

***DEVELOPMENT OF ISLAMIC RELIGIOUS EDUCATION MEDIA BASED ON NEUROSCIENCE IN IMPROVING HIGHER-ORDER THINKING SKILLS (HOTS): SEBUAH LITERATUR REVIEW***

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***Abstract***

*The Islamic education curriculum is seen as only developing the left brain and ignoring the function of the right brain, this leads to the right brain being less optimized in learning. Although learning media of Islamic education and neuroscience-based learning have enormously been researched, there is still little mention of Neuroscience-Based learning media in Islamic education in improving HOTS. This study aimed to analyze neuroscience-based learning media and their relation enhancing students' HOTS. This study used a systematic literature review (SLR) with the PRISMA model. The findings reveal a relationship between learning media and Neuroscience, which can increase HOTS. The temporal lobe and occipital lobe process the conveyed information optimally, if Islamic education is delivered by learning media.*

**Keywords:** *Learning Media of Islamic Education, Neuroscience, Higher-Order Thinking Skills*

**Introduction**

Islamic education is seen to optimize the left brain and to neglect the potential of the right brain, in the fact that the current Islamic educational curriculum enhances only the left brain and ignores the right brain (Suyadi, 2020). Proportionally, the right brain is less optimally evolved in the learning process because education concerns only the goal's accomplishment rather than creative and imaginative content in the curriculum. As a result, students have less opportunity to think divergently (Saifurrahman & Suyadi, 2019). Indeed, many teachers understand the characteristics of the child's brain. However, their opinions regarding what teachers should do while teaching (changing the brain) are not always the same (Suyadi, 2017). Furthermore, the teacher must substitute the early habit which using conventional methods, namely lectures and memorization, in learning. Child's brains are not trained to benefit from critical thinking, in a contrast, 21st-century teachers require teaching models that help Higher Order Thinking Skills (Lestari & Suyadi, 2021). In optimizing brain function, the appropriate learning media is needed to develop learning media related to neurosciences (Dewi et al, 2018). Siregar et al (2020)

mention that accuracy in using learning media can stimulate and even create students' thinking to a higher level (HOTS).

