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The Use of 3D Learning Media in Stimulating Motor and Cognitive Development in Early Childhood: An Islamic Education Perspective

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Abstract

Three-dimensional learning media are increasingly being used in early childhood education due to their ability to provide concrete and multisensory learning experiences. From an Islamic educational perspective, the use of these media not only contributes to cognitive development but also has the potential to integrate spiritual values into the learning process. This study aims to analyze the characteristics and synthesize findings regarding the use of three-dimensional learning media in stimulating the fine motor and cognitive development of early childhood from an Islamic educational perspective. The method used is a Systematic Literature Review (SLR) of 170 articles published between 2020 and 2025, employing thematic analysis. This study employed a Systematic Literature Review method by identifying 1,097 articles from Scopus and Sinta spanning the years 2020–2025 through a structured selection process, resulting in 15 articles that were analyzed using a thematic approach. The research findings indicate that three-dimensional learning media promote multisensory learning experiences that enhance children's active exploration, hand-eye coordination, attention to detail, and logical thinking skills. Furthermore, the use of these media supports the integration of Islamic values through reflective and contemplative learning. Overall, three-dimensional media contribute to a holistic learning approach that integrates children's physical, cognitive, and spiritual development. This study offers practical implications for early childhood educators and parents in designing three-dimensional media-based learning activities integrated with Islamic values, and points the way toward the development of more innovative and holistic learning models.

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INTRODUCTION

The early years of a child's development, from ages 0 to 6, constitute a critical foundational phase in shaping their potential, which will influence their future life (Laing et al., 2022). During this period, all aspects of a child's development physical, cognitive, and spiritual grow rapidly and interact with one another (Sugita et al., 2024). Three-dimensional (3D) learning materials serve as an excellent tool for stimulating children's motor skills, particularly fine motor skills, as they provide a multisensory learning experience that encourages children to actively explore. Through the manipulation of three-dimensional objects that can be touched, arranged, and reshaped, children can easily hone hand-eye coordination, build conceptual understanding in a more concrete and credible way, and strengthen concentration (Ebrahim, 2017; James & Engelhardt, 2012). Three-dimensional learning media not only enrich children's learning experiences visually and kinesthetically but also foster symbolic thinking skills, an understanding of the meanings of surrounding shapes, and imagination all of which play a crucial role in their cognitive development (Prasetya et al., 2023). As children grow and develop, they go through various real-life experiences that involve physical movement, the five senses, and the strengthening of their concentration (Dinehart & Manfra, 2013). Simple activities such as stacking blocks, playing with playdough, gluing, or folding objects not only develop fine motor skills but also stimulate cognitive abilities, creativity, and a child's capacity to make sense of every interaction they experience (Syafril et al., 2018; Wei, 2016). Every small movement a child makes is a complex coordination exercise involving the sensory, motor, and cognitive systems, which gradually develops logical thinking, focus, and problem-solving skills (Abdel Karim & Mohammed, 2015; Lin et al., 2014; Ningtyas et al., 2024).

In the Islamic perspective, childhood is understood not merely as a biological stage, but as a phase of tarbiyah fitrah a process of nurturing that balances the intellectual, physical, and spiritual aspects so that children grow into insan kamil, or whole human beings of noble character (Ijudin et al., 2024; Prasetiawan, 2019). This perspective aligns with Al-Ghazali, (2004) theory of Islamic education, which emphasizes the importance of harmony between intellectual and physical education as the path toward the formation of perfect character (Barni & Mahdany, 2017). Meanwhile, Ibn Kathir in his *Tafsir al-Quran al-'Azhim* asserts that every child is born with the *fitrah of tawhid* an innate, upright potential to recognize and affirm the Oneness of Allah (Purnama et al., 2020). Early childhood education from an Islamic perspective is not only oriented toward worldly cognitive achievements but also serves as a means to strengthen the divine fitrah that guides children toward spiritual and moral balance (Nasirudin et al., 2025). Previous research indicates that the use of learning media in Islamic education plays a strategic role in enhancing students' understanding and engagement in the learning process (Humairo et al., 2025). Furthermore, it is important to adopt a comprehensive approach to understanding early childhood development, encompassing both cognitive and socio-emotional aspects (Qur'ani & Syafril, 2025).

