

THE EFFECTIVENESS OF INTERACTIVE LEARNING MEDIA IN EARLY CHILDHOOD EDUCATION: EVIDENCE FROM INDONESIAN PRESCHOOLS

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Abstract

This study aims to examine the effectiveness of interactive learning media in early childhood education, with a focus on Indonesian preschools. A quantitative approach with a quasi-experimental design was employed, involving an experimental group and a control group using a pre-test and post-test framework. The participants consisted of children aged 4–6 years selected through purposive sampling. Data were collected using learning outcome tests, observation sheets to measure student engagement, and teacher questionnaires. The results indicate that the experimental group exposed to interactive learning media showed a substantially higher improvement in learning outcomes compared to the control group. The mean post-test score of the experimental group increased from 62.4 to 85.7, whereas the control group improved from 61.8 to 74.3. Student engagement was also higher in the experimental group, with attention, participation, interaction, and enthusiasm reaching 88%, 85%, 90%, and 92%, respectively. Statistical analysis confirmed that the differences between the two groups were significant at the 0.05 level. The findings suggest that interactive learning media are effective in enhancing both cognitive development and classroom engagement in early childhood education. However, challenges such as limited infrastructure and teacher readiness were also identified. This study highlights the importance of integrating interactive media with appropriate pedagogical strategies and recommends broader implementation supported by adequate training and resources.

Keywords: Interactive Learning Media, Early Childhood Education, Student Engagement, Learning Outcomes, Indonesian Preschools.

INTRODUCTION

Early childhood education (ECE) plays a crucial role in shaping children's cognitive, social, and emotional development during their formative years. At this stage, children are highly receptive to stimuli, making the learning environment and instructional strategies particularly influential in determining educational outcomes. Traditional teaching approaches, which often rely on passive learning methods, are increasingly being challenged by the need for more engaging and child-centered practices. As a result, the integration of interactive learning media has emerged as a promising strategy to enhance learning experiences in early childhood settings (Piaget, 1952; Vygotsky, 1978).

Interactive learning media refer to tools and technologies that actively engage learners through visual, auditory, and kinesthetic elements, encouraging participation and exploration. These media include digital applications, educational games, audiovisual content, and hands-on learning tools that stimulate children's curiosity and creativity. Previous studies have shown that interactive media can significantly improve children's attention span, motivation, and comprehension compared to conventional teaching methods (Mayer, 2009; Moreno & Mayer, 2007). In early childhood education, where play-based learning is essential, interactive media align well with developmental needs and learning styles.

In the context of Indonesia, early childhood education has undergone significant transformation in recent years, driven by policy reforms and increasing awareness of the importance of quality education at the preschool level. However, disparities in access to educational resources and teacher competencies remain challenges, particularly in integrating technology into classroom practices. While some preschools have adopted interactive learning tools, many still rely on

traditional approaches due to limited infrastructure, training, and support (UNESCO, 2020). This gap highlights the need to examine the effectiveness of interactive learning media within the Indonesian preschool context.

Furthermore, the effectiveness of interactive learning media is influenced not only by the tools themselves but also by how they are implemented by educators. Teachers play a central role in facilitating meaningful interactions between children and learning media. Their ability to design, adapt, and integrate interactive content into lesson plans determines the extent to which these tools can support learning objectives. Research suggests that teacher readiness, pedagogical competence, and attitudes toward technology are critical factors affecting the success of media integration in early childhood classrooms (Ertmer & Ottenbreit-Leftwich, 2010).

Despite the growing body of literature on educational technology, there remains limited empirical evidence specifically focusing on the effectiveness of interactive learning media in Indonesian preschools. Most existing studies are conducted in developed countries, where access to technology and educational resources differs significantly from developing contexts. Therefore, there is a need for context-specific research that considers cultural, infrastructural, and pedagogical factors unique to Indonesia. Such research can provide valuable insights for policymakers, educators, and stakeholders in improving early childhood education practices.

Based on these considerations, this study aims to examine the effectiveness of interactive learning media in early childhood education, with a focus on Indonesian preschools. It seeks to evaluate how interactive media influence children's learning outcomes, engagement, and overall classroom experience. Additionally, the study explores the challenges and opportunities associated with the implementation of such media. The findings are expected to contribute to the development of more effective, inclusive, and innovative learning strategies in early childhood education.