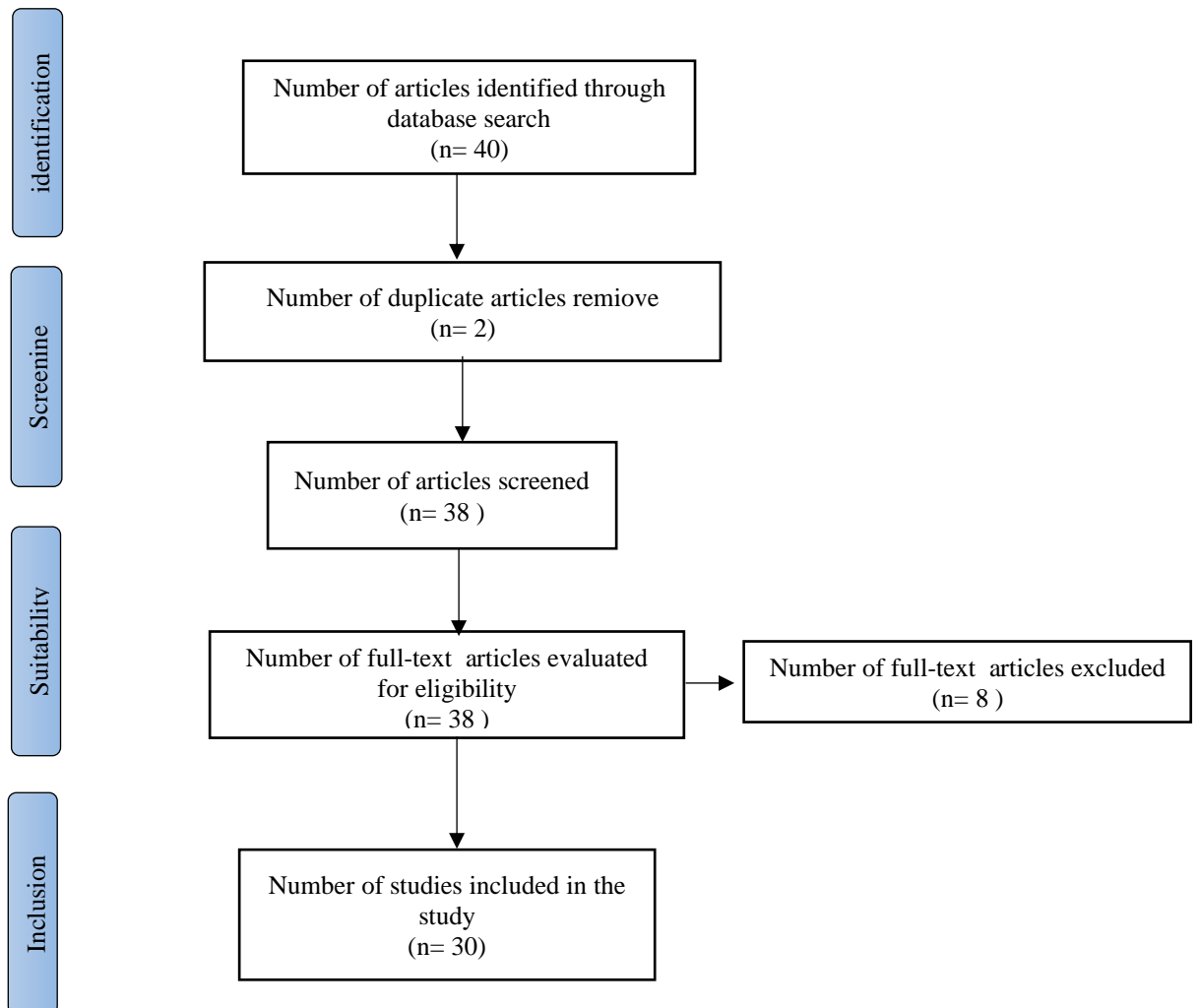
The challenge of Islamic education involves implementing an education system that can optimize brains' function; moreover, brains can receive, manage, store and use the information obtained in an integrated manner. Referring to the definition of education in the national education system (SISDIKNAS), there should be no more misunderstandings about brain optimization in the educational process. Research related to neuroscience-based learning media has not been widely carried out, this is according to (Hrp, 2014); (Saifurrahman & Suyadi, 2019); (Lestari & Suyadi, 2021); (Nursa et al, 2020) and (Dewi et al., 2018). On the contrary, the previous research has not discussed learning media suitable for Islamic education, which can mutually function the left and the right brains. Based on previous studies above-mentioned by the author, there is still no broad discussion regarding learning media used in learning Islamic education, which can optimize the function of the right and the left hemisphere. Therefore, in this study, the researcher discusses in-depth learning media to maximize brain function and neglects the assumption that learning in Islamic education only optimizes the function of the left brain.

According to the problem exposure mentioned earlier, the researcher will examine the development of neuroscience-based learning media for students' higher-order thinking skill improvements. Even far, the lecture method often used in learning has only functioned for the left brain. Therefore, the research objective in this study is to be able to associate and explain neuroscience-based learning media and its relation to a child's higher-order thinking skill improvements. This research benefits by providing the inputs of the Islamic education teachers to select and develop neuroscience-based learning media to improve HOTS in optimizing the functions of the brains.

## **Method**

According to A. Putra & Afrilia (2020) This scoping review aims to analyze the scientific literature on the development of neuroscience-based learning media in improving students' higher-order thinking skills (HOTS). For this reason, a systematic literature review (SLR) (A. Putra & Afrilia, 2020) (Kitchenham et al., 2010) with the model of PRISMA (Page et al., 2021) in this study was used as a reference. The bibliographic sources were searched by browsing articles in Indonesian and English. This search was associated with learning materials to obtain the desired information, and the

subsequent analysis was further carried out. This analysis compiled neuroscience-based learning media for improving HOTS in students. The articles of this study contain articles from 2013-2022 as references to find out the neuroscience-based learning media.



*figure 1 Diagram PRISMA*

The research questions related to neuroscience-based learning media in improving HOTS are as follows: 1) How many scientific articles have been published concerning neuroscience-based learning media improving HOTS? 2) How many articles are in Indonesian and English related to neuroscience-based learning media in improving HOTS? 3) What is the use of learning media in Islamic religious learning? 4) How is the development of Learning Media for Islamic Education based on Neuroscience in improving HOTS?

The following database is used to search for articles through Google scholars with the keywords of neuroscience-based learning media and Higher-order thinking skill (HOTS). It is found that 30 references and the fact that 10 references are used under the

searched parameters with Neuroscience-based Learning Media for Islamic Education toward HOTS Improvement.

