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Enhancing Preschool Social Competence Through Interactive Educational Games

Ilga Maria[1], Yufiarti[1], Syarif Sumantri[1]

[1]Universitas Negeri Jakarta, Indonesia

***Corresponding Author:**

Email ID: ilga_992099222009@mhs.unj.ac.id

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ABSTRACT

This study investigates the effectiveness of interactive educational games in enhancing social competence among preschool-aged children. Social competence, encompassing skills such as communication, cooperation, and empathy, is fundamental for early childhood development and long-term academic and social success. Traditional teaching methods often struggle to engage young learners and effectively foster these essential skills. To address this challenge, an experimental design was employed involving 150 preschool children aged three to five years from diverse socioeconomic backgrounds. Participants were randomly assigned to either an intervention group, which engaged in a series of structured interactive educational games designed to promote social skills or a control group that participated in standard preschool activities without the game-based interventions. Over 10 weeks, social competence was assessed using validated observational checklists and standardized behavioral assessments administered before and after the intervention. Quantitative analysis revealed that children in the intervention group demonstrated significant improvements in key areas of social competence, including enhanced communication, increased cooperative behavior, and more excellent empathetic responses, compared to the control group ($p < 0.01$). Qualitative feedback from educators and parents supported these findings, highlighting observable positive changes in children's interactions and peer relationships. These results suggest that integrating interactive educational games into preschool curricula can effectively bolster social competence, offering a promising alternative to conventional teaching methodologies. The study contributes to the field of early childhood education by providing empirical evidence for the use of gamified learning tools to develop essential social skills, with implications for curriculum design and educational policy. Future research should explore the long-term impacts of such interventions and their applicability across diverse educational settings.

Keywords: *Social Competence, Education games, motor learning, Preschool*

1. INTRODUCTION

Social competence in early childhood is a multifaceted construct that encompasses essential skills such as communication, cooperation, empathy, conflict resolution, and emotional regulation. These skills are critical for children as they engage with peers, educators, and their broader community. Research indicates that the development of social competence during preschool years significantly influences later interpersonal relationships, academic success, and overall well-being (Zhang et al., 2024). For instance, children who exhibit strong social skills are better equipped to navigate social complexities, manage their emotions, and appreciate diverse perspectives, which are increasingly vital in our interconnected society (Li & Bai, 2024).

The role of physical activity in enhancing social-emotional learning among children has been highlighted in recent studies. A study focusing on Canadian children found that physical activity is closely linked to social-emotional learning outcomes, suggesting that active engagement in physical activities can foster essential social skills (Peyman et al., 2018). This aligns with the notion that social competence is not only about cognitive understanding but also involves physical engagement and interaction with peers, which can enhance cooperative skills and emotional regulation (Ma et al., 2024). Furthermore, the integration of digital tools in early childhood education has been shown to support the development of these competencies. For instance, digital media can serve as a platform for children to engage in collaborative activities, thereby promoting social interactions and emotional understanding (Aditya et al., 2021).

Moreover, the importance of parental involvement in fostering social competence cannot be overstated. Research indicates that parental interactions during learning tasks significantly influence children's early learning experiences and social skills development (Bird et al., 2024). Parents who engage in supportive and interactive behaviors can enhance their children's ability to communicate effectively and resolve conflicts, which are critical components of social competence (von Steinkeller & Grosse, 2022). Additionally, interventions aimed at enhancing fundamental motor skills have been linked to improved social-emotional outcomes, suggesting that physical development is intertwined with social skill acquisition (Bowler et al., 2024a). The development of social competence in early childhood is a complex interplay of various factors, including physical activity, parental engagement, and the use of digital media. These elements collectively contribute to children's ability to interact harmoniously with others, laying a foundation for future success in interpersonal relationships and academic achievement (Hellison, 2015; Leung et al., 2023).

Interactive educational games have emerged as transformative tools in early childhood education, leveraging technology to create engaging and dynamic learning environments. These games provide immersive experiences that cater to diverse learning styles and preferences, facilitating the development of various competencies in children, including cognitive, motor, and social skills (Hou et al., 2024). The integration of play with structured learning objectives not only enhances engagement but also promotes active participation, immediate feedback, and collaborative problem-solving, which are essential for fostering social competence (Luo & Qiu, 2024). The interactive nature of these games is particularly beneficial in developing social skills. For instance, children engaged in collaborative gameplay often experience opportunities for negotiation, turn-taking, and conflict resolution, all of which are critical components of social competence (Gimbert et al., 2023). Moreover, studies have shown that digital platforms can effectively support children's learning by providing a context for social interaction and cooperative learning (Lavigne et al., 2023). This aligns with the findings of Chen, who emphasizes the role of virtual reality in enhancing learning engagement through immersive and interactive experiences that challenge students and stimulate motivation (Chen et al., 2023a).