To date, teaching practices in early childhood education institutions still tend to emphasize verbal and theoretical cognitive aspects, such as memorizing letters and numbers, while exploratory activities based on concrete experiences have not been given a balanced share (Sukmawati et al., 2022). Learning patterns with minimal physical and sensory engagement have the potential to hinder children's fine motor development, which is actually the gateway to more complex cognitive development (Yogman et al., 2018).

Several studies have demonstrated the effectiveness of concrete media in stimulating the motor and cognitive development of young children (Fitriana & Sudaryanti, 2024; Sukmawati et al., 2022; Yuniyartika & Sudaryanti, 2024). However, these studies are still dominated by technical and psychological approaches; they have not comprehensively integrated Islamic educational values, nor have they specifically examined the use of three-dimensional learning media as a means of cognitive-motor stimulation with spiritual value.

Previous research using the keywords refers to studies on three-dimensional learning media for motor and cognitive stimulation in early childhood from an Islamic education perspective, as shown in figure 1 below:

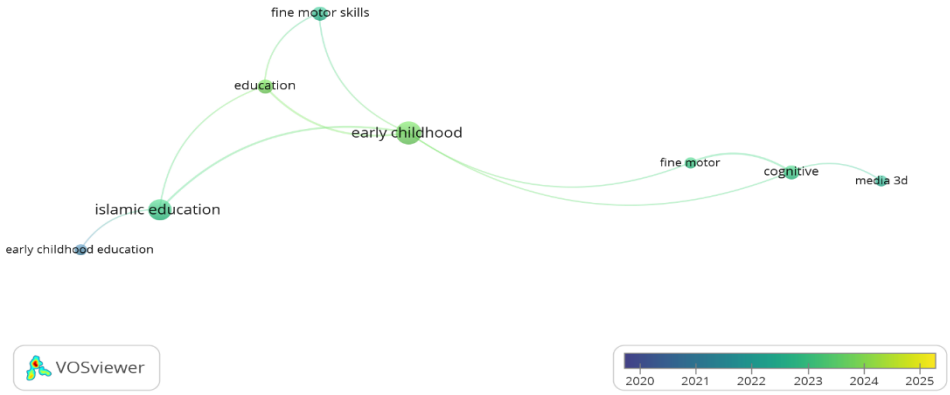

Fig 1. Keywords related to three-dimensional learning materials for the motor and cognitive development of young children from an Islamic educational perspective

Previous studies on the use of three-dimensional learning media in early childhood education have generally focused on technical and psychological aspects, such as improvements in children's motor and cognitive skills. However, these studies still have several limitations. First, most studies have not comprehensively integrated Islamic educational values into their analyses. Second, existing research tends to be partial and has not provided a comprehensive synthesis of existing findings. Third, there are still limited studies that specifically use a Systematic Literature Review approach to examine the use of three-dimensional learning media in the context of early childhood motor and cognitive development from an Islamic education perspective.

Therefore, this study aims to address this gap by analyzing and synthesizing research findings related to the use of three-dimensional learning media in stimulating the motor and cognitive development of young children from an Islamic educational perspective. The results of this analysis are expected to provide a theoretical contribution to the development of the concept of Islamic-values-based learning media, as well as serve as a practical reference for early childhood educators in designing learning experiences that support children's holistic development, encompassing physical, cognitive, and spiritual aspects.

Based on the identified research gaps and to provide a clear direction for the analysis, this study formulates the following research questions:

RQ 1: What are the characteristics of three-dimensional learning media in early childhood education?

RQ 2: How does the use of three-dimensional learning media stimulate the fine motor development of early childhood?

RQ 3: How does the use of three-dimensional learning media stimulate the

cognitive development of early childhood?

METHODS

This study employs a systematic literature review methodology to systematically identify, evaluate, and synthesize relevant research findings in addressing the research questions (Aryasutha et al., 2025; Dwijayanti & Syafril, 2024; Engkizar et al., 2025; Kitchenham et al., 2009; Sari et al., 2024). This approach was chosen to gain a comprehensive understanding of the use of three-dimensional learning media in stimulating the motor and cognitive development of young children from an Islamic educational perspective.

Articles were reviewed by highlighting key points or sections from various studies that shared a common focus of discussion (Syafril et al., 2018). The five steps taken in this study are keyword identification, data search, article selection, data validation, and data analysis (Busro et al., 2021). Keywords were determined based on the research focus, namely three-dimensional learning media, motor and cognitive aspects, early childhood, and Islamic education. The search strategy employed involved using a combination of English keywords, namely "*three-dimensional media*," "*fine motor skills*" OR "*cognitive stimulation*" AND "*Islamic education*," linked with the Boolean operators AND and OR to broaden and narrow the relevant search results (Dinet et al., 2004).