Searching for references is by exploring articles in Bahasa Indonesia and English. Additionally, searching for references related to the topics of learning media, neuroscience, and HOTS is to get the information needed that further is analyzed. The analysis aims to describe learning media in neuroscience-based Islamic education to help students improve higher-order thinking skills (HOTS). Thus far, this research covers references from 2013 to 2022 that examine the development of neuroscience-based learning media. The researcher searched for references from *Google Cendekia* and Google Book with the keywords such as Islamic education learning media, neuroscience, and higher-order thinking skills (HOTS). It resulted in approximately 60 book articles the researcher read, reviewed, and analyzed, around 30 articles acquired from national and international journals, and 13 e-books. The search was obtained according to the topics of this research. The references the researcher has received are listed in the following table.

<b>Year of Publikation</b>	<b>International Journal</b>	<b>National Journal</b>	<b>Books</b>
2022	0	1	0
2021	2	2	1
2020	1	4	5
2019	1	2	2
2018	0	2	1
2017	0	2	2
2016	1	4	1
2015	0	3	0
2014	1	3	0
2013	0	0	0
Total	6	24	12

*Table 1 the Lists of the Research References*

	<b>Learning Media for Islamic Education</b>
Authors	(Zaim, 2020), (Suryani, 2015), (Abidin, 2016), (Siregar et al., 2020).
	Neurosains for Islamic Education
Authors	(Dewi et al., 2018), (Sidah & Suyadi, 2020), (Prihantoro & Suyadi, 2021), (Wathon, n.d.), (Musi & Nurjannah, 2021).
	Learning-Based for Higher-Order Thinking Skill (HOTS)
Authors	(Sani, 2019), (Pasutri et al, 2021), (Lestari & Suyadi, 2021),(Wahyudi et al, 2020), (Prasetyo et al, 2021), (Jazeel et al, 2016).
	Neuroscience-based Learning Media for Islamic Education toward HOTS Improvement
Authors	(Saifurrahman & Suyadi, 2019), (Hrp, 2014), (Kemenkes, 2016), (Ernanida, 2019a), (Waluyo, 2014), (Khalimah, 2015), (Lusiawati, 2017), (Chamidiyah, 2015), (Kahfi, 2020), (Kurniawan, 2016), (Hayati et al, 2017), (Pujol et al., 2019), (Kuo et al, 2014), (Wijaya, 2018), (Nursa et al., 2020)

*Table 2 Authors classified by subject*

Based on the searches from Google Scholar were resulted as follows: 4 references regarding Learning Media of the Islamic Education being studied and analyzed; 5 references under the keyword of Neuroscience in Islamic Education; 6 references on the topics of the learning in Islamic education to improve Higher Order Thinking Skills (HOTS); and 15 references about Neuroscience-based learning Media of Islamic education toward the Improvement of HOTS.

## **Research Results and Discussion**

### **Learning Media for Islamic Education**

According to Hamid et al. (2020) in delivering the messages, an intermediary is needed to achieve the values and transfer of knowledge on the targets. One of the mediums for transferring values and knowledge is through learning media. According to Kutsiyyah (2019) Similarly, in the learning process that uses active, effective, interesting, and creative learning models, teachers cannot be separated from learning media. Afterward, learning media is a pivotal part of education in this process conducted in a school environment. Learning media is a set of tools and materials used by teachers in learning activities in delivering learning, graphic tool and electronics, both software and

hardware (Purba & Al, 2020), that involve five senses, to deliver messages to students. Furthermore, it can stimulate students' willingness, attention, thought, feeling, and interest to encourage (Hasan & Et.al, 2021) them to participate in learning activities and educational goals can be achieved (Jalinus & Ambiyar, 2016).

In general, learning media uses for teaching and learning activities. According to Sumiharsono & Hasanah (2017) these benefits are messages are not verbal enough, growing the spirit of learning, being limited to senses, time, space, and power can be overcome with learning media, being able to be independent for students, being interacted between students and learning sources which directly can be done, being same to be stimulated, equating the experiences that went through students, and catching the same perception for the student. Teachers highly need the selected learning media. Because learning media is selected relevant to materials and student development, such as tools for delivering messages, learning media is an effective tool to achieve educational goals (Suryani, 2015). The selection of learning media is a crucial and interesting decision in determining effective and efficient learning media as learning media. Abidin (2016) states that the selection of learning media following the child's brain development will affect the efficiency and effectiveness of the learning process.

