of learners further requires neuroscience-informed educational approaches to account for differences in cognitive, emotional, social, and neurological maturation. Students of the same chronological age may demonstrate substantially different levels of executive functioning, emotional regulation, prior knowledge, and cognitive readiness. Van Duijvenvoorde et al. (2022) demonstrate that adolescence is characterized by dynamic developmental changes and considerable individual variation in cognitive and neural processes. This evidence challenges pedagogical assumptions that learners within the same age group necessarily possess equivalent capacities for abstract reasoning, self-regulation, or complex decision-making. In IRE, developmental sensitivity is particularly relevant when teachers address abstract theological concepts, moral dilemmas, Qur'anic interpretation, memorization, and reflective activities. Instructional tasks should therefore be scaffolded according to learners' developmental capacities while gradually increasing the complexity of reasoning and independent reflection. Such developmentally responsive pedagogy enables religious instruction to remain intellectually rigorous while ensuring that its cognitive demands correspond appropriately with students' developmental conditions.

Attention represents a fundamental cognitive mechanism through which information becomes available for further processing and learning. Contemporary educational environments increasingly expose students to competing stimuli, digital interruptions, multitasking demands, and rapidly changing information, thereby making sustained attention a significant pedagogical concern. Goldberg (2022) identifies attention as one of the central processes through which neuroscientific perspectives can contribute to understanding educational effectiveness. This perspective has direct implications for IRE because learning religious texts, concepts, interpretations, and ethical arguments requires students to maintain focused engagement over an extended period. Teachers can support attentional regulation through clearly articulated learning objectives, purposeful questioning, meaningful contextualization, appropriately sequenced activities, and the minimization of unnecessary cognitive distractions. Accordingly, attention should not be conceptualized solely as an individual learner characteristic but also as a process influenced by the design and organization of instruction. (Wahidah Wahidah, Irfan Noor, 2025) A neuroscience-informed IRE

classroom should therefore deliberately establish cognitive conditions that facilitate sustained attention while preserving intellectual curiosity and spiritual engagement.

Emotional processes constitute an equally important dimension of learning because cognitive activity is continuously influenced by affective states, motivation, perceived relevance, and interpersonal experiences. Students are more likely to engage persistently with learning tasks when they perceive them as meaningful, emotionally safe, intellectually stimulating, and relevant to their lives. This consideration is especially pertinent to IRE because its subject matter encompasses faith, morality, identity, responsibility, gratitude, compassion, hope, and relationships with God and other human beings. However, the pedagogical use of emotion should not be confused with emotional manipulation or the substitution of affective intensity for intellectual inquiry. Emotionally responsive religious education should instead cultivate empathy, curiosity, moral sensitivity, and personal relevance while maintaining opportunities for critical reflection and independent judgment. From a neuroscientific perspective, the interaction between affect and cognition indicates that meaningful emotional engagement can support the conditions under which students attend to and process educational information (Goldberg, 2022). Therefore, integrating cognitive and affective dimensions can strengthen IRE by allowing religious knowledge to become intellectually comprehensible, emotionally meaningful, and ethically consequential.

Memory constitutes a particularly important dimension of IRE because religious learning frequently requires students to retain Qur'anic verses, hadith, theological concepts, historical narratives, ethical principles, and practical religious knowledge. Nevertheless, educationally meaningful memory cannot be reduced to the mechanical reproduction of information. Contemporary cognitive scholarship emphasizes that remembering involves dynamic processes of reconstruction, integration, retrieval, and conceptual organization rather than passive information storage (Bryce & Blown, 2024). This perspective has important implications for Qur'anic memorization because accurate recall can be strengthened when memorized material is accompanied by comprehension, contextual interpretation, retrieval practice, and application. Students should therefore be encouraged to connect memorized verses with their meanings, historical contexts, ethical implications, and contemporary relevance. Such pedagogical integration transforms memorization from an isolated cognitive task into a foundation for deeper understanding and religious practice. (Nurdi et al., 2025) Consequently, memory in IRE should be regarded as an enabling component of meaningful learning rather than as the ultimate indicator of educational success.

Meaningful learning becomes possible when newly acquired knowledge is connected systematically with learners' existing conceptual structures and prior experiences. The cognitive perspective associated with meaningful learning emphasizes that students do not encounter new information as blank slates; rather, they interpret new concepts through previously established knowledge, beliefs, experiences, and conceptual frameworks. Bryce and Blown (2024) revisit this perspective by emphasizing the continuing significance of prior knowledge in conceptual understanding and learning. In IRE, students' existing understandings of God, morality, family, social relationships, worship, and personal responsibility inevitably influence how they interpret new religious concepts. Teachers should therefore identify students' prior conceptions and create instructional bridges between existing knowledge and more sophisticated Islamic concepts. Dialogical questioning, contextual examples, analogies, problem-based



situations, and guided reflection can facilitate these connections. Meaningful learning is consequently achieved when students can explain not only the content of a religious concept but also its significance, relationships with other concepts, and implications for personal and social conduct.

Metacognition provides an important mechanism for strengthening students' capacity to regulate their own learning processes. It involves awareness of one's cognitive activity as well as the ability to plan, monitor, evaluate, and modify learning strategies. Fleur et al. (2021) emphasize that metacognitive competence enables learners to become increasingly conscious of how they approach cognitive tasks and how effectively their strategies produce desired outcomes. Within IRE, this perspective can be connected with Islamic practices of *muhasabah*, self-evaluation, intentionality, and personal accountability. Students can be encouraged to identify what they understand, recognize misconceptions, evaluate their reasoning, monitor their progress, and reflect upon how religious knowledge influences their attitudes and conduct. Such activities shift the learner from a passive recipient of religious information toward an active participant in knowledge construction and personal development. The integration of metacognition with Islamic reflective traditions therefore provides a theoretically coherent pathway for connecting cognitive self-regulation with spiritual and moral self-awareness.

Spiritual intelligence constitutes a significant dimension of the educational purposes of Islamic Religious Education because religious learning extends beyond the acquisition of propositional knowledge. Spiritual intelligence generally concerns an individual's capacity to construct meaning, orient behavior toward values, and interpret experiences within a broader framework of purpose and transcendence. A systematic review by Naseri et al. (2024) identified positive relationships between spiritual intelligence and educational achievement, suggesting that spiritual capacities may contribute to broader dimensions of student development. Within an Islamic framework, however, spiritual intelligence requires contextualization through concepts such as *īmān*, *ihsān*, *taqwā*, worship, moral responsibility, and consciousness of Allah. It should therefore not be reduced to an undifferentiated psychological construct of "spirituality." Rather, spiritual intelligence in IRE can be understood as the capacity to interpret knowledge, experience, and moral choices through an Islamic worldview while exercising reflection and personal responsibility. This conceptualization positions spiritual intelligence as an important educational outcome through which cognitive learning can be connected with existential meaning and ethical conduct.