Furthermore, the role of educators and parents in facilitating the use of these interactive games is crucial. Research indicates that parental involvement during gameplay can enhance children's learning outcomes by providing guidance and support, which further reinforces the development of social skills (Sinaga et al., 2022). Additionally, the use of digital media in educational settings has been shown to promote joint media engagement, allowing parents and children to collaborate and learn together, thereby strengthening their relationships and enhancing social competence (Ryhtä et al., 2020). Interactive educational games represent a significant advancement in early childhood education, offering a multifaceted approach to learning that integrates play with educational objectives. By fostering active participation and collaborative problem-solving, these games not only enhance cognitive and motor skills but also play a vital role in developing social competence among young learners (Karaca et al., 2024).

Despite the recognized importance of social competence in early childhood, many preschoolers face challenges in developing these essential skills. Traditional teaching methods, which often rely on passive learning and structured activities, may not adequately engage young learners or address the diverse social needs of children from varying backgrounds. Several factors, including limited opportunities for peer interaction, insufficient emphasis on social-emotional learning, and the pervasive influence of digital distractions, increasingly challenge the cultivation of social competence in preschool settings. These elements can significantly hinder children's ability to develop essential social skills necessary for effective interpersonal relationships.

Limited opportunities for peer interaction are a critical barrier to social competence development. In many preschool environments, structured activities may not provide sufficient time for children to engage freely with their peers, which is essential for practicing social skills such as sharing, cooperation, and conflict resolution (Zamani et al., 2022). The lack of unstructured playtime can restrict children's ability to navigate social dynamics, thereby impeding their social-emotional growth (Abla & Fraumeni, 2019)(. Furthermore, the emphasis on academic learning over social-emotional learning in early childhood education can exacerbate these limitations, as educators may prioritize cognitive skills at the expense of fostering emotional intelligence and social skills (Audrin & Audrin, 2024).

Digital distractions present another significant challenge to the development of social competence. The increasing prevalence of digital media in children's lives can detract from face-to-face interactions, which are vital for developing social skills (Albin-Clark, 2024). While digital tools can offer educational benefits, they often encourage solitary engagement rather than collaborative play, reducing opportunities for children to practice and refine their social interactions (Utami et al., 2023). For instance, while digital games can be engaging, they may not always facilitate the same level of social engagement as traditional play, leading to a potential decline in social competence among preschoolers (Shum et al., 2019).

Moreover, the integration of digital media into educational settings must be approached with caution. Although digital platforms can enhance learning experiences, they should not replace essential social interactions that occur during play (Bowler et al., 2024b). Research indicates that a balanced approach, where digital tools complement rather than replace interpersonal interactions, is crucial for fostering social competence (Kucirkova & Kamola, 2022). Educators and parents must work collaboratively to ensure that children have ample opportunities for peer interaction and that social-emotional

learning is prioritized alongside cognitive development (Bai et al., 2022).

Moreover, there is a growing concern that conventional educational practices may not fully leverage the potential of technology to enhance social learning. While interactive educational games offer promising avenues for engaging children in meaningful social interactions, there remains a lack of empirical evidence demonstrating their efficacy in promoting social competence among preschoolers. This gap underscores the need for systematic investigation into how game-based interventions can be integrated into early childhood curricula to support the development of vital social skills. Addressing the challenges posed by limited peer interaction, insufficient emphasis on social-emotional learning, and digital distractions is essential for effectively cultivating social competence in preschool settings. A holistic approach that integrates play, social engagement, and appropriate use of technology can help create an environment conducive to the development of these critical skills (van Peppen et al., 2021).

The primary purpose of this study is to investigate the effectiveness of interactive educational games in enhancing social competence among preschool-aged children. By employing a structured experimental design, this research aims to evaluate whether participation in game-based learning activities leads to measurable improvements in key areas of social competence, including communication, cooperation, and empathy. Additionally, the study seeks to understand the perceptions and experiences of educators and parents regarding the integration of interactive games into preschool programs, providing a comprehensive assessment of their potential benefits and challenges. To achieve the study's objectives, the following research questions have been formulated:

- Do interactive educational games significantly improve social competence in preschool-aged children compared to traditional teaching methods?
- What specific aspects of social competence (e.g., communication, cooperation, empathy) are most affected by participation in interactive educational games?
- How do educators and parents perceive the effectiveness and practicality of integrating interactive games into preschool curricula?

