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Learning Taxonomy of Islamic Education: The Development of *Aql* and the Brain in Quran from a Neuroscience Perspective

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Abstract

The hierarchical thinking concept in the Islamic education field is based on theological and philosophical beliefs. Up to now, this concept is not yet proven scientifically and neurobiologically. As a result, Islamic education does not yet have a learning taxonomy that accommodates the effective and spiritual aspects of developing students' intellectual potential. Consequently, it forced its system to apply Bloom's taxonomy which focuses only on the cognitive part. With the rising of new theories, especially neuro-theology, neuro-philosophy, and neuro-education, emerge the opportunities to connect hierarchical thinking in Islamic education with these three theories. This research aims to compile a learning taxonomy of Islamic education based on neuroscience, accommodating the emotional, intellectual, and spiritual aspects. This research is a systematic review, which integrates, interprets, and synthesizes the hierarchical thinking concept with neuro-theology, neuro-philosophy, and neuro-education. The result shows that hierarchical thinking in Islamic education has neuro-physiological with six brain components: temporal lobe, parietal association cortex-temporal-occipital, limbic system, cingulate gyrus, prefrontal context, and prefrontal association cortex. These six components of the brain have relevance to hierarchical thinking and bloom taxonomy, namely remember (dzikir), understand (nazhr), apply ('ilm-amal), evaluate (muhasabah); analyze (fikr), and create (ijtihad). Thus, the brain's six components and hierarchical thinking can be narratively synthesized into a learning taxonomy of Islamic education. In the future, this finding could become theoretical discourse because hierarchical thinking, neuro-theology, neuro-philosophy, and neuro-education emerge the further development of learning taxonomy in Islamic education.

Keywords: *Hierarchical thinking; learning taxonomy; Islamic education; and neuroscience*

Taksonomi Pembelajaran dalam Pendidikan Islam: Pengembangan Akal dan Otak dalam Al-Qur'an dari Perspektif Neurosains

Abstrak

Konsep pemikiran hierarkis dalam bidang pendidikan Islam didasarkan pada keyakinan teologis dan filosofis. Sampai saat ini, konsep ini belum terbukti secara ilmiah dan neurobiologis. Akibatnya, pendidikan Islam belum memiliki taksonomi pembelajaran yang mengakomodasi aspek efektif dan spiritual dalam mengembangkan potensi intelektual peserta didik. Akibatnya, memaksa sistemnya untuk menerapkan taksonomi Bloom yang hanya berfokus pada bagian kognitif. Munculnya teori-teori baru, khususnya neuro-teologi, neuro-filsafat dan neuro-edukasi, membuka peluang untuk menghubungkan pemikiran hierarkis dalam pendidikan Islam dengan ketiga teori tersebut. Penelitian ini bertujuan untuk menyusun taksonomi pembelajaran pendidikan Islam berbasis neurosains, yang mengakomodasi aspek emosional, intelektual, dan spiritual. Penelitian ini merupakan tinjauan sistematis, yang mengintegrasikan, menafsirkan, dan mensintesis konsep berpikir hierarkis dengan neuro-teologi, neuro-filsafat, dan neuro-edukasi. Hasil penelitian menunjukkan bahwa pemikiran hierarkis dalam pendidikan Islam memiliki neuro-fisiologis dengan enam komponen otak: lobus temporal, korteks asosiasi parietal-temporal-oksipital, sistem limbik, cingulate gyrus, konteks prefrontal, dan korteks asosiasi prefrontal. Keenam komponen otak ini memiliki relevansi dengan hierarki berpikir dan berkembang taksonomi, yaitu mengingat (*dzikir*), memahami (*nazhr*), menerapkan (*'ilm-amal*), mengevaluasi (*muhasabah*); menganalisis (*fikr*), dan menciptakan (*ijtihad*). Dengan demikian, enam komponen otak dan hierarki berpikir dapat disintesis secara naratif menjadi taksonomi pembelajaran pendidikan Islam. Di masa depan, temuan ini dapat menjadi wacana teoritis karena pemikiran hierarkis, neuro-teologi, neuro-filsafat, dan neuro-edukasi muncul sebagai pengembangan lebih lanjut dari taksonomi pembelajaran dalam pendidikan Islam.

Kata kunci: *Hierarki berpikir; taksonomi belajar; pendidikan Islam; neurosains*

INTRODUCTION

There is a dichotomy between Islamic philosophical and theological perspectives with neuroscience toward research on the human's mind. On the one hand, the mind is seen as a spiritual entity that functions normatively, while the brain is considered a biological organ that serves mechanically.[1] On the other hand, some interpreters associated the mind with something negative, such as "devil mind" and other negative connotations. Meanwhile, in the neuroscience field, the mind is seen as an essential part of the human body that functions to think critically, be creative, and be innovative.[2] Some interpreters stated that the brain functions as the mind. Meanwhile, neuroscience scholars said that the brain functions to think.[3] However, up to now, there is no interdisciplinary, multidisciplinary, and transdisciplinary studies that combine Islamic theology and neuroscience.[4] As a result, Islamic education does not have a thinking taxonomy based on the Quran. Practically, Islamic education applied Bloom's taxonomy, which is irrelevant to the Islamic education field. If Islamic education does not find an alternative to replace this

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[1] Muhammad Faiz Rofdli and Suyadi, "Tafsir Ayat-Ayat Neurosains ('Aql Dalam Al-Qur'an Dan Relevansinya Terhadap Pengembangan Berpikir Kritis Dalam Pendidikan Islam) [Interpretation of Neuroscience Verses ('Aql in the Qur'an and Its Relevance to the Development of Critical Thinking in Islamic Education)]," *Jurnal At-Tibyan: Jurnal Ilmu Alqur'an Dan Tafsir* 5, no. 1 (2020): 134–52, https://doi.org/10.32505/at-tibyan.v5i1.1399.

[2] Ahmat Miftakul Huda and Suyadi, "Otak Dan Akal Dalam Kajian Al-Quran Dan Neurosains [Brain and Reason in the Study of the Qur'an and Neuroscience]," *Jurnal Pendidikan Islam Indonesia* 5, no. 1 (2020): 67–79, https://doi.org/10.35316/jpii.v5i1.242.

[3] Mulizar, "Hermeneutika Sebagai Metode Baru Dalam Menafsirkan Al-Qur'an [Hermeneutics as a New Method in Interpreting the Qur'an]," *Jurnal At-Tabaan* 2, no. 2 (2017): 159–77, https://doi.org/10.32505/at-tibyan.v2i2.386; Syafieh, "Perkembangan Tafsir Falsafi Dalam Ranah Pemikiran Islam [The Development of Falsafi Interpretation in the Realm of Islamic Thought]," *Jurnal At-Tibyan* 2, no. 2 (2017): 140–58, https://doi.org/10.32505/at-tibyan.v2i2.385.

[4] Arifin Zein, "Tafsir Alquran Tentang Akal (Sebuah Tinjauan Tematis) [The Qur'anic Commentary on Intellect (A Thematic Review)]," *Jurnal At-Tibyan: Jurnal Ilmu Alqur'an Dan Tafsir* 2, no. 2 (2017): 233–45, https://doi.org/10.32505/at-tibyan.v2i2.392.

taxonomy, it will lose its transcendental dimension, which is the core of Islamic teaching.

The previous studies on *'Aql* in Quran and brain in neuroscience and its implications for Islamic education's thinking taxonomy have not been done much. In the 13th century, the concept of *'Aql* was understood metaphysically as a spirit, *nafs*, and *qolb*.[5] Even Al-Farabi's and Ibn Sina's review on the hierarchical thinking,[6] were seen metaphysically and not yet scientifically.[7] Other studies focus on *'aql* and the brain in the Quran and neuroscience and its implications for Islamic education, which is relatively new. Some of these studies focus on the hierarchical thinking of Islam.[8] Other study criticizes

[5] Imam Al-Ghazali, *Raudhah Ihya Ulumuddin [Garden of the Revival of the Religous Sciences]* (Semarang: Asy-Syifa, 2003); Imam Al-Ghazali, *Menuju Labuhan Akhirat: Mengungkap Problematika Keberagamaan Umat [Towards the Harbor of the Hereafter: Revealing the Religious Problems of the Ummah]*, trans. Masyhur Abadi and Hussain Aziz (Surabaya: Pustaka Progressif, 2002); Fuadi, "Peran Akal Menurut Pendangan Al-Ghazali [The Role of Reason According to Al-Ghazali .'s View]," *Jurnal Substansia* 15, no. 1 (2013): 81–90, https://doi.org/10.22373/substantia.v15i1.3791.

[6] Waryani Fajar Riyanto, *Studi Islam Integratif: Dari Psikologi Islam(i) Ke Integrasi-Interkoneksi Psikologi (Int-I-P) Mazhab Jogja, Psikologi Mazhab Keempat [Integrative Islamic Studies: From Islamic Psychology(i) to the Integration-Interconnection of Psychology (Int-I-P) of the Jogja School, Fourth School of Psychology]* (Yogyakarta: Int-I-P, 2013); Tauiq Pasiak, *Revolusi IQ/EQ/SQ: Menyingkap Rahasia Kecerdasan Berdasarkan Al-Quran Dan Neurosains Mutakhir [The IQ/EQ/SQ Revolution: Uncovering the Secrets of Quran-Based Intelligence and State-of-the-Art Neuroscience]* (Bandung: Mizan Bandung, 2008).

