

## The Early Childhood Development through Puzzle Games Viewed from Neuroscience Theory and Al-Qur'an

Irfan Anshori<sup>1</sup>, Imam Syafe'i<sup>2</sup>, Elsa Nabila Zahrotunnisa<sup>1</sup>

<sup>1</sup>STIT Ad-Da'wah Rangkasbitung, Indonesia

<sup>2</sup>Universitas Islam Negeri Raden Intan Lampung, Indonesia

 [bobby.boy@bsi.ac.id](mailto:bobby.boy@bsi.ac.id)

### Abstract

The aim of this research is to identify the relationship between Neuroscience and child development by linking the game learning model Puzzle. This research was conducted at PAUD Darel Azhar; the Jl. Education Complex 08/09, Muara Ciujung Timur Village, Rangkasbitung District, Lebak Regency, Banten Province, 42314. The method used is a qualitative method. Data collection techniques include observation, interviews and documentation. Interviews were conducted on certain objects that were closely related to this research; such as teachers, parents and students. The data analysis technique used begins with organizing and preparing the data; understand all research data; interpret the data and then draw conclusions. The results of this research explain that the relationship between neuroscience and child development is influenced by the stimulation given to children. Puzzle games are a form of stimulation for the growth of children's brain cells. Neuroscience in the Qur'an is mentioned as thinking, thank you, tadabur, and tabashshur. Neuroscience from the perspective of Islamic educational thought is mentioned in the metaphysics of al-Ghazali, al-Farabi and Ibn Sina. Neuroscience in child development can foster high discipline values, want to try new things, have special value for children and have a high sense of curiosity; and all of this is a form of providing stimulation by using puzzle games for children.

**Keywords:** Early Childhood, Neuroscience, Puzzle Games

### ARTICLE INFO

*Article history:*

Received

January 03, 2024

Revised

February 03,

2024

Accepted

March 15, 2024

Published by

ISSN

Website

This is an open access article under the CC BY SA license

CV. Creative Tugu Pena

2774-4299

<https://attractivejournal.com/index.php/bse/>

<https://creativecommons.org/licenses/by-sa/4.0/>



### INTRODUCTION

Early childhood is the embryo of the nation's future (Kausar, 2023); and become hope for parents and the country (Gallagher, S., & Stobbs, 2023). The presentation showed that 100% of parents expect their children to grow up to be children who are useful for religion and the country (Rahmadiani, 2020). Early childhood education is a form of education that focuses on laying the foundation for growth and development (Haslip, M. J., & Gullo, 2018), motor coordination (Ardoin, N. M., & Bowers, 2020), emotional intelligence (Buşu, 2020), plural intelligence or *mutiple intelligences*, as well as spiritual intelligence (Harris, 2022).

Early childhood grows at a vulnerable age of 0-6 years (Sivrikova, N. V., Ptashko, T. G., Perebeynos, A. E., Chernikova, E. G., Gilyazeva, N. V., & Vasilyeva, 2020). This age is a very determining age in the formation of a child's character and personality (Alwaely, S. A.,

Yousif, N. B. A., & Mikhaylov, 2021). Early age is the age where children experience rapid growth and development (Wong, L. P., Wong, P. F., & Abu Bakar, 2020); and is an important and fundamental initial period in the development of human life. The periods that characterize early childhood are: *the golden ages* or golden period (Grubb, M., Golden, A., Withers, A., Vellone, D., Young, A., & McLachlan, 2021). The concept that is attached to early childhood is normal child development (Li, J., Ghosh, R., & Nachmias, 2020).

Early childhood education seeks to stimulate, guide, nurture and provide learning activities that will produce abilities and skills in children at an early age (Hautakangas, M., Kumpulainen, K., & Uusitalo, 2022). Objectives of early childhood education; able to develop all children's potential so that they can function as complete human beings according to the philosophy of a nation (Wiyani, 2020). In Islam the whole person is called *Perfect human being* or a perfect human (As-Shidqi, M. H., & Abbas, 2022). The pattern of making him a perfect human being must maintain his inner nature (Costanza, 2020). Fitrah is an Islamic concept about children (Purnama, S., & Ulfah, 2020). Children are seen as unique creatures with positive potential (Bassetti, C. L., Kallweit, U., Vignatelli, L., Plazzi, G., Lecendreux, M., Baldin, E., ... & Lammers, 2021). On this basis, children can be seen as individuals who are new to the world according to their nature.