Although interactive learning media have been widely discussed in educational technology research, empirical studies focusing specifically on Indonesian preschool settings remain relatively limited. Most previous studies were conducted in developed countries with different educational infrastructures, technological access, and teaching practices. Consequently, there is still insufficient evidence regarding how interactive learning media influence learning outcomes and student engagement within the Indonesian early childhood education context. This study seeks to address this gap by providing empirical evidence from Indonesian preschools and examining both the educational benefits and implementation challenges associated with interactive learning media.

LITERATURE REVIEW

Early childhood education is grounded in developmental theories that emphasize active learning and meaningful interaction. According to Jean Piaget (1952), children construct knowledge through direct experiences and interactions with their environment. Similarly, Lev Vygotsky (1978) highlighted the importance of social interaction and scaffolding in cognitive development. These theoretical perspectives support the integration of interactive learning media, as such tools enable children to engage actively with content and peers, fostering deeper understanding and skill development.

Interactive learning media have been widely recognized as effective tools for enhancing educational outcomes. Richard E. Mayer (2009) introduced the Cognitive Theory of Multimedia Learning, which posits that individuals learn more effectively from words and pictures than from words alone. This theory is reinforced by studies showing that multimedia elements—such as animation, sound, and interactivity—can improve memory retention and comprehension (Moreno & Mayer, 2007). In early childhood settings, interactive media also align with play-based learning principles, which are essential for young learners' engagement and motivation.

Several empirical studies have demonstrated the positive impact of interactive learning media in early education. For instance, digital storytelling, educational games, and interactive videos have been found to improve language development, problem-solving skills, and social interaction among preschool children (Neumann, 2018). Additionally, research indicates that children exposed to interactive media tend to show higher levels of engagement and participation compared to those taught using traditional methods (Hirsh-Pasek et al., 2015). However, the effectiveness of these tools often depends on their design quality and appropriateness for children's developmental stages.

Teacher competence is a critical factor influencing the successful implementation of interactive learning media. Educators are not only required to understand how to operate technological tools but also how to integrate them pedagogically into meaningful learning experiences. Peggy A. Ertmer and Ottenbreit-Leftwich (2010) argue that teachers' beliefs and attitudes toward technology significantly affect their willingness to adopt innovative teaching methods. In early childhood education, where guidance and facilitation are crucial, teachers must be able to balance the use of technology with hands-on and social learning activities.

In the Indonesian context, the adoption of interactive learning media is still evolving. While national policies have encouraged the integration of technology in education, implementation at the preschool level faces several challenges, including limited infrastructure, insufficient teacher training, and unequal access to digital resources (UNESCO, 2020). Some studies in Indonesia have reported that interactive media can enhance children's learning interest and creativity; however, these findings are often limited to small-scale or localized research, highlighting the need for broader empirical investigation.

Despite the growing interest in interactive learning media, gaps remain in understanding their effectiveness in diverse educational settings, particularly in developing countries. Many existing studies focus on short-term outcomes without considering long-term impacts on children's cognitive and social development. Moreover, there is limited research examining how cultural and contextual factors influence the use of interactive media in early childhood classrooms. Therefore, this study seeks to address these gaps by providing empirical evidence from Indonesian preschools, contributing to a more comprehensive understanding of the role of interactive learning media in early childhood education.

Previous studies generally agree that interactive learning media can improve children's motivation, engagement, and academic achievement. However, findings vary depending on educational settings, technological readiness, and teacher competence. While studies conducted in technologically advanced environments report substantial improvements in learning outcomes, research in developing countries often highlights challenges related to infrastructure and implementation. These differences indicate the importance of conducting context-specific investigations to better understand how interactive learning media function in diverse educational environments, particularly within Indonesian preschool education.

RESEARCH METHODOLOGY

This study employs a **quantitative research approach** with a quasi-experimental design to examine the effectiveness of interactive learning media in early childhood education. The research uses a **pre-test and post-test control group design**, allowing for comparison between groups exposed to interactive learning media and those taught using conventional methods. This approach is chosen to measure the causal impact of interactive media on children's learning outcomes and engagement levels in a structured and measurable manner.

The research was conducted in several preschools in Indonesia, involving children aged 4–6 years as the primary participants. The sample was selected using a **purposive sampling technique**, considering schools that have access to basic learning media and are willing to participate in the study. A total of two groups were formed: an experimental group that received instruction using interactive learning media and a control group that followed traditional teaching methods. Teachers involved in the study were first given brief training to ensure consistent implementation.