[7] Muhammad Aziz, "Tuhan Dan Manusia Dalam Perspektif Pemikiran Abu Nasr Al-Farabi [God and Man in the Perspective of Abu Nasr Al-Farabi's Thought]," *Jurnal Studi Islam* 10, no. 2 (2015): 62–91, http://ejournal.kopertais4.or.id/tapalkuda/index.php/pwahana/article/view/2694; M. Wiyono, "Pemikiran Filsafat Al-Farabi [Al-Farabi's Philosophical Thoughts]," *Substantia: Jurnal Ilmu-Ilmu Ushuluddin* 18, no. 1 (2016): 67–80, https://doi.org/10.22373/substantia.v18i1.3984; Frida Akmalia and Sofyan Sauri, "The Concepts of Al-Farabi in Education: It's Implications in Learning Arabic," *Attanwir : Jurnal Keislaman Dan Pendidikan* 11, no. 2 (2020): 14–24, https://doi.org/10.53915/jurnalkeislamandanpendidikan.v11i2.41.

[8] Huda and Suyadi, "Otak Dan Akal Dalam Kajian Al-Quran Dan Neurosains [Brain and Reason in the Study of the Qur'an and Neuroscience]"; Ranu Suntoro and Suyadi, "Konsep Akal Bertingkat Al-Farabi dalam Perspektif Neurosains dan Relevansinya Dengan Pembelajaran Sains di Madrasah [Al-Farabi's Concept of Multilevel Intellect in the Perspective of Neuroscience and Its Relevance to Science Learning in Madrasas]," *Risâlah, Jurnal Pendidikan dan Studi Islam* 6, no. 2 (2020): 209–304, https://doi.org/10.31943/jurnal_risalah.v6i2.147.

Indonesia's education policy, which tends to prioritize the cognitive domain and ignores the affective and psychomotor domains, where in neuroscience, all these three domains are regulated in the same body organ, namely the brain.[9] Rusdianto's research states that neuroscience's involvement is a good beginning in producing holistic education.[10] The research by Karisma and Handayani state that the hierarchical thinking theory offered by Ibnu Sina is relevant to the learning taxonomy in Islamic education.[11]

Based on a search of previous studies, no research has attempted to develop the concept of *'aql* in the Qur'an into a scientific taxonomy of thinking. As a literature study, this research aims to develop the concept of "reasoning" in the Qur'an from a neuroscience perspective into a taxonomy of Islamic religious education learning. This research is based on the argument that the concept of Aql in the Qur'an can be a philosophical basis for the preparation of a taxonomy of thinking in learning Islamic religious education. This argument is strengthened by previous studies which show that the concept of aql has been discussed in earlier Islamic thought, especially by Ibn Sina and Al-Farabi. Al-Farabi's hierarchical thinking was considered relevant to

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[9] Taufiq Pasiak, "Konsep Akal Dalam Perspektif Neurosains: Kajian Qur'ani Dan Implikasinya Dalam Penyelenggaraan Pendidikan Islam [Concept of Intellect in Neuroscience Perspective: Study of the Qur'an and Its Implications in the Implementation of Islamic Education]" (PhD Thesis, IAIN Alauddin Makasar, 2003).

[10] Rusdianto, "Interaksi Neurosains Holistik Dalam Perspektif Pendidikan Dan Masyarakat Islam [The Interaction of Holistic Neuroscience in the Perspective of Islamic Education and Society]," *Hunafa: Jurnal Studia Islamika* 12, no. 1 (2015): 71–94, https://doi.org/10.24239/jsi.v12i1.382.71-94.

[11] Astuti Budi Handayani and Suyadi, "Relevansi Konsep Akal Bertingkat Ibnu Sina Dalam Pendidikan Islam Di Era Milenial [The Relevance of Ibn Sina's Multilevel Concept of Intellect in Islamic Education in the Millennial Era]," *Ta'dibuna: Jurnal Pendidikan Islam* 8, no. 2 (2019): 222–40, https://doi.org/10.32832/tadibuna.v8i2.2034; Kharisma Noor Latifatul Mahmudah and Suyadi, "Akal Bertingkat Ibnu Sina Dan Taksonomi Bloom Dalam Pendidikan Islam Perspektif Neurosains [Ibn Sina's Multilevel Intellect and Bloom's Taxonomy in Islamic Education from a Neuroscience Perspective]," *Edukasia Islamica: Jurnal Pendidikan Islam* 5, no. 1 (2020): 121–38, https://doi.org/10.28918/jei.v5i1.2432.

Islamic education's thinking stages,[12] and Ibnu Sina's hierarchical thinking concept was also found relevant to Bloom's taxonomy and can potentially be developed as the thinking stages in learning the Islamic education field.[13] Thus, the study of mind-brain in the Qur'an and neuroscience enriched with the concept of hierarchical thinking by Ibn Sina and Al-Farabi. It opens the opportunity for the emergence of a new theory of thinking taxonomy in the Islamic education field.

RESEARCH METHOD

This paper is a systematic review of qualitative-descriptive research.[14] The systematic review is chosen because this approach can reveal specific knowledge and synthesize a theoretical contribution to become an actual configuration concept. Systematic review applies rigorous, transparent, explicit, and accountable research methodology. The systematic review steps in this study follow the procedure set by Goaggoses and Koglin[15] with the following guidelines.

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[12] Ruri Afria Nursa and Suyadi, "Konsep Akal Bertingkat Al-Farabi Dalam Teori Neurosains Dan Relevansinya Dengan Pendidikan Islam [Al-Farabi's Concept of Multilevel Intellect in Neuroscience Theory and Its Relevance to Islamic Education]," *Tawazun: Jurnal Pendidikan Islam* 13, no. 1 (2020): 1–17, https://doi.org/10.32832/tawazun.v13i1.2757.

[13] Mahmudah and Suyadi, "Akal Bertingkat Ibnu Sina Dan Taksonomi Bloom Dalam Pendidikan Islam Perspektif Neurosains [Ibn Sina's Multilevel Intellect and Bloom's Taxonomy in Islamic Education from a Neuroscience Perspective]."

[14] Mark Newman and David Gough, "Systematic Reviews in Educational Research: Methodology, Perspectives and Application," in *Systematic Reviews in Educational Research: Methodology, Perspectives and Application*, ed. Olaf Zawacki-Richter et al. (Wiesbaden: Springer Fachmedien, 2020), 3–22, https://doi.org/10.1007/978-3-658-27602-7_1.

[15] Naska Goagoses and Ute Koglin, "The Role of Social Goals in Academic Success: Recounting the Process of Conducting a Systematic Review," in *Systematic Reviews in Educational Research: Methodology, Perspectives and Application*, ed. Olaf Zawacki-Richter et al. (Wiesbaden: Springer Fachmedien, 2020), 145–61, https://doi.org/10.1007/978-3-658-27602-7_9.

Data research design

The research data design is based on the problem formulation, that is, the fundamental questions to be answered from various literature. The answers are expected to develop or synthesize a new theory. This systematic review's fundamental question is: What is the relationship between hierarchical thinking and the thinking taxonomy from Quranic dan neuroscience perspectives? Is the learning taxonomy in Islamic education different from the learning taxonomy in general? and "How is the taxonomy of Islamic teaching-learning composed?"

Article Criteria

a. The article should be relevant to the research topic; the hierarchical thinking in the Quran and neuroscience and its relevance to learning taxonomy of Islamic education.
b. The relevant article is published in accredited national journals and / or reputable international journals of neuroscience, philosophy, religion, social humanities, and Islamic education.
c. The relevant article is published from 2010 to 2020.

Research strategy development in Scopus database

The search for data sources in this systematic review uses key terms to answer the fundamental research questions, following the method developed by Dickson, by entering controlled keyword terms, "substitute words", (* sign in the database) and Boolean operators "or" and " and ".[16] Explicitly, the keywords used to explore the data in this study are the philosophy of neuroscience, educational neuroscience;

[16] Kelly Dickson, Carol-Ann Vigurs, and Mark Newman, "Youth Work: A Systematic Map of the Research Literature," Report (Leinster. Ireland: Health Service Executive, Republic of Ireland, 2013), https://www.lenus.ie/handle/10147/306851.

neuro-philosophy; theology; neurotheology; religious belief, and religious education.

Article selection

Selecting article or screening data is needed to ensure that the item is relevant to the discussed topic. Potential articles in this systematic review were obtained through the electronic search engine of the Web of Science database, and duplicate articles were removed. The first screening focuses on the title and abstract to decide whether the article is relevant or irrelevant to the topic. Furthermore, the selected article's reference was checked to find another potential paper according to the requirement. Reference examination is recognized as a balanced component of searching strategy in several systematic review guidelines. The search strategy in various systematic review guidelines.[17] Figure 2 shows the flow of data selection or screening in a systematic review adapted from Moher et al.[18]

The writer conducted a comprehensive examination of the article to explore research gaps in that scope and determine further research interest. In the beginning, the writer planned to analyze the articles using a qualitative and quantitative method. However, Dixon-Wood stated that this step is more problematic and complicated.[19] The qualitative articles are often excluded from the systematic review,

[17] Kayla M. Atkinson et al., "Reporting Standards for Literature Searches and Report Inclusion Criteria: Making Research Syntheses More Transparent and Easy to Replicate," *Research Synthesis Methods* 6, no. 1 (2015): 87–95, https://doi.org/10.1002/jrsm.1127.

[18] David Moher et al., "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement," *PLOS Medicine* 6, no. 7 (2009): e1000097, https://doi.org/10.1371/journal.pmed.1000097.