Fitrah, spirit, qolb, nafs and aql in neuroscience are certainly different. Neuroscience is a multilevel concept of reason (Nursa, R. A., & Suyadi, 2020). Neuroscience is called a science that tries to uncover the mysteries of the brain (Cisek, P., & Hayden, 2022). Multilevel intelligence consists of four elements, namely active intelligence; actual; potential. and empirical (Wang, Z., Fang, J., Dai, X., Zhang, H., & Vlacic, 2020). The implications for the implementation of education are derived from the equality of the functions of the mind and brain, in this case Islamic education. The macro implication is in the form of the birth of students who have *skill of life*. Islamic education must be successful in making students successful in their lives (Amiruddin, A., Nurdin, N., & Ali, 2021). The success in question is not only in the realm of education; but rather success in terms of general and specific skills.

The general and specific skills possessed by children are obtained from the learning process in the classroom (Rahmasari, T., Pudyaningtyas, A. R., & Nurjanah, 2021). 56.3% of children can grow by having skills at school (Anitha, 2022). Children's growing skills result from a variety of learning methods (Pianta, R. C., Whittaker, J. E., Vitiello, V., Ruzek, E., Ansari, A., Hofkens, T., & DeCoster, 2020). Active learning methods through puzzle games can improve students' skills (Mshayisa, 2020); and can affect brain development (Yilmaz, E., Yel, S., & Griffiths, 2022). Puzzle games can certainly implement character education (Wathoni, H., Kustiono, K., & Ahmadi, 2021). This is because puzzle games can stimulate children to be more independent, active, focused (Sun, K., & Moreno, 2021) and not boring. It can be concluded that the media *Puzzle* related to children's cognitive development. This relates to a neuroscientific review that balances function and development in the performance of the left and right brain. Neuroscience has traces of Islamic education, where if it is combined with Al-Qur'an learning methods, it will be very precisely formed *perfect person*. The aim of this research is to determine the correlation of Neuroscience on child development. The aim of this research is to identify the relationship between neuroscience and early childhood development by linking the game learning model *Puzzle*.

## METHOD

This research was conducted at PAUD Darel Azhar's address is Jl. Education Complex 08/09, Muara Ciujung Timur Village, Rangkasbitung District, Lebak Regency, Banten Province 42314. The method used is a qualitative method. Data collection techniques used include observation, interviews and documentation. Interviews were conducted on certain objects that were closely related to this research; such as teachers,

parents and students. The data analysis technique used begins with organizing and preparing the data; understand all research data; interpret the data and then draw conclusions.

## RESULT AND DISCUSSION

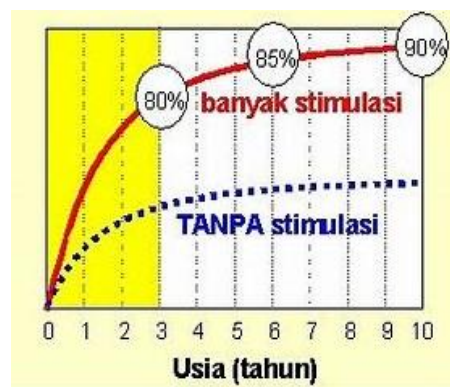
GamesPuzzle can improve social emotional development in children aged 4-5 years. GamePuzzle has many types; likePuzzle fruits, animals, shapes,and puzzleslimbs (Maxsudovna, I. S., & Qizi, 2022). Puzzle games certainly contain a multitude of benefits for children such as;

Table 1 Multitude Of Benefits For Children Using Puzle Games

No	Benefit	Implementation
1	Training Memory	Children will remember pieces of pictures, patterns, or words so that they fit together
2	Sharpening Visuospatial Skills	Children can recognize and understand shapes, sizes, colors and spaces.
3	Sharpens Fine Motor Skills	Children can assemble the shape of the puzzle according to the hole in the puzzle
4	Train Eye and Hand Coordination	Children play puzzle games using visual and hand motor elements.
5	Practice Social Skills	Playpuzzle in groups will help children understand the meaning of patience and cooperation.
6	Sharpening Problem Solving Skills	Putting together a puzzle requires creative thinking. If you succeed in compiling it, it is included in the problem solving category
7	Increase Self-Confidence	A child's success in putting together a puzzle can increase their self-confidence.