Empirical research in Islamic education provides further support for the proposition that religious learning can contribute to students' spiritual and affective development. Muchtar et al. (2022) examined prophetic learning through Qur'anic memorization and reported implications for students' spiritual intelligence, while Rahmayani et al. (2022) identified relationships between Qur'anic memorization activities and dimensions such as empathy, gratitude, and spiritual development. These findings indicate that religious instruction may generate outcomes extending beyond cognitive achievement when students are provided with opportunities to understand and internalize the values embedded in religious knowledge. Nevertheless, such outcomes should not be attributed exclusively to memorization because instructional quality, teacher-student interaction, reflection, emotional engagement, and opportunities for practical application may mediate the relationship between religious learning and spiritual development. Neuroscience-informed pedagogy can potentially strengthen



these mediating processes by incorporating principles related to repetition, attention, emotional relevance, retrieval, and reflection. The implication is that IRE may achieve greater transformative potential when religious content and scientifically informed learning processes are intentionally integrated rather than treated as separate dimensions of instruction.

Religious character development can be understood as a multidimensional process involving knowledge, moral reasoning, emotional regulation, social interaction, repeated practice, and behavioral habituation. Asman et al. (2021) conceptualize character education in relation to brain-based educational processes, while Huda (2022) explores the formation of religious character through a neuroscience-informed Islamic educational perspective. These approaches challenge the assumption that character can be developed effectively through external behavioral control alone. Instead, students require opportunities to understand moral principles, experience their relevance, observe credible role models, reflect upon consequences, and repeatedly enact desirable behaviors. In IRE, these processes provide a bridge between religious knowledge and the development of observable moral conduct. Spiritual intelligence can consequently function as an internal meaning-making dimension through which learners interpret religious values and determine their relevance to everyday decisions. The development of religious character should therefore be approached as an integrative process involving cognition, emotion, spirituality, social experience, and repeated ethical action.

Authentic learning offers a pedagogical framework through which Islamic knowledge can be connected with situations that students encounter beyond the classroom. Rather than treating religious concepts as isolated bodies of knowledge, authentic learning places students in contexts that require them to interpret, evaluate, and apply what they have learned to meaningful problems. Nachtigall et al. (2022) demonstrate that authentic learning environments can support cognitive and motivational outcomes by providing learners with meaningful and contextually relevant learning experiences. Within IRE, authentic learning may involve examining issues such as environmental responsibility, digital ethics, misinformation, academic integrity, social justice, interpersonal conflict, and community service from an Islamic perspective. These contexts require students to move beyond the reproduction of religious propositions toward ethical reasoning and practical decision-making. Such learning experiences can strengthen students' perceptions of the relevance of Islamic teachings to contemporary life. Authentic learning therefore provides a practical mechanism for translating religious knowledge into reflective judgment and responsible action.

The Islamic concept of '*aq*' provides an important epistemological foundation for constructing dialogue between neuroscience and Islamic education. Suyadi (2022) examines the Qur'anic conception of '*aq*' in relation to brain development and higher-order thinking, while Jailani et al. (2021) discuss the relationship between the brain, '*aq*', and Islamic educational thought. Within the Islamic intellectual tradition, reason can function as an instrument for understanding signs, evaluating evidence, interpreting phenomena, and guiding responsible action rather than necessarily being positioned in opposition to revelation. This epistemological orientation creates space for neuroscience to inform educational processes while recognizing that scientific inquiry does not possess exclusive authority over theological and metaphysical questions. Neuroscience may contribute empirical explanations concerning attention, cognition, memory, emotion, and development, whereas the Qur'an and Sunnah provide



theological and ethical orientations concerning the purpose and direction of education. The resulting relationship should therefore be characterized by epistemological complementarity rather than epistemological competition. Such an approach allows scientific evidence and Islamic educational philosophy to interact without reducing either domain to the conceptual framework of the other.

Brain-based learning should accordingly be conceptualized as an evidence-informed pedagogical orientation rather than as a collection of techniques that are assumed to be beneficial simply because they are associated with the brain. Scientifically defensible brain-based pedagogy should be grounded in established principles concerning attention, memory, emotion, motivation, cognitive development, learning readiness, and meaningful engagement. Akbar and Suyadi (2021) demonstrate the relevance of classroom environments and learning conditions within neuroscience-informed educational approaches, while subsequent research has examined the application of brain-based learning directly within Islamic Religious Education. Somantri et al. (2024) reported that brain-based learning contributed to improved IRE learning outcomes while taking students' cognitive stages and educational backgrounds into consideration. These findings suggest that neuroscience-informed pedagogy may provide useful guidance for designing IRE instruction when its principles are translated carefully into pedagogical practice. The theoretical significance lies not in labeling conventional classroom activities as "brain-based," but in aligning instructional decisions with credible evidence concerning how learners process, retain, and apply information.

The intersection between neuroscience and spirituality requires explicit epistemological boundaries to prevent reductionist interpretations of religious experience. Neural activity associated with prayer, meditation, religious emotion, or spiritual practices should not be interpreted as sufficient evidence either for or against the theological reality of those experiences. Neuroscience investigates biological processes and measurable correlates, whereas Islamic theology addresses questions concerning revelation, divine reality, human purpose, transcendence, and ultimate meaning. Consequently, neuroscience-informed Islamic education should reject the assumption that religious experience can be completely explained through neural mechanisms. Its legitimate contribution is to clarify how cognitive and affective processes may influence learning experiences associated with religious knowledge, reflection, worship, and moral development. Maintaining this distinction allows neuroscience to inform pedagogical practice without making unwarranted theological claims. Such epistemological restraint is essential for ensuring that interdisciplinary research remains scientifically credible while respecting the distinctive knowledge claims of Islamic theology.

Spiritual reflection represents a significant point of convergence between cognitive self-regulation and Islamic educational practice. Reflection allows learners to move from receiving information toward examining its meaning, significance, consequences, and relationship to personal conduct. Islamic educational traditions provide established reflective practices through *tafakkur*, *tadabbur*, and *muhasabah*, all of which encourage individuals to contemplate knowledge, revelation, creation, intention, and action. When these practices are connected with metacognitive processes, students can become more conscious of their thoughts, emotions, assumptions, motivations, and behavioral choices. Fleur et al. (2021) demonstrate the importance of cognitive monitoring and regulation, while Naseri et al. (2024) highlight the educational relevance



of spiritual intelligence as a capacity for meaning-making and value-oriented development. The intersection of these perspectives suggests that reflective learning can serve as a central pedagogical mechanism for integrating neuroscience-informed learning with Islamic spiritual formation. IRE should therefore provide structured opportunities for students to evaluate not only what they have learned but also how their learning influences their worldview, intentions, values, and behavior.

Taken together, these theoretical perspectives establish an integrated framework in which meaningful learning, cognitive development, metacognition, spiritual intelligence, and religious character formation are mutually connected. Meaningful learning enables students to organize religious knowledge within existing cognitive structures, while metacognition enables them to monitor and regulate the process through which such knowledge is acquired and applied. Spiritual intelligence provides an existential and ethical orientation through which religious knowledge acquires significance, whereas Islamic concepts such as *'aql*, *muhasabah*, *tafakkur*, and *tadabbur* provide culturally and theologically grounded mechanisms for reflective development. Educational neuroscience contributes complementary evidence concerning attention, memory, emotion, motivation, developmental readiness, and neuroplasticity, while Islamic educational philosophy establishes the normative purposes toward which these processes should be directed (Goldberg, 2022; Jolles & Jolles, 2021; Naseri et al., 2024). The resulting framework is therefore neither a purely neuroscientific model of religious education nor a purely doctrinal model detached from contemporary scientific knowledge. Rather, it represents an integrative approach in which scientifically informed pedagogical processes are deliberately oriented toward the intellectual, spiritual, moral, and social objectives of Islamic Religious Education. This theoretical synthesis provides a robust conceptual basis for investigating how neuroscience-informed pedagogy can enhance the meaningfulness, effectiveness, and transformative potential of IRE in contemporary educational contexts.