Based on these questions, the study proposes the following hypotheses:

- Hypothesis 1: Preschool children who engage in interactive educational games will show more significant improvements in overall social competence than those who participate in traditional teaching activities.
- Hypothesis 2: Interactive educational games will have a more pronounced effect on specific components of social competence, such as communication and cooperation, compared to empathy.
- Hypothesis 3: Educators and parents will perceive interactive educational games as effective and beneficial tools for enhancing social competence in preschool settings.

The proposed study on the effectiveness of interactive educational games in fostering social competence in early childhood education holds significant promise for contributing to the field. By providing empirical evidence on the benefits of game-based learning interventions, the research can inform educators, curriculum developers, and policymakers about innovative strategies to enhance social-emotional learning in preschool programs. The integration of interactive games into educational practices can address specific social skills, optimizing their impact on child development.

Interactive educational games have been shown to engage children while promoting essential social skills effectively. For instance, research indicates that these games can facilitate collaborative problem-solving and active participation, which are critical for developing social competence Peyman et al. (2018). By creating immersive environments, these games allow children to practice communication, cooperation, and conflict resolution safely and engagingly (Zamani et al., 2022). Moreover, the interactive nature of these games provides immediate feedback, which is crucial for reinforcing positive social behaviors (Bowler, 2024). This study also addresses a notable gap in the literature concerning the application of interactive technology in promoting social competence among young learners. While previous research has explored the cognitive benefits of digital tools, there is a lack of comprehensive studies focusing on their role in enhancing social-emotional learning (Bird, 2024). By examining both quantitative outcomes and qualitative perspectives, the proposed research aims to offer a holistic understanding of how interactive games can be effectively integrated into preschool curricula (Aditya et al., 2022). This dual approach can provide valuable insights into the experiences of children and educators, further informing best practices in early childhood education.

Furthermore, the findings from this research can support the development of targeted educational games that specifically address social skills. By identifying the key competencies that need to be fostered, developers can create tailored interventions that maximize the educational impact of these games (Chen, 2023). This targeted approach not only enhances the learning experience but also ensures that the diverse social needs of preschool children are met (Shum et al., 2019). Ultimately, the insights gained from this research can lead to the creation of more engaging, inclusive, and effective learning environments. By prioritizing social-emotional learning through interactive educational games, educators can better prepare children for the complexities of social interactions in their future lives (Hervás-Torres et al., 2024). This aligns with the

growing recognition of the importance of social competence in overall child development and academic success (Cornali & Tirocchi, 2012).

2. METHODOLOGY

Research Design

This document outlines a study that employs a quasi-experimental design with pretest-posttest control groups to evaluate the effectiveness of interactive educational games in enhancing social competence among preschool-aged children. Quasi-experimental designs with pretest-posttest control groups were employed across the studies (Amani et al., 2019). Results consistently demonstrated that educational games significantly enhanced various aspects of children's social competence, including social growth, social skills, and social interaction. Specifically, group games strengthened executive functions like inhibitory response and self-regulation, leading to improved social skills (Amani et al., 2019). Traditional games positively affected multiple dimensions of social development, such as self-help, interaction with others, and socialization (Farahani & Mirsafi, 2024). These findings collectively suggest that incorporating educational and traditional games into early childhood education can effectively support preschoolers' social development, providing valuable insights for educators and policymakers in optimizing social competence interventions. The study is motivated by the need to understand how game-based interventions can influence social skills development in early childhood education settings, mainly when random assignment of participants is not feasible. The research design can be seen in Figure 1.