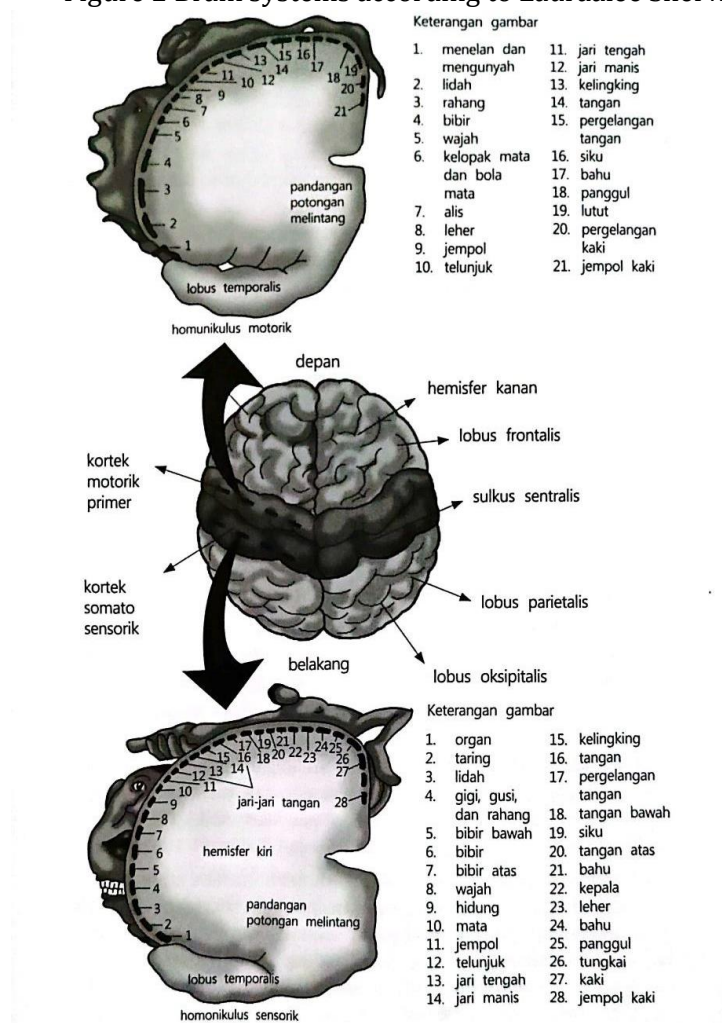
Through puzzle games you can certainly train your child's brain; especially children aged 0-6 years. Theories about children's brains and intelligence certainly cannot be separated from the term Neuroscience (Byrnes, J. P., & Eaton, 2020). Neuroscientific findings are facts about children's brains that when a child is born their brain cells reach 100 billion, but they are not yet connected to each other except for a few, namely only the brain cells that control heartbeat, breathing, reflex movements, hearing and life instincts. Therefore, children must be given lots of stimulation so that brain cells can be connected and strong.

Figure I  
The development of brain tissue according to age based on stimulation



The image above shows that there are significant differences between the brains of children who were stimulated and those who were not. The stimulation referred to here is children aged 0-6 years or children attending PAUD school. Therefore, it is clear that PAUD is very important for providing stimulation to children's brains. Lack of stimulation will cause the child's brain development to not be optimal. There are differences in the brain development of children who attend PAUD and those who do not. The main goal of Neuroscience to learn the biological underpinnings of each behavior. This means that the main task of neuroscience is to explain human behavior from the perspective of the activities that occur in the brain. There are six brain systems that regulate all human behavior (Zhang, J., Yin, Z., Chen, P., & Nichele, 2020); *prefrontal cortex, limbic system, cingulate gyrus, basal ganglia, temporal lobe, and cerebellum* (Yusmaliana, D., Fitriana, F., Zakaria, G. A. N., & Kurbiyanto, 2023). The six of them have an important role in regulating cognition, affection, and psychomotor, including IQ, EQ, and SQ.