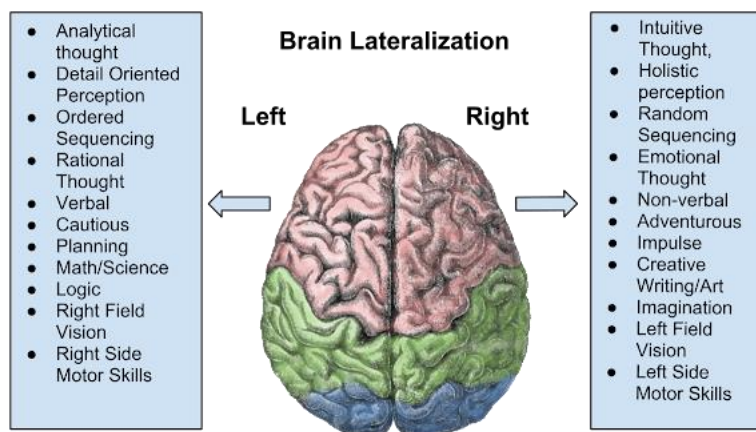
The accuracy in selecting learning media and activities stimulates students to create higher-level thinking (HOTS). This skill, in the learning and teaching process, can be trained. Higher Order Thinking Skills are obtained by providing space for students in terms of their determination of the concept of knowledge which leads to student creativity and can encourage students to develop creativity and higher-order thinking skills. HOTS take higher-level thinking and tends to encourage someone to think according to the conclusions they reach (Siregar et al., 2020).

### **Neuroscience for Islamic Education**

So far, Islamic Education has not paid serious attention to Neuroscience, the indication is that Islamic religious learning seems doctrinal pedagogical, not yet rational empirical, this has implications for the condition of Islamic Education which is limited to developing competencies statically, not developing potential dynamically, as a result, Islamic Education has not been able to develop the brain potential of students into superior humans (Ulul Albab) because of human excellence determined by his intellect and brain (Sidah & Suyadi, 2020).

Etymologically, Neuroscience is a neural science that studies the nervous system using a multidisciplinary approach (Prihantoro & Suyadi, 2021). While in terminology, it

is a field of science that discusses explicitly the nervous system in scientific studies. Therefore, learning concerned with neuroscience is often referred to as the study of the brain and all the functions of the spinal cord (Suyadi, 2017). A fundamental of neuroscience is to examine neurological basics from human behavior. Consequently, one of the main goals of neuroscience is to describe all the human behavior related to the process of the brain. Many breakthroughs in neuroscience have shown that the brain and human behavior are closely related. Under the Positron Emission Tomography (PET) equipment, six brain systems in the human body are found to comprehensively regulate the entire behaviors. These six brain systems are the prefrontal cortex, limbic system, gyrus cingulate, ganglia basal, temporal lobe and cerebellum. Six brain systems play essential roles in the regulation of cognition (knowledge), emotion (affective), and psychomotor (skills), also including what can set IQ, EQ, and SQ (Wathon, n.d.).



*Figure 1 the Right Brain and the Left Brain* ("Otak Kiri Dan Kanan," 2021)

The brain contains two hemispheres, and each hemisphere plays its role. Both sides of the brain (left and right) communicate with each other through the corpus callosum. What it means that each share with the other in the brain is that the human brain has functions in a very complex chemical field through various neurons and neurotransmitters. The cells in the brain are billions of neurons. These neurons can communicate quickly with one another through information carriers called neurotransmitters. Brain cells will constantly receive and obtain information about the individual's living in our lives. Then, the brain conducts experiments to internally characterize our external environment through complex chemical changes.

The findings by Putri (2020), Akarim (2019), and the experts at the University of Utah did not find evidence of the theory on the dominance of the human brain, both the

right hemisphere and the left hemisphere. In other words, the two hemispheres of the brain interact and communicate with each other. The brain does have a role of its own, according to research. For example, the job of the right brain is to obey commands, while the left brain is to communicate, but this does not mean that one side of the brain is dominant (Musi & Nurjannah, 2021). In addition, the brain also has a long-term and short-term memory. The left brain employs short-term memory, while the right brain has long-term memory (Kahfi, 2020).