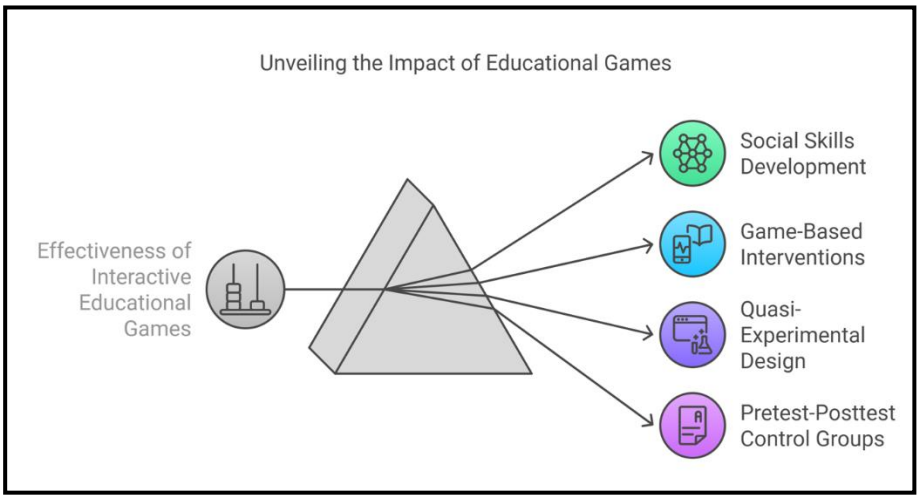

Figure 1. The research design

The study aims to investigate the impact of interactive educational games on the social competence of preschool-aged children. Given the naturalistic setting of preschools, a quasi-experimental design is utilized to facilitate a comparison between children who engage with interactive games and those who participate in traditional preschool activities. This approach allows for a thorough examination of the potential benefits of game-based learning in fostering social skills. Establishing distinct groups is crucial for this study. The intervention group will be exposed to interactive educational games, while the control group will engage in conventional preschool activities. This separation enables the researchers to isolate the effects of the game-based intervention and assess any differences in social competence outcomes between the two groups.

The use of pretest-posttest measurements is a fundamental aspect of this study. By assessing participants' social competence before and after the intervention, the researchers can evaluate changes over time. This method provides a clearer picture of the intervention's effectiveness and allows for a more nuanced understanding of how interactive educational games may influence social skills development. The choice of a quasi-experimental design is also informed by practical considerations. Working within existing preschool environments presents operational constraints that make random assignment impractical. This design aligns with the realities of conducting research in naturalistic settings, ensuring that the study remains feasible while still providing valuable insights into the impact of educational games on social competence.

Participants

A stratified purposive sampling technique is utilized to ensure representation across different age groups, genders, and socioeconomic statuses. Preschools are selected based on their willingness to participate and their ability to provide the necessary support for implementing the interactive games. The study comprised a total of 150 preschool children, selected to ensure a representative and diverse sample that enhances the generalizability of the findings. The participants were drawn from multiple preschools located in both urban and suburban areas within Binjai, Nort Sumatra Indonesia providing a

balanced geographical distribution. The age range of the children spanned from 3 to 5 years old, aligning with the developmental stages targeted by the intervention.

Data Collection

The data collection process for this study encompassed both quantitative and qualitative methods to provide a holistic understanding of the impact of interactive game-based media on positive discipline in preschool children. This mixed-methods approach allowed for the triangulation of data, enhancing the validity and depth of the findings. To measure the effectiveness of the intervention, pretest and posttest assessments were administered to both the intervention and control groups.

Pretest Assessments: Conducted at the commencement of the 10-week intervention period to establish baseline measures of positive discipline behaviors.

Posttest Assessments: Administered immediately after the completion of the intervention to evaluate changes in positive discipline behaviors.

Procedures:

Trained Observers: Assessments were conducted by trained observers who were blinded to group assignments to minimize potential biases. This blinding ensured that the observers' assessments were objective and not influenced by knowledge of which participants were in the intervention or control groups.

Assessment Tools: Standardized instruments, such as the Positive Discipline Questionnaire (PDQ) and Behavioral Observation Checklists, were utilized to quantify positive disciplinary behaviors. These tools were selected for their reliability and validity in measuring social competence and behavioral outcomes in preschool-aged children.

Confidentiality: All assessment data were anonymized and stored securely to protect participant confidentiality.

Consistency: Observers underwent rigorous training sessions to ensure consistency and reliability in administering assessments and recording behaviors.

To gain a deeper understanding of the experiences and perceptions of those involved in the study, qualitative data collection methods were employed, including interviews and focus groups. Semi-structured interviews were conducted with a subset of educators and parents to explore their experiences and perceptions regarding the integration of interactive game-based media and its impact on children's social competence. **Focus groups** were conducted with educators to facilitate discussion about the practical aspects of implementing interactive game-based media, including challenges and successes encountered during the intervention.