Figure 2 Brain systems according to Lauraalee Sherwood



### Neuroscience in the Qur'an

Draft *perfect person* explains that a perfect human is a human who reflects the characteristics and *Asma Allah*, for *multiple intelligences* states that a perfect human is a developed human *multiple intelligences*-his. Traces of neuroscience in the Qur'an can be found in the terms used by the Qur'an to refer to brain activity, such as: *thinking* (thinking) *tadzakkur* (take lessons and observe) *tadabur* (staring) and *tabashshur* (understanding).

Table 2 Neuroscience in the Qur'an

No	Neuroscience terms in the Qur'an	Letters and Verses
1	thoughtful	QS. Al-Hasir verse 21
2	Tadzakkur (taking lessons and observing)	QS-Ali-Imran verse 191
3	Tadabur (contemplate)	QS.An-Nisa verse 82
4	Tabashshur (memahami).	QS.Al-Baqarah verse 76

This concept can be used as a basis for educational stimulation which has the potential to optimize multiple intelligences (*multiple intelligences*) for early childhood.

Table 3 Neuroscience in Islamic Educational Thought

No.	Figure	Thoughts
1	Neuroscience in Al-Ghazali's Metaphysical Thought	Differentiate the brain from <i>Fitrah, Ruh, Qalb, Nafs and Aql</i> . It has two meanings, namely biological and metaphysical. In the context of education, Al-Ghazali provides more ways to maintain <i>nature, guard soul and heart</i> control lust and use <i>mind</i>
2	Hierarchy of Reason in Al-Farabi's Thought	al-Farabi believes that reason consists of 10 levels, namely the first reason to the tenth reason. Using cosmological terms to explain the ten minds, such as stars, sun and planets. As an inspiration for the perfection of human potential if one's thinking has reached astronomy-cosmology; and then trace your footsteps in the brainonomy area.
3	Elevated Intellect in Ibnu Sina	Multilevel intellect according to Ibn Sina; active, actual, potential and empirical sense.

The implementation of puzzle games at PAUD Darel Azhar is an effort to stimulate children. When carrying out the learning process, this game has an important role in the continuity of the learning process, namely balancing the work of the child's right and left brain. Thus, the researcher chose this game as the research object. Mrs. Endahsari, S.Pd, one of the PAUD Darel Azhar teachers stated that the game *Puzzle* has its own appeal for children; in addition to its unique gameplay, media *Puzzle* forms children's imaginations, such as an arrangement of images related to everyday life. For example, a child succeeds in composing *Puzzle* with the shape of a duck and expressing his imagination "Wow, this duck's feathers are yellow, mine at home are white. When I grow up (duck), my mother likes to cook fried duck." Likewise with other pictures, children can express their imagination, such as pictures of fruits, vegetables, animals and so on.

Table 4 Benefits of Puzzle games

No.	Benefits of Puzzle games
1	Improve thinking ability
2	Increases the ability to concentrate
3	Improve communication skills
4	Improve collaboration capabilities
5	Increase imagination ability

One of the PAUD teachers, Darel Azhar; Mrs. Endahsari, S.Pd; regarding game implementation *Puzzle* At PAUD Darel Azhar is a very effective effort in learning. Kids can be creative and collaborate when putting together the pieces *Puzzle*, cooperation between teams makes children play an active role and help each other. They are so enthusiastic that the children sometimes play *Puzzle* while waiting for their turn to recite the Koran because

when the picture is formed there is a special satisfaction, and it is not uncommon for children to compete to compose it. *Puzzle* The fastest is the winner.

Mrs. Nurhalimah, one of the parents of Ahmed Nuhadzim Syafiq who attends Darel Azhar PAUD school, said that sending children to Darel Azhar PAUD has a great influence in stimulating children's development. As a parent, he provides facilities that support his abilities, such as pictures/posters about numbers and facilitating educational toys. Like children his age, he has very high curiosity, is critical and always asks lots of questions, which is proof that educational games can stimulate the brain and way of thinking.