Based on the previous explanations, the researcher concludes that in the learning process, no term only functions for the left brain or the right brain. However, both brains must have functioned properly. If only the left brain is optimally in charge, the children only master learning which sharpens their cognitive skills and is limited to their creativity. Otherwise, for children who function their right brain, the only skill that stands out is their creativity, yet the skill of mastering language and critical thinking will be reduced. Therefore, a child's brain will function properly if both brains can operate balanced. Thus, teachers must develop learning media that are able to optimally function in the left and right hemispheres of humans.

### **Learning-Based Higher-Order Thinking Skill (HOTS)**

Bloom's taxonomy is a thinking model developed by Benjamin S. Bloom. This model divides thinking skills into six cognitive levels. In the 1990s, Lorin Anderson, a former Bloom student, created a draft to update Bloom's taxonomy (Pasutri et al., 2021).

HOTS is the ability to think critically, be able to solve problems (Simarmata et al., 2020), make decisions and be able to think creatively, analyze, synthesize (Sani, 2019), and associate to infer and create creative ideas (Wahyudi et al., 2020). Learners who learn HOTS can distinguish between main thoughts and side ideas, argue effectively, solve problems, develop explanations, speculate, and easily understand complex concepts (Lestari & Suyadi, 2021). According to Lewis & Smith in (Sani, 2019), the ability of HOTS in students will be able to occur if students already have information contained in the memory and get new information, then the information contained in the memory and the new information are connected, compiled and developed in order to achieve a goal or solution to the problem that occurs and is confusing for students. Critical, rational, introspective, metacognitive, and creative thinking skills are examples of high-order thinking skill (Sani, 2019).



Students are taught higher-order thinking processes in the cognitive domain (C4-C6) (Prasetyo et al., 2021). Krathwohl, who made improvements to Bloom's Taxonomy, defined Higher Order Thinking Skills (HOTS), the revisions are as follows:

1. An analysis is the ability to separate material into parts or components to understand its structure. Identify the material elements, examine the relationships in one section with another and with the whole section, and identify the principles of making lesson materials. These are part of the analysis of this activity. In this case, the child is required to categorize the topics of the materials. The frontal lobe of the brain strives at this level.

At this stage, analyzing has involved higher-order thinking because a divergent thinking process has begun. (Suyadi, 2017) Some characteristics to consider when analyzing higher-order thinking skills are as follows: Identifying the patterns of the relationships by analyzing data and separating or organizing them into smaller components. Being able to recognize and distinguish aspects and effects in complex situations and being able to ask and answer questions (Wahyudi et al., 2020).

2. An evaluation. This level is associated with the capacity to evaluate material values based on a set of criteria and standards. Children can set their own criteria, or teachers can fix it for them. They evaluate and study criteria from various categories before deciding which one is the most acceptable to the contexts. Because it includes aspects of other levels and assessments based on defined criteria, evaluation is considered higher-order cognitive processing (Suyadi, 2017). Providing an assessment of solutions, approaches, and ideas with criteria or standards that is acceptable to verify the value of the benefits, formulate hypotheses, analyze and conduct research, and accept or reject a statement based on what has been determined are indicators of higher-order thinking at the evaluation level, according to Lewy in (Wahyudi et al., 2020).
3. A creating. This level demonstrates the capacity to combine a sort of knowledge or different data to create new designs for children. Producing unique games (e.g., block robots/robots made from blocks) are examples. As a result, creating or thinking creative requires knowledge, understanding, and application to develop actual work (Suyadi, 2017). The creative level, according to Kwartolo, relates to a student's ability to integrate various types of information and develop it into new forms, as well as discover, plan, and have the skills to design, create, develop, strengthen, accomplish, and beautify are also displayed (Wahyudi et al., 2020). Krathwohl, who made

improvements to Bloom's Taxonomy, defines learning stages into three included in higher-order thinking (HOTS). These three following stages are to analyze, evaluate and create.

The whole cognition is built from the low brain system, including sensorimotor, auditory system & language, attention and executive function, social & emotional systems, memory system and behavior system, & reward. Humans are not born with a complete system but are acquired from their surroundings and experiences. Based on the central brain of the human's smart brain, several aspects encourage one to think critically, encompassing: the unique brain, problem-solving brain, mature brain, adaptive brain, and emotional brain. The entire students either identified as 'gifted' or 'struggling' need education on thinking skills. Brain-based learning is based on the connection of thought. The aim is to realize "how the brain learns." Wolfe said that to define new meaning from the new information, our brain must have previous information to reactivate the connection. When neurons first make connections in our brains, a certain amount of energy is required. Because the further connection is made, less energy is needed. An automatic connection is eventually paired and provides strong memory (Jazeel et al., 2016).