The predefined keywords were then used as the basis for the data retrieval process in the selected databases. The literature search and selection process was conducted in stages through a structured mechanism, which included the identification, screening, eligibility assessment, and final article selection stages. The literature selection process in this study followed the PRISMA 2020 guidelines; the flow of this process is presented in the PRISMA flow diagram in figure 2.

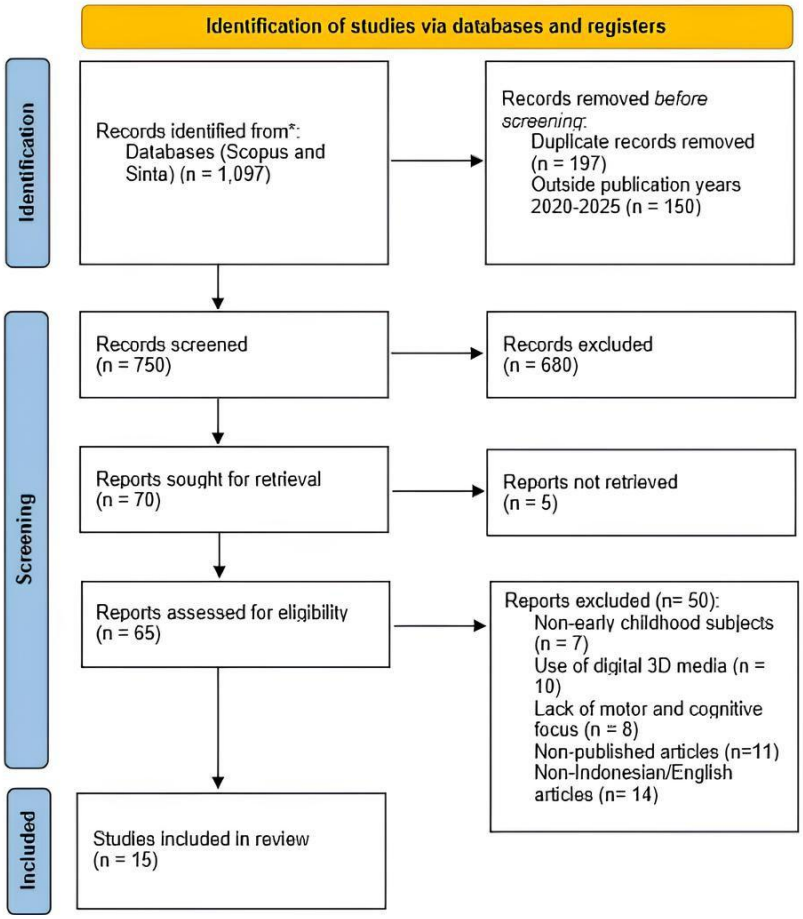

Fig 2. PRISMA Flow Diagram

Based on the PRISMA diagram in figure 2, the literature search for this study was conducted using two primary databases, namely Scopus and Sinta, with predefined keywords. This process yielded a total of 1,097 articles, comprising 927 articles from Scopus and 170 articles from Sinta. Subsequently, 197 duplicate articles were removed, and 150 articles outside the 2020–2025 publication range were eliminated, resulting in 750 articles for the initial screening stage.

The screening stage involved reviewing titles and abstracts to ensure alignment with the research focus. At this stage, 680 articles were eliminated for irrelevance, leaving 70 articles for the full-text retrieval stage. However, 5 articles were inaccessible in full, resulting in 65 articles analyzed further during the eligibility assessment stage. In the eligibility assessment stage, articles were evaluated based on the relevance of the subject, research variables, and type of media used. A total of 50 articles were eliminated because they did not meet the criteria, resulting in 15 articles that were used as the primary sources in the research analysis.

The final selection stage was conducted based on the following inclusion and exclusion criteria: i) the research subjects were young children (ages 0–6), ii) the studies utilized non-digital three-dimensional learning materials, iii) the studies addressed aspects of motor and cognitive development, iv) the studies were officially published scientific articles, and v) the studies were written in Indonesian or English.