Learning activities at PAUD Darel Azhar are said to be very good for children's growth and development. He said that PAUD is provided *Puzzle* diverse with interesting shapes. After school the child told the story "*Syafiq finished playing with his friends putting together a puzzle*" he said about the picture he had drawn up with great enthusiasm. Game implementation *Puzzle* at PAUD Darel Azhar is an effort to stimulate children's cognitive and fine motor skills, problem solving, as well as improving social skills, namely the skills to interact with each other. This game has an important role in the continuity of the learning process, there children express a lot about what they see and think. In this way, puzzle games have an influence in stimulating early childhood and also really help schools in achieving learning goals at PAUD Darel Azhar.

### Neuroscience with Early Childhood Development

In Neuroscience, some brain cells develop very rapidly at the age of 0-6 years, also known as the golden age or *golden ages*. This phase is full of imagination. Children have more diverse imaginaries than adults; and have high curiosity. Early childhood development at PAUD Darel Azhar is very good. Remembering that the need for stimulation is very much needed in this phase, because the child's brain cells are developing rapidly, so they are very easy to shape and direct. Stimulation with educational games and Islamic-based learning models is an appropriate combination for student development.

Mrs. Omah Istiqomah; one of the parents of students from Afiya Huriyatul Jannah who attends the Darel Azhar PAUD school; said that sending children to PAUD Darel Azhar greatly influenced their learning development and made them more disciplined. For example, waking up in the morning to recite the Koran, reading before going to school or in the afternoon, simply for the reason that "*Embarrassed to go to school if asked by the teacher he doesn't know*" he always used that excuse. Before attending PAUD Darel Azhar it was very difficult for him to recite the Koran, let alone study regularly. Regarding the stimulation provided, he, as a parent, said that the most important thing to teach children is how to respect their parents and that they are starting to be introduced to religion little by little. He only facilitates according to age and ability, does not force. Children always feel "curious" about something new, and always want to try new things, such as cooking or even ironing their own clothes, and of course this is all under the supervision of their parents.

Table 5 Neuroscience in Child Development

No.	Neuroscience in Child Development
1	Want to try new things
2	Cultivate high discipline values
3	Has unique advantages in children
4	Have curiosity about new things

Darel Azhar PAUD students' activities in the morning begin with reading Iqro', guided one by one by the teacher. The results of the researchers' observations were that when reciting the Koran, children began to get used to stringing together several letters

and trying to remember the shapes of the letters they had learned. After all the students finished reciting the Koran, they formed a line for cleanliness and uniform checks while singing Islamic children's songs, hadiths of the Prophet and Asmaul Husna. The students were very enthusiastic in demonstrating movements and shouting at each other according to the teacher's commands. Researchers saw that some of the material and memorization applied at PAUD Darel Azhar led to behavior related to learning models that instill Islamic education in children.

Table 6 Learning Models That Instill Islamic Education in Children

No	Learning model	Implementation
1	<i>At-Tarbiyyah bi al-Qudwah</i>	Education by example; Children are given good examples so that they can be good role models.
2	<i>At-Tarbiyah bi al-'Adah</i>	Education with customs; Children are always given Islamic activities continuously so they get used to them.
3	<i>At-Tarbiyah bi al-Mauidhah</i>	Education with Advice; Children are given advice as a form of example.
4	<i>Al-Tarbiyah bi al-Muldhazah</i>	Education with supervision; Children are given full supervision of their moral and moral development.
5	<i>Al-Tarbiyah bi al-Uqubah</i>	Education by punishment; Children are given punishment in the form of memorization activities. A form of education that utilizes guidance.

Implementation of the game model *Puzzle* It is very important to stimulate early childhood development because it is able to stimulate brain development, especially the right and left brain, and also so that children do not feel bored in understanding the learning methods used. The formation of Islamic morals is carried out by habituation. Neuroscience theory as a reference for understanding the brain development system in PAUD children so that teachers and parents can know that each child has unique advantages in their respective fields. Early childhood education essentially facilitates the child's overall growth and development which emphasizes the child's personality. Likewise, the essence of Islamic religious education produces perfect humans (*perfect human*) which develops its full potential. All potential lies in his brain. Thus neuroscience and Islamic religious education are very important to be integrated.

