

Development of Interactive Media Islamic Kids Learning Media to Improve Early Childhood Cognitive Development

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Abstract: Cognitive development in early childhood is an important foundation for thinking skills and learning readiness, but the limited availability of learning media integrated with Islamic values remains a challenge in educational practice. This study aims to develop and evaluate the effectiveness of interactive learning media based on Islamic values in improving the cognitive development of early childhood using a Design-Based Research approach that includes needs analysis, design and development, as well as implementation and evaluation. The research subjects consisted of 30 early childhood students and 5 educators, with data collected through observation, interviews, and cognitive development tests analysed qualitatively and quantitatively. The results of the study indicate that the developed media has high validity, is practical to use in learning, and effectively improves children's cognitive abilities, especially in recognizing concepts, thinking logically, and solving simple problems. These findings confirm that the integration of Islamic values in learning media is not only pedagogically relevant but also makes a significant contribution to the cognitive development of early childhood and innovation in technology-based Islamic education.

Keywords early childhood, cognitive development, interactive media, Islamic values, digital learning

1. Introduction

Early childhood education is the primary foundation of the education system, playing a strategic role in shaping the quality of future human resources (Rambe et al., 2024). At this stage, children enter a golden age, characterized by rapid development in various aspects, particularly cognitive development, including the ability to think, understand concepts, remember, and solve simple problems. Optimal cognitive development during this period will significantly determine a child's readiness to face the next level of education. Therefore, the learning process in early childhood must be designed systematically, engagingly, and in accordance with the child's developmental characteristics. Effective learning emphasizes not only the transfer of knowledge but also active stimulation that encourages exploration, interaction, and meaningful learning experiences (Ramadhan et al., 2022; Rahman et al., 2024). In this context, the use of learning media plays a crucial role as a means of bridging the delivery of material to make it easier for children to understand. Appropriately designed media can increase children's attention, interest, and engagement in the learning process.

Along with the development of digital technology, digital-based interactive learning media has become an innovation capable of providing a richer, more dynamic, and more adaptive learning experience to the needs of early childhood. This media allows the integration of visual, audio, and interactivity elements, which can significantly improve the quality of learning.

Various studies have shown that the use of interactive media can improve children's cognitive abilities, particularly in the aspects of concept recognition, classification, and simple problem solving ([Abbas, 2025](#); [Kharismatunisa, 2023](#)). However, the effectiveness of such media is highly dependent on its design and suitability to the developmental characteristics of early childhood, so it is necessary to develop media that is not only engaging but also has a strong pedagogical foundation.

On the other hand, Islamic education plays a crucial role in shaping children's character and spiritual values from an early age. Integrating Islamic values into the learning process not only strengthens affective aspects but also supports children's cognitive development through the introduction of meaningful concepts ([Syahmil & Sa-U, 2024](#)). Values such as honesty, discipline, responsibility, and an introduction to the concept of monotheism can be internalized through contextual and interactive learning media. However, in practice, the integration of learning technology and Islamic values remains suboptimal. Many early childhood education institutions still use conventional, less interactive learning media, while available digital media generally do not systematically integrate Islamic values to support children's cognitive development. This situation indicates a gap between ideal learning needs and actual practice ([Efendi, 2025](#); [Rahman, 2025](#)).

Several previous studies have examined the use of learning media in early childhood education and the development of media based on Islamic values. However, most of these studies have been conducted separately, focusing on digital media development and the integration of Islamic values, thus lacking a holistic approach ([Aziz et al., 2025](#); [Hoerudin et al., 2023](#); [Rahmi & Fajrussalam, 2022](#)). Furthermore, the use of the Design-Based Research (DBR) approach in developing Islamic values-based learning media at the early childhood education level remains relatively limited ([Saguni et al., 2026](#); [Sugiantoro et al., 2024](#)). Most studies utilize a conventional development approach without engaging in an in-depth iterative process. Furthermore, research specifically testing the effectiveness of Islamic values-based interactive media on early childhood cognitive development using an empirical approach is also limited ([Rifai, 2025](#); [Safiah et al., 2025](#)). This indicates a significant research gap that needs to be developed.

Based on these gaps, this study aims to develop and evaluate interactive learning media based on Islamic values, namely Islamic Kids Learning Media (IKLM), in improving the cognitive development of early childhood. The media development was carried out using a Design-Based Research (DBR) approach that involves the stages of needs analysis, design, implementation, and evaluation in an iterative manner. This study specifically focuses on (1) identifying learning needs related to the use of interactive media based on Islamic values, (2) developing valid and practical IKLM media, (3) testing the effectiveness of the media in improving children's cognitive abilities, and (4) analyzing educators' responses to the use of media in learning. The novelty of this study lies in the integration of Islamic values in interactive digital media that was systematically developed through a DBR approach and empirical testing of its impact on the cognitive development of early childhood. Thus, this study is expected to provide theoretical and practical contributions in the development of technology-based Islamic education, especially at the early childhood education level.