Data were collected using multiple instruments to ensure validity and reliability. These included **learning outcome tests** (pre-test and post-test), **observation sheets** to measure student engagement, and **teacher questionnaires** to assess perceptions of media use. The learning tests were designed based on early childhood curriculum standards, while observation instruments focused on indicators such as attention, participation, and interaction. All instruments were validated through expert judgment and pilot testing prior to data collection.

To make sure the research tools were good we had them checked by experts. This included two people who specialize in teaching kids and one person who is an expert in measuring how well education works. We also did a test before we started collecting all the data to see if everything was clear and made sense. We picked the people who took part in the study on purpose. The schools they went to had already used learning tools and were happy to help us throughout the study. We made sure to do the thing by getting permission from the school leaders and parents before we started the research. The school administrators and parents gave us their okay to do the study after we told them what it was, about.

The implementation procedure began with administering a pre-test to both groups to assess baseline abilities. The experimental group was then exposed to interactive learning media, such as digital animations, educational games, and audiovisual tools, over a period of several weeks. Meanwhile, the control group received instruction through conventional methods such as lectures and printed materials. At the end of the intervention, a post-test was conducted to evaluate improvements in learning outcomes. Observations were carried out throughout the process to capture behavioral engagement.

Data analysis was conducted using **descriptive and inferential statistics**. Descriptive analysis was used to summarize mean scores, standard deviations, and percentage improvements, while inferential analysis (such as **paired sample t-tests** and **independent sample t-tests**) was applied to determine the significance of differences between groups. The results

were interpreted at a significance level of 0.05. This analytical approach enables the study to provide empirical evidence on the effectiveness of interactive learning media in improving early childhood learning outcomes.

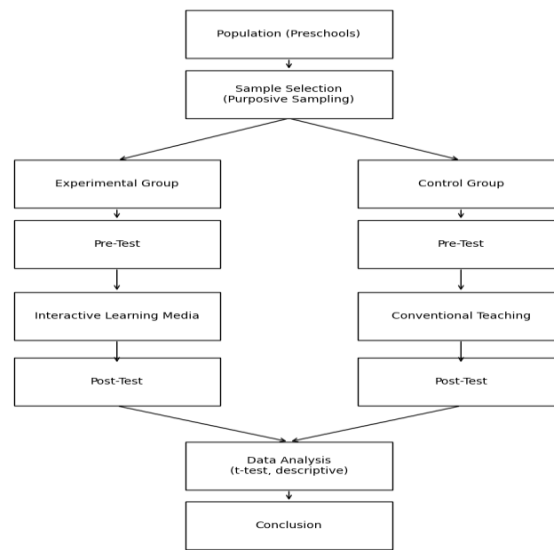


Figure 1. Research Framework

RESULTS AND DISCUSSION

The results of this study indicate that the use of interactive learning media has a significant impact on early childhood learning outcomes. Based on the pre-test and post-test scores, both the experimental and control groups showed improvement; however, the increase in the experimental group was substantially higher. This suggests that interactive learning media contribute positively to enhancing children's cognitive abilities and understanding of learning materials.

Before the intervention, the average pre-test scores of both groups were relatively similar, indicating that the initial abilities of the participants were comparable. This baseline equivalence is important to ensure that any observed differences in post-test results can be attributed to the treatment rather than pre-existing differences. The data are presented in Table 1.

Table 1. Pre-test Scores of Experimental and Control Groups

Group	N	Mean	Standard Deviation
Experimental Group	30	62.4	8.5
Control Group	30	61.8	8.1

After the implementation of interactive learning media, the post-test results revealed a notable improvement in the experimental group compared to the control group. The experimental group achieved a higher mean score, indicating better learning outcomes. This finding supports the argument that interactive media facilitate more effective learning by engaging multiple senses and promoting active participation. The comparison is shown in Table 2.

Table 2. Post-test Scores of Experimental and Control Groups

Group	N	Mean	Standard Deviation
Experimental Group	30	85.7	6.2
Control Group	30	74.3	7.4

Furthermore, inferential statistical analysis using an independent sample t-test showed that the difference between the two groups was statistically significant ($p < 0.05$). This confirms that the improvement in the experimental group was not due to chance, but rather the effect of the interactive learning media intervention. Therefore, it can be concluded that interactive media are more effective than conventional teaching methods in early childhood education.