### **Development Neuroscience-based Learning Media for Islamic Education toward HOTS Improvement**

The nerve membrane that connects the right and left brain is called the corpus callosum. This neural membrane is able to combine abstract images with concrete and logical signals while maintaining a balance between left and right brain input. Optimizing the human brain requires utilizing all the senses while operating all brain areas. Brain optimization is to use all areas of the brain simultaneously by using the senses as much as possible. The use of various learning media aims to optimize the function of all parts of the brain, both right and left hemispheres, spiritual, emotional and rational. This rationale makes good ideas to experiment with color, shapes, textures, and voices. It will be possible to maximize the function of the right and left brains by involving several senses in the learning process. Endorphins are released from the brain glands to keep the child happy during the procedure, and acetylcholine is activated at the synapse. Synapses, which serve as links between nerve cells, utilize chemicals, particularly acetylcholine, as a neurotransmitter. Memory is better preserved if acetylcholine is activated. Furthermore, a positive environment impacts how the brain processes, stores, and retrieves data.

It is impossible to separate all the learning process achievements from the so-called learning media. The use of learning media used by teachers so that the learning process will be fun and exciting, efficient and effective. Further, if effective and interesting, the display of learning materials at the beginning of the learning process will inspire students to imagine. The stability of the left and right brain is one of the most important factors in learning achievement (Hrp, 2014).

Developing learning media that can be used to promote the optimization of left and right brain functions are concept maps (mind mapping), colored reading materials, graphics, music, interactive learning films, and replica material, which are the examples of media that can be used to improve the brain function. Also, educational media can help student to improve their brain function. The media used to optimize the brain function must be able to activate the functions of the left and the right brain of the students. Furthermore, after they understand the reading contents, they will develop imagination skills and stimulate and optimize right brain function (Kemenkes, 2016).

The stability of both brain hemispheres is either vital for intellectual or essential for health. The function of the human brain will be optimally robust if the two of them are balanced. Due to stability, brains work better. The brain activities do not work alone, but they interact with each other. Studies on learning media, neuroscience and Higher Order Thinking Skills have been widely carried out such as research conducted by (Saifurrahman & Suyadi, 2019), (Hrp, 2014), (Kemenkes, 2016), (Ernanida, 2019a), (Waluyo, 2014), (Khalimah, 2015), (Lusiawati, 2017), (Chamidiyah, 2015), (Kahfi, 2020), (Kurniawan, 2016), (Hayati et al., 2017), (Pujol et al., 2019), (Kuo et al., 2014), (Wijaya, 2018), and (Nursa et al., 2020). The learning media for Islamic education can be used to optimize the brain function as follows:

### **Audio Media & Temporal Lobe**

Audio media is the complete form of media using the voice or the sense of hearing as a medium to communicate media contents. Radio, voice recording, and other audio media independently work but produce the effect due to the synchronization of one another (Pakpahan & et al., 2020). Audio learning media is able to stimulate the sense of hearing. Audio media application in the Islamic education learning process, for instance, is to depict the materials by talk show that discusses *Infaq*, *Zakat*, and *Sedekah* (Ernanida, 2019b). Students who have an auditory learning style rely on this audio media. Reading aloud or listening to audio media can help these children memorize faster (Waluyo, 2014).

In general, an auditory learning style for students reached 34% of the student's learning style. During the class learning process, the left brain focuses on the information and the facts conveyed by teachers, while the values of the right brain how the knowledge has been delivered. The right and the left brain are actively involved in the learning activities, either directly or indirectly.

According to (Khalimah, 2015) learning through music can also be helpful for the learning process. Learning through music creates new neural connections in the brain, and music is more than just a connection because it is a product of long-term brain development. Music connects the left and right hemispheres of the brain, as well as the parts of the brain responsible for memory and human emotions, it is better than any other stimulus. It will be worthwhile to use music to optimize human potential. Music is able to encourage students to engage in activities that will help them achieve the goals of musical, language, and motoric function. According to Campbell, listening to music has also been shown to increase heart rate, activate brain waves for higher-order thinking processes (HOTS), and create a positive, relaxed, and responsive mental state.

