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## Hybridization of Islamic Education and Neuroscience: Transdisciplinary Studies of 'Aql in the Quran and the Brain in Neuroscience

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### Abstract

The essence of Islamic education, in addition to the transfer of value and knowledge is the optimization of all human potential. Most of human potential rests on his brain. The science of studying the brain is neuroscience. Therefore, Islamic education and neuroscience can be hybridized in an interdisciplinary manner. The purpose of this study was to find new scientific varieties resulted from hybridization of Islamic education and neuroscience. This research is an interdisciplinary study with a qualitative approach in the form of library research. The source of the research data is the literature in the field of Islamic education and neuroscience that is explored and collected documentary and analyzed with content analysis. The results of the study showed that the concepts of *naṣīyah* (crown) and '*aql* (mind) in the Quran have a correlation with the brain and mind in neuroscience. Both can be hybridized so as to find new varieties of science called the Islamic Education Neuroscience. This new branch of science has the potential to be equivalent to the scientific branches that have been developing so far, such as the philosophy of Islamic education, the psychology of Islamic education, the anthropology of Islamic education and so is the neuroscience of Islamic education. Educators, both teachers and lecturers who study this science can do stimulation and intervention to optimize students' brain potential in an integrated manner in learning Islamic diversity.

**Keywords:** Islamic Education, neuroscience, hybridization, mind, and brain

### A. Introduction

This research is motivated by theoretical conflicts in the fields of Islamic education and neuroscience. According to prominent neuroscientist Sousa, although Educators (teachers and lecturers) are not brain experts, but educators are one of the professions whose every day work changes or develops the potential of the brain (Sousa, 2012). Furthermore, Sylvester's study states that for centuries Educators developed the potential of the brain without knowledge of brain science or neuroscience (Sylvester, 2012). Therefore, interdisciplinary, multidisciplinary and disciplinary approach is needed to integrate Islamic education and neuroscience.

So far, new Islamic education only discusses mind ('*aql*) in the Quran, and it hasn't been related to the brain in neuroscience. In other words, Islamic education has not paid serious attention to neuroscience. One of the indications is that Islamic religious learning

seems doctrinal pedagogical, and not empirical rational (Suyadi, 2018d). This has implications for the condition of Islamic education which is limited to developing static competencies, not dynamically developing potential (Suyadi, 2016). As a result, Islamic education has not been able to develop the brain potential of students into superior humans (*ulul al bab*) while human excellence is determined by their thought and brain (Rahman et al., 2017).

Therefore, the study of Islamic education and neuroscience needs to be integrated or intertwined. Scientific integration (Abdullah, 2015), Islamization of Science (Al-Faruqi, 1995), and Islamic studies (Kuntowijoyo, 2004), can be used as an entrance gate to integrate both (Islamic education and neuroscience). Scientific integration for example, has an adequate concept to integrate all fields of science (including neuroscience) and all religions (Suyadi, 2019). Therefore, basically the study of neuroscience and Islamic education can use the scientific integration paradigm.

However, so far studies in the field of neuroscience have developed rapidly and found a different form of scientific integration, namely scientific expansion, such as neuroscience and theology (neurotheology) (Newberg, 2010), spirituality (neurospiritual), to education (education) neuroeducation (Rich, 2009). Initially, research in the field of neuroscience focused on Sperry's findings about the right brain and left brain (Suyadi, 2018c). The right brain processes rhythm, space awareness, imagination, daydreaming, color and dimensions, while the left part of the brain processes words, logic, numbers, sequences, linearity, analysis and lists. Rogers Sperry's findings have a wide influence, not only in the field of neuroscience, but also in other fields, including education. Education, including Islamic education is criticized for over-indulging the left brain and not developing the right brain (Suyadi, 2018b).

Sperry's findings however were broken by Hebb who found the fact that the right hemisphere of the left brain works simultaneously in processing every information that comes in (Hebb, 2012). Hebb views that the two hemispheres of the brain are only physical, while their functions are not specialized as suggested by Sperry. Hebb's opinion is also supported by Jensen who states that the right brain and left brain paradigms are outdated (Jensen, 2000). Since this finding surfaced, left-right brain discourse began to be abandoned, then shifted towards Whole Brain Learning (Medina, 2011), including holistic education that respects the full potential or student's intelligence (Sutarman, Tjahjono, Hamami, 2017). Even this concept of holistic intelligence in the latest study has similarities with Al-Ghazali's thinking regarding intellectual, emotional, physical, and spiritual development (Barni, 2017).