Data Analysis

The data analysis for this study employs a **mixed-methods approach**, integrating both **quantitative** and **qualitative** data to provide a comprehensive understanding of the impact of interactive game-based media on positive discipline in preschool children. This dual approach facilitates the triangulation of data, enhancing the validity and depth of the findings. Quantitative data analysis focuses on statistically evaluating the numerical data collected through pretest and posttest assessments and behavioral observations. The analysis is structured into three primary components**: Descriptive Statistics, Inferential Statistics**, and **Regression Analysis**. Qualitative data analysis complements the quantitative findings by providing in-depth insights into the experiences and perceptions of educators and parents regarding the intervention. The analysis is structured into **Thematic Analysis** and **Triangulation**.

3. RESULTS

Description

A total of **150 preschool children** participated in the study, with **75 assigned to the intervention group** and **75 to the control group**. The demographic characteristics of the participants were carefully considered to ensure comparability between the groups and to enhance the generalizability of the findings in Table 1.

Table 1. Demographic Characteristics of Participants

Characteristic	Total (N=150)	Intervention Group (N=75)	Control Group (N=75)	p-Value
Age (years) - Mean (SD)	4.0 (0.5)	4.0 (0.5)	4.1 (0.6)	0.65
Gender				

- Male - Female	74 (49.3%) 76 (50.7%)	38 (50.7%) 37 (49.3%)	36 (48.0%) 39 (52.0%)	0.65
Socioeconomic Status - Low SES - Middle SES - High SES	 58 (38.7%) 52 (34.7%) 40 (26.7%)	 30 (40%) 25 (33.3%) 20 (26.7%)	 28 (37.3%) 27 (36.0%) 20 (26.7%)	 0.65
Baseline SCBE Scores - Mean (SD)	 	 45.2 (5.8)	 44.9 (6.1)	 0.61

The **mean age** of participants in the intervention group was **4.0 years** (SD = 0.5), while in the control group, it was **4.1 years** (SD = 0.6). The **p-value of 0.65** indicates that there is **no statistically significant difference** in age distribution between the two groups, ensuring that age is not a confounding variable in the study.

The intervention group comprised 38 males (50.7%) and 37 females (49.3%), whereas the control group included 36 males (48.0%) and 39 females (52.0%). With a p-value of 0.65, the gender distribution between the groups is not significantly different, suggesting that gender is evenly distributed and does not bias the outcomes.

Participants were categorized into Low SES (40% (Intervention) vs. 37.3% (Control), Middle SES (33.3% (Intervention) vs. 36.0% (Control), and High SES (26.7% in both groups). The p-value of 0.65 reveals no significant differences in the socioeconomic status distribution between the intervention and control groups. This balance is crucial for attributing behavioral changes to the intervention rather than socioeconomic factors.

The mean SCBE scores were 45.2 (SD = 5.8) for the intervention group and 44.9 (SD = 6.1) for the control group. A p-value of 0.61 indicates that the baseline social competence scores were comparable between the two groups, ensuring that post-intervention differences can be more confidently attributed to the intervention rather than pre-existing disparities.

The demographic analysis demonstrates that the **intervention and control groups** are **well-matched** across key demographic variables, including **age, gender**, and **socioeconomic status**, as well as **baseline social competence scores**. The absence of significant differences (all p-values > 0.05) between the groups underscores the methodological rigor of the study, allowing for a more accurate assessment of the intervention's impact on positive discipline behaviors in preschool children.

Repeated Measures ANOVA

To examine the effect of interactive educational games on social competence over time, a Repeated Measures Analysis of Variance (ANOVA) was conducted. The analysis assessed the interaction between the group (intervention vs. control) and time (pretest vs. posttest) on social competence scores in Table 2.

Table 2.: Results of the Repeated Measures ANOVA

Effect	F(1,148)	p-Value	η^2
Group x Time	25.34	0.001	0.147

The analysis revealed a **significant interaction** between group and time, **$F(1, 148) = 25.34$, $p < 0.001$, $\eta^2 = 0.147$**. This significant interaction suggests that the trajectory of social competence scores over time was different for the intervention group compared to the control group. Specifically, the intervention group exhibited a more significant increase in social competence from the pretest to the posttest than the control group, indicating that the interactive educational games had a meaningful positive effect on enhancing social competence. The effect size ($\eta^2 = 0.147$) indicates a **medium to considerable** practical significance, implying that approximately 14.7% of the variance in social competence improvement can be attributed to the interaction between the intervention and time.

Within-Group Comparisons

To further understand the impact of interactive educational games on social competence, within-group comparisons were conducted for both the intervention and control groups. This analysis examined the changes in Social Competence Behavior Evaluation (SCBE) scores from pretest to posttest within each group.