2. Methodology

This research uses a Design-Based Research (DBR) approach, which aims to develop and evaluate the effectiveness of a learning product in a real-world context ([Fowler & Leonard, 2024](#); [Rahman et al., 2025](#)). This approach was chosen because it systematically and iteratively integrates the design, implementation, and evaluation processes, resulting in a product that is not only theoretically valid but also practically and effectively used. In this research, the product developed is an interactive learning media based on Islamic values, namely *Islamic Kids Learning Media (IKLM)*, which is designed to enhance the cognitive development of early childhood.



The research was conducted at an early childhood education institution, involving 30 children and five educators as research subjects. Subject selection was conducted purposively, taking into account active involvement in the learning process and the institution's readiness to implement technology-based media. The children who became the subjects were aged 4-6 years, which is a crucial phase in cognitive development. The educators involved had teaching experience and understood the characteristics of early childhood development, so they could provide relevant feedback on the use of the developed media.

The research procedure followed the four main stages of Design-Based Research: needs analysis, design and development, implementation, and evaluation and reflection ([Tinoca et al., 2022](#)). During the needs analysis stage, researchers observed the ongoing learning process, interviewed educators, and analyzed the learning media used. This stage aimed to identify learning needs, particularly those related to the limitations of interactive media that integrate Islamic values to support children's cognitive development.

The next stage is media design and development, which includes concept design. *Islamic Kids Learning Media (IKLM)*, developing materials based on Islamic values, and developing interactive features such as animation, audio, and visuals that are appropriate for the characteristics of early childhood. The product produced at this stage is a media prototype, which is then validated by media experts, material experts, and Islamic education experts to ensure the appropriateness of the content, presentation, and pedagogical suitability ([Santosa & Jazuli, 2022](#)). The validation results are used as a basis for revising the media before implementation.

During the implementation phase, the IKLM media was piloted in learning activities, involving early childhood education as primary users and educators as facilitators. Throughout the process, researchers observed children's activities, engagement in learning, and interactions with the media. Furthermore, children's cognitive development was measured through pre- and post-tests to determine its effectiveness. The final stage is evaluation and reflection, which aims to comprehensively analyze the results of the media implementation. The evaluation is conducted by combining qualitative and quantitative data, including observations, interviews, questionnaires, and cognitive tests. Based on the analysis, reflection is conducted on the media's strengths and weaknesses, which are then used as a basis for product refinement, resulting in valid, practical, and effective media.

Data collection techniques in this study included observation, interviews, questionnaires, tests, and documentation. Observations were used to observe children's activities and engagement during learning, interviews were used to gather information from educators regarding media needs and responses, questionnaires were used to assess the media's feasibility and practicality, and tests were used to measure children's cognitive development. Documentation was used as supporting data to strengthen the research findings.

Data analysis was conducted qualitatively and quantitatively. Qualitative data were analyzed through the stages of data reduction, data presentation, and drawing conclusions. Meanwhile, quantitative data were analyzed using descriptive statistics to assess the validity, practicality, and effectiveness of the media. Media effectiveness was measured using an improvement score (*N-Gain*) between the pre-test and post-test results, with high, medium, and low categories ([Halevi Hochwald et al., 2023](#); [Love & Corr, 2022](#)).

Table 1. Design-Based Research (DBR) Stages

Level	Main Activities	Output
Needs Analysis	Observation, interviews, problem identification	Media needs

Design & Development	Design, media creation, expert validation	Prototype IKLM
Implementation	Trials in early childhood	Usage data
Evaluation & Reflection	Data analysis, revision	Final product

Table 2. Data Collection Techniques

Technique	Instrument	Objective
Observation	Observation sheet	Observing children's activities
Interview	Interview guidelines	Exploring needs & responses
Questionnaire	Likert scale	Assessing the practicality of the media
Hand	Cognitive questions	Measuring cognitive development
Documentation	Photos/videos	Supporting data

Table 3. N-Gain Categories

N-Gain Value	Category
> 0.7	High
$0.3 - 0.7$	Currently
< 0.3	Low

3. Result and discussion

3.1 Needs Analysis Results

The needs analysis was conducted through observations and interviews with five early childhood education educators. Observations revealed that learning still relies on conventional methods with limited use of media, such as picture books and simple teaching aids. This situation results in low child engagement in the learning process, particularly in exploration and active interaction. Furthermore, interviews revealed that educators experienced difficulties in systematically integrating Islamic values into media-based learning. This was due to limited media availability and a lack of Islamic-based digital media references appropriate to the characteristics of early childhood.