At the end of the 20<sup>th</sup> century more research in the field of neuroscience intersects with psychology, especially aspects of human intelligence. For example, Emotional Intelligences (Goleman, 2006), Spiritual Intelligence (Zohar dan Marshal, 1994), Social Intelligences (Goleman, 2007), the Revolution of IQ/ EQ/ SQ (Pasiak, 2008); Unlimited Potency of the Brain (Pasiak, 2009), Intelligence Management (Pasiak, 2006), Understanding Brain Work (Damasio, 2009), and so on. These studies are almost entirely written by neurologists and/ or psychologists. They carry the same academic concern, namely the abandonment of human brain potential.

In the context of Islamic education, the study of neuroscience focuses more on the area of brain-based learning methods, such as Brain Based Learning (Jensen, 2000),

Teaching With Brain Mind (Jensen, 2005), Art with the Brain in Mind (Eric Jensen, 2010), (Suyadi, 2018c). How Brain Learns, and How the ELL Brain Learn, Accelerated Learning, Quantum Learning (DePorter & Hernacki, 2000), Active Learning (Gunawan, 2003), and so on. The entirely mentioned literatures are an attempt to implement neuroscience or brain-based learning theories into learning praxis.

Yet the effort to implement theories in the field of neuroscience into classroom learning practices was criticized by Tommerdahl as a patchwork effort because it is done without going through the bridge of the science of education so that it seemed forced (Tommerdahl, 2010). Therefore, comprehensive research is needed in Islamic education and neuroscience.

The scientific integration model cannot be used to integrate Islamic education and neuroscience because according to Sa'adi it is still limited to specific, speculative philosophical descriptions and has not been empirically tested and implemented (Sa'adi, 2011). Similarly, expansion models such as those that have run so far cannot be applied because they are still patchy. Therefore, this study uses a hybridization approach to cross between Islamic education and neuroscience. Hybridization, in addition to having a comprehensive element of integration, also has empirical and implementative field specifications, thus accommodating the criticism of Sa'adi and Tommerdahl.

Hybridization, initially only used in the natural sciences such as agriculture, animal husbandry, algorithms, and other natural sciences. For example, Sudirman Numba uses hybridization to analyze DNA genome segregation in rice plants (Numba et al., 2017), Hadie uses hybridization to increase the productivity of catfish between species (Hadie, Tahapari, & Hadie, 2010), Asyrofa Rahmi using hybridization genetic algorithm with neighborhood variable on optimization of distribution costs (Rahmi, Mahmudy, & Anam, 2017). Based on these studies, hybridization in the field of natural science is believed to be accurately proven to produce new high-yielding varieties of seeds (Rahmi et al., 2017).

However, in the last few decades scientific discourse with an interdisciplinary, multidisciplinary and transdisciplinary approach, began to use hybridization on the humanities social sciences. For example, Pramono uses hybridization in analyzing fiction and science literature, so literature does not only focus on the life figure with romanticism aspect that is so sentimental and dramatic, but also the use of literature in certain scientific fields so that fiction must also be rational (Pramono & Ansori, 2016). Wahyono uses hybridization to develop the management of Islamic Religious Higher Education (PTKI) and General Higher Education (PTU), so that both are integrated (Wahyono, 2014). Hadi uses hybridization to analyze pesantren policies in adopting state education political policies as well as accommodating public preferences for public education (Hadi, 2016). Even hybridization has also been used by Beratha in analyzing the acculturation of art and culture (Kedisan, 2016).

Referring to the use of hybridization in various fields of science, this research uses hybridization to facilitate the integration of Islamic education and neuroscience. Islamic education and neuroscience hybridization do not merely "Islamicising" neuroscience or "neurosciencing" Islamic education. This research "crossed" between Islamic education and neuroscience so that it gave birth to new scientific varieties resulted from the combination of both disciplines.