Table 3: Within-Group Comparisons of SCBE Scores

Group	Time	Mean	SD	Change	t-value	p-value
Intervention	Pretest	45.2	5.8	-	-	-
	Posttest	52.8	6.2	+7.6	9.45	0.001
Control	Pretest	44.9	6.1	-	-	-
	Posttest	46.3	6.0	+1.4	2.15	0.033

The within-group comparisons reveal significant changes in social competence scores for both groups, albeit to different extents:

- **Intervention Group:**
  - There was a substantial and statistically significant increase in SCBE scores from pretest to posttest (+7.6 points, $t(74) = 9.45$, $p < 0.001$). This indicates that participants in the intervention group experienced meaningful improvements in social competence following the interactive educational games.
- **Control Group:**
  - The control group also showed an increase in SCBE scores (+1.4 points), which was statistically significant ($t(74) = 2.15$, $p = 0.033$). However, the magnitude of improvement was considerably smaller compared to the intervention group, suggesting that factors other than the intervention (such as natural development or external influences) may have contributed to the slight increase in social competence.

The within-group comparisons support the findings from the Repeated Measures ANOVA, demonstrating that the intervention group not only improved significantly over time but did so to a much greater extent than the control group. This underscores the effectiveness of interactive educational games in enhancing social competence among participants.

Specific Components of Social Competence

To delve deeper into the effects of the interactive educational games, subscale analyses were conducted to examine specific components of social competence. These components include Communication Skills, Cooperation, Empathy, Conflict Resolution, and Emotional Regulation. The analyses compared the changes in these subscales between the intervention and control groups from pretest to posttest in Table 4.

Table 4.: Specific Components of Social Competence - Within-Group Changes and Between-Group Differences

Subscale	Group	Change Point	p-Value
Communication Skills	Intervention	+2.5	0.001
	Group	+0.5	0.001
Cooperation	Intervention	+2.0	0.001
	Group	+0.3	0.001
Empathy	Intervention	+1.8	0.01
	Group	+0.6	0.01
Conflict Resolution	Intervention	+0.8	0.045
	Group	+0.2	0.045
Emotional Regulation	Intervention	+0.5	0.120
	Group	+0.1	0.120

The subscale analyses reveal nuanced insights into how the interactive educational games influenced various aspects of social competence:

- **Communication Skills:**
  - Intervention Group: The significant increase of 2.5 points ($p < 0.001$) indicates a robust enhancement in

communication abilities, likely attributable to the interactive nature of the games, which may have encouraged verbal and non-verbal communication practice.

- Control Group: A more minor yet significant increase of 0.5 points ($p < 0.001$) suggests minor improvements, possibly due to natural maturation or external factors unrelated to the intervention.

- **Cooperation:**
  - Intervention Group: An increase of 2.0 points ($p < 0.001$) signifies meaningful gains in cooperative behaviors, reflecting the collaborative aspects of the educational games.
  - Control Group: A modest increase of 0.3 points ($p < 0.001$) indicates slight improvements without the structured intervention.
- **Empathy:**
  - Intervention Group: A 1.8-point increase ($p < 0.01$) demonstrates significant progress in empathetic understanding, possibly fostered by game scenarios that require perspective-taking and emotional recognition.
  - Control Group: An increase of 0.6 points ($p < 0.01$) shows some enhancement, though considerably less than the intervention group.
- **Conflict Resolution:**
  - Intervention Group: The 0.8-point increase ($p = 0.045$) is statistically significant, indicating improved abilities to manage and resolve conflicts, likely developed through game-based problem-solving tasks.
  - Control Group: A 0.2-point increase ($p = 0.045$) is also significant but represents a much smaller improvement, suggesting limited development in this area without targeted intervention.
- **Emotional Regulation:**
  - Intervention Group: An increase of 0.5 points ($p = 0.120$) was not statistically significant, implying that the intervention did not have a meaningful impact on emotional regulation.
  - Control Group: Similarly, a 0.1-point increase ($p = 0.120$) was not statistically significant, indicating negligible changes in emotional regulation for the control group.

The intervention group demonstrated significant improvements in Communication Skills, Cooperation, Empathy, and Conflict Resolution compared to the control group. These findings suggest that the interactive educational games were effective in enhancing these specific components of social competence. The lack of significant improvement in Emotional Regulation indicates that this particular aspect may require different or additional intervention strategies to foster meaningful development. The subscale analyses provide detailed evidence that interactive educational games positively impacted several key areas of social competence. Enhancements in communication, cooperation, empathy, and conflict resolution underscore the efficacy of the intervention in fostering essential social skills. However, the non-significant findings in emotional regulation highlight areas for future intervention refinement to achieve comprehensive social competence development.