[19] Mary Dixon-Woods et al., "How Can Systematic Reviews Incorporate Qualitative Research? A Critical Perspective," *Qualitative Research* 6, no. 1 (2006): 27–44, https://doi.org/10.1177/1468794106058867.

although this combination can increase the value and understand the synthesized result. Therefore, this systematic review's steps are a systematic review of qualitative research that accentuates the epistemology and methodology.[20]

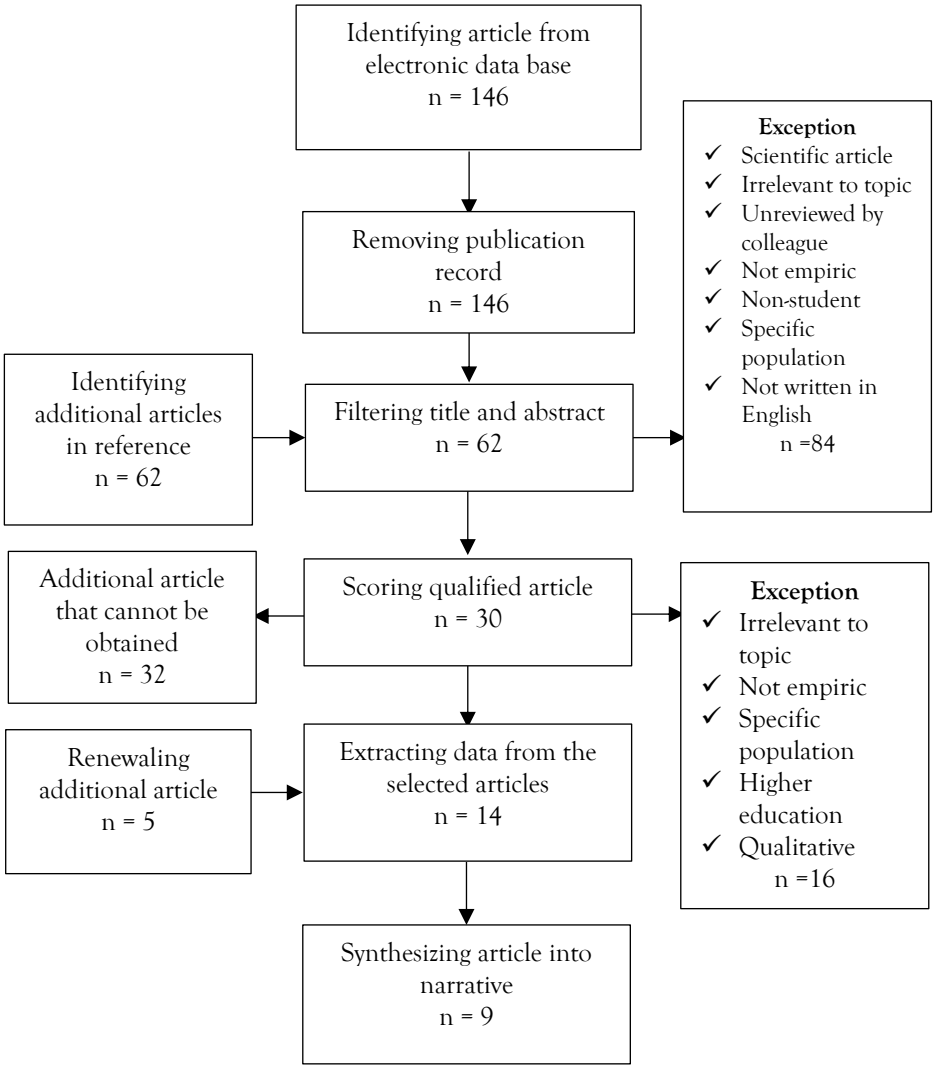

Figure 2. The flow of data screening

[20] Dixon-Woods et al.

Data extraction (article coding)

Data extraction is a systematic identification to ensure that articles contain relevant information to answer research questions, such as the context of the study, method, and findings.[21] This systematic review applies open and categorical data coding to extract information, including research objectives, types and approaches, research questions, hypotheses, the detailed participant (number, age range, education level), methodological aspects (design, period time, variables, measurement tools), and findings (main results and brief conclusions).

Identifying what theory is applied in the article is quite challenging because not all papers explicitly stated the hypotheses or arguments. Therefore, the coding is focused on the analysis of contributed theory. Table 1 shows a summary of some of the extracted data from the particular articles.

Table 1. Article data in a systematic review

Author	Key concept	Comparative Analysis	Scholarly highlights
Clark[22]	philosophy of neuroscience; magnetic resonance imaging; educational administration; neurophilosophy; educational neuroscience	Neuroscience and education draw on a variety of fields to gain a deeper understanding of the functioning of the brain. While neurosciences are around and come to the attention of	Education philosophers play an important role in both these fields, and in neurophilosophy and education, by advancing well-trained arguments, presenting

[21] Martyn Hammersley, "Reflections on the Methodological Approach of Systematic Reviews," in *Systematic Reviews in Educational Research: Methodology, Perspectives and Application*, ed. Olaf Zawacki-Richter et al. (Wiesbaden: Springer Fachmedien, 2020), 23–39, https://doi.org/10.1007/978-3-658-27602-7_2.

[22] John Clark, "Philosophy, Neuroscience and Education," *Educational Philosophy and Theory* 47, no. 1 (2015): 36–46, https://doi.org/10.1080/00131857.2013.866532.

Author	Key concept	Comparative Analysis	Scholarly highlights
		philosophers interested in their claims as a science discipline, only recently did educational philosophers begin to be critically concerned about how neuroscience can make a difference in our understanding of education.	philosophical principles and informing critical commentaries on concepts, theoretics and methods.
Jungert [23]	Interdisciplinarity' psychology; philosophical method; autobiographical memory; philosophy of neuroscience; personal identity; scientific debate; neurophilosophy theology	Combining the autobiographical memory's features and mechanisms discovered by neuroscience with the philosophical concept of biographical identity, the relationship between memory and identity compared with classical analytical approaches can be developed into a much richer theory. In contrast, the application of philosophical methods in the field of neuroscience will not be regarded by the neurophilosophers as a	In the last few decades, the neuroscience philosophy has developed two different approaches to the challenges and perspectives: on the one hand, it tries to use methods and classical approaches from science philosophy to neuroscience, for example, to shed light on its particular explanatory strategies. Such empirical findings are of great help in developing an advanced

[23] M. Jungert, "Neurophilosophy or Philosophy of Neuroscience? What Neuroscience and Philosophy Can and Cannot Do for Each Other," in *The Human Sciences after the Decade of the Brain*, ed. Jon Leefmann and Elisabeth Hildt (Cambridge, US: Academic Press, 2017), 3–13, https://doi.org/10.1016/B978-0-12-804205-2.00001-X.

Author	Key concept	Comparative Analysis	Scholarly highlights
		method for correction or forgery from a neutral external perspective.	philosophical theories of the importance of memory for personal identity, which can explain how people are able to develop narrative structures.
Sayadmansour [24]	Theology; human mind; neurotheology; brain science; spiritual experience; religious experience	One of cognitive neuroscience's most important goals is to improve understanding of how people think and interact with our environment. This concerns in particular our perception and response to the external reality that the brain presents continuously to our deep awareness. Neurotheology as an emerging field of study has the ability to offer our understanding of human mind, consciousness, scientific discovery, spiritual experience and theological debate much.	Neurotheology is a new field in which the relationship between the sciences of the brain and the religion is being understood. Neurotheology should be seen as a multidisciplinary trial which calls for the considerable integration of divergent fields, neurosciences and religious phenomena. Neurotheology is the only way of exploring epistemological issues arising from neuroscience and theology.

[24] Alireza Sayadmansour, "Neurotheology: The Relationship Between Brain and Religion," *Iranian Journal of Neurology* 13, no. 1 (2014): 52–55.

Author	Key concept	Comparative Analysis	Scholarly highlights
Klemm [25]	cognitive dissonance; religious belief; religious instructionc; cognitive process; Neuroscience	Religion information is problematic from any source. There are so many religious belief systems in 19 main religions, 270 different groups, and a thousand smaller groups. This is because believers often decide without much introspection and evaluation on the information they want to enter their belief system.	A college course integrating neuroscience and religion can help students learn how experiences, conditioning, education, culture, biology, emotions, psychology and cognition are affected by their religious beliefs.
Blevins [26]	Neuroscience and religious education		Neuroscience promotes certain behavior by spiritual change. Every part of the brain, in particular brain stem, hippocampus, tonsils, temporarily lobes, frontal cortex, corpus callosum and many other parts has a function in spiritual moments to bring about new behavioral changes in religion.
Martín-Loeches [27]	cognitive neuroscience functional magnetic	A debate on whether neuroscience is actually useful for education,	The articles in this monograph provide empirical evidence

[25] W. R. Klemm, "Accommodating Religion to Modern Neuroscience," *Mental Health, Religion & Culture* 20, no. 1 (2017): 1–19, https://doi.org/10.1080/13674676.2017.1313826.

[26] Dean G Blevins, "Brains on Fire: Neuroscience and the Gift of Youth.," *Journal of Youth Ministry* 12, no. 2 (2014): 7–24.