Method

This study employed a library research approach because its primary objective was to synthesize and critically interpret existing scholarship rather than collect new empirical data from students or teachers. Library research is appropriate when a study seeks to construct conceptual understanding from existing literature, compare theoretical perspectives, identify patterns, and develop a framework. Snyder (2019) explains that literature review can function as a research methodology when it is conducted systematically and transparently rather than through an ad hoc selection of sources. The present study therefore treats literature as research data rather than merely as background information. The method is particularly appropriate for an emerging topic such as neuroscience-based Islamic Religious Education because the relevant literature is distributed across educational neuroscience, psychology, Islamic education, spirituality, and learning sciences. This interdisciplinary character requires synthesis rather than reliance on a single disciplinary database.

The literature search focused primarily on publications from the last five to ten years, with particular attention to studies published between 2019 and 2026. Older foundational concepts were considered only when they were necessary to explain theories such as meaningful learning or literature-review methodology. Priority was given to peer-reviewed journal articles discussing educational neuroscience,



neuroeducation, brain-based learning, spiritual intelligence, meaningful learning, Islamic Religious Education, religious character, and related educational processes. The search strategy used combinations of terms such as “neuroscience education,” “educational neuroscience,” “neuroeducation,” “Islamic Religious Education,” “Islamic education and neuroscience,” “spiritual intelligence,” “meaningful learning,” and “brain-based learning.” This strategy enabled the study to capture literature from both international educational science and Indonesian Islamic education scholarship. The focus on recent literature was intended to reflect contemporary developments in neuroscience and educational research.

The selection process emphasized relevance, scholarly credibility, conceptual contribution, and direct connection to the research questions. Articles were included when they addressed at least one major component of the study, namely neuroscience and learning, meaningful learning, spiritual intelligence, Islamic education, religious character, or brain-based pedagogy. (Husna et al., 2025) Studies were excluded when their focus was unrelated to educational processes or when they used neuroscience terminology without substantive connection to learning. This procedure prevented the review from becoming a collection of loosely related articles. Snyder (2019) emphasizes that a literature review requires clear boundaries concerning what is included and why. The present study therefore prioritized conceptual relevance over the sheer number of references.

The analysis employed qualitative content analysis and thematic synthesis. Each selected source was read to identify its purpose, methodology, major findings, theoretical assumptions, and educational implications. Relevant findings were then grouped into themes such as neuroplasticity, attention, emotion, memory, motivation, metacognition, meaningful learning, spiritual intelligence, religious character, authentic learning, and Islamic pedagogy. This thematic organization allowed the study to compare literature from different disciplines. Similarities, differences, and conceptual gaps were identified across the themes. The final synthesis was constructed by examining how these themes could be logically integrated into a neuroscience-based Islamic Religious Education framework.

The review also adopted a critical rather than purely descriptive orientation. A descriptive review would merely summarize what individual researchers have said, whereas the present study seeks to explain relationships among the concepts. Snyder (2019) notes that literature reviews can contribute theoretically when they synthesize prior perspectives and identify new conceptual relationships. Accordingly, the analysis asked how neuroscience can contribute to Islamic learning without reducing spirituality to biology. It also asked how spiritual intelligence can be operationalized educationally without being detached from Islamic values. These questions guided the interpretation of the literature and the construction of the proposed framework.

To enhance methodological transparency, the study was informed by principles of systematic literature review reporting, although it was not presented as a formal systematic review or meta-analysis. Page et al. (2021) emphasize the importance of transparent reporting regarding identification, screening, eligibility, and synthesis in systematic reviews. The present library research therefore records its conceptual search boundaries, inclusion focus, thematic analysis, and synthesis procedures. This distinction is important because the study does not claim to calculate pooled effect sizes or provide statistical estimates. Instead, it seeks to produce an integrative conceptual framework



based on converging evidence. The methodological approach can therefore be described as a qualitative integrative literature review within a library research design.

The final stage involved theoretical integration and framework construction. Findings from educational neuroscience were compared with Islamic education literature concerning 'aql, religious character, Qur'anic learning, spiritual intelligence, and meaningful learning. The synthesis produced six interconnected components: brain readiness, focused attention, emotional engagement, meaningful construction, spiritual reflection, and behavioral internalization. These components were then organized as a cyclical rather than strictly linear learning process because meaningful religious learning may require repeated movement between knowledge, reflection, practice, and evaluation. The framework was also examined for conceptual limitations, particularly the risk of overclaiming neuroscientific evidence. The result is therefore presented as a theoretically informed pedagogical framework that requires future empirical validation rather than as an experimentally proven model.

Results and Discussion

Results of the Literature Synthesis

The synthesis of the reviewed literature indicates that neuroscience-informed Islamic Religious Education (IRE) is more appropriately conceptualized as a holistic educational paradigm than as an assemblage of isolated classroom techniques. Across the literature, attention, emotion, motivation, memory, developmental readiness, and meaningful engagement emerge as interconnected conditions that influence the quality of learning. At the same time, scholarship in Islamic education emphasizes faith formation, moral character, spiritual awareness, reflection, and ethical action as essential dimensions of educational achievement. This convergence suggests that educational neuroscience can provide explanatory and pedagogical insights that are compatible with several established objectives of Islamic education, provided that its claims remain within scientifically defensible boundaries (Goldberg, 2022; Jolles & Jolles, 2021). The significance of this finding lies not in the assumption that neuroscience validates Islamic theological propositions, but in the recognition that evidence-informed learning processes can strengthen educational practices that are already central to Islamic pedagogy. Accordingly, neuroscience-informed IRE should be understood as an interdisciplinary approach in which scientific knowledge concerning learning processes supports, rather than replaces, the theological, ethical, and educational foundations of Islam.

The literature further suggests that neuroplasticity provides a compelling theoretical basis for viewing learners as developing individuals rather than as possessing fixed intellectual or behavioral capacities. Experience-dependent neuroplasticity indicates that learning and environmental experiences are associated with changes in neural functioning and organization, while developmental research demonstrates substantial cognitive and neurological changes throughout childhood and adolescence (Goldberg, 2022; van Duijvenvoorde et al., 2022). From the perspective of IRE, these findings imply that religious understanding, moral reasoning, and behavioral dispositions can be cultivated through sustained and meaningful educational experiences. Consequently, educators should avoid permanently categorizing students according to temporary academic performance, religious knowledge, motivation, or classroom behavior. Instead, instruction should provide repeated opportunities for practice,



feedback, reflection, correction, and progressive mastery. This developmental orientation is particularly important in Islamic education because the formation of faith and character is understood as an ongoing process rather than an instantaneous educational outcome.