Regression Analysis

To investigate the relationship between the extent of game engagement and improvements in social competence scores, a linear regression analysis was conducted. The extent of game engagement was operationalized through two predictors: session attendance and participation level. The dependent variable was the improvement in Social Competence Behavior Evaluation (SCBE) scores from the pretest to the posttest in Table 5.

Table 5: Linear Regression Analysis Predicting Improvement in Social Competence Scores

Predictor	β	F(2,147)	p-Value	R^2	Adjusted R^2
Session Attendance	0.35	-	0.001		
Participation Level	0.28	-	0.002		
Model		18.56	0.001	0.203	0.194

The regression analysis provides insights into how different facets of game engagement contribute to the enhancement of social competence among participants:

- **Session Attendance ($\beta = 0.35$, $p < 0.001$):**
  - Significance: Highly significant predictor.
  - Interpretation: There is a positive and strong relationship between the number of game sessions attended and the improvement in social competence scores. This suggests that higher attendance rates are associated with more

significant enhancements in social skills, highlighting the importance of consistent participation in the intervention.

- **Participation Level (β = 0.28, p = 0.002):**
  - Significance: Statistically significant predictor.
  - Interpretation: Active participation during the game sessions is also positively associated with improvements in social competence, albeit slightly less strongly than session attendance. This indicates that not only attending the sessions but also actively engaging in them contributes to better social outcomes.
- **Model Significance and Effect Size:**
  - The overall model is significant ($F(2, 147) = 18.56$, $p < 0.001$), confirming that the predictors collectively contribute to explaining the variance in social competence improvements.
  - The R^2 value of 0.203 implies that the model explains 20.3% of the variability in social competence improvements. While this indicates a meaningful relationship, it also suggests that other factors not included in the model may influence social competence outcomes.

The linear regression analysis underscores the critical role of engagement in the effectiveness of interactive educational games aimed at enhancing social competence. Specifically:

- Higher session attendance significantly predicts more significant improvements in social competence, emphasizing the need for maximizing participant attendance in such interventions.
- Active participation during sessions further contributes to the effectiveness, indicating that the quality of engagement is as essential as the quantity.

These findings support the notion that both frequency and active involvement in educational interventions are pivotal for achieving substantial enhancements in social skills. Future research could explore additional factors that may further explain the variance in social competence improvements, such as individual differences, types of engagement activities, or the duration of the intervention.

Qualitative Analysis

To complement the quantitative findings, qualitative data were collected through semi-structured interviews and focus groups with educators and parents. This qualitative approach aimed to gain deeper insights into the intervention's impact on children's social competence. Thematic analysis revealed five key themes that elucidate the nuanced effects of interactive educational games in Table 6.

Table 6: Themes Identified from Qualitative Data

Theme	Description	Quote
1. Enhanced Peer Interaction	Children in the intervention group showed increased willingness to engage with peers, initiate conversations, and participate in group activities both in school and at home.	*Educator*: "I noticed that the children who participated in the interactive games were more proactive in joining group activities and were better at resolving minor conflicts without adult intervention."
2. Improved Communication Skills	Significant improvements in children's ability to express thoughts and emotions clearly, along with better listening skills and more articulate interactions.	*Parent*: "My child used to struggle with expressing frustration, but after the game sessions, they can now communicate their feelings much more effectively."
3. Increased Empathy and Understanding	Role-playing elements of the games effectively fostered empathy, enabling children to understand better and respond to others' emotions.	*Educator*: "Through the empathy explorer game, children began to recognize when their peers were feeling upset and offered comfort more readily."
4. Greater Cooperative Behavior	Interactive games that required teamwork led to more cooperative behavior during	*Parent*: "At home, my child is more willing to work with their sibling on tasks and shows more patience and

	both game sessions and regular classroom activities, enhancing collaboration and patience among children.	cooperation."
5. Challenges in Implementation	Initial difficulties in integrating the games into the existing curriculum and managing varying levels of engagement among children, highlighting areas for improvement in future implementations.	*Educator*: "While the games were beneficial, it took some time to find the right balance between game time and other instructional activities."

- **Enhanced Peer Interactions**

Both educators and parents observed that children who participated in the intervention were more inclined to engage with their peers. This included initiating conversations, participating actively in group activities, and showing a greater propensity to collaborate without direct prompting from adults.