In addition to learning outcomes, student engagement was also observed throughout the study. The results indicate that children in the experimental group were more active, attentive, and enthusiastic during the learning process. They

participated more frequently in classroom activities and showed higher levels of curiosity. In contrast, children in the control group tended to be more passive and less engaged.

Table 3. Student Engagement Observation Results

Indicator	Experimental Group (%)	Control Group (%)
Attention	88%	72%
Participation	85%	70%
Interaction	90%	75%
Enthusiasm	92%	73%

The findings also highlight the role of interactive learning media in supporting social interaction among children. Activities involving digital games and collaborative tasks encouraged children to communicate and work together, which are essential skills in early childhood development. This aligns with constructivist learning theories that emphasize the importance of social interaction in knowledge construction.

From the teachers' perspective, the use of interactive learning media was perceived as beneficial in facilitating teaching and improving classroom dynamics. Teachers reported that children were easier to manage and more responsive when interactive tools were used. However, some challenges were identified, such as limited technical skills and occasional technical issues during implementation.

The results of this study are really important for what we do in preschools. We found out that the kids who used learning media did a lot better on their tests their scores went from 62.4 to 85.7. The kids who did not use learning media also did better but not as much their scores went from 61.8 to 74.3. This tells us that interactive learning media can really help kids learn when we use it the way. We also have to think about other things like how good the teachers are, what the classroom is like and if we have the technology we need. So when we use learning media again we should think about these things so that the kids can get the most out of it. Interactive learning media can be very helpful, for preschools and we should use interactive learning media in a way that works best for the kids.

Despite these challenges, the overall findings of this study confirm that interactive learning media significantly enhance both learning outcomes and engagement in early childhood education. These results are consistent with previous studies that highlight the effectiveness of multimedia and interactive tools in improving educational quality.

In conclusion, this study provides empirical evidence that integrating interactive learning media into preschool education can lead to better academic performance and more engaging learning experiences. Therefore, it is recommended that educators and policymakers support the wider adoption of interactive media, accompanied by adequate training and infrastructure development to maximize its benefits.

CONCLUSION

This study concludes that interactive learning media are significantly effective in improving learning outcomes in early childhood education. The findings demonstrate that children who were exposed to interactive media achieved higher post-test scores compared to those who experienced conventional teaching methods. This indicates that interactive media can enhance cognitive development by making learning more engaging, meaningful, and accessible for young learners.

In addition to improving academic performance, interactive learning media also play an important role in increasing student engagement. Children in the experimental group showed higher levels of attention, participation, interaction, and enthusiasm during the learning process. These aspects are crucial in early childhood education, as active involvement supports not only knowledge acquisition but also social and emotional development.

The study also highlights the importance of integrating interactive learning media with appropriate pedagogical strategies. The effectiveness of these media depends largely on how teachers utilize them in the classroom. Teachers who are able to combine interactive tools with play-based and student-centered approaches can create a more dynamic and effective learning environment for children.

Furthermore, this research identifies several challenges in the implementation of interactive learning media, particularly in the Indonesian preschool context. These include limited access to technological infrastructure, insufficient teacher training, and occasional technical issues. Addressing these challenges is essential to ensure the optimal use of interactive media in early childhood education settings.

Despite these limitations, the overall findings provide strong evidence that interactive learning media offer substantial benefits for early childhood education. They not only improve learning outcomes but also foster engagement, creativity,

and collaboration among young learners. Therefore, the integration of interactive media should be considered as a strategic approach to enhance the quality of preschool education.

Finally, this study recommends that policymakers, educators, and stakeholders support the broader adoption of interactive learning media through investment in infrastructure, professional development for teachers, and the development of contextually relevant learning resources. Future research is also encouraged to explore long-term impacts and expand the scope of study across different regions and educational settings.

The use of learning media in Indonesian preschool education is a good thing. This is what this study is trying to show. It found out that kids who used learning media did better on tests. They got a score of 85.7 on average after using the media. The kids who did not use the media only got 74.3. The kids who used the media also paid attention and participated more in class. They even seemed to enjoy learning more.

This means that interactive learning media can really help kids learn better in preschools. It can also make them more excited about learning. We should do studies to see how interactive media affects kids in the long run. We want to know if it can help them with their thinking skills and how they get along with others. We should look at this in different schools, in Indonesia.

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