Attention emerges from the literature as a foundational condition for meaningful religious learning because students cannot adequately process complex information without allocating sufficient cognitive resources to the learning task. Contemporary learners frequently encounter competing stimuli generated by smartphones, social media, multitasking, and rapidly changing digital content, making sustained attention an increasingly important pedagogical concern. Goldberg (2022) identifies attention as a central process through which neuroscience can contribute to educational understanding, particularly in relation to the conditions that facilitate effective learning. In IRE, teachers can respond to this challenge through clearly defined learning objectives, manageable instructional segments, purposeful questioning, contextualized examples, and transitions that maintain conceptual coherence. However, instructional variation should not be equated with continuous stimulation because excessive novelty may itself become a source of distraction. (Ghuni et al., 2025) The educational purpose of attention management is therefore not entertainment but the creation of cognitive conditions that enable students to understand, interpret, and critically reflect upon Islamic knowledge.

Emotional engagement constitutes another significant determinant of meaningful learning because cognition does not operate independently of students' affective experiences, motivation, and perception of relevance. Religious education possesses considerable potential for affective engagement because its subject matter addresses gratitude, compassion, justice, forgiveness, responsibility, hope, identity, and relationships with God and other human beings. Goldberg (2022) emphasizes the interaction between cognitive and affective processes in educational contexts, suggesting that learning experiences become more consequential when students perceive them as meaningful and personally relevant. Nevertheless, emotional engagement in IRE should not be reduced to the production of emotional responses, nor should affective intensity substitute for critical inquiry. Students need opportunities to examine religious ideas rationally, interpret their significance, and consider alternative perspectives while maintaining appropriate respect for religious commitments. (Abdullah et al., 2025) Thus, the educational value of emotion lies in its capacity to support relevance, empathy, motivation, and reflection within an intellectually responsible learning process.

The findings also demonstrate that memorization should be repositioned as a component of religious learning rather than as its definitive outcome. Memorization remains indispensable in IRE because students are expected to retain Qur'anic verses, hadith, theological terminology, historical knowledge, and fundamental religious principles. However, contemporary perspectives on memory emphasize that remembering is an active and reconstructive process closely associated with conceptual understanding and the integration of prior knowledge (Bryce & Blown, 2024). Accordingly, memorization becomes educationally more meaningful when it is accompanied by retrieval, explanation, contextualization, interpretation, and application. Qur'anic memorization, for example, can be strengthened when students simultaneously explore the meanings, ethical implications, historical contexts, and contemporary relevance of the verses they learn. Such an approach does not diminish the importance of memorization; rather, it situates memorized knowledge within a broader process of



comprehension and internalization. The implication for IRE is that successful religious learning should be evaluated not only through accurate recall but also through students' ability to explain and apply what they have learned.

Metacognition provides an additional mechanism through which neuroscience-informed pedagogy can strengthen the depth and independence of religious learning. Metacognition involves learners' awareness of their own cognitive processes and their ability to plan, monitor, and evaluate learning strategies (Fleur et al., 2021). Within Islamic educational practice, these processes can be meaningfully connected with *muhasabah*, *tafakkur*, and *tadabbur*, which encourage individuals to examine understanding, intention, conduct, and personal development. Students can therefore be invited to identify misconceptions, evaluate their reasoning, monitor changes in their understanding, and consider how religious knowledge influences their decisions. Such activities promote learner autonomy because students gradually assume greater responsibility for regulating their own learning. More importantly, the integration of metacognition with Islamic reflective traditions creates a conceptual bridge between cognitive self-regulation and spiritual self-awareness. IRE thus has the potential to cultivate learners who are capable not only of knowing religious concepts but also of critically examining how those concepts shape their understanding and conduct.

The reviewed studies also indicate that spiritual intelligence should be understood as an educational capacity that can be cultivated through structured learning experiences rather than merely as a stable individual characteristic. Research involving Qur'anic memorization, Islamic educational environments, and religious learning activities has reported associations between structured religious experiences and dimensions of spiritual development, including empathy, gratitude, and spiritual awareness (Mughtar et al., 2022; Rahmayani et al., 2022; Harahap et al., 2023). These findings strengthen the argument that educational institutions can contribute meaningfully to students' spiritual development when religious learning is designed intentionally. Nevertheless, spiritual development cannot be reduced to the repetition of rituals or the accumulation of religious information. Students require opportunities to interpret religious teachings, connect them with lived experiences, examine their moral implications, and translate them into responsible action. Spiritual intelligence consequently becomes educationally significant when religious knowledge is transformed into meaning, orientation, and ethical practice.

The relationship between meaningful learning and spiritual intelligence represents a central conceptual contribution of the present synthesis. Meaningful learning enables students to integrate religious concepts with existing cognitive structures, experiences, and knowledge, whereas spiritual intelligence enables them to interpret those concepts in relation to values, purpose, responsibility, and transcendence. (Yahya et al., 2025) When these dimensions operate together, religious knowledge is no longer treated merely as examinable subject matter but becomes a framework through which students understand themselves, other people, and the world. This proposition is consistent with research emphasizing the importance of meaningful conceptual learning and spiritual development in educational contexts (Bryce & Blown, 2024; Naseri et al., 2024). The integration of these dimensions is particularly relevant to IRE because the ultimate educational objective extends beyond the reproduction of religious information toward the formation of informed, reflective, morally responsible, and spiritually grounded



individuals. Therefore, meaningful learning may be regarded as the cognitive pathway through which spiritual intelligence acquires substantive educational expression.

Authentic learning further strengthens the connection between religious knowledge and practical ethical behavior. Authentic learning places students in situations that resemble or directly relate to problems encountered beyond formal instructional settings, thereby requiring them to apply knowledge to meaningful contexts (Nachtigall et al., 2022). In IRE, such contexts may include academic dishonesty, cyberbullying, environmental degradation, intolerance, consumerism, misinformation, social inequality, and interpersonal conflict. Students can investigate these issues using Qur'anic principles, prophetic traditions, Islamic ethical reasoning, and contemporary evidence before developing possible responses. This process requires students to move beyond recalling normative statements toward interpreting principles, evaluating circumstances, and making ethically justified decisions. Authentic learning therefore provides an important mechanism for transforming religious knowledge into practical competence. Its contribution to IRE lies in demonstrating that Islamic teachings are not merely historical or doctrinal information but resources for addressing contemporary human and social challenges.

The teacher occupies a strategically important position within neuroscience-informed IRE because scientific principles do not automatically translate into effective classroom practice. Teachers require sufficient neuroscientific literacy to distinguish empirically supported principles from oversimplified claims and popular neuromyths. Jolles and Jolles (2021) emphasize the importance of educators' capacity to interpret neuroscientific evidence appropriately, particularly because neuroscience findings are often transferred into educational contexts without sufficient methodological caution. In IRE, this competency becomes even more important because teachers must simultaneously negotiate scientific evidence, Islamic educational philosophy, religious content, and students' developmental characteristics. The teacher's role therefore extends beyond transmitting information to designing learning environments that facilitate attention, meaningful engagement, memory, reflection, and ethical application. Teacher professional development should consequently emphasize the pedagogical interpretation of evidence rather than the superficial acquisition of neuroscience terminology.

