



The Influence of Augmented Reality-Based Play Activities on Children's Social and Emotional Skill Moderated by Parental Involvement

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Abstract: The study aims to analyze the influence of augmented reality (AR)-based play activities on children's social and emotional skills moderated by their parents' involvement. We employed a quantitative approach with a quasi-experimental design involving 30 children in Group B of Angkasa 3 Mandai Kindergarten, Maros Regency, in the 2024–2025 academic year. Data were collected through structured observation and questionnaires, then analyzed using descriptive statistics and moderated regression. The results showed that AR-based play activities positively and significantly influenced children's social and emotional development ($\beta = 0.612$; $p < 0.05$), and parental involvement significantly strengthened this influence ($\beta = 0.289$; $p = 0.012$). These findings confirm that the impact of AR learning in early childhood education will be more effective if supported by active parental involvement through continuous collaboration with teachers.

Keywords: Augmented Reality; Social emotional development; Parental involvement; Early childhood

Introduction

Early childhood socio-emotional development, commonly referred to in the literature as children's social and emotional skills, is the main foundation of early childhood education. This is because the 0-6 year period is the golden age for developing the ability to manage emotions, recognize the feelings of oneself and others, and interact intensively with the environment through structured social and emotional experiences. According to Erikson's psychosocial theory, early childhood is a crucial phase for the development of self-confidence, initiative, and social skills, making the quality of stimulation during this period highly determinative of children's long-term social and emotional trajectories. Emotional and social skills help children recognize emotions, regulate responses to social situations, and establish healthy relationships with peers and educators (Fuadia, 2025). In the context of early childhood education (ECD), collaboration between parents and educational institutions plays a

crucial role in strengthening the integration of social and emotional learning through consistent learning experiences and ongoing support in the home and school environments (Sheridan et al., 2019; Courtney et al., 2024).

Ideally, the application of technological approaches such as Augmented Reality (AR) in play can create interactive and contextual learning media, and stimulate meaningful social-emotional experiences for early childhood education (ECE), because it combines the real world and virtual elements that can boost children's engagement and collaboration (Citariyani et al., 2024). Grounded in Vygotsky's social constructivism theory, AR functions as a cultural tool that enriches children's experiences through visual, auditory, and social interaction stimulation, especially when they engage in collaborative play activities. From the perspective of Bandura's social learning theory, AR activities further enable children to learn through observation, imitation, and emotional responses to visual and social stimuli that arise during play, making AR not merely a medium for

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cognitive development but also a potential stimulator of children's affective and social aspects in a planned and directed manner (Elyakim et al., 2024). However, in many early childhood education institutions, including TK Angkasa 3 Mandai, Maros, South Sulawesi, the implementation of social-emotional learning still applies conventional methods such as turn-based storytelling, simple group games, and the teacher's role as the main facilitator.

This condition suggests that the application of technology-based interactive media, such as AR, is still limited, whereas to some extent, it indicates that such technology can play an important role in the social-emotional stimulation of AUD (Elyakim et al., 2024). The latest research shows that AR can boost engagement, focus, and motivation in early childhood because it brings a learning experience that resembles real play but is more immersive (Cahyaningtyas, 2024; Purba & Silitonga, 2024). In the context of AR-based learning specifically, play involving joint exploration, simple discussions, and emotional responses to virtual objects can improve children's ability to understand their own and others' feelings, as well as build positive social relationships that are essential foundations for school readiness (Fadila et al., 2025; Puspawati & Suyadi, 2024). Because Generation Alpha children are very familiar with digital technology, AR media has the potential to increase their motivation and engagement in learning activities (Nurdiantini et al., 2023). On the other hand, children receive different levels of parental support in the use of digital media at home, resulting in variations in social-emotional responses that emerge between children (Nasution et al., 2022).

The role of parental involvement in this dynamic cannot be separated from the broader ecological context of child development. Based on Bronfenbrenner's ecological systems theory, child development is influenced by interactions between various environmental systems, and the family plays the most intimate and ongoing role. Parental involvement – which includes mentoring, emotional support, supervision, and reflective interactions between parents and children during and after play – serves as a key factor bridging children's learning experiences from school to home, particularly in the use of digital technologies like AR. Latest research shows that active involvement of parents improves the effectiveness of technology-based learning in supporting children's social and emotional development through mentoring, emotional management, and the development of social values (Mashudi et al., 2025; Sutari, 2024). Within this relational framework, parental involvement serves as a moderating factor determining how strong the influence of AR-based play activities is on children's social and emotional development, suggesting that the effectiveness of AR depends not only on the technology

but also on the quality of social and emotional interactions parents build while accompanying children during its use.