[27] Manuel Martín-Loeches, "Neuroscience and Education: We Already Reached the Tipping Point," *Psicología Educativa*, Neuroscience and education: We already reached the

Author	Key concept	Comparative Analysis	Scholarly highlights
	resonance imaging educational psychology Neuroscience	whether the latter really contributes to education is currently taking place, and which began several years ago. The debate is not over, but it may be time to conclude it, as we will see in this special issue	of sufficient knowledge already being gained from neuroscience to improve education and political decision making considerably in this regard. Neuroscience has a great deal to do with education, and its contribution in future to this field of the human social, cognitive and emotional development is increasingly important.
Mudge et al. [28]	social neuroscience; value education; psychology; religious education	This not only means that religious and spirits' education can respond to the challenge of neuroscientistic insight and to other fields of the curriculum, but also the deliberative reasoning Narvaez identifies within her theory of threefold ethics mentioned above.	Stressing research that supports an approach to values education, which promotes the development of those provisions, which promotes understanding of the character provisions and decision-making processes as operational in an automated manner

tipping point [Neurociencia y educación: ya hemos alcanzado el punto crítico], 21, no. 2 (2015): 67–70, https://doi.org/10.1016/j.pse.2015.09.001.

[28] Peter Mudge, Daniel Fleming, and Terence Lovat, "The Potential Impact of the Neurosciences on Religious and Spiritual Education: Ramifying from the Impact on Values Education," *Journal of Beliefs & Values* 35, no. 2 (2014): 144–54, https://doi.org/10.1080/13617672.2014.953299.

Author	Key concept	Comparative Analysis	Scholarly highlights
			at a preconscious level. If the above neuroscientific findings are genuinely insightful, and if education is seen to play a role in addressing those issues of personal discomfort, putting these two together would seem to be a unique position to play in a comprehensive curriculum. religious and spiritual education.
Elka and Aleman [29]	religious vision; medial prefrontal cortex; default mode network	The theory of predictive processing is presented as an integral basis for the neurocognitive foundation of religion and spirituality by the authors. The authors compares the predictive model of processing with religion and spirituality accounts of two systems by emphasizing the central role of predictive error monitoring.	The author's model is based on four different brain mechanisms that play a key role in religion and spirituality: the temporal area of the brain is linked to religious visions and ecstatic experiences; the multi-senior area of the brain and the defective mode network involves self-transcending experiences.

[29] Michiel van Elk and André Aleman, "Brain Mechanisms in Religion and Spirituality: An Integrative Predictive Processing Framework," *Neuroscience & Biobehavioral Reviews* 73 (2017): 359–78, https://doi.org/10.1016/j.neubiorev.2016.12.031.

Author	Key concept	Comparative Analysis	Scholarly highlights
Arievitch [30]	contemporary psychology; human mind; behaviorism; information processing	This is mainly because Taxonomy is implicitly based on outdated mentalist assumptions and the mechanical model of human knowledge as "information processing" in line with defective computer metaphor, with their hierarchy of levels and educational objectives.	From the perspective of the DTL, knowledge is a set of works and activities can only be developed, implemented and redeveloped; it is not something to be "stored and retrieved." The whole discourse about the aims and tasks of learning change with regard to the mind, cognitive capacity and learning of students in activities which are inseparable from acting.

Source: Scopus database, Author's compilation.

Thematic narrative synthesis (comparative blending)

Narrative and thematic synthesis is a textual approach that is applied systematically, including summarizing, linking, and explaining the theoretical findings of various research.[31] It can be said that this thematic narrative synthesis is the most complicated step in a systematic review because it is not only summarizing the findings of

[30] Igor M. Arievitch, "The Vision of Developmental Teaching and Learning and Bloom's Taxonomy of Educational Objectives," *Learning, Culture and Social Interaction* 25 (2020): 100274, https://doi.org/10.1016/j.lcsi.2019.01.007.

[31] Jennie Popay et al., "Guidance on the Conduct of Narrative Synthesis in Systematic Reviews: A Product from the ESRC Methods Programme" (Lanchaster: Lanchaster University, 2006), https://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/fhm/dhr/chir/NSsynthesisguidanceVersion1-April2006.pdf.

each study but it should find a meta-perspective. According to Siddaway's synthesis, it is the process of interpreting, integrating, comparing, and criticizing the entire article's theoretical findings.[32] The results of neuroscience theory with its various themes, such as the prefrontal cortex, limbic system, cingulate system, and prefrontal position, are compared with the functions of the brain and the hierarchical thinking from a religious point of view, starting from *dzikr, nazhr, 'ilm-amal, muhasabah,* to *ijtihad*. The theoretical themes of neuroscience and religion are integrated into neuro-theology, neuro-philosophy, and neuro-spiritual. Thus, thematic synthesis is a structured and systematic activity to integrate the research findings from various perspectives.

RESULTS AND DISCUSSION

The findings of this study are presented in two narrative synthesis themes. First, the brain's parts with specific functions are interpreted, compared, and integrated with hierarchical thinking from an Islamic perspective. This first narrative synthesis resulted in a new meaning configuration on the neurobiological basis of the mind (Quranic perspective) in the brain (neuroscience perspective). Second, the hierarchical thinking from an Islamic perspective is interpreted, compared, and integrated with Bloom's taxonomy from a neuroscience perspective. This second narrative synthesis resulted in a new concept configuration named the Islamic taxonomy of Islamic teaching-learning. On the one hand, these two primary findings reinforce the concept of neuro-education, which is still developing. On the other hand, since this narrative synthesis

[32] Andy P. Siddaway, Alex M. Wood, and Larry V. Hedges, "How to Do a Systematic Review: A Best Practice Guide for Conducting and Reporting Narrative Reviews, Meta-Analyses, and Meta-Syntheses," *Annual Review of Psychology* 70, no. 1 (2019): 747–70, https://doi.org/10.1146/annurev-psych-010418-102803.

applies a different approach—the hierarchical thinking from an Islamic point of view—becomes a new variant concept and theory on Islamic neuroeducation.

Neurobiological basis of hierarchical thinking and its implications for Islamic education

The neurobiological basis of the human brain can be found in the Quranic concept of mind through interpretation, comparison and integration with neurophysiology. This find has a significant implication for the Islamic education theory's development. Up to now, Islamic education is understood as a process of nurturing student to have a good character,[33] but also developing and optimizing the mind and intellectual potency.[34] This implication is relevant to the research which states that character-building means mind and intellectual building.[35] Character building is an essential part of Islamic education, but Islamic education is broader than character building. Therefore, the hierarchical thinking implications on Islamic education in this study are more general than in the previous study.[36]

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[33] Deswita, "Konsep Pemikiran Ibnu Sina Tentang Pendidikan Akhlak [The Concept of Ibn Sina's Thoughts About Moral Education]," *Ta'dib* 16, no. 2 (2013): 168–76, https://doi.org/10.31958/jt.v16i2.249.

[34] Suyadi, *Pendidikan Islam Dan Neurosains: Menelusuri Jejak Akal Dan Otak Dalam Al-Qur'an Hingga Pengembangan Neurosains Dalam Pendidikan Islam [Islamic Education and Neuroscience: Tracing the Traces of Reason and Brain in the Qur'an to the Development of Neuroscience in Islamic Education]* (Jakarta: Kencana, 2020).

[35] Taufiq Pasiak, "Pendidikan Karakter Sebagai Pendidikan Otak [Character Education as Brain Education]," *Jurnal AKRAB* 1, no. 3 (2010): 7–15, https://doi.org/10.51495/jurnalakrab.v1i3.52; Awhinarto and Suyadi, "Otak Karakter Dalam Pendidikan Islam: Analisis Kritis Pendidikan Karakter Islam Berbasis Neurosains," *Jurnal Pendidikan Karakter* 10, no. 1 (2020): 143–56, https://doi.org/10.21831/jpk.v10i1.29693.

[36] Pasiak, "Pendidikan Karakter Sebagai Pendidikan Otak [Character Education as Brain Education]."

The concept of mind-brain is also relevant to research finding which states that one's excellence is determined by the brain's quality.[37] This finding is in line with research on *Ulul Albab*[38] that found the best human is the one who has the best brain performance. Therefore, Islamic education should be oriented toward developing the potency of mind-brain integrally to create an excellent person.

Furthermore, six brains' autonomous nervous systems synergize simultaneously regulating behavior that later forms one's character.[39] Those six brain components are the *prefrontal cortex, limbic system, cingulate gyrus, basal ganglia, temporal lobes, and cerebellum*.[40] Brain capacity to regulate behavior has also been tested in other research[41] and proves that the six brain components are correlated with Bloom's taxonomy: remember, understand, apply, evaluate, analyze and create.[42] Based on previous verified findings, this study synthesizes

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[37] Fikri Saudu, *Manusia Unggul: Neurosains Dan Al-Qur'an [Superior Man: Neuroscience and the Qur'an]* (Jakarta: Penjuru Ilmu Sejati, 2018).

[38] Hamdi Rahman et al., "Aplikasi Pemikiran Islam Dalam Pendidikan Sains [The Application of Islamic Thought in the Teaching of Science]," *Global Journal Al-Thaqafah* 7, no. 1 (2017): 79–89, https://doi.org/10.7187/GJAT12920170701; Sri Aliyah, "Ulul Albab Dalam Tafsir Fi Zhilaili Al-Qur'an [Ulul Albab in Tafsir Fi Zhilalil Al-Qur'an]," *Jurnal Ilmu Agama: Mengkaji Doktrin, Pemikiran, Dan Fenomena Agama* 14, no. 1 (2013): 115–50, http://jurnal.radenfatah.ac.id/index.php/JIA/article/view/465/; M. Taib Hunsouw, "Ulul Albab Dalam Tafsir Fi Zhilal Al-Qur'an Kitab Tafsir Sayyid Quthb [Ulul Albab in Tafsir Fi Zhilal Al-Qur'an Book of Tafsir by Sayyid Qutb]," *Tahkim: Jurnal Hukum Dan Syariah* 9, no. 1 (2017): 172–97, https://doi.org/10.33477/thk.v9i1.97.