Table 4. Results of the Educator Needs Analysis

No	Aspect	Findings
1	Instructional Media	Still conventional
2	Child involvement	Low to medium

3	Integration of Islamic values	Not yet systematic
4	Media needs	Interactive and Islamic based

Some statements from educators that support the results of the needs analysis are as follows:

"Children get bored quickly if they only use ordinary books or pictures." (Teacher 1)

"We want media that can teach Islamic values, but still be interesting like games." (Teacher 2)

"Digital media exists, but none of it is truly in line with Islamic learning for early childhood." (Teacher 3)

This finding is the basis for media development. Islamic Kids Learning Media (IKLM).

3.2 Results of IKLM Media Development

IKLM media is developed as an interactive application that combines visual elements, audio, and educational game activities. This media was designed based on a needs analysis, focusing on enhancing children's cognitive development and integrating Islamic values ([Satria, 2024](#)).

Key features of the media include: a) identification of colors, shapes, and numbers, b) object classification game, c) Islamic story-based activities, d) automatic feedback system.

3.3 Expert Validation Results

Validation was conducted by three experts: a media expert, a material expert, and an Islamic education expert. The assessment was conducted using a Likert-scale questionnaire.

Table 5. Expert Validation Results

Aspect	Score (%)	Category
Content Eligibility	92%	Very Valid
Media View	90%	Very Valid
Interactivity	88%	Very Valid
Practicality	91%	Very Valid
Rate-rate	90.25%	Very Valid

3.4 Practical Results of Media

The practicality of the media is assessed by educators after using the media in learning.

Table 6. Media Practicality Results

Indicator	Score (%)	Category
Ease of use	89%	Practical
Learning suitability	91%	Very Practical
Time efficiency	87%	Practical
Rate-rate	89%	Practical

"This media is very helpful because the children are immediately interested and more active." (Teacher 4)

"It is not difficult to use, even children can learn while playing." (Teacher 5)

3.5 Media Effectiveness Results

The effectiveness of the media was measured through the results of pre-tests and post-tests on 30 early childhood children.

Table 7. Descriptive Statistics

Indicator	Mark
Installment-installment Pre-test	5.2
Rate-rate Post-test	8.6
Improvement	3.4

3.6 N-Gain Results

Table 8. N-Gain Calculation

Indicator	Mark
N-Gain	0.71
Category	High

3.7 Results of Observations of Children's Activities

Observations were made during the use of IKLM media to see children's involvement in learning.

Table 9. Results of Observations of Children's Activities

Indicator	Score	Category

Activity	3.6	Very good
Focus	3.5	Good
Interaction	3.7	Very good
Understanding	3.6	Very good

3.8 Qualitative Findings (Child Behavior)

During the implementation of IKLM media, several changes in children's behavior were found: a) Children are more enthusiastic about participating in learning, b) Children actively ask questions and try out media features, d) Children show increased concentration, e) Children are able to complete tasks independently. In addition, children appear to understand concepts more easily through visualizations and animations presented in the media.

Discussion

The results of this study indicate that the Islamic Kids Learning Media (IKLM) developed has very high validity (an average of 90.25%), indicating that the media design has met the principles of content appropriateness, display quality, interactivity, and practicality. This finding is consistent with the literature that confirms that the quality of instructional design including the alignment of objectives, materials, activities, and feedback is a major determinant of the effectiveness of digital learning media ([Castro & Tumibay, 2021](#); [Spatioti et al., 2023](#)). Within the Cognitive Theory of Multimedia Learning framework, the appropriate combination of visuals, audio, and interactivity can optimize information processing through two cognitive channels (visual and auditory), thereby reducing irrelevant cognitive load and improving conceptual understanding ([Mayer, 2024](#)). The high scores on the display and interactivity aspects of the IKLM indicate that this media has successfully utilized these principles effectively.

From a methodological perspective, the use of a Design-Based Research (DBR) approach has been shown to contribute significantly to the quality of the resulting product. DBR enables a development process that is iterative, context-based, and responsive to user needs. This finding aligns with the view that DBR not only produces functional learning artifacts but also generates design principles that can be generalized to similar contexts ([Hoadley & Campos, 2022](#); [Mygdanis, 2025](#)). In this study, the iteration between the design, expert validation, implementation, and reflection stages enabled continuous media refinement, resulting in a product that is not only theoretically valid but also practically relevant in early childhood classrooms.

In terms of practicality, an average score of 89% indicates that IKLM is easy for educators to use and can be integrated into learning without significant obstacles. This finding is important because technology adoption in education is strongly influenced by perceived ease of use and perceived usefulness, as explained in the Technology Acceptance Model ([Al-Rahmi et al., 2021](#)). In the context of early childhood education, practicality is crucial because teachers require media that is not complex but still effective. Interviews with educators corroborate

this finding, where teachers stated that IKLM helps deliver material in a more systematic and engaging manner. Thus, the usability aspect of IKLM can be considered a key factor in its successful implementation.