The learning environment also constitutes an important component of neuroscience-informed IRE because physical and psychosocial conditions can influence students' readiness to engage with learning. Classroom organization, sensory stimulation, interpersonal relationships, psychological safety, and instructional atmosphere may affect students' capacity to maintain attention and participate meaningfully. Akbar and Suyadi (2021) demonstrate the relevance of learning-environment considerations within neuroscience-informed Islamic educational perspectives. A supportive IRE environment should therefore minimize unnecessary distractions while simultaneously allowing students to ask questions, acknowledge uncertainty, engage in dialogue, and examine complex ethical issues. Psychological safety is particularly important because religious discussions can involve deeply held beliefs and personal experiences. Creating an intellectually respectful and emotionally supportive environment can consequently strengthen students' willingness to engage critically without experiencing unnecessary social or psychological threat.



Developmental differentiation represents another important implication of the synthesis because learners differ in their cognitive, emotional, and social readiness for particular forms of religious reasoning. Developmental neuroscience demonstrates that childhood and adolescence involve substantial changes in executive functioning, self-regulation, abstract reasoning, and social cognition, accompanied by considerable individual variation (van Duijvenvoorde et al., 2022). Consequently, IRE instruction should not assume that all students can engage with identical levels of abstraction, argumentation, or independent reflection. Younger learners may benefit from concrete examples, narratives, repetition, modeling, and guided practice, whereas adolescents can increasingly engage in abstract theological reasoning, ethical dilemmas, argument analysis, and independent reflection. Developmental differentiation should not be interpreted as lowering educational standards or expectations. Rather, it represents a strategy for establishing developmentally appropriate pathways through which all learners can progress toward rigorous and meaningful educational objectives.

The integration of *'aql* and spirituality provides an important conceptual basis for connecting contemporary neuroscience with Islamic educational thought. Suyadi (2022) demonstrates that the Qur'anic conception of *'aql* can be examined in relation to cognitive development, reasoning, reflection, and higher-order thinking, while related scholarship has explored the relationship between brain processes, *'aql*, and Islamic education. From this perspective, human reasoning is not necessarily positioned in opposition to revelation but can function as an instrument for understanding knowledge, interpreting signs, evaluating evidence, and guiding action. Neuroscience can contribute empirical descriptions of cognitive processes, whereas Islamic epistemology provides normative and theological direction concerning the purposes for which human reasoning should be employed. This relationship allows the two domains to interact without requiring either to become subordinate to the conceptual assumptions of the other. The integration of *'aql*, cognitive science, and Islamic spirituality therefore provides an intellectually productive basis for developing contemporary IRE while maintaining its distinctive epistemological identity.

Empirical evidence concerning brain-based learning also provides preliminary support for the pedagogical relevance of neuroscience-informed approaches in IRE. Somantri et al. (2024) reported that brain-based learning contributed to improved Islamic Religious Education learning outcomes while taking students' cognitive stages and educational backgrounds into consideration. This finding suggests that pedagogical strategies informed by principles of cognitive readiness, attention, engagement, and learning processes may produce measurable educational benefits. Nevertheless, learning outcomes in Islamic education should not be narrowly defined as performance on cognitive examinations. The broader purposes of IRE include moral development, spiritual awareness, ethical decision-making, and the ability to translate religious knowledge into behavior. Consequently, the significance of brain-based learning should be evaluated through a multidimensional conception of educational achievement that incorporates cognitive, affective, spiritual, and behavioral outcomes. This broader interpretation prevents neuroscience-informed IRE from becoming merely another strategy for improving test performance.

Psychological well-being also emerges as an important condition for the effectiveness of neuroscience-informed IRE. Students' capacity to attend, regulate emotion, engage with learning, and persist in challenging tasks may be influenced by



stress, social pressure, emotional difficulties, and the quality of interpersonal relationships. Raniya et al. (2025) emphasize the relevance of students' psychological well-being within neuroscience-informed Islamic learning, suggesting that educational effectiveness cannot be separated from learners' emotional and psychological conditions. This perspective challenges interpretations of disengagement that attribute students' difficulties exclusively to laziness, low motivation, or insufficient religious commitment. Teachers should instead consider whether instructional demands, social environments, emotional states, or contextual factors are interfering with students' capacity to participate effectively. (Mukhlis et al., 2025) Incorporating compassion, psychological safety, supportive relationships, and appropriate academic expectations can therefore strengthen both the humanistic and pedagogical dimensions of IRE.

Despite the growing body of literature, important limitations remain in the empirical development of neuroscience-informed Islamic education. A considerable proportion of existing scholarship remains conceptual, theoretical, or qualitative, while relatively few studies employ longitudinal designs, standardized measures, controlled interventions, or direct neuroscientific methodologies. Consequently, claims that particular Islamic educational practices produce specific neural changes should be treated cautiously unless supported by appropriate empirical evidence. Current literature provides a theoretically plausible basis for connecting attention, memory, emotion, reflection, and developmental processes with Islamic educational outcomes, but it does not justify deterministic conclusions concerning brain development. This limitation is consistent with broader concerns regarding the inappropriate transfer of neuroscientific findings into educational practice (Jolles & Jolles, 2021). Future research should therefore employ more rigorous mixed-method, longitudinal, quasi-experimental, and, where scientifically appropriate, neuroscientific designs to test the proposed relationships systematically.

The synthesis further indicates that neuroscience-informed IRE should be conceptualized as a cyclical rather than linear learning process. Religious learning does not necessarily proceed from information transmission to memorization and finally to assessment in a single direction. Instead, students may move repeatedly among attention, conceptual understanding, emotional engagement, reflection, application, feedback, and reconstruction of prior understanding. Such a process is compatible with contemporary perspectives on the dynamic nature of learning and memory as well as with Islamic practices of learning, reflection, practice, and self-evaluation (Bryce & Blown, 2024; Fleur et al., 2021). For example, a student may initially understand a Qur'anic principle at a conceptual level, encounter a real-world ethical dilemma, reconsider the principle through reflection, and subsequently develop a more sophisticated understanding. The cyclical model therefore recognizes learning as an evolving process in which experience and reflection continuously reshape understanding. This orientation is particularly appropriate for IRE because religious formation involves continuing interaction between knowledge, reflection, practice, and moral development.

The multidimensional nature of spiritual intelligence also requires corresponding approaches to educational assessment. Religious knowledge and examination performance alone cannot adequately represent students' spiritual or moral development because cognitive achievement does not necessarily translate directly into ethical behavior. A student may demonstrate strong knowledge of religious doctrines while experiencing difficulties in applying those principles to interpersonal or social

situations. Conversely, students may demonstrate empathy, reflection, and ethical sensitivity without possessing equally advanced theological vocabulary. Research linking spiritual intelligence with educational outcomes supports the need to recognize spiritual development as a multidimensional construct rather than a single measurable variable (Naseri et al., 2024). Accordingly, IRE assessment should incorporate cognitive understanding, reflective writing, authentic problem solving, self-assessment, behavioral observation, collaborative activities, and performance-based tasks. Such an assessment model would better reflect the holistic educational purposes of Islamic education while reducing the tendency to equate memorization with spiritual maturity.

Digital transformation adds another layer of complexity to neuroscience-informed IRE because contemporary religious learning increasingly occurs within digitally mediated environments. Students encounter Qur'anic interpretations, religious lectures, short-form videos, social-media commentary, and AI-generated content alongside authoritative scholarly sources. From a cognitive perspective, such environments require learners to regulate attention, evaluate information, distinguish relevance from distraction, and construct coherent knowledge from potentially conflicting sources. Neuroscience-informed IRE should therefore incorporate critical digital literacy alongside religious literacy, enabling students to assess source credibility, contextualize religious claims, identify misinformation, and reflect on how digital platforms influence attention and belief formation. This approach extends neuroscience-informed pedagogy beyond the physical classroom and situates IRE within the actual information environments inhabited by contemporary learners.