[39] Pasiak, "Pendidikan Karakter Sebagai Pendidikan Otak [Character Education as Brain Education]."

[40] Matthew H. Olson and B. R. Hergenhahn, *An Introduction to Theories of Learning*, Ninth Edition (New York: Routledge, 2016), 355–67; Pasiak, "Pendidikan Karakter Sebagai Pendidikan Otak [Character Education as Brain Education]."

[41] Desfa Yusmaliana et al., "Creative Imagination Base on Neuroscience: A Development and Validation of Teacher ' s Module in Covid-19 Affected Schools," *Universal Journal of Educational Research* 8, no. 11B (2020): 5849–58, https://doi.org/10.13189/ujer.2020.082218; Nurjanah Wijayanti and Suyadi, "Rational and Intuitive Brains in Islamic Education: Analysis of Al-Ma'un Theology in the Neurosains Perspective," *Edukasi* 8, no. 2 (2020): 1–25, https://ejournal.staim-tulungagung.ac.id/index.php/edukasi/article/view/252.

[42] Awhinarto and Suyadi, "Otak Karakter Dalam Pendidikan Islam: Analisis Kritis Pendidikan Karakter Islam Berbasis Neurosains."

that the six components of the brain are correlated with the hierarchy contained in the semantic field of reason: *dzikr* (remember), *nazhr* (understand), *muhasabah* (evaluate), *ilm-amal* (apply), *fikr* (analyze), and *ijtihad* (create).[43] Thus, hierarchical thinking has a neurobiological basis that can be seen in the brain's six components. Table 2 is a narrative analysis of the neurobiological basis of hierarchical thinking and its implications for Islamic education.

Tabel 2. The neurobiological basis of stratified reason and its implications for Islamic education

No	Hirarkhi akal	Basis neurobiologis	Implications for Islamic Education
1	*Dzikr* and *remember*	Temporal lobe	Repeating the lesson
2	*Nazhr* and *Understa nd*	Occipital temporal parie tal association cortex	Multi-sensory learning, using all five senses in every observing learning object
3	*'Ilm-amal* and *apply*	Limbic System	Controlling emotions: be patient and forgiving
4	*Muhasabah* and *eval uate*	Cingulate system	Contemplation and reflection stimulation
5	*fikr* and *analyze*	Prefrontal cortex	Stimulating to be a critical
6	*ijtihad* and *create*	Prefrontal association cortex	Stimulating to be a creative and imaginative student

Table 2 explains that the hierarchical thinking from the Islamic perspective, which correlates with Bloom's taxonomy, has a brain's neurobiological. As a result, Islamic education is expected to optimizing the function of the brain as categorized in the hierarchical

[43] Pasiak, *Revolusi IQ/EQ/SQ: Menyingkap Rahasia Kecerdasan Berdasarkan Al-Quran Dan Neurosains Mutakhir [The IQ/EQ/SQ Revolution: Uncovering the Secrets of Quran-Based Intelligence and State-of-the-Art Neuroscience]*.

thinking.[44] This analysis is more comprehensive than the neuro-education initiated by Barbara Rich [45], and is also more advance than neuroscience that only has a one-way learning direction.[46] Thus, the research of hierarchical thinking implication with a neurobiological basis towards Islamic education has a novel value compared to previous studies.

Learning Taxonomy theory in Islamic education's perspective

Quran explains how the brain works, which is called the semantic field of '*aql*. According to Quran, the brain functions to *dabbara* (contemplate), *faqiha* (understand), *fahima* (understand), *nazhara* (see with the eyes), *dzakara* (remember), *fakkara* (think deeply), and *'alima* (understand comprehensively).[47] These seven semantic fields of '*aql* can be summarized into four terms, namely *fikr, dhikr, 'ilm, and nazhr*.[48] This study adds two words of the semantic field of *'aql* called *muhasabah* and *ijtihad*. The semantic field of *'aql* is still a divine-

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[44] Peter Mudge, Daniel Fleming, and Terence Lovat, "The Potential Impact of the Neurosciences on Religious and Spiritual Education: Ramifying from the Impact on Values Education," *Journal of Beliefs & Values* 35, no. 2 (2014): 144–54, https://doi.org/10.1080/13617672.2014.953299; Igor M. Arievitch, "The Vision of Developmental Teaching and Learning and Bloom's Taxonomy of Educational Objectives," *Learning, Culture and Social Interaction* 25 (2020): 100274, https://doi.org/10.1016/j.lcsi.2019.01.007.

[45] Barbara Rich (ed), *Neuroeducation: Learning, Arts, And The Brain* (New York/ Washington, D.C.: Johns Hopkins University Summit, 2009).

[46] Kurt W Fischer, "Mind , Brain , and Education : Building a Scientifi c Groundwork for Learning and Teaching 1," *Mind, Brain and Education*, 2009, https://doi.org/10.1111/j.1751-228X.2008.01048.x; Michael Atherton and R Diket, "Applying the Neurosciences to Educational Research: Can Cognitive Neuroscience Bridge the Gap? Part I," in *Annual Meeting of the American Educational Research Association*, 2005, 1–12, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.78.4727&rep=rep1&type=pdf.

[47] Suyadi and Hendro Widodo, "Millennialization of Islamic Education Based on Neuroscience in The Third Generation University in Yogyakarta Indonesia," *Qudus International Journal of Islamic Studies* 7, no. 1 (2019): 173–202, https://doi.org/10.21043/qijis.v7i1.4922.

[48] Pasiak, *Revolusi IQ/EQ/SQ: Menyingkap Rahasia Kecerdasan Berdasarkan Al-Quran Dan Neurosains Mutakhir [The IQ/EQ/SQ Revolution: Uncovering the Secrets of Quran-Based Intelligence and State-of-the-Art Neuroscience]*.

metaphysic concept and not yet structured scientifically. For example, Imam al-Ghazali stated that *tafakkur* is close to *tadzakkur*. *Taffakur* emphasizes thinking about something new (innovative), while tadzakur stress this innovation's memory. Everyone can be in *tadzakur*, but not all *tadzakur* is part of a thinking activity. Al-Ghazali has distinguished each term's meaning in the semantic fields of '*aql*, but has not compiled these terms into hierarchical thinking. Therefore, the depth and breadth of thinking can be measured.

By summarizing the semantic field of '*aql* into four terms and adding two new aspects (*muhasabah* and *ijtihad*), the sixth of *'aql* hierarchy can be arranged scientifically following the thinking taxonomy, especially Bloom's taxonomy.[49] The reason for using Bloom's taxonomy because it has been studied from the Islamic perspective in Malaysia.[50] Furthermore, this taxonomy is widely applied in the learning process in Asia[51] and even in the Islamic world in general, including Saudi Arabia[52] and Jordan.[53]

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[49] David A. Sousa, *How the Brain Learns*, Fifth edition (Thousand Oaks, California: Corwin, a Sage Publishing Company, 2017).

[50] Nursyahirah Wahidah Masrom et al., "Kedudukan Taksonomi Bloom Menurut Perspektif Islam [Bloom's Taxonomy Position According to an Islamic Perspective]," *Journal of Quran Sunnah Education & Special Needs* 2, no. 1 (2018): 18–26, https://doi.org/10.33102/jqss.vol2no1.8.

[51] Mahmoud Sulaiman Hamad Bani Abdelrahman, "An Analysis of the Tenth Grade English Language Textbooks Questions in Jordan Based on the Revised Edition of Bloom's Taxonomy An Analysis of the Tenth Grade English Language Textbooks Questions in Jordan Based on the Revised Edition of Bloom's Taxonomy," *Journal of Education and Practice* 5, no. 18 (2016): 139–51, https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.968.5734&rep=rep1&type=pdf.

[52] Masrom et al., "Kedudukan Taksonomi Bloom Menurut Perspektif Islam [Bloom's Taxonomy Position According to an Islamic Perspective]"; Simona Şimon, "An Overview of Speech Acts in English," *Scientific Bulletin of the Politehnica University of Timişoara Transactions on Modern Languages* 14, no. 1 (2015): 1–104, https://www.ceeol.com/search/article-detail?id=329987.

[53] Syed Zainal Abidin, Syed Kamarul Bahrin, and Nur Firdaus Abdul Razak, "Defining The Cognitive Levels In Bloom's Taxonomy Through The Quranic Levels of Understanding-Initial Progress of Developing An Islamic Concept Education," *International Journal of Asian*

Bloom's taxonomy has six stages: remembering, understanding, applying, analyzing, evaluating, and creating.[54] These six learning taxonomies can be combined with the semantics of *'aql* which also contains six aspects. Figure 3 shows the semantic of *'aql* following Bloom's taxonomy.