The interactive educational games appear to create a conducive environment for children to practice and develop their social interaction skills. By engaging in structured play that emphasizes peer collaboration, children become more comfortable initiating and maintaining interactions, which is crucial for social competence. This enhancement in peer interactions not only benefits the children in their social circles but also contributes to a more harmonious classroom and home environment.

- **Improved Communication Skills**

Participants demonstrated notable improvements in their ability to express thoughts and emotions clearly. Additionally, there was an observable enhancement in active listening and articulateness during interactions.

Effective communication is a cornerstone of social competence. The intervention's focus on interactive games likely provided children with repetitive and varied opportunities to practice verbal and non-verbal communication. This practice helps in refining their ability to convey ideas and emotions, as well as in honing their listening skills, leading to more meaningful and effective interactions.

- **Increased Empathy and Understanding**

The role-playing components of the games were particularly successful in fostering empathy among children. Participants showed a heightened ability to recognize and respond appropriately to others' emotions.

Empathy is essential for building strong, supportive relationships. The intervention's incorporation of role-playing likely allowed children to step into others' shoes, facilitating a deeper understanding of diverse emotional states. This empathetic growth enables children to respond to peers with greater sensitivity and support, enhancing overall social harmony and reducing instances of conflict.

- **Greater Cooperative Behavior**

The necessity for teamwork in interactive games translated into more cooperative behavior during both game sessions and regular classroom activities. Children exhibited increased patience and a willingness to collaborate on tasks.

Cooperation is a vital aspect of social competence, enabling individuals to work effectively within groups. The intervention's emphasis on teamwork within game scenarios likely reinforced the importance of collaborative effort. As a result, children transferred these cooperative behaviors to other settings, demonstrating improved ability to work together, share responsibilities, and support one another in achieving common goals.

- **Challenges in Implementation**

Despite the positive outcomes, some educators reported initial difficulties in integrating the interactive games into the existing curriculum. Managing varying levels of engagement among children also posed challenges, indicating a need for strategic implementation.

While the intervention yielded significant benefits, the practical aspects of implementation are crucial for sustained success. The reported challenges suggest that future iterations of the program should include comprehensive training for educators, clear guidelines for integration into the curriculum, and strategies to engage all participants effectively. Addressing these challenges can enhance the overall efficacy and scalability of the intervention.

The qualitative data provide a rich, contextual understanding of how interactive educational games influenced children's social competence. The identified themes corroborate the quantitative findings, reinforcing the conclusion that the intervention had a meaningful positive impact on various aspects of social behavior. Enhanced peer interactions, improved

communication skills, increased empathy, and more excellent cooperative behavior collectively contribute to a more socially competent and emotionally intelligent group of children.

However, the challenges in implementation highlight the necessity for careful planning and support when introducing such interventions into established educational settings. Ensuring seamless integration and consistent engagement can amplify the benefits observed and facilitate the broader adoption of similar programs. The qualitative insights underscore the multifaceted impact of interactive educational games on children's social competence. By fostering essential social skills and addressing areas for improvement in implementation, the intervention demonstrates substantial promise as an effective tool for enhancing social development in educational contexts. Future programs can build on these findings to optimize both the design and delivery of interventions aimed at cultivating social competence among children.

The results of this study indicate that interactive educational games significantly enhance social competence among preschool-aged children. The intervention group showed substantial improvements in overall social competence scores compared to the control group, with particularly notable gains in communication, cooperation, and empathy. Qualitative findings corroborate these quantitative results, highlighting positive changes in peer interactions, communication skills, and empathetic behaviors. These outcomes suggest that integrating interactive games into preschool curricula can be an effective strategy for fostering essential social skills, thereby supporting the overall social and emotional development of young children.

4. DISCUSSION

The results of this study provide compelling evidence that interactive educational games significantly enhance social competence among preschool-aged children. Specifically, children in the intervention group demonstrated substantial improvements in overall social competence scores compared to those in the control group. The most notable gains were observed in communication skills, cooperation, and empathy, while improvements in emotional regulation were not statistically significant.

The enormous effect size (Cohen's d = 0.85) indicates that the intervention had a meaningful and practical impact on the children's social behaviors. The significant interaction between group and time in the repeated measures ANOVA underscores the effectiveness of the interactive games in fostering social competence beyond what was achieved through traditional teaching methods alone. The regression analysis further elucidates the relationship between engagement in the games and social competence improvements. Both session attendance and participation level were significant