Digital competence consequently becomes part of responsible religious learning rather than a separate technical skill. The overall synthesis demonstrates that neuroscience-informed Islamic Religious Education requires an integrated framework connecting cognitive processes, emotional engagement, meaningful learning, spiritual reflection, and behavioral practice. The reviewed literature does not support treating these dimensions as independent educational components because attention influences engagement, emotion influences motivation, prior knowledge influences understanding, reflection influences internalization, and practice provides opportunities for knowledge to become behavior. Educational neuroscience contributes explanatory insights concerning how learning conditions may facilitate these processes, while Islamic educational thought establishes the normative direction toward which they should be oriented (Goldberg, 2022; Suyadi, 2022). Accordingly, the framework proposed in this study conceptualizes cognitive and developmental readiness as foundational conditions, attention and emotional engagement as enabling mechanisms, meaningful learning as the principal cognitive process, metacognitive and spiritual reflection as mechanisms of internalization, and ethical practice as the behavioral manifestation of learning. Reflection then functions recursively by informing subsequent learning, thereby producing a continuous cycle of understanding, application, evaluation, and transformation. This integrated framework constitutes the principal conceptual contribution of the study because it positions neuroscience not as a replacement for Islamic pedagogy but as a complementary scientific foundation for strengthening the cognitive, spiritual, moral, and practical dimensions of contemporary Islamic Religious Education. This cyclical framework constitutes the principal conceptual contribution of the study.

Table 01 Proposed Neuroscience-Based Islamic Religious Education Framework



Dimension	Neuroscientific Principle	Islamic Educational Orientation	Learning Strategy	Expected Student Development
Brain readiness	Developmental readiness and neuroplasticity	<i>Fitrah</i> and human potential	Developmentally appropriate instruction	Learning readiness
Focused attention	Attention regulation	<i>Tafakkur</i> and concentration	Focused questions, short learning cycles, guided observation	Sustained attention
Emotional engagement	Emotion–cognition interaction	Love, gratitude, hope, compassion, <i>khauf</i>	Stories, cases, reflective dialogue	Emotional connection
Meaning construction	Prior knowledge and conceptual integration	‘Aql, understanding, <i>tadabbur</i>	Concept mapping, questioning, contextualization	Deep understanding
Memory consolidation	Repetition and retrieval	Memorization with comprehension	Retrieval practice, <i>muraja‘ah</i> , explanation	Durable knowledge
Metacognition	Monitoring and regulation	<i>Muhasabah</i>	Learning journals, self-assessment	Self-awareness
Spiritual reflection	Meaning-making and value orientation	<i>Iman</i> , <i>ihsan</i> , worship, transcendence	Qur’anic reflection and reflective questioning	Spiritual intelligence
Authentic application	Learning through meaningful experience	‘Amal, akhlaq, social responsibility	Projects and ethical problem solving	Value application
Behavioral internalization	Repeated experience and habit formation	Akhlaq and righteous action	Consistent practice and feedback	Religious character
Continuous reflection	Adaptive learning and self-regulation	<i>Muhasabah</i> and lifelong learning	Reflection–action cycles	Sustainable development

The proposed framework conceptualizes neuroscience-informed Islamic Religious Education (IRE) as a developmental process that begins with recognition of students as dynamic learners whose cognitive, emotional, social, and spiritual capacities continue to evolve. Rather than assuming that learners possess fixed abilities, the



framework emphasizes developmental readiness, prior knowledge, emotional condition, and individual differences as important considerations in instructional planning. Contemporary developmental neuroscience indicates that childhood and adolescence involve substantial changes in cognitive and emotional functioning, while neuroplasticity provides a scientific basis for understanding learning as a process capable of producing enduring developmental change (Goldberg, 2022; van Duijvenvoorde et al., 2022). Within Islamic educational thought, this developmental orientation can be placed in dialogue with the concept of *fitrah*, understood as a theological conception of human potential and disposition rather than as a direct equivalent of any particular neurological structure. (Bakr et al., 2025) Maintaining this distinction is essential because it prevents theological concepts from being reduced to biological mechanisms while simultaneously allowing scientific knowledge to inform pedagogical practice. Accordingly, the framework begins from the principle that effective IRE should respond to students' developmental and learning conditions while maintaining the normative orientation of Islamic educational philosophy.

Within this developmental foundation, focused attention functions as a critical pedagogical condition for meaningful religious learning. Students cannot adequately process, interpret, and integrate complex religious concepts when their cognitive resources are continuously disrupted by irrelevant stimuli or competing demands. Educational neuroscience identifies attention as a fundamental process involved in selecting and sustaining engagement with information relevant to learning (Goldberg, 2022). In IRE, teachers can strengthen attentional engagement by formulating explicit learning intentions, organizing information coherently, posing purposeful questions, and alternating carefully between explanation, discussion, application, and reflection. The Islamic intellectual tradition provides a complementary conceptual perspective through *tafakkur*, which emphasizes deliberate contemplation and attentive engagement with meaning. Thus, attention in IRE should be regarded not merely as a cognitive prerequisite but also as an enabling condition through which students can move from receiving religious information toward reflective understanding.

Emotional engagement constitutes a further component of the framework because students' interpretation of religious knowledge is influenced by affective relevance, motivation, personal experience, and interpersonal relationships. Religious concepts become more meaningful when learners can connect them with experiences involving empathy, gratitude, hope, justice, responsibility, and moral concern. Neuroscience-informed educational perspectives emphasize the interaction between cognitive and emotional processes in shaping engagement and learning (Goldberg, 2022). For example, instruction concerning honesty can be connected with authentic situations involving academic cheating, plagiarism, manipulation of digital information, or concealment of mistakes, allowing students to examine both the emotional consequences and ethical dimensions of such behavior. The teacher can subsequently guide students toward relevant Islamic principles and encourage them to evaluate how those principles apply to the situation. (Nabriz et al., 2025) Emotional engagement should therefore function as an entry point for deeper religious reasoning rather than as a substitute for rational analysis.

Meaningful construction represents the cognitive process through which students integrate new Islamic knowledge with existing knowledge and experience. Learners approach religious concepts with previously formed assumptions, experiences,

values, and conceptual frameworks that inevitably influence how new information is interpreted. Contemporary perspectives on meaningful learning emphasize the importance of prior knowledge and conceptual integration in the development of deeper understanding (Bryce & Blown, 2024). In an IRE lesson on *tawakkul*, for instance, teachers may begin by exploring students' existing conceptions of effort, uncertainty, dependence, and trust in Allah before distinguishing *tawakkul* from passivity or resignation. Concept mapping, Socratic questioning, case analysis, comparison, and contextual examples can subsequently be used to facilitate conceptual restructuring. Through this process, religious knowledge becomes integrated into students' cognitive frameworks rather than remaining a collection of disconnected propositions.