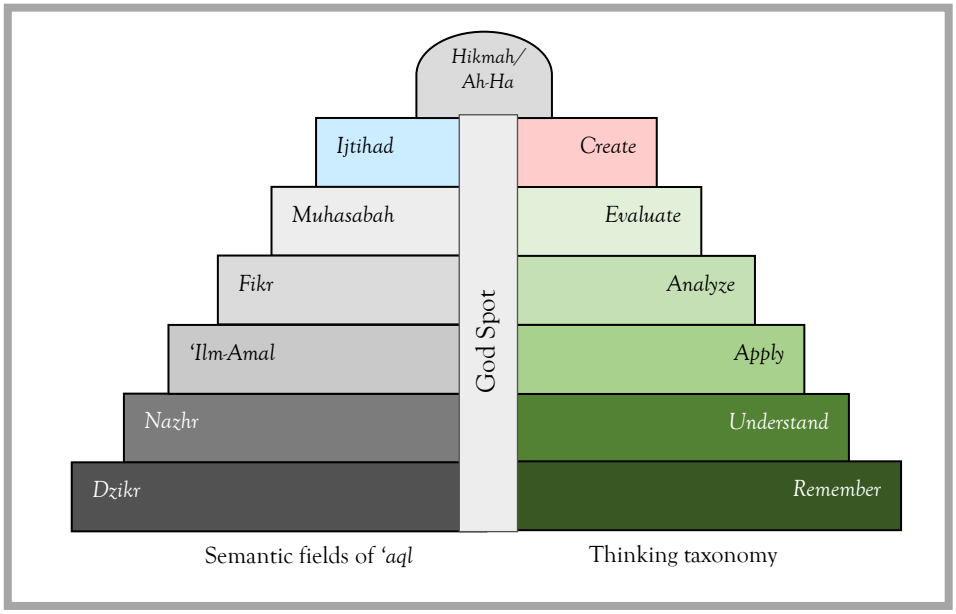

Figure 3. Hierarchy of 'aql in the Qur'an and taxonomy bloom

Figure 3. is the hierarchical thinking composed from the semantic field of '*aql*' arranged systematically following Bloom's taxonomy. In other words, the hierarchical thinking is equivalent to Bloom's taxonomy. *Dzikr* is equal to remember, *nazhara* is similar to understand, *'ilm* is equal to apply, *fikr* is equal to analyse, *muhassabah*

Social Science 3, no. 9 (2013): 2060–65, https://archive.aessweb.com/index.php/5007/article/view/2563.

[54] Francis A Adesoji, "Bloom Taxonomy Of Educational Objectives And The Modification Of Cognitive Levels," *Advances in Social Sciences Research Journal* 5, no. 5 (2018): 292–97, https://journals.scholarpublishing.org/index.php/ASSRJ/article/view/4233; David R. Krathwohl, "A Revision of Bloom's Taxonomy: An Overview," *Theory into Practice* 41, no. 4 (2002): 215, https://doi.org/10.1207/s15430421tip4104_2.

is equivalent to evaluate, and *ijtihad* is equal to create. All these processes of thinking are aimed to create *hikmah* (wisdom). The following discussion is a more detailed narrative synthesis of a meta-analysis of the neurobiological basis on t intellect in the brain.

Temporal lobe: dzikr dan remember

The temporal lobe is part of the cerebral cortex, located in both hemispheres' lateral parts.[55] The temporal lobe is the memory center or house of memory The stimulation in this part evokes the experiences of the past.[56] Suppose this temporal lobe's neurophysiology is associated with *dzikr* in the mind hierarchal term or remembering in Bloom's taxonomical term. In that case, this temporal lobe is the neuroanatomy of *dzikir* and *remember*. Therefore, Islamic education must stimulate this temporal lobe so the student can have a strong memory. One way to stimulate this part is by repeating the lesson given,[57] including the *zikr* ritual[58] which terminologically is saying certain praying repeatedly.

The word "*zikr*" derived from the word "*dzakara - yadzkuru-dzikran* ", which means remembering something, produces an idea and keeping the memory. The meaning of his call or remember

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[55] Ryan Splittgerber and Richard S. Snell, *Snell's Clinical Neuroanatomy*, Eighth edition (Philadelphia: Wolters Kluwer, 2019).

[56] Saudu, *Manusia Unggul: Neurosains Dan Al-Qur'an [Superior Man: Neuroscience and the Qur'an]*.

[57] Bobbi DePorter and Mike Hernacki, *Quantum Learning: Unleashing the Genius in You* (New York, N.Y: Dell Publishing, 1992); Barbara K. Given and Bobbi DePorter, *Excellence in Teaching and Learning: The Quantum Learning System* (Oceanside, California: Learning Forum Publications, 2015).

[58] Ahmad Tafsir, *Ilmu Pendidikan Dalam Perspektif Islam [Educational Science in Islamic Perspective]*, Cet. 1 (Bandung: Remaja Rosdakarya, 1992); Arief Rifkiawan Hamzah, "Konsep Pendidikan Dalam Islam Perspektif Ahmad Tafsir [The Concept of Education in Islam Ahmad Tafsir .'s Perspective]," *At-Tajdid : Jurnal Pendidikan dan Pemikiran Islam* 1, no. 01 (January 10, 2017), https://doi.org/10.24127/att.v1i01.336.

something, produces an idea, and honouring the memory".[59] Therefore, the words " *dzikr*" and "*dzaakirah*" (in noun form) means memory or memory power.[60] *Dzakirå* (memory) is a storage place for any obtained knowledge and information, and it can be recalled at any time needed. Dzakira can be called 'memory' or 'data storage'.

In Bloom's taxonomy perspective, *Zikr* can be understood as remember or memorize. Memorizing is the first and simplest stage of thinking. Since the Quranic revelation up to now, Quranic memorizing is used to preserve the Quran. Since the decline of the Qur'an until this century, memorization is still a method of protecting the Qur'an,[61] especially in Indonesia and Malaysia.[62]

Although the memorizing method was criticized as the worst learning method,[63] memorizing, with a reference to Bloom's taxonomy, is one of the lowest scientific ways. Memorizing is the first step in learning where the student can analyze his difficulties to determine his next learning stage.

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[59] Hans Wehr and J. Milton Cowan, *A Dictionary of Modern Written Arabic* (Beirut: Librairie du Liban, 1980).

[60] Mahmud Yunus, *Kamus Arab-Indonesia [Arabic-Indonesian Dictionary]* (Jakarta: Hidakarya Agung, 1990).

[61] A. Sadek et al., "Implementation of Panipati Method on Memorization the Quran in Malaysia: A Study in Tahfiz Institute" (International Conference on Innovative Trends in Multidisciplinary Academic Research, Istanbul, Turkey, 2014), 146, https://eprints.um.edu.my/15674/.

[62] Muhaidi Mustaffa Al Hafiz et al., "Historiography of Quranic Memorization from the Early Years of Islam until Today," *Mediterranean Journal of Social Sciences* 7, no. 1 (2016): 279–83, https://doi.org/10.5901/mjss.2016.v7n1s1p279.

[63] Karel A Steenbrink, *Pesantren, madrasah, sekolah: pendidikan Islam dalam kurun moderen [Islamic boarding schools, madrasas, schools: Islamic education in the modern era]* (Jakarta: Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi dan Sosial, 1986), http://catalog.hathitrust.org/api/volumes/oclc/15218103.html.

The parietal-temporal-occipital association cortex: Nazhr dan Understand

The parietal-temporal-occipital association cortex is located at the three lobes' junction, which its name is derived (parietal lobe, temporal lobe and occipital lobe). This area's function is to integrating and collecting somatic sensations, such as hearing and seeing.[64] In this area, the somatic sensation is received and is projected to be more complex processed through the three lobes.

Suppose the parietal-temporal-occipital association cortex's function is associated with *nazhr* in the mind hierarchical thinking 's point of view or understand in the Bloom' taxonomy point of view. In that case, this brain's part regulates the understanding function. Technically, this part obtains visualization from the somatic sensation and then it is processed into understanding. Therefore, Islamic education must stimulate this brain's part to train to understand the observed object. This train can be stimulated by multi-sensory,[65] by optimizing sense in every learning process.

In the hierarchical thinking perspective, the word *nazhr* is derived from the word "*nazhara yanzharu , yanzhiru - nazharan*" means seeing, viewing, thinking, paying on a particular object, comparing, and considering ".[66] In the Arabic language, this word is used to describe the theory or thought.[67] According to the Quraish, Shihab *nazr* is mind. This word describes someone seeing an object

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[64] Lauralee Sherwood, *Human Physiology* (Toronto: Cengage, 2018), http://public.eblib.com/choice/PublicFullRecord.aspx?p=6371882.

[65] Jamal Badi and Mustapha Tajdin, *Islamic creative thinking: Berpikir kreatif berdasarkan metode Qurani [Islamic creative thinking: Creative thinking based on the Quranic method]* (Bandung: Penerbit Mizania, 2007).

[66] Wehr and Cowan, *A Dictionary of Modern Written Arabic*.

[67] Yunus, *Kamus Arab-Indonesia [Arabic-Indonesian Dictionary]*.

with his eyes and mind.[68] Etymologically, the word *nazhr* is every close to the phrase *al-fahsh* (investigation) or contemplation (*al-ta'ammul*) and seeing with an eye (*ra'yu or bashr*).

Terminologically, the word *nazhr* describes the process of understanding a particular object, including social reality. For example, understanding the map of *da'wah* in a plural society.[69] In Bahasa Indonesia, this word can be explained by the pleonasm sentence: *seeing with your own eyes*. In this context, seeing with their own eyes (*nazhr*) is a method to convince themselves of the truth of the object he observed.

In Bloom's taxonomy, the word *nazar* is equal to understanding. Understanding is the second stage of thinking after memorizing.[70] Understanding is the process of thinking to grasp the meaning of the object. Understanding can be done by changing a certain matter into another matter, for instance, from a sentence into a number, etc. Therefore, *nazhr* in the semantic field is equal to understanding in Bloom's taxonomy. At some point, *nazhr* in hierarchical thinking is more comprehensive than understanding Bloom's taxonomy because nazhr includes a method of thinking.