Most present research examines the application of technology in early childhood education (ECE), including the impact of interactive media on children's cognitive development, including literacy and science. However, quantitative research that specifically examines the influence of AR on children's social and emotional skills, while also incorporating the role of parental involvement as a moderating variable, was limited between 2020 and 2025. For example, Elyakim et al. (2024) found that interactive technology applications had positive impacts, but their primary purpose was general, not specifically experimentally measuring the impact of AR on socio-emotional aspects in a controlled quantitative design. Furthermore, parental involvement in children's socio-emotional research is often treated as a descriptive supporting factor (Arisanti et al., 2024) and has not been widely tested as a moderating variable in a clear causal model. This gap indicates the need for elaborate studies of technology variables (AR), upstream socio-emotional development, and parental involvement as a moderator in a real-life PAUD context.

Children's social and emotional skills should not be merely normative, but should also be the primary foundation for adapting, interacting, managing behaviour, and building readiness for higher levels of education (Ilmi Tahirah et al., 2025). Without proper stimulation, children are at risk of difficulty interacting, having difficulty regulating their emotions, and lacking empathy later in life. The urgency of this research refers to the reality that technology has now become a part of children's lives from an early age. If not used effectively and with parental support, it can actually distract or isolate social life (Li et al., 2025). Therefore, quantitative research that examines the impact of AR on the social and emotional well-being of children with early childhood education (AUD), while taking parental involvement into account, is important to provide empirical evidence and practical recommendations for educators and parents.

The present study focuses on Angkasa 3 Mandai Kindergarten, Maros Regency, South Sulawesi, in the 2024-2025 academic year, involving children aged 4-6 years who are highly relevant for their social-emotional development phase. This location was strategically chosen because the institution has adequate technology and heterogeneous parental involvement (high-low), allowing for a moderation analysis of parental involvement in the impact of AR use on children's social-emotional development.

As an initial response to the challenges of social-emotional stimulation, some early childhood education centers (PAUDs) combine traditional play activities with simple interactive modules to build empathy,

cooperation, and emotional regulation skills in children, but their effectiveness has not been supported by strong scientific evidence. Parenting education mentoring programs have also been implemented in several institutions and have shown that parental knowledge and involvement are positively related to children's social-emotional development (Ardiyana et al., 2019). However, a more systematic and data-driven implementation is still very limited in the context of digital technology.

This study aims to empirically measure the influence of Augmented Reality-based play activities on children's social and emotional skills, test the moderation of parental involvement on the relationship between AR use and children's social and emotional development, and recommend implementation to PAUD teachers and parents to optimize AR media as an effective social and emotional learning tool. Through this objective, an innovative learning model that integrates technology, child development psychology, and family and school collaboration, which is beneficial for the development of PAUD practices in the digital era, can be developed.

Method

This research applied a quantitative approach with a quasi-experimental design, as the subject selection was based on pre-formed groups in the school, rather than randomization. This study employed a pretest-posttest design with moderator variables, where Augmented Reality (AR)-based play activities served as the independent variable, children's social and emotional skills as the dependent variable, and parental involvement as the moderator variable (Creswell & Creswell, 2018; Sugiyono, 2022). The subjects were all students (30) in Group B of Angkasa 3 Mandai Kindergarten for the 2024-2025 academic year, selected through a total sampling technique, and involving parents or guardians as supporting respondents to measure the level of parental involvement (Arikunto, 2016). The study was conducted at Angkasa 3 Mandai Kindergarten, Maros Regency, South Sulawesi Province, in the even semester of the 2024-2025 academic year, adjusting to the school's academic calendar.

The research variables included AR-based play activities, defined as educational play activities using interactive AR media; children's social and emotional skills, including emotional regulation, social interaction, empathy, and cooperation; and parental involvement, defined as the level of parental guidance, emotional

support, and participation in the child's learning process (Santrock, 2020; Suyadi, 2021). Data were collected through structured observations to examine children's social and emotional development, a Likert-scale questionnaire to measure parental involvement, and documentation to gather supporting data (Morrison, 2019). The content validity of the instrument was tested involving early childhood education (PAUD) and learning technology experts, while its reliability was tested using Cronbach's Alpha, ensuring the value with a value criterion above 0.70 to ensure its consistency (Ghozali, 2013).

Data analysis was carried out using descriptive statistics to describe the variable profiles, and Moderated Regression Analysis to examine the effect of AR-based play activities on children's social and emotional development, moderated by the involvement of the parents (Sugiyono, 2022). The research stages included the preparation step (seeking approval and developing instruments), the implementation step (pretest distribution, implementation of AR-based play activities with parental guidance, and a posttest), and the final stage consisting of data processing, analysis, and conclusions.