This data analysis was conducted using a thematic approach designed to identify patterns, relationships among findings, and trends in the research results. All findings were then synthesized thematically, narratively, and analytically, resulting in a comprehensive understanding of the use of three-dimensional media in the context of Early Childhood Education. Since most of the empirical literature analyzed did not explicitly examine the Islamic perspective, the Islamic educational framework was used as an interpretive lens during the synthesis phase to strengthen the analysis results in accordance with the research objectives.

RESULT AND DISCUSSION

Characteristics of Three-Dimensional Media in Early Childhood Education

The analysis results indicate that there are six main characteristics of three-dimensional learning media in early childhood education, namely: i) multisensory, ii) children as active participants, iii) nature-based with spiritual value, iv) flexible and creative, v) integrated with Islamic values, and vi) holistic (cognitive, affective, and spiritual). Understanding the characteristics of three-dimensional learning media serves as the primary foundation for analyzing its effectiveness in early childhood education. This study highlights the characteristics of three-dimensional media in early childhood education, as presented in table 1 below:

Table 1. Characteristics of Three-Dimensional Media in Early Childhood Education

No	Findings	Number of Articles (n)	Percentage (%)	Description
1	Multisensory Learning	14	93.33%	The involvement of sensory modalities and movement reinforces the meaning of learning in children.

No	Findings	Number of Articles (n)	Percentage (%)	Description
2	Children as Active Subjects	13	86.67%	Direct exploration fosters meaning-making and the development of children's critical thinking skills.
3	Nature-Based Three-Dimensional Media	11	73.33%	Interaction with nature-based objects introduces children to the creations of God.
4	Flexibility and Creativity	11	73.33%	Exploration of loose parts nurtures children's creativity and self-confidence.
5	Integration of Islamic Values	7	46.67%	Children's exploration serves as a medium for reflection (*tadabbur*) and the strengthening of monotheism (*tauhid*).
6	Integration of Cognitive, Affective, and Spiritual Development	8	53.33%	Concrete experiences unify children's intellectual, emotional, and spiritual capacities.

As shown in table 1, three-dimensional learning materials have multisensory properties that allow children not only to see or hear, but also to touch, manipulate, and observe objects directly. This provides space for children to understand concepts concretely, as evidenced by research by Fikriyati et al., (2023); Rianti et al., (2022); Sugita et al., (2024), who found that activities with loose parts, pop-up books, and *hijaiyah* letter blocks enhance the activity, focus, and imagination of young children. Another prominent characteristic is the child's role as an active learner. Through direct exploration, children become independent learners who can construct their own knowledge, rather than merely imitating. This finding aligns with the theories of Montessori, 2013; Piaget, (1962), which emphasize that hands-on activities are the primary bridge to cognitive development, where "true learning only occurs when children work with their hands."

Three-dimensional learning materials made from natural materials possess a distinctive spiritual dimension. Children's interaction with elements of God's creation such as leaves, stones, and sand fosters both ecological and spiritual awareness. Research by Rianti et al., (2022) indicates that children who play with loose parts while naming God's creations demonstrate increased gratitude and environmental concern. In the context of Islamic education, this practice reflects the principle of *tadabbur al-kaun* and contemplating God's greatness through the surrounding natural world (Abdul-Jabbar & Makki, 2024). The flexibility of 3D materials also provides space for expression and creativity without limitations on form. Children can create various shapes from simple materials such as buttons, cardboard, and seeds. A study by Utamimah et al., (2025) demonstrates that children's freedom in loose-parts-based projects fosters high self-confidence and a strong sense of initiative in learning, while teachers act as reflective facilitators who guide the process without stifling creativity.

Three-dimensional learning media enable the integration of Islamic values

into learning activities. Play is not separate from spiritual values but serves as a means of instilling monotheism through the observation of God's creation. According to Al-Ghazali, true education does not stop at the transfer of knowledge but must lead humanity toward recognition of the Creator (Salaeh et al., 2023). The characteristics of three-dimensional learning media that integrate cognitive, affective, and spiritual aspects demonstrate unity in the process of Islamic education. Katsir, (1999) in his exegesis of QS. An-Nahl verse 78 explains:

وَاللّٰهُ اَخْرَجَكُمْ مِّنْۢ بُطُوْنِ اُمَّهٰتِكُمْ لَا تَعْلَمُوْنَ شَيْـًٔاۙ وَّجَعَلَ لَكُمُ السَّمْعَ وَالْاَبْصَارَ وَالْاَفْـِٕدَةَۙ لَعَلَّكُمْ تَشْكُرُوْنَ

Meaning: *And Allah has extracted you from the wombs of your mothers not knowing a thing, and He made for you hearing and vision and intellect that perhaps you would be grateful* (QS. An-Nahl :78)

This verse emphasizes that humans have been endowed with the senses of hearing and sight, as well as a heart, as means of recognizing the truth through direct experience a principle that aligns with the characteristics of three-dimensional media-based learning in fostering children's holistic development.