Limbic system: 'ilm-amal dan apply

The part of the brain that predominantly regulates the application or practice is the limbic system. It is located in the middle

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[68] Elvina Wati, "Pendidikan Antikorupsi Di Sekolah Menurut Islam [Anti-Corruption Education in Schools According to Islam]," *TAJDID : Jurnal Ilmu Keislaman Dan Ushuluddin* 17, no. 1 (2019): 53–65, https://doi.org/10.15548/tajdid.v17i1.106; Muh Mustakim, "Wawasan Al-Quran Tentang Pendidikan Anti Korupsi [Al-Quran Insights About Anti-Corruption Education]," *At-Tajdid: Jurnal Ilmu Tarbiyah* 2, no. 1 (2013): 69–92.

[69] Mohd Farid Mohd Sharif and Roshimah Shamsudin, "Intercultural Da'wah Taxonomy for a Pluralist Society," *KATHA- The Official Journal of the Centre for Civilisational Dialogue* 13, no. 1 (2017): 94–117, https://doi.org/10.22452/KATHA.vol13no1.5.

[70] Adesoji, "Bloom Taxonomy Of Educational Objectives And The Modification Of Cognitive Levels."

of the brain and has many anatomies, such as the amygdala, thalamus, hypothalamus, cingulate system and so on.[71] In general, the limbic system functions to regulate emotions or feelings in various expression.[72] If in the Qur'an feelings are controlled in *qolb*, then *qolb* is the neurophysiology of this limbic system. Al-Ghazali once stated that '*ilm* is stored in *qolb*, while *qolb* is stored in the *nafs*.[73] Some religious scholars also say that *qolb* is a heart that controlling emotions, such as joy, sadness, fear, jealousy, envy, and greed.[74] In the perspective of neuroscience, *qolb* (heart), which functions to modulate the emotional system, actually resides in the limbic system, in the middle of the brain.[75] Thus, '*ilm-amal* in hierarchical thinking or *apply* in bloom taxonomy is modulated by the limbic system.

Islamic education plays a vital role in stimulating the limbic system because Islamic education aims to create an excellent person who has a noble character and can control his emotions well.[76] When someone fails to control his feelings, this failure causes the prefrontal cortex's bluntness, which resists thinking critically and creatively. Some of the methods stimulating the limbic system[77] are patience and forgiveness.[78]

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[71] Splittgerber and Snell, *Snell's Clinical Neuroanatomy*.

[72] Sherwood, *Human Physiology*.

[73] Al-Ghazali, *Menuju Labuhan Akhirat: Mengungkap Problematika Keberagamaan Umat [Towards the Harbor of the Hereafter: Revealing the Religious Problems of the Ummah]*.

[74] Fariza Md Sham, "Elemen Psikologi Islam Dalam Silibus Psikologi Moden : Satu Alternatif [Elements of Islamic Psychology in Modern Psychology Syllabus: An Alternative]," *Global Journal Al Thaqafah* 6, no. 1 (2016): 75–86, http://www.gjat.my/gjat062016/10920160601.pdf.

[75] Sherwood, *Human Physiology*.

[76] Saudu, *Manusia Unggul: Neurosains Dan Al-Qur'an [Superior Man: Neuroscience and the Qur'an]*.

[77] Daniel Goleman, *Emotional Intelligence: Why It Can Matter More than IQ*, 2020.

[78] Mohammad Hossein Rouhani and Leila Azadbakht, "Is Ramadan Fasting Related to Health Outcomes? A Review on the Related Evidence.," *Journal of Research in Medical Sciences : The Official Journal of Isfahan University of Medical Sciences* 19, no. 10 (2014): 987–92; Cayce J. Hook and Martha J. Farah, "Neuroscience for Educators: What Are They Seeking,

The word '*ilm* is derived from the word '*alima-ya'lamu-'ilman*", *which* means to know, recognize, and learn The word '*ilm* is the antonym of the word "*jahl*" means stupid.[79] The word '*ilm* and its derivation *('alima, 'alim,'alam)* are mentioned in Quran 854 times. This word and its derivation in noun, verb, and adverb form are found in the Makiyah and Madaniyah verses in a balanced way.

The word '*ilm* is usually used in the sense of a process of seeking knowledge and an object of knowledge. Linguistically, '*ilm* means clarity, and in its derivation, this word contains "clarity" meaning. *'Ilm* also means recognition of an object. Therefore, from the Quranic perspective, a person can know a certain object's meaning without a doubt. When one is doubtful, he is still at a knowledge level, not a knowledgeable person. Thus,*'ilm* is higher than *nazhr*.

'*Ilm* cannot be separated from the application. One hadith stated, "Whoever applies his knowledge, God will grant him more knowledge that he did not know before".[80] This hadith suggests that all knowledge must be applied, so this knowledge brings benefits. The Prophet PBUH said, "O Lord, I take refuge in You from the knowledge that is not useful".[81] Contextually, this hadith means knowledge will be useful when it is applied or practised. Based on this explanation, '*ilm* in the hierarchical thinking is equal to *apply* in Bloom's taxonomy.

In Bloom's taxonomy, *apply* is understood as implementing knowledge that has been learned or understood. This stage refers to

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and What Are They Finding?," *Neuroethics* 6, no. 2 (2013): 331–41, https://doi.org/10.1007/s12152-012-9159-3; Ardi Primasari and Kwartarini Wahyu Yuniarti, "Enjoying Every Moment: Improving Adolescent's Subjective Well-Being Through Adolescent Mindfulness Program," *Gadjah Mada Journal of Professional Psychology (GamaJPP)* 7, no. 2 (October 30, 2021): 115–28, https://doi.org/10.22146/gamajpp.65594.

[79] Yunus, *Kamus Arab-Indonesia [Arabic-Indonesian Dictionary]*.

[80] M. Quraish Shihab, *Wawsan Al-Qur'an: Tafsir Tematik Atas Pelbagai Persoalan Umat [Insights of the Qur'an: Thematic Interpretation of Various Issues of the Ummah]* (Bandung: Mizan, 2012).

[81] Shihab.

one's ability to benefit from knowledge learned to solve problems in any situation. For example, this application applies *maqasid syari'ah* in schools to develop educational value.[82] Thus, the applied *'ilm* of the hierarchical thinking is equal to *apply* in Bloom's taxonomy.

Cingulate system: muhasabah dan evaluate

The cingulate system is part of the limbic system as well as the cerebral cortex.[83] The cuneiform system is located in the medial cerebral hemisphere, connected to the amygdala and hypothalamus. The back of the cingulate system, namely the posterior, regulates emotional stimuli associated with recalling memories and reflects them on plans.[84] This thinking process considers the various consequences of the taken actions and chooses different social situations options.

Suppose the cingulate system's neurophysiology is associated with *muhasabah* in the hierarchical thinking perspective or evaluate in Bloom's taxonomy. In that case, this brain neuroanatomy is the most powerful in modulating *muhasabah* or *evaluate.* In the Islamic educational context, the learning process should stimulate this part of the brain by contemplating, imagining, reflecting, and so on.[85]

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[82] Hamdun I Sulayman, "Values-Based Curriculum Model: A Practical Application of Integrated 'Maqasid Al-Sharia' for Wholeness Development of Mankind," *Procedia-Social and Behavioral Sciences* 123, no. 2 (2014): 477–84, https://doi.org/10.1016/j.sbspro.2014.01.1447; Mohd Syaubari Bin Othman and Ahmad Yunus Bin Kassim, "Teaching Practice of Islamic Education Teachers Based on Higher Order Thinking Skills (HOTS) in Primary School in Malaysia: An Overview of the Beginning," *International Journal of Academic Research in Business and Social Sciences* 7, no. 3 (2017): 401–15, https://doi.org/10.6007/IJARBSS/v7-i3/2745.

[83] Richard S. Snell, *Clinical Neuroanatomy*, *7th Edition*, *Statistical Science*, 7th ed. (China, 2010).

[84] Sherwood, *Human Physiology*.

[85] Saijing Zheng et al., "Understanding Student Motivation, Behaviors and Perceptions in MOOCs," in *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15 (New York, NY, USA: Association for Computing Machinery, 2015), 1882–95, https://doi.org/10.1145/2675133.2675217; Colwyn Trevarthen and

The word *Muhasabah* is derived from the word *hasibah* means reckoning or counting.[86] Contextually, *muhasabah* means self-reflection, introspection, and self-evaluation. Furthermore, *muhasabah* also means evaluating the thinking, recalling a particular object, considering the risk, choosing something form various options, and making a decision.

In Bloom's taxonomy, " *Evaluate or evaluating*" is the high level of cognitive thinking as it includes other elements of thinking. Additionally, it also assesses an object based on the defined criteria. According to the explanation above, it can be said that *muhasabah* in the hierarchical thinking perspective is equal to evaluate in Bloom's taxonomy perspective.

The prefrontal cortex: fikr dan analyze

In general, the *prefrontal cortex* functions to regulate critical-analytical thinking, planning for the future, and making a decision. Specifically, the *prefrontal cortex,* which functions for *fikr* or *analyze,* is the frontal lobe and parietal lobe. The frontal lobe, located in front of or on the forehead, works to the thinking process, planning, and conceptualizing. While the parietal lobe, located at the top of the head, is specifically responsible for managing memory.[87]

Suppose the neurophysiology prefrontal cortex is linked with *fikr* in the hierarchical thinking concept or analyze in Bloom's taxonomy concept. In that case, this brain area regulates the function

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Jonathan Delafield-Butt, "Intersubjectivity in the Imagination and Feelings of the Infant: Implications for Education in the Early Years," in *Under-Three Year Olds in Policy and Practice*, ed. E. Jayne White and Carmen Dalli, Policy and Pedagogy with Under-Three Year Olds: Cross-Disciplinary Insights and Innovations (Singapore: Springer, 2017), 17–39, https://doi.org/10.1007/978-981-10-2275-3_2.