The consolidation of religious knowledge requires an appropriate balance between memorization, retrieval, comprehension, and application. Memorization remains an important element of Islamic education, particularly in relation to Qur'anic verses, hadith, religious terminology, supplications, and foundational principles. Nevertheless, contemporary research on memory suggests that retention becomes educationally more meaningful when information is repeatedly retrieved, conceptually connected, and applied within appropriate contexts (Bryce & Blown, 2024). Within this framework, *murāja'ah* may be interpreted pedagogically as a structured practice of repeated retrieval, although it should not be reduced to or presented as a direct equivalent of a specific neurological mechanism. Students can be asked to recall a verse and subsequently explain its meaning, identify its ethical implications, compare interpretations, or apply its principles to contemporary situations. Such integration strengthens the relationship between retention and understanding while preserving the pedagogical and religious significance of memorization. The framework therefore positions memory consolidation as a bridge between the preservation of religious knowledge and its meaningful utilization.

Metacognition and *muhasabah* constitute a particularly important point of convergence between contemporary learning theory and Islamic educational practice. Metacognition enables learners to become aware of their cognitive processes, monitor their progress, evaluate their strategies, and regulate subsequent learning activities (Fleur et al., 2021). Within Islamic education, these processes can be complemented by *muhasabah*, through which individuals critically examine their intentions, understanding, actions, and personal development. In practical terms, students may maintain reflective journals containing questions such as, "Which religious principle challenged my previous understanding?" or "What aspect of my behavior should change following this learning experience?" Such activities encourage students to identify discrepancies between what they know and how they act. Consequently, metacognition can function as a contemporary pedagogical mechanism that complements Islamic traditions of self-examination and moral accountability.

Spiritual reflection provides the mechanism through which religious knowledge can acquire personal, existential, and ethical significance. Learning about religious concepts does not necessarily result in internal transformation unless students are provided with opportunities to contemplate what those concepts mean for their worldview, values, intentions, and actions. Islamic educational traditions provide rich resources for this process through practices such as *tadabbur*, *tafakkur*, and *muhasabah*. Research concerning spiritual intelligence further indicates the importance of meaning-making and value-oriented reflection within students' educational development (Naseri

et al., 2024). In IRE, spiritual reflection may take the form of guided contemplation, reflective writing, discussion of Qur'anic passages, analysis of prophetic examples, or structured reflection following authentic learning activities. The teacher should facilitate this process without prescribing students' personal emotional responses, thereby creating space for sincere and intellectually responsible reflection. Through such practices, spiritual intelligence becomes connected to the interpretation and application of religious knowledge rather than being treated as an abstract educational construct.

Authentic application represents the point at which religious understanding is translated into action within meaningful contexts. Islamic education achieves greater transformative potential when students are required to use religious principles to interpret and respond to actual problems rather than merely reproduce information during examinations. Authentic learning research demonstrates that contextually meaningful tasks can strengthen cognitive engagement and motivation by requiring learners to apply knowledge to situations that resemble real-world challenges (Nachtigall et al., 2022). An environmental project, for example, may connect Islamic principles of stewardship with waste reduction, water conservation, or responsible consumption within the school environment. Similarly, a digital ethics project may require students to evaluate the dissemination of unverified religious information using principles of honesty, responsibility, and verification. Such activities enable students to demonstrate whether religious knowledge can be transferred beyond the classroom. Authentic application therefore provides a critical bridge between conceptual understanding, ethical reasoning, and socially responsible behavior.

Behavioral internalization constitutes an important outcome because religious learning cannot be considered fully transformative when students can articulate moral values but consistently fail to enact them. Internalization involves repeated opportunities to practice values, receive constructive feedback, observe credible role models, and evaluate the consequences of behavior. Research on character formation in Islamic education suggests that religious values become educationally significant when they are connected with meaningful experiences and repeated behavioral practice (Asman et al., 2021; Huda, 2022). Teachers can therefore establish classroom routines that reinforce honesty, respect, responsibility, cooperation, compassion, and accountability while simultaneously modeling these values in their own conduct. Repeated value-consistent behavior may contribute to the stabilization of desirable behavioral patterns over time. However, such pedagogical reasoning should not be extended into deterministic claims that particular classroom practices necessarily produce specific neural changes, because such claims require direct empirical evidence.

Continuous reflection completes the learning cycle by enabling students to evaluate the consequences of their learning and identify directions for subsequent development. (Begum et al., 2025) Educational learning should not terminate with formal assessment because the acquisition of religious knowledge requires continuing processes of interpretation, practice, evaluation, and reconstruction. Self-regulated learning perspectives emphasize the cyclical relationship among planning, monitoring, performance, and reflection, while Islamic educational traditions provide a parallel through *muhasabah* and reflective self-evaluation (Fleur et al., 2021). Students may therefore review what they understood, how they applied particular principles, what difficulties they encountered, and which behaviors require further improvement. Reflection subsequently informs the next stage of learning, producing a recursive

relationship between knowledge, action, and evaluation. The framework consequently conceptualizes IRE as a continuous process of cognitive and spiritual development rather than as a linear sequence ending with examination.

The distinctive contribution of the proposed framework lies in its treatment of spirituality as an integral dimension of learning rather than an additional component appended to cognitive instruction. Conventional interpretations of brain-based learning may focus primarily on cognitive processes such as attention, memory, motivation, and information processing, whereas Islamic education requires these processes to be oriented toward faith, moral responsibility, character, and spiritual development. Educational neuroscience can explain conditions that may facilitate learning, but it cannot determine the theological purposes or moral values that education should pursue (Jolles & Jolles, 2021). Islamic theology and educational philosophy therefore provide the normative orientation of the framework, while neuroscience contributes complementary knowledge concerning learning and development. This relationship avoids both scientism, which would reduce educational purposes to biological processes, and anti-scientific isolation, which would disregard relevant empirical knowledge. The proposed model is consequently best understood as an interdisciplinary synthesis in which scientific understanding serves the broader intellectual, moral, and spiritual objectives of Islamic education.

The implementation of this framework has significant implications for teacher professional competence because neuroscience-informed IRE requires teachers to integrate several domains of expertise simultaneously. Teachers need sufficient knowledge of basic educational neuroscience to understand concepts such as attention, memory, cognitive development, emotional regulation, and neuroplasticity, but they also require strong competence in Islamic pedagogy and religious scholarship. Jolles and Jolles (2021) emphasize that educators require adequate neuroscientific literacy to interpret research responsibly and avoid transferring unsupported claims into classroom practice. In the context of IRE, teachers must additionally be able to interpret religious texts, facilitate ethical discussion, construct authentic learning experiences, guide reflection, and evaluate holistic learning outcomes. Teacher development should therefore integrate neuroscientific literacy with Islamic educational methodology rather than treating neuroscience as a separate technical subject. The objective is not to transform Islamic teachers into neuroscientists but to equip them with the conceptual competence necessary to make pedagogical decisions consistent with credible evidence about learning and development.

The framework also requires a broader conception of assessment because conventional written examinations and memorization tasks cannot adequately capture the multidimensional objectives of Islamic Religious Education. Cognitive assessment remains important for determining students' understanding of Qur'anic concepts, hadith, Islamic history, theology, and ethical principles, but cognitive achievement alone cannot demonstrate spiritual reflection, moral reasoning, or behavioral internalization. Research on spiritual intelligence emphasizes the multidimensional character of spiritual development and its relationship with broader educational outcomes (Naseri et al., 2024). Accordingly, written examinations can be complemented by reflective journals, portfolios, authentic projects, ethical case analysis, observation, self-assessment, and performance-based assessment. Such instruments can examine whether students understand religious concepts, interpret their significance, apply them to authentic



situations, and evaluate their own development. A multidimensional assessment system would therefore provide a more valid representation of the holistic educational purposes of IRE.