Thus, the fundamental characteristics of three-dimensional media being multisensory, flexible, and rich in spiritual values serve as a crucial foundation for stimulating the fine motor skills of young children, a topic to be discussed in the following section. The integration of Piaget's constructivist theory and Ibn Katsir's perspective on sensory experience positions three-dimensional learning media as a tool for *tarbiyah aqliyah* the education of the mind and heart that cultivates both cognitive and spiritual abilities.

The Use of Three-Dimensional Media to Stimulate Fine Motor Development

Further findings indicate that the use of three-dimensional media contributes to children's fine motor development. There are five main patterns of findings that demonstrate how three-dimensional media plays a role in stimulating fine motor development in young children. These five points are interrelated: i) improved visual-motor coordination, ii) the development of patience and focus, iii) manipulative skills, iv) the integration of Islamic values into physical activities, and v) the role of the teacher as a spiritual guide. A synthesis of the thematic analysis results is presented in table 2 below:

Table 2. Use of Three-Dimensional Media to Stimulate Fine Motor Development

No	Findings	Number of Articles (n)	Percentage (%)	Description
1	Enhancing Children's Visual-Motor Coordination	12	80%	Object manipulation exercises train children's hand movement precision
2	Fostering Patience and Focus	10	66.67%	Fine motor practice cultivates perseverance and concentration in children
3	Strengthening Manipulative Skills	13	86.67%	Grasping, pinching, and pressure control support children's writing and drawing abilities
4	Integration with Islamic Values	6	40%	Nature-based hijaiyah learning nurtures faith from an early age

No	Findings	Number of Articles (n)	Percentage (%)	Description
5	Teachers as Spiritual Guides	8	53.33%	Teacher direct children's movements while instilling values of gratitude

As shown in table 2, manipulative activities using three-dimensional materials consistently improve children's fine motor skills. Research by Zahra et al., (2024) indicates that the use of modeling techniques and positive reinforcement with 3D materials improves children's precision in handling and arranging small objects. Similarly, Yuniyartika & Sudaryanti, (2024) found that play activities using playdough and other plasticine-based materials strengthen finger muscles and enhance visual-motor coordination in children aged 4–6 years. Within the theoretical framework of Vygotsky & Cole, (1978), fine motor stimulation through three-dimensional media occurs within the zone of proximal development, where teacher guidance and social interaction accelerate the achievement of children's motor skills. On the other hand, Al-Ghazali, (2004) asserts that cultivating good outward actions fosters inner refinement, and patient, focused hand exercises can cultivate spiritual discipline. Thus, activities such as beading or shaping playdough are not merely games but also spiritual exercises that hone earnestness (*mujahadah*) from an early age.

Similar findings also emerge from the study by Fikriyati et al., (2023), which examined the use of loose-part materials made of cardboard and sand in Islamic schools. Activities involving assembling and attaching simple objects not only develop fine motor skills but also foster children's awareness of God's creation. These fine motor activities ultimately serve a dual purpose: strengthening sensorimotor skills while instilling spiritual values through concrete experiences.

This transition between motor skills and spirituality demonstrates the integration inherent in Islamic education: a child's hand movements can serve as a practical spiritual tool that fosters awareness of *tawhid* through daily activities. Therefore, early childhood education teachers must view fine motor activities not merely as exercises in physical coordination, but also as part of *tarbiyah aqliyah wa jasadiyah* that is, intellectual and physical education rooted in Islamic values.

Thus, it can be concluded that three-dimensional media not only trains children's manual dexterity but also develops spiritual and emotional aspects rooted in the values of sincerity and precision. These characteristics form the foundation for strengthening children's cognitive aspects, which will be discussed in the following section.