[86] Yunus, *Kamus Arab-Indonesia [Arabic-Indonesian Dictionary]*.

[87] Pasiak, *Revolusi IQ/EQ/SQ: Menyingkap Rahasia Kecerdasan Berdasarkan Al-Quran Dan Neurosains Mutakhir [The IQ/EQ/SQ Revolution: Uncovering the Secrets of Quran-Based Intelligence and State-of-the-Art Neuroscience]*.

of *fikr* or *analyze*. Therefore, Islamic education should stimulate the cortex prefrontal so the student can be an expert in particular subjects.[88] One of the methods used to stimulate this brain part is training to ask the question critically.[89] Thus, the prefrontal cortex is considered excellent not because one can answer the question but because he is critical in asking questions.

One derivation of word *fikr* is *tafakkur*. In Arabic, *tafakkur* has some synonyms such as *tabasyur* (taking into account), *taddabur* (contemplating), *tafaqquh* (deepening), *tadzakur* (considering), *ta'aqul* (applying), I'tibar (learning), and *tawassum* (reading).[90] These two words share the same meaning but used in a different context. The word '*fikr*' is used to describe something abstract, and '*fark*' is used to describe something concrete.[91] These various synonyms show that the thinking process is varied and complex.

Fikr in the hierarchical thinking is equal to analyze in Bloom's taxonomy's perspective. *Analyze* is the ability to explain object knowledge into structured parts or components to be easily understood. Analyzing activity includes identifying the object's part, examining the relationship between elements, and identifying principles in compiling it.

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[88] Robert Wagenaar, "Competences and Learning Outcomes: A Panacea for Understanding the (New) Role of Higher Education ?," *Tuning Journal for Higher Education* 1, no. 2 (2014): 279–302, https://doi.org/10.18543/tjhe-1(2)-2014pp279-302; Ivar Bleiklie et al., "Academic Institutions, Ambiguity and Learning Outcomes as Management Tools," *European Journal of Education* 52, no. 1 (2017): 68–79, https://doi.org/10.1111/ejed.12200.

[89] Ali Nouri, "The Basic Principles of Research in Neuroeducation Studies," *International Journal of Cognitive Research in Science, Engineering and Education* 4, no. 1 (2016): 59–66, https://doi.org/10.5937/IJCRSEE1601059N.

[90] Departeman Pendidikan Nasional, *Tesaurus Alfabetis Bahasa Indonesia, Pusat Bahasa: Sinonim, Antonim, Hiponim, Dan Meronim [Indonesian Alphabetical Thesaurus, Language Center: Synonyms, Antonyms, Hyponyms, and Meronyms]* (Bandung: Mizan Bandung, 2012).

[91] Badi and Tajdin, *Islamic creative thinking: Berpikir kreatif berdasarkan metode Qurani [Islamic creative thinking: Creative thinking based on the Quranic method]*.

According to Raghib, "*fark* ", which is derived from the word '*fikr*', is rubbing (*al-hamm*), releasing (*al-'uqdata*), and liberating (*al-asir*) .[92] Therefore, the word 'fikr' contains a profound meaning related to the seriousness, activeness, tirelessness and effort to elaborate or even seek the deepest part of the universe. The discovery of *atoms, neutrons, electrons, protons*, and so on is an example of the *'fikr'* thinking model.

Prefrontal association courtex: ijtihad dan create

The prefrontal association cortex is located in front of the frontal lobe anterior to the premotor cortex. It is the part of the brain that creates a brilliant idea, specifically, functions to plan, make decision, be creative, and personality.[93]

If the prefrontal association cortex's neurophysiology is connected to *ijtihad* of the hierarchical thinking and *create* of Bloom Taxonomy, this prat modulates *ijtihad* or *create*. As a result, Islamic education has to stimulate this part to lead students to become *mujtahids* (reformers), creators, and inventors. One method to stimulate this part is by training students to be imaginative and creative.[94]

Ijtihad is derived from the word *al-jahd,* or *al-juhd* means difficulty and ability. The word *al-jahd* and all its derivations mean work very hard to solve the complex problem. In a broader sense, *ijtihad* can be seen as creativity (*ifti'ai*) which taken from the

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[92] Pasiak, *Revolusi IQ/EQ/SQ: Menyingkap Rahasia Kecerdasan Berdasarkan Al-Quran Dan Neurosains Mutakhir [The IQ/EQ/SQ Revolution: Uncovering the Secrets of Quran-Based Intelligence and State-of-the-Art Neuroscience]*.

[93] Sherwood, *Human Physiology*.

[94] Trevarthen and Delafield-Butt, "Intersubjectivity in the Imagination and Feelings of the Infant"; Lev Semenovich Vygotsky, "Imagination and Creativity in Childhood [Voobrazhenie i Tvorchestvo v Detskom Vozraste]," *Journal of Russian and East European Psychology* 42, no. 1 (2004): 7–97, https://doi.org/10.1080/10610405.2004.11059210.

word 'work' and 'hard work' (*juhd*).[95] *Al-juhd* means difficulty (*al-masyaqqah*) and ability (*al-thaqah*).

Term *ijtihad* also can be interpreted as thinking carefully to become a *mujtahid* (researcher or legal expert). It shows that *al-ijtihad* means to exert all abilities and feel impossibility beyond effort. In the Bloom taxonomy, creativity (to create) is the highest level of thinking. This level refers to the ability to combine pieces of information to form a new design. Therefore, creativity or thinking requires a lot of knowledge, understanding, and applications to produce innovative and approved masterpiece.

Neuroeducation, Neuro-religion, Neuro-philosophy

The study of hierarchical thinking and integration of three disciplines is relatively new in Islamic education.[96] Neuroeducation examines the learning process from different perspectives. The body and brain are physically able to respond to the psychological learning process and engaged in learning tasks or strategic implementation. It impacts the pedagogical practice in the future.[97] Neuro-religion is an integration of brain science and religion. Although religion is often at odds with neuroscience, these two entities are rooted and working in the same brain. With the emergence of modern cognitive neuroscience, the religious and spiritual phenomenon's study becomes more extensive and sophisticated. [98]

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[95] Badi and Tajdin, *Islamic creative thinking: Berpikir kreatif berdasarkan metode Qurani [Islamic creative thinking: Creative thinking based on the Quranic method]*.

[96] John Clark, "Where Neuroscience and Education Meet: Can Emergentism Successfully Occupy the Middle Ground between Mind and Body?," *Educational Philosophy and Theory* 50, no. 4 (2017): 404–16, https://doi.org/10.1080/00131857.2017.1376649.

[97] Laurie Curtis and Jana Fallin, "Neuroeducation and Music," *Music Educators Journal* 101, no. 2 (2014): 52–56, https://doi.org/10.1177/0027432114553637.

[98] Departeman Pendidikan Nasional, *Tesaurus Alfabetis Bahasa Indonesia, Pusat Bahasa: Sinonim, Antonim, Hiponim, Dan Meronim [Indonesian Alphabetical Thesaurus, Language Center: Synonyms, Antonyms, Hyponyms, and Meronyms]*.

Meanwhile, neuro-philosophy is an interdisciplinary study on prospects for the integration of cognitive neurobiology. Contemporary neuroscience research shows empirical evidence of the relationship between cognitive theory and philosophical abstracts with empirical neuroscience.[99] These three fields (neurotheology, neuro-philosophy, and neuro-education) enrich the Islamic education perspective (see Table 1), enlarging the opportunities to develop challenging research in the future.

Based on the narrative synthesis formed in interpretation, comparison, and integration between neurotheology, neuro-philosophy, and neuroeducation, it can be concluded that hierarchical thinking in Islam has relevance to these three fields. Therefore, hierarchical thinking can be an alternative to Islamic teaching-learning taxonomy. Thus, the essence of Islamic teaching education is to optimize students' brains' potential to prepare for an excellent generation. The Islamic teaching-learning process can be designed gradually.

CONCLUSION

Based on a systematic review of the hierarchical thinking concept in both of Qur'an and neuroscience, the result shows that this concept is relevant to neuro-theology, neuro-philosophy, and neuroeducation. However, little literature synthesizes the narrative relationship between the three fields with the findings on clinical neuro-anatomy and neurophysiological, especially the *prefrontal cortex, limbic system, cingulate gyrus, basal ganglia, lobe temporal*, and *cerebellum. Islamic Neuroeducation* is a synthesis narrative that combines the three fields with clinical neuroanatomy and

[99] Vygotsky, "Imagination and Creativity in Childhood [Voobrazhenie i Tvorchestvo v Detskom Vozraste]."

neurophysiological findings to form a hierarchical relationship that covers the rational to the spiritual dimension. This finding is a new alternative for the Islamic teaching-learning taxonomy and complementing Bloom's taxonomy that has been enforced in Islamic education. Therefore, the learning taxonomy in Islamic education starts from this discourse. Learning taxonomy in Islamic education can be developed by synthesizing neuro-theology, neuro-philosophy and neuro-education in an integrative way, and more complex than Bloom's taxonomy which only focuses on the cognitive aspect.

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