The development of children's brain tissue needs to be given various stimulation. Children aged 0-6 years are children who still attend early school. Therefore, it needs to be given lots of food to stimulate brain development. Puzzle games are one of the learning patterns in children's learning activities. The correlation between neuroscience and children's brain development is clearly true. By facilitating various stimulations for children's growth and development, brain tissue cells will automatically be connected and strong with each other. In the Qur'an the term neuroscience has long been included in it; *thinking, thank you, tadabur, and tabashshur*. Each child must have these terms as a form of giving birth to a child with the concept of human beings. This certainly has the potential to optimize children's intelligence. Neuroscience from the perspective of Islamic educational thought is mentioned in the metaphysics of al-Ghazali, al-Farabi and Ibn Sina. Neuroscience in child development can foster high discipline values, want to try new things, have special value for children and have a high sense of curiosity; and all of this is a form of providing stimulation by using puzzle games for children.

## REFERENCES

- Alwaely, S. A., Yousif, N. B. A., & Mikhaylov, A. (2021). Emotional development in preschoolers and socialization. *Early Child Development and Care*, 191(16), 2484–2493.
- Amiruddin, A., Nurdin, N., & Ali, M. (2021). Islamic Education Teacher Communication Strategy in Increasing Students' Learning Interest. *International Journal of Contemporary Islamic Education*, 3(1), 41–61.
- Anitha, R. (2022). Nature, Prevalence, and Impact of Undernutrition on Intelligence Among School Children: A Cross-Sectional Study from South India. *ECS Transactions*, 107(1), 637.
- Ardoin, N. M., & Bowers, A. W. (2020). Early childhood environmental education: A systematic review of the research literature. *Educational Research Review*, 31, 100353.
- As-Shidqi, M. H., & Abbas, Q. (2022). Achieving Insan Kamil Through Maqamat Tauhid Muhammad Nafis Al-Banjari and its Relevance to Modern Life. *Journal of Religious Studies*, 6(2), 81–94.
- Bassetti, C. L., Kallweit, U., Vignatelli, L., Plazzi, G., Lecendreux, M., Baldin, E., ... & Lammers, G. J. (2021). European guideline and expert statements on the management of narcolepsy in adults and children. *European Journal of Neurology*, 28(9), 2815–2830.
- Buşu, A. F. (2020). Emotional intelligence as a type of cognitive ability. *Journal of Political Science. Revue Des Sciences Politiques*, 66, 204–215.
- Byrnes, J. P., & Eaton, J. T. (2020). The Relevance of Neuroscience to Understanding Achievement in Special Needs Children. *Handbook of Educational Psychology and Students with Special Needs*, 655–683.
- Cisek, P., & Hayden, B. Y. (2022). Neuroscience needs evolution. *Philosophical Transactions of the Royal Society B*, 377(1844), 20200518.
- Costanza, R. (2020). Valuing natural capital and ecosystem services toward the goals of efficiency, fairness, and sustainability. *Ecosystem Services*, 43, 101096.
- Gallagher, S., & Stobbs, N. (2023). Creating hope in dystopia: Utopia as Method as social pedagogy in early childhood studies. *International Journal of Social Pedagogy*, 12(1), 1–12.
- Grubb, M., Golden, A., Withers, A., Vellone, D., Young, A., & McLachlan, K. (2021). Screening approaches for identifying fetal alcohol spectrum disorder in children, adolescents, and adults: A systematic review. *Alcoholism: Clinical and Experimental Research*, 45(8), 1527–1547.
- Harris, K. I. (2022). Caring for the Hearts and Souls of Young Children: Acknowledging Spiritual Intelligence. *Childhood Education*, 98(1), 22–31.
- Haslip, M. J., & Gullo, D. F. (2018). The changing landscape of early childhood education: Implications for policy and practice. *Early Childhood Education Journal*, 46, 249–264.
- Hautakangas, M., Kumpulainen, K., & Uusitalo, L. (2022). Children developing self-regulation skills in a Kids' Skills intervention programme in Finnish Early Childhood Education and Care. *Early Child Development and Care*, 192(10), 1626–1642.
- Kausar, M. (2023). Young People, Elections and Indonesian Politics. *JIP-Scientific Journal of Educational Sciences*, 6(7), 5315–5320.
- Li, J., Ghosh, R., & Nachmias, S. (2020). In a time of COVID-19 pandemic, stay healthy, connected, productive, and learning: words from the editorial team of HRDI. *Human Resource Development International*, 23(3), 199–207.
- Maxsudovna, I. S., & Qizi, S. M. S. (2022). The role and importance of puzzles in the development of intellectual abilities of primary school students. *ACADEMICIA: An International Multidisciplinary Research Journal*, 12(2), 209–213.
- Mshayisa, V. V. (2020). Students' perceptions of Plickers and crossword puzzles in undergraduate studies. *Journal of Food Science Education*, 19(2), 49–58.