The temporal lobe is the region of the brain that processes sound or audio. The lobe above the ear is called the temporal lobe. This lobe is responsible for the processing of sound and speech and some long-term memory abilities (Lusiawati, 2017). The temporal lobe is an important part of the brain for processing linguistic skills in humans. The temporal lobe is located below the anterior occipital cortex and the Sylvian fissure. The insula, which covers the gustatory cortex, is located in the Sylvian fissure. The STS brain receives input from the auditory, visual, and somatic and is multimodal. The temporal lobe is a brain region that can receive auditory and visual impressions that humans need to maintain positive relationships with society and the environment. The primary auditory cortex, secondary auditory and visual cortex, limbic cortex, and amygdala are all located in the temporal lobe (D. Putra, 2018). The temporal lobe is a part of the brain that works to process voices from audio media.

### **Visual Media & Occipital Lobe**

Visual media are all forms of media that use the senses as an intermediary or a means to distribute media material. Globes, embossed maps, mockups, animals, plants, and other media are examples of media (Pakpahan & et al., 2020). Children with visual learning styles generally use visual materials. Visual learning style is characterized by ideas that have been packaged, information, data and other concepts in the form of

pictures and procedures. Students who are visually learning tend to make detailed notes to store the information in the class (Waluyo, 2014). Children with visual learning styles accounted for 39% of all the students. According to (Hrp, 2014) if the teachers used graphics (visual) to deliver various learning information, the learning process would be more effective. Students can better understand various ideas depicted in photos, maps, diagrams, charts, and modeling. For example, in Islamic education, a visual is used for teaching *Zakat*. From the definition of reading and learning, students benefit from using physical representation to help them to memorize.

Understanding students' emotions, according to Dryden (Chamidiyah, 2015), is a way to increase student motivation. If the message to be conveyed to students is only packaged in the form of words, then the message will only be stored in the left hemisphere of the brain; otherwise, if the messages are conveyed in the form of colored pictures, graphics, and chart, then it will be stored to the left hemisphere of the brain. Consequently, the messages conveyed in images, words, and audio ease students to absorb and store the information delivered throughout the teaching and learning process. An example of optimizing a child's brain by using media in the form of a concept map. Since mind mapping uses color, imagination, and figures are organized by the right hemisphere. In addition, in a concept map that discusses the brain hemispheres, the use of a concept map involves the two brain hemispheres. According to Aris Shoimin (Kahfi, 2020), Mind mapping is an approach to utilizing all brain parts by using visual images and other graphic designs to generate sensations.

The occipital lobe is the brain region that processes images and views. The occipital lobe, which controls the visual function, is located in this lobe, which lies behind the neocortex (Lusiawati, 2017). The central visual cortex and the part of the brain where dreams originate from the functional aspects of the occipital lobe. The sensory retina transmits stimuli to the lateral geniculate body, where optical impulses are conveyed to the visual brain through the optic tract. The visual cortex on the opposite side of the brain receives raw sensory information from the retina's inner surface. Cuneus, also known as Brodmann area 17, gets visual information from the superior retina, located on the opposite side of the inferior visual field. The contralateral inferior retina represents the ideal visual field, which receives visual information from the lingual. Before reaching the cortex, retinal input must travel through the lateral geniculate nucleus of the thalamus. Cells in the gray matter of the posterior occipital lobe are arranged in a spatial map of the retinal area (Kurniawan, 2016).

The visual system, part of the central nervous system, allows nature to interpret visual information in great detail. An optical system performs the activities like receiving light and establishing eye formation, building a binocular vision from two-dimensional projection, observing and categorizing visual items, calculating the distance among the objects, and directing body movements to visible things. These previous explanations indicate that visual perception is the psychological manifestation of visual information (Kurniawan, 2016).

### **Visual-Audio Media, Temporal and Occipital lobe**

Visual-Audio Media, Temporal and Occipital lobe are kinds of media that combine the sense of hearing and sight, known as visual-audio. The sense of hearing and sight is used as a mediator in the visual-audio media to deliver materials. Video, film, television, interactive CD, digital information, and video-slide presentation with voice recording are examples of visual-audio media (Abidin, 2016) (Pakpahan & et al., 2020). The learning media is used in an integrated way to maximize a child's potential, which can be represented through feelings, ideas, and attitudes (Kemenkes, 2016). One of the functions of audio-visual media, according to Yusufhadi Miarso in (Hayati et al., 2017), is to convey the different inputs to the brain; therefore, it is likely possible for the brain to optimize the functions.