The most significant result of this study is the effectiveness of media in improving children's cognitive development, as indicated by an increase in the average score from 5.2 (pre-test) to 8.6 (post-test) with an N-Gain value of 0.71 (high category). This finding indicates that IKLM has a substantial impact on children's cognitive abilities, including concept recognition, classification, logical thinking, and simple problem solving. Theoretically, this improvement can be explained through a constructivist approach that emphasizes that children learn actively through interaction with the environment (Piaget, 1972). IKLM provides a learning environment that allows children to explore, experiment, and receive direct feedback, thereby strengthening the process of knowledge construction.

Furthermore, cognitive improvement can also be explained through the concept of engagement in learning. Observations show that children become more active, focused, and involved during media use. This engagement acts as an important mediator between technology use and learning outcomes. Previous studies have shown that interactive media that can increase behavioral and cognitive engagement will have a direct impact on improving learning outcomes ([Li et al., 2024](#); [Tang & Hew, 2022](#)). In this context, interactive features of IKLM such as educational games and immediate feedback serve as triggers for engagement that ultimately improve children's cognitive performance.

One of the main contributions of this research lies in the integration of Islamic values into digital learning media. Unlike most previous studies that separate digital media development from values-based education, this research combines the two into a single, integrated platform. This integration not only enriches learning content but also provides a meaningful context for children to understand concepts. From a meaningful learning perspective, learning that is linked to everyday values and experiences is easier to understand and remember ([Ardoin & Heimlich, 2021](#); [Knowlton & Castel, 2022](#)). In IKLM, values such as honesty, responsibility, and the concept of monotheism are presented through narratives and interactive activities, so that children not only understand the concepts cognitively but also begin to internalize them.

These findings extend the existing literature by demonstrating that the integration of religious values does not hinder, but can actually enhance, cognitive processes when designed appropriately. This challenges the assumption that values-based learning tends to be solely affective ([Currier et al., 2023](#)). Instead, this research demonstrates that a holistic approach combining cognitive and spiritual aspects can produce more comprehensive learning. Thus, IKLM can be positioned as a pedagogical innovation that connects technology, cognition, and values within a single learning ecosystem.

From a comparative perspective, the results of this study align with various studies demonstrating the effectiveness of interactive media in improving early childhood learning outcomes, yet offer additional contributions in terms of approach and context. While previous research has tended to focus solely on technological or cognitive aspects, this study offers a

multidimensional integration encompassing technology, pedagogy, and Islamic values ([Buchner & Kerres, 2023](#); [Mubaidilla, 2025](#)). This strengthens the research's position as a novel contribution to the field of technology-based Islamic education.

However, this study has several limitations that should be considered. First, the relatively limited number of subjects (30 children) may affect the generalizability of the results. Second, the limited implementation duration does not allow for long-term impacts on cognitive development and value internalization. Third, this study focused on a single early childhood education institution, so further research in more diverse contexts is needed to test the consistency of the findings.

Overall, this discussion confirms that the IKLM media developed through the DBR approach is not only effective in enhancing early childhood cognitive development but also successfully integrates Islamic values into learning in a meaningful way. These findings offer important implications for future learning media development, particularly in creating innovations that are not solely technology-oriented but also value- and character-driven.

3. Conclusion

This study demonstrates that the development of Islamic Kids Learning Media (IKLM) through the Design-Based Research (DBR) approach resulted in a valid, practical, and effective learning product for enhancing early childhood cognitive development. Its effectiveness was evidenced by a high N-Gain score of 0.71, indicating significant improvement in children's learning outcomes. The findings confirm that integrating technology, pedagogy, and Islamic values into interactive learning media can effectively enhance concept recognition, logical thinking, and simple problem-solving skills while creating a more engaging and meaningful learning experience. Theoretically, this study contributes to the field of early childhood education by highlighting the potential of systematically integrating Islamic values into digital learning media. Practically, it offers an innovative alternative for educators to improve learning quality in the digital era. Future research is recommended to involve larger samples, more diverse educational settings, and longer implementation periods to further examine the long-term effectiveness and sustainability of the media's impact.

AUTHOR'S DECLARATION

Author contribution

Reza Rahma Yanti: Data curation, Conceptualization, supervision, providing feedback, editing. **Yolanda Pahrul:** data curation, validation, observations, **Irfal Khairul Fadri & M. Yakub Iskandar:** validation, writing-reviewing, and investigation

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Cometing interest

The authors declare that this research was conducted without any conflict of interest in the research.

AI Statement

The language structure used in this article has been checked and verified by English language experts. In addition, none of the sentences and images in this article were generated by AI tools. All data was obtained from the research process, and the author's review and previous research.

Ethical clearance

The research company has agreed to carry out the research and is willing if the results of this research are published.

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