Based on the background above, the main problem in this study is, how are the theoretical concepts of hybridization of Islamic education and neuroscience? What are the new science varieties generated from the hybridization or "cross-breeding" of Islamic education and neuroscience? This academic problem is important because the Islamic education discourse in Indonesia is still dominated by a mono-disciplinary approach so that it tends to have pedagogical doctrinal nuances, which are not yet inter-multi, and trans-disciplinary so that they can't reach the rational and empirical domains.

The hybridization of Islamic education and neuroscience gained the right momentum as there were bubbling waves simultaneously in Paris, Tokyo, and Cambridge to bring neurobiology and cognitive psychology into education-intensive relations (Fischer, 2009) at the end of the 20th century. The big wave reached its peak with the declaration of "Decade of the Brain" in America in 1990. In Indonesia, the declaration of the decade of the brain (Indonesian Brain Decade [DOI]) was carried out by the Indonesian Neuroscience Society (MNI) in 2012 but the declaration has not received a warm welcome from the education community. Islamic education hybridization and neuroscience reignited the ever burning scientific fire. The hybridization of Islamic education and neuroscience will influence the learning process which was originally pedagogical doctrinal to become empirical rational.

## B. Traces of Neuroscience in Islamic Education

The trace of neuroscience in the Qur'an can be traced through the concept of "nasiyah" (crown) which is stated in QS. 96: 15-16. In Salman's interpretation, the term "nasiyah" (fontanel) is a term intended to refer to the brain (ITB, 2014). Historically, the term "brain" has not appeared in the VII M century or when the Koran was revealed, so that Alqur'an uses a term commonly understood by society, namely nasiyah or fontanel.

كَلَّا لَئِنْ لَمْ يَنْتَهِ لَنَسْفَعًا بِالنَّاصِيَةِ  
نَاصِيَةٍ كَاذِبَةٍ خَاطِئَةٍ

"No!, If he does not desist we will surely drag him by his forelock, a lying sinning forelock." (QS. Al-Alaq: 15-16).

Neurobiologically, the brain behind the crown is the prefrontal cortex. This part of the brain functions to think critically, plan, motivate and initiate good and bad deeds, including expressing honesty or lies (Pasiak, 2012). In the Qur'an, such brain functions are similar to *aql* or thought. Even the word sense in the Indonesian language dictionary is translated into thinking power which also comes from the word *'aql* in the Qur'an. Thus, what is meant by "*naasiyah*" in Q.S. Al-Alaq [96]: 15-16 above is the human brain, especially the prefrontal cortex which functions to think as *'aql* (thought).

The terms *nasiyah* and *'aql* have indeed emerged since the seventh century, but the term brain and neuroscience only emerged in the nineteenth century, discussed in the mid-1960s (Squire (ed), 2008). Therefore, it is natural that explicitly the word brain, moreover neuroscience are not contained in the Koran, because the Arabs society do not yet understand what lies behind the crown (*nasiyah*), which is the brain whose studies is now known as neuroscience.

Neuroscience studies human's most precious part which actually also studies a part of the body that is extremely complex because it affects all layers of human life ranging from the atomic level to the global community (Ikrar, 2016). Pasiak published neuroscience as scientific studies that specifically discuss the nervous system, some neurons or nerve cells with multidisciplinary participants (Pasiak, 2012). According to him, the brain can only be determined if it is agreed with the mind. Similarly, *nasiyah* can only be defined if it is related to the mind.

In its development, studies in the field of neuroscience have crossed into the realm of theology (neuroteology) (Newberg & Waldman, 2009), spirituality (neurospiritual) (Pasiak, 2012), to neuroeducation (Rich (ed), 2009). These studies dwell on the investigation of the same object, namely what happens to the human brain when carrying out activities related to spirituality and religious rituals. The results of these studies show almost the same brain wave phenomena in all believers when performing ritual or spirituality activities (Sayadmansour, 2014). This indicates that *nasiyah*, *aql*, brain or mind have an important role to relate to God.

Thus, it can be concluded that the neuroscience that emerged in the 19th century was basically a development of the critical study of the concept of *nashiyah* in the Koran which emerged in the 7th century. This can be proven that behind *nasiyah* or fontanel is where the brain lies which functions to think as the *nasiyah* function is also to think.