Visual-audio media is highly effective and efficient to use in the learning process. In learning following visual-audio media, students use two learning styles, namely visual and auditory. Using visual-audio media, they can optimize and balance their brain functions. Because in the learning media, audio-visual contains colorful pictures, music, and writing to activate the right brain, while concerning the sound, the material presented will activate left brain function. In addition, the left brain will process factual information, while the right brain will process abstract information. Nevertheless, it will be easier for students to remember or learn if spoken and combined with music or pictures, or if the words combine with music and images and are spoken with passion. For instance, animation-based learning media, interactive learning videos, and others.

According to the research in (Pujol et al., 2019), he explained the same level of knowledge could be achieved through different cognitive strategies. Its study showed that learning using visual-audio media benefit prefrontal executive resources (as opposed to memorizing verbal information), which is better than using traditional books. In audio-visual media, more brain systems are involved in processing information and are

consistent with the multi-source sensory properties. Additionally, another research (Kuo et al., 2014) showed that participants receive traditional instruction, while audio-assisted instructions did not show a significant effect; however, those taught English with audio-visual assisted instructions have reached statistically high performance. They imply an alternative approach using visual-audio supplementary learning materials compared to another method because the combination of visual and aural stimuli triggers more brain interaction to speed up foreign language processing.

The cerebral cortex contains the frontal lobes (on the forehead), the occipital lobes (at the back of the head), the temporal lobes (around the ears), and the parietal lobes (at the top of the head). The frontal lobe is responsible for action planning, conceptualization, and judgment. Additionally, the temporal lobe is responsible for hearing and hearing perception. This lobe also has the responsibility for the functions of thinking, including memory control. This lobe assists in regulating visitor work by collaborating with the occipital lobe. This lobe is vital to support the cerebral cortex, responsible for many important functions, including rational thinking and memory (Wijaya, 2018).

According to neuroscience, brain activities in the passive learning process and stress (students focus on a lecture from teachers) do not significantly activate brain performance, which results in less optimal. In comparison, active and interesting learning (HOTS) activates more brain regions and results in more successful learning (Lestari & Suyadi, 2021). It is believed that the brain (right and left) consists of two hemispheres that control various brain activities such as thinking, abstraction, and language (Nursa et al., 2020). Although no particular part of the brain is filled with higher-order thinking, brain stimulation and optimization cause these parts of the brain to become more integrated and active, resulting in specific review. According to Suyadi, higher-order thinking is produced by certain obligations of the brain and inputs that can activate more parts of the brain as part of the emotion. With the brain working system bestowed on humans, the brain must be used optimally to facilitate higher thinking, which is also known as Higher Order Thinking Skills (HOTS) (Nursa et al., 2020).

As previously stated, schools currently emphasize the left brain, but to optimize brain function, the right brain must also function like the left brain. The left brain is responsible for words and language, while the right brain is responsible for music, pictures, and colors (Chamidiyah, 2015). Furthermore, 21st-century learning is supposed to adapt to technological advancement to select the media for learning. In addition, to choose the learning media, one must also be able to optimize the right brain's function

and the function of the left brain. Therefore, the media selection based on neuroscience will improve children's higher-order thinking skills (HOTS). Although, in essence, no particular part of the brain is filled with higher-order thinking, with stimulation and optimization of brain function, these parts of the brain are interconnected and more active, resulting in specific ideas.

## **Conclusion and Suggestion**

### **Conclusion**

According to the above-mentioned explanations, it can be concluded that learning media has a significant role in learning activities. Learning media is a place or means for conveying abstract material; as a result, it is easily accepted and absorbed by students. Learning media is one of the most important tools for optimizing the functions of the right and the left brain related to the brain. Because learning that uses interactive and engaging media will be able to sharpen the brain in receiving and processing the information that has been obtained. Learning media in Islamic education can operate optimally in two brain hemispheres: audio media processed by the temporal lobe, visual media processed by the occipital lobe, and visual-audio media processed in the occipital and temporal lobes.

### **Suggestion**

The suggestion for the following research is to specifically develop learning media in Islamic education, which can optimize brain function, in which, in learning, students can consequently learn effectively and joyfully. In this research, there are still deficiencies, the suggestions from researchers for conducting further research can complement this research, moreover.

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