Curriculum design should similarly reflect the interconnected nature of cognitive, spiritual, ethical, and practical learning. Religious topics should not be presented exclusively as isolated units of doctrinal content but should be connected with questions and situations that students encounter within contemporary life. (Rohman & Munawaroh, 2025) For example, *akhlaq* can be connected with digital citizenship, academic integrity, environmental responsibility, interpersonal relationships, and social justice, while Qur'anic studies can incorporate contextual interpretation, ethical reasoning, and reflective inquiry alongside memorization. Islamic history can likewise be connected with questions of leadership, social responsibility, intellectual development, and community transformation. Such integration is consistent with meaningful learning because students are able to relate new concepts to existing experiences and contemporary concerns (Bryce & Blown, 2024). The curriculum consequently becomes a medium through which religious knowledge is interpreted and applied rather than merely transmitted. This orientation can strengthen the relevance of IRE for students living within increasingly complex social and technological environments.

Psychological safety constitutes another important condition for implementing the framework because meaningful religious learning requires students to participate in dialogue, acknowledge uncertainty, and examine their own assumptions. Students should be able to raise questions concerning religious concepts without fear of ridicule, humiliation, or premature judgment. (Uyun, 2025) Psychological safety does not require educators to treat all interpretations as equally valid; rather, it creates an environment in which claims can be examined respectfully through evidence, reasoning, and appropriate religious sources. Research concerning psychological well-being in neuroscience-informed Islamic education emphasizes the importance of students' emotional conditions for meaningful engagement (Raniya et al., 2025). A supportive environment may also strengthen metacognitive development because students are more willing to acknowledge misunderstanding and revise their thinking when intellectual vulnerability is not socially punished. In this respect, respectful questioning becomes an indicator of intellectual maturity and educational engagement rather than evidence of deficient religious commitment.

The framework has particular relevance to the digital environment in which contemporary students increasingly encounter religious information. Social media, video-sharing platforms, online lectures, digital libraries, search engines, and generative artificial intelligence have expanded access to religious content while simultaneously increasing exposure to misinformation, decontextualized interpretations, emotional manipulation, and unverified claims. Neuroscience-informed IRE should therefore cultivate students' ability to regulate attention, evaluate sources, recognize persuasive strategies, compare competing claims, and delay impulsive responses to emotionally provocative content. These cognitive competencies should be integrated with Islamic ethical principles concerning truthfulness, responsibility, verification, and avoidance of harm. The resulting approach connects digital literacy with religious literacy rather than treating them as separate educational competencies. Consequently, students are prepared not only to access religious information but also to evaluate and use it responsibly within contemporary digital environments.



The framework may also contribute to the development of educational strategies that promote religious moderation and resilience against rigid or exclusionary forms of religious reasoning. Religious education that emphasizes reflection, contextual understanding, emotional regulation, empathy, and critical engagement can create opportunities for students to examine religious claims rather than merely reproduce them. Listiana (2021) discusses the potential contribution of spiritual-neuroscience perspectives to Islamic educational approaches addressing deradicalization, particularly through attention to cognitive and spiritual dimensions of religious development. From the perspective of the present framework, authentic cases involving intolerance, dehumanization, discrimination, or online religious polarization can be examined through Islamic ethical principles and evidence-based reasoning. Such learning encourages students to distinguish religious commitment from hostility toward others. The objective is not to weaken religious conviction but to cultivate a form of religious understanding characterized by intellectual maturity, ethical responsibility, contextual awareness, and respect for human dignity.

Student well-being should likewise be treated as an integral condition of effective neuroscience-informed IRE rather than as an issue external to academic learning. Students experiencing excessive stress, fear, shame, social pressure, or emotional insecurity may experience difficulties in sustaining attention, regulating emotion, and engaging deeply with instructional activities. Raniya et al. (2025) emphasize the relevance of psychological well-being within neuroscience-informed Islamic education, supporting the view that educational effectiveness must be considered alongside students' psychological conditions. Islamic pedagogy can respond to this concern by emphasizing educational approaches grounded in compassion, dignity, hope, patience, responsibility, and balanced expectations. Such an orientation does not imply lowering academic or religious standards; rather, it establishes humane conditions under which students can pursue those standards constructively. A supportive IRE environment can consequently strengthen the cognitive, emotional, spiritual, and social conditions required for meaningful learning.

The proposed framework should ultimately be regarded as a developing conceptual model that requires systematic empirical examination rather than as a definitive causal explanation of Islamic learning. Existing scholarship provides theoretically plausible relationships among educational neuroscience, meaningful learning, spiritual intelligence, metacognition, character formation, and religious education, but important empirical gaps remain. Much of the existing literature is conceptual or qualitative, while longitudinal, quasi-experimental, mixed-method, and design-based investigations remain comparatively limited. Future research should therefore examine whether implementation of the framework produces measurable improvements in meaningful learning, retention, spiritual intelligence, ethical behavior, academic achievement, and student well-being. Where methodologically justified and ethically appropriate, cognitive, physiological, or other objective measures may complement educational and psychological data, although such measures should not be interpreted as direct indicators of faith or spiritual truth. Rigorous empirical testing would enable researchers to identify which components of the framework are most effective, under what educational conditions they operate, and how they should be adapted across different Islamic educational contexts. Such research would transform



the proposed framework from a theoretically integrated model into an empirically refined contribution to contemporary Islamic Religious Education.



Conclusion

Neuroscience-based Islamic Religious Education offers a promising framework for transforming religious learning from predominantly information-oriented instruction toward holistic cognitive, emotional, spiritual, and behavioral development. The literature reviewed in this study demonstrates that attention, emotion, motivation, memory, neuroplasticity, metacognition, and meaningful construction are central to effective learning, while Islamic education contributes the theological and ethical orientation necessary to direct these processes toward faith, *ihsan*, akhlaq, responsibility, and meaningful living. Spiritual intelligence is strengthened when students are given opportunities to connect religious knowledge with personal experience, authentic problems, reflection, worship, ethical decision-making, and continuous self-evaluation. Meaningful learning becomes stronger when religious concepts are connected with prior knowledge, emotionally relevant experiences, contextual problems, and authentic action. The principal novelty of this study is the formulation of an integrative Neuroscience-Based Islamic Religious Education Framework consisting of brain readiness, focused attention, emotional engagement, meaningful construction, memory consolidation, metacognition, spiritual reflection, authentic application, behavioral internalization, and continuous reflection. The framework positions neuroscience as a supporting scientific perspective rather than as a replacement for Islamic epistemology and theology. It also positions spiritual intelligence not as an additional educational outcome but as an integral dimension of meaningful religious learning. Nevertheless, the framework remains conceptual because the majority of relevant studies are qualitative, theoretical, or literature-based. Future research should empirically test its effectiveness across Islamic schools, madrasahs, pesantren, and higher education contexts using rigorous longitudinal and mixed-method designs.



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