### C. The Gap Between Islamic Education and Neuroscience

According to Bruer, education — including Islamic education — and neuroscience has a great distance (Bruer, 1997). Varma and Edelenbosch state that neuroscience and education are too distant to be connected. At least, the distance extends from a very scientific area to a very pragmatic region (Varma, at al., 2008). The scientific area is concerned with methods, data, theory and philosophy; while the pragmatic region operates on aspects of cost, time, control, and results to be achieved.

Similar views were also expressed by Ansari who was skeptical of efforts to connect the mind, brain, and education or neuroscience and education (Ansari, at al., 2011). Ansari's skepticism is based on the ups and downs of the neuroeducation project which has been going on for almost 100 years and costs a lot but has not shown significant progress. In fact, Hardiman in his recent research still shows skepticism (Hardiman, at al, 2012).

Ormrod, a leading psychologist, said that if you want to understand the nature of learning, you must review what psychologists have found, not neurologists (Ormrod, 2008). That is, Ormrod doubted the ability of neurologists to connect neuroscience and education. Ormrod's view was supported by Sigman who stated that between education and neuroscience a bridge must be built through cognitive psychology (Sigman, at al., 2014).

However, there are not few neurologists and also some psychologists - even educators who remain optimistic to build a "bridge" that connects neuroscience and education, including Islamic education. Bruer, for example, gives an optimistic, though cautious, consideration that neuroscience can be linked to education. He saw that there was a short bridge that already existed and could be used to connect the two, namely cognitive psychology. Ayvaz also stated that in the past few years, interdisciplinary

theoretical discussion of the relationship of neuroscience, especially cognitive neuroscience and education has been strengthened with the aim of understanding how one can learn better (Dundar & Ayvaz, 2016).

As the time went by and with increasing findings in the field of neuroscience, the number of neurologists and psychologists who are optimistic about being able to connect neuroscience and education is increasing. In almost the same time, along with the weakening of the skepticism above, in 1900 there was an amazing awakening with the declaration of decades of the brain (Brain Decade) in America that triggered a reaction not only from neurologists and psychologists, but also from the fields of biology, pharmacology, art, and so on to bring themselves into the discipline of education. They work together to build a "bridge" to connect neuroscience and education through cognitive psychology (Goswami, 2004). Their efforts culminated in a movement to connect the brain, mind and education or better known as neuroeducation (Suyadi, 2015).

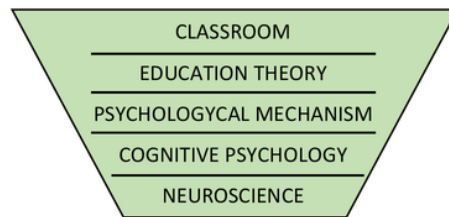
In its development, neuroscience research in the field of education has experienced rapid growth, despite its one-way nature, which only comes from scientists (neurologists, psychologists, biologists, etc.) to pragmatic (learning) or education. For example, a study conducted by Atherton and Diket (Atherton, 2005) that seeks to apply the findings of brain research in the neuroscience laboratory into classroom learning practices. Similar research is carried out with different focus and specifications, including Jensen, DePorter and Sousa and other neurologists.

The rise and optimism of scientists from various disciplines is not without reason. Until now, a variety of efforts have been made, various studies have been completed, and various conferences have been held in which all of them are carried out in order to build a strong "space" of academic arguments to connect education and neuroscience or (neuroeducation: brain, mind, and education).

On the other hand, there are conflicting opinions, especially from Fischer. He stated that the relationship between neuroscience and education must be done in the classroom, not in the neuroscience laboratory. The argument is that in classrooms children "sculpt" their own brains. Montessori is the first neurologist to make Kindergarten (TK) classrooms a research laboratory that links the brain and education (Crain, 2007). Now, the Montessori laboratory has developed into a very well-known School and has been widespread throughout the world. In Indonesia alone, the Montessori School has spread to all corners of the country and many of them are among the best schools.