The Use of Three-Dimensional Media for Cognitive Development Stimulation

Further findings indicate that the use of three-dimensional media plays a strategic role in developing the cognitive abilities of young children. Through exploration of real objects, children not only understand shapes and colors, but also learn to think logically, solve problems, recognize number and letter patterns, and build early conceptual skills. Additionally, these activities foster children's curiosity and reflective thinking about the world around them. The five key aspects of this cognitive stimulation are summarized in table 3 below.

Table 3. The Use of Three-Dimensional Media to Stimulate Cognitive Development

No	Findings	Number of Articles (n)	Percentage (%)	Description
1	Developing Logical Thinking	11	73.33%	Children learn patterns, sequences, and cause–effect relationships in a concrete manner
2	Practicing Simple Problem-Solving	10	66.67%	Children attempt, make mistakes, and engage in self-correction
3	Strengthening Mathematical and Language Concepts	12	80%	Numbers, shapes, and three-dimensional letters make abstract concepts easier to understand
4	Fostering Curiosity and Creativity	11	73.33%	Children are encouraged to experiment and discover new ideas
5	Integration of Spiritual Awareness	5	33.33%	Cognitive activities serve as a medium for reflection (*tafakkur*), reinforcing intellect and faith

As shown in table 3, three-dimensional media consistently enhance children's logical and conceptual thinking skills through hands-on learning experiences. Research conducted by Kurniawati et al., (2024) indicates that educational wooden blocks can significantly improve the logical thinking skills of children aged 4–5 years. Activities such as assembling blocks, recognizing shapes, and grouping colors encourage children to understand cause-and-effect relationships and develop systematic thinking skills from an early age.

Similar results were shown by a study by Nasution et al., (2024) evaluating the use of loose parts in mathematical play activities. They found an increase in cognitive scores from 30% to 85.2% after two learning cycles, indicating that interaction with three-dimensional materials can accelerate the internalization of number and pattern concepts. These concrete activities help children build a stable mathematical thinking structure, consistent with Piaget, (2013) theory that children learn through direct manipulation of physical objects.

In addition to logical thinking skills, three-dimensional media also strengthen problem-solving skills. Utamimah et al., (2025) found that a Project-Based Learning approach using loose parts fosters children's ability to plan, predict outcomes, and generate ideas. Activities such as designing bridges from popsicle sticks or building houses from natural materials foster initiative and reflection.

Educational games such as the Big Maze Snakes and Ladders game conducted by Sukmawati et al., (2022) have proven effective in improving children's cognitive abilities in recognizing numbers and patterns. This game not only involves movement and strategy but also provides collaborative and social experiences. The integration of Islamic values into these activities allows children to understand the concepts of order and cause-and-effect as a reflection of *sunnatullah* the order of Allah's creation in the universe.

Furthermore, exploratory activities using three-dimensional media foster children's curiosity and creativity. Research by Rianti et al., (2022) confirms that loose-parts activities provide children with space to experiment, compare, and

interpret their own experiences. This supports the spirit of freedom learning, which positions children as active participants while instilling values of responsibility and empathy.

From an Islamic perspective, this cognitive development through empirical experience affirms Katsir, (1999) interpretation of Quranic Surah Al-Imran [3]:190, that reflecting on the creation of the heavens and the earth is a path to recognizing the greatness of Allah. Thus, cognitive activities are not separate from spirituality but serve as a means of *tafaqquh* and *tadabbur*.

Taken together, all the findings indicate that three-dimensional learning media serve as a holistic learning platform that integrates cognitive, affective, and spiritual functions. Children do not merely think to understand, but also to recognize the meaning behind God's creation. Thus, the use of three-dimensional learning media underscores the essence of Islamic education as *tarbiyah aqliyah wa ruhiyah* an education that nurtures intellectual intelligence and spiritual sensitivity in a balanced manner.

CONCLUSION

This study demonstrates that three-dimensional learning media play a crucial role in supporting early childhood learning through their concrete, multisensory nature and their ability to encourage children's active engagement. From an Islamic educational perspective, the use of these media not only contributes to motor and cognitive development but also creates opportunities for integrating spiritual values into the learning process. These findings confirm that three-dimensional learning media can serve as a relevant approach to achieving holistic learning that integrates children's physical, intellectual, and spiritual aspects. Therefore, early childhood educators and parents can utilize this media as a more meaningful and contextual learning strategy. Further research is recommended to develop a more structured three-dimensional media-based learning model and to empirically test its implementation in various early childhood education contexts to strengthen the findings obtained.

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