- Nursa, R. A., & Suyadi, S. (2020). Al-Farabi's concept of multilevel reasoning in neuroscience theory and its relevance to Islamic education. *Tawazun: Journal of Islamic Education*, 13(1), 1–17.
- Pianta, R. C., Whittaker, J. E., Vitiello, V., Ruzek, E., Ansari, A., Hofkens, T., & DeCoster, J. (2020). Children's school readiness skills across the pre-K year: Associations with teacher-student interactions, teacher practices, and exposure to academic content. *Journal of Applied Developmental Psychology*, 66, 101084.
- Purnama, S., & Ulfah, M. (2020). The Concept of Fitrah for Children in Ibn Katsir's Qur'an Exegesis: A Pedagogical Implication in Early Childhood Islamic Education. *Journal of Islamic Education*, 9(1), 79–104.
- Rahmadiani, N. (2020). Parents' Understanding of the Urgency of Play in Improving Early Childhood Social Development. *Early Childhood: Journal of Education*, 4(1), 57–64.
- Rahmasari, T., Pudyaningtyas, A. R., & Nurjanah, N. E. (2021). Profile of Critical Thinking Ability of Children Aged 5-6 Years. *Kumara Scholar*, 9(1), 41–48.
- Sivrikova, N. V., Ptashko, T. G., Perebeynos, A. E., Chernikova, E. G., Gilyazeva, N. V., & Vasilyeva, V. S. (2020). Parental reports on digital devices use in infancy and early childhood. *Education and Information Technologies*, 25, 3957–3973.
- Sun, K., & Moreno, R. P. (2021). Chinese mother-child interactions in everyday math activities: engaging young children in mathematics at home. *Early Childhood Education Journal*, 49, 1061–1072.
- Wang, Z., Fang, J., Dai, X., Zhang, H., & Vlacic, L. (2020). Intelligent vehicle self-localization based on double-layer features and multilayer LIDAR. *IEEE Transactions on Intelligent Vehicles*, 5(4), 616–625.
- Wathoni, H., Kustiono, K., & Ahmadi, F. (2021). Multimedia-based E-Puzzle development to improve visual-spatial abilities and early childhood religious character. *Journal of Primary Education*, 10(2), 141–150.
- Wiyani, N. A. (2020). Implementation of a character education strategy in the perspective of permendikbud number 23 of 2015 at Raudhatul Athfal. *Tarbawi: Scientific Journal of Educational Management*, 6(02), 141–152.
- Wong, L. P., Wong, P. F., & AbuBakar, S. (2020). Vaccine hesitancy and the resurgence of vaccine preventable diseases: the way forward for Malaysia, a Southeast Asian country. *Human Vaccines & Immunotherapeutics*, 16(7), 1511–1520.
- Yilmaz, E., Yel, S., & Griffiths, M. D. (2022). Comparison of children's social problem-solving skills who play videogames and traditional games: A cross-cultural study. *Computers & Education*, 187, 104548.
- Yusmaliana, D., Fitriana, F., Zakaria, G. A. N., & Kurbiyanto, A. (2023). Ecological Education in Islamic Religious Learning Based on Creative Imagination. *In Bridging Peace and Sustainability Amidst Global Transformations*, 53–68.
- Zhang, J., Yin, Z., Chen, P., & Nichele, S. (2020). Emotion recognition using multi-modal data and machine learning techniques: A tutorial and review. *Information Fusion*, 59, 103–126.

---

**Copyright Holder :**

© Irfan Anshori, Imam Syafe'i, Elsa Nabila Zahrotunnisa (2024).

**First Publication Right :**

© Bulletin of Science Education

**This article is under:**

CC BY SA