Fischer's idea above was criticized constructively by Tommerdahl, who stated that it was impossible that findings from neuroscience laboratories to be directly applied to classroom learning (Tommerdahl, 2010). Therefore, he built strong bridges to connect mind, brain, and education; from neuroscience laboratories to praxis of learning in the classroom. Tommerdahl proposed five steps to implement research findings in the neuroscience laboratory into classroom learning practices. The five steps are neuroscience, cognitive neuroscience, psychology mechanisms, educational theory, and classrooms learning. The five are depicted in the picture as follows:





**Figure 2.**  
Bridge connecting education and neuroscience according to Jodi Tommerdahl  
(Tommerdahl, 2010)

Although Fischer, Tommerdahl and Montessori, argue that the basis of neuroscience and education research is in the classroom, one thing needs to be noted, that they are all neurologists, not educators. This condition is different from educators who have not come into contact with neuroscience laboratories. That is, if educators simply agree with the opinions of neurologists, then the practice of learning in the classroom will not be much different from before, and one might find the occurrence of misunderstanding or misapplication and oversimplification as what had happened so far. Although they proposed that the basis of educational research and neuroscience was in the classroom, they themselves were not active educators teaching in the classroom. They remain as neurologists who want to apply their findings from neuroscience laboratories to classroom learning practices. As a result, the practice of education has always been a scientific "object". They try to "forcefully" apply neuroscience findings in the laboratory into the classroom. As a result, all these efforts always lead to misunderstanding or misapplication and oversimplification (Alferink & Dougan, 2010).

The author disagrees with Varma, Ansari and Ormrod who are pessimistic and assuming that neuroscience and education cannot be connected because of the far distance. The author agrees more with Truer, Fischer and Tommerdahl who are optimistic that neuroscience and education can be linked, one of which is through the "bridge" of cognitive psychology, especially cognitive neuroscience. Nonetheless, Authors tend to use hybridization, not connecting bridges like Fischer. The argument, connecting bridges is only a means to implement findings in the field of neuroscience into learning classrooms so that there is no turmoil, while hybridization requires both (neurologists and educators) to collaborate to find ways together so that students' brain potential develops maximally through learning.

#### **D. The Hybridization of Islamic Education and Neuroscience**

The hybridization of neuroscience and Islamic education can be a middle ground for the conflict between Tommerdahl and Fischer, where Tommerdahl wants the neuroscience research base to be in the laboratory while Fischer wants the neuroscience research base to be in the classroom. Although Tommerdahl has provided a solution by



building a bridge between the laboratory and the classroom with five steps, it still leaves a distance. Even Edelenbosch's offer to directly focus on brain-based learning is not a solution (Edelenbosch, et al., 2015).

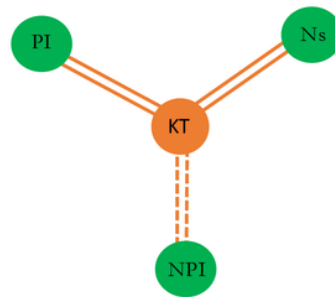
The author argues that the hybridization of neuroscience and Islamic education can be carried out in "integrated classes" namely classrooms equipped with neuroscience laboratory devices at once. For neurologists, classrooms or neuroscience laboratories are not important, but educators and neurologists are in one place to do joint research (Nouri, 2016). Wit offers a class concept as an affordable, easy and practical neuroscience learning laboratory, which uses neurogaming EEGs to recognize key concepts in neuroscience (Wit, et al., 2017). However, according to the author, Wit's offer can only be done on medical faculties that study neurology, not education that studies intelligence.

Integrated class laboratories or integrated learning laboratories in the hybridization of Islamic education and neuroscience can be seen in the research of Norsiah and Naqiah who recorded brain waves using Quantitative Electroencephalograph (qEEG) to readers of the Holy Qur'an as a therapy (Norsiah & Naqiah, 2015). Ofen has also used brain imaging technology to measure memory or memory in learning, even to the different age groups (Mattson, et al., 2017). At the end of his research, he suggested that there be an effort to increase memory power, including learning memory.

Integrated classes in the hybridization of Islamic education and neuroscience are classes in which all students have access to using EEG devices while studying Islam, then measured brain waves. In such situations, the teacher can find out whether the learning has implications for optimizing the potential of the brain or not.

The hybridization of Islamic education and neuroscience can also strengthen the concept of neuroeducation which was pioneered by Johns Hopkins University in a consortium of neurologists, psychologists and artists in 2009. Although neuroeducation continues to grow, until 2015 this neuroeducation initiative has only arrived on explaining the biological bases for learning (Rodgers, 2015). Thus, neuroeducation and hybridization of Islamic education and neuroscience can strengthen each other.

Based on the analysis of theoretical concepts in Islamic education and neuroscience above, it can be stated that hybridization of neuroscience and Islamic education produces new varieties of science as a whole scientific configurative formulation. The new science variety resulting from the hybridization of neuroscience and Islamic education is referred to as the Islamic Education Neuroscience (NPI). If the hybridization model of Islamic education and Neuroscience with this integrated class is described in the form of a model, it will appear as follows:



**Figure 3.**  
The Model of Hybridization of Islamic Education and Neuroscience

Picture Explanation:

PI : Islamic Education

Ns : Neuroscience

NPI : Islamic Education Neuroscience

KT : Integrated Classroom

Figure 1 above explains that hybridization of Islamic education (PI) and neuroscience (Ns) gave birth to a variety of new sciences called the Islamic Education Neuroscience (NPI). Briefly NPI can be defined as the study of optimizing the potential of the brain in Islamic religious learning. This definition is in accordance with the objectives of Indonesia's national education, namely to educate the life of the nation (Suyadi, 2018a). Given that the center of intelligence is the brain, while the way to optimize the brain is education, optimizing the potential of the brain is hybridization of both. This definition is in line with Ikrar's opinion which states that neuroscience is the study of the brain in an interdisciplinary manner (Ikrar, 2016). Islamic Education Neuroscience (NPI) is oriented to learning a healthy brain for intelligence, while pure neuroscience or neurology is still oriented to studying the sick brain for healing.

The Islamic neuroscience of education corresponds to the concept of Ulul Albab in QS. 35:28, namely superior humans or excel educators as scholars who are scientists or scholars (Rahman et al., 2017). Therefore, the educator's "right foot" must stand in the learning classroom while the "left leg" stands in the neuroscience laboratory and it applies vice versa, for neuroscience, "his right leg must stand in the neuroscience laboratory while his left foot must stand in the learning classroom. Thus, the competence of educators and neurologists is the accumulation of the science of Islamic education and neuroscience itself. This competence is what in the XXI century or the era of disruption is called interdisciplinary and/ or trans-disciplinary approach (Oey-Gardiner et al., 217AD). Educators and neurologists must collaborate and synergize or hybridize to optimize the potential of their students' brains.

Islamic education neuroscience can explore neuroanatomy and neurophysiology, so that brain stimulation and intervention through the design of learning strategies can be done properly. For example, one neuroanatomy is the prefrontal cortex. Neurophysiology or prefrontal cortex function is sloppy, analytical, systematic thinking or often referred to as sublime brain function (Snell, 2010). One form of critical thinking is asking. Therefore, intervention in the prefrontal cortex can be done by training students to ask as much as possible, not answer as many questions as they have done so far. The more skillful the question, the more optimal the potential for prefrontal cortex. Likewise with other brain neuroanatomy, such as the limbic system, broca area, temporal width, and so on. The more neuroanatomy that educators can recognize, the easier it will be to intervene with special stimulation so that the brain's potential is maximized.

### **E. Conclusion**

The hybridization of Islamic education and neuroscience can be positioned as sustainability of empirical specialization of Islamic scholarship, Islamic science, and scientific integration. If Al-Faruki Islamizes science, while Kuntowijoyo studies Islam, and Amin Abdullah integrates both, then this study (Suyadi), hybridizes science specifically (neuroscience) and Islam in particular (Islamic education).

*'Aql* in the Qur'an and the brain in neuroscience can be an embryo for the hybridization of Islamic education and neuroscience to produce new scientific varieties, namely the neuroscience of Islamic education. This finding has the potential to be equivalent to the scientific branches that have been developing so far, such as: the philosophy of Islamic education, educational psychology, the sociology of Islamic education, Anthropology of Islamic education and the neuroscience of Islamic education.

Neuroscience Islamic education is defined as the study of optimizing the potential of the brain in Islamic religious learning. By mastering this knowledge, criticism of Sousa and Sylwester can be avoided, because Educators, both teachers and lecturers can do stimulation and intervention to accurately optimize the potential of brain students.

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