Result and Discussion

Results

Description of Research Subjects

The study involved 30 B Group students in TK Angkasa 3 Mandai in the academic year of 2024-2025 and their parents. All subjects followed all series of the Augmented Reality (AR)-based learning during the research period. Data on children's social and emotional development were obtained through structured observations, while data on parental involvement were obtained through a Likert-scale questionnaire (Riskia et al., 2025; Sartika et al., 2025).

The table 1 shows that the average AR-based play activity score was good, indicating that most children actively participated in games using AR media. The mean score of children's social-emotional development was also in the good category, indicating fair development in their emotional regulation, social interaction, and collaboration skills. Meanwhile, parental involvement obtained the highest mean score, indicating relatively active parental participation in supporting children's learning activities (Puspita Sari et al., 2025).

Table 1. Descriptive Statistics of Research Variables

Variables	N	Min Score	Max Score	Mean	Standard Deviation
AR-Based Play Activities (X)	30	65	92	78.43	7.12
Social Emotional Development (Y)	30	60	90	76.87	6.85
The Involvement of Parents (Z)	30	58	95	80.10	8.04

Table 2. Normality Test (Kolmogorov-Smirnov)

Variable	Sig.
AR play activities	0.200
Social and Emotional Development	0.153
The Involvement of Parents	0.178

The normality test above shows that the significance scores of all variables are higher than 0.05, so that the data are considered normally distributed and can be analyzed using the regression method.

Table 3. Results of Simple Regression Analysis ($X \rightarrow Y$)

Variable	Coefficients β	t-count	Sig.
AR Play	0.612	4.875	0.000

Data analysis shows that AR-based play positively and significantly influences social and emotional skills of children at Angkasa 3 Mandai Kindergarten ($\beta = 0.612$; $p < 0.05$). High intensity and quality of AR play is associated with an increase in children's social interaction, emotional regulation, empathy, and cooperation (Nurhayati, 2021). The findings also show that parental involvement significantly moderated and strengthened the impact of AR-based play on children's social and emotional improvement.

Table 4. Results of Moderation Regression Analysis (MRA)

Model	Variable	Coefficients β	Sig.
Model 1	AR based play (X)	0.421	0.003
Model 2	Parental Involvement (Z)	0.367	0.005
Model 3	$X \times Z$ (Interaction)	0.289	0.012

Moderation regression analysis shows that the interaction between AR-based play activities and parental involvement is significant ($\text{Sig.} < 0.05$), indicating that parental involvement acts as a moderator that strengthens the influence of AR on children's social and emotional skills (Masfufah et al., 2025).

Overall, the findings show that Augmented Reality-based play activities bring a positive impact on children's social and emotional skills. This influence is even stronger when parents are actively involved in mentoring the interaction during learning activities. Therefore, the integration of AR technology in early childhood education should be supported by the involvement of parents to ensure children's social and emotional skills develop optimally.

The moderation interaction coefficient of $\beta = 0.289$ ($p = 0.012$) shows that children who received active parental guidance and support during AR play demonstrated better social and emotional development than children who applied AR without parental involvement. Thus, the effectiveness of AR applications

in early childhood education is highly influenced by the synergy between schools and families.

In addition, the results of this study can inform the education policymakers to encourage the integration of innovative learning technologies supported by families in early childhood education. Curriculum development policies and early childhood teacher training should incorporate technological literacy and parental involvement strategies to ensure that the application of digital technology benefits children's development holistically.

Conclusion

Early childhood education (PAUD) teachers should integrate planned and structured Augmented Reality-based play activities into their learning, based on play while learning principles and developmental characteristics of early childhood education (PAUD). Teachers also need to design collaborative AR activities to stimulate social interaction and emotional management in children. Second, parents should be more actively involved in assisting their children when using AR media, either through direct guidance, reflective communication, or emotional support. This parental guidance reinforces the social and emotional values children obtain from digital play experiences. Third, schools and early childhood education administrators should organize digital literacy programs for teachers and parents so that technology, particularly AR, can be used wisely, safely, and meaningfully for children's development. Fourth, future researchers should expand this study by involving a larger sample size, a more robust experimental design, or more variables, such as teacher readiness, AR content quality, or duration of technology use, to obtain a more comprehensive understanding. Theoretically, the present study could advance the technology-based early childhood education studies, particularly by confirming that AR technology can effectively stimulate children's social and emotional development when supported by their environment, especially parents. These findings reinforce the theories of social constructivism and developmental ecology, which emphasize the importance of social interaction in children's learning processes. Practically, this research implies that the application of AR in early childhood education cannot be separated from the active role of teachers and parents. Technology is not a substitute for human interaction, but rather a supporting tool that will be effective when used collaboratively and contextually.

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Author Contributions

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Conflicts of Interest

The authors declare no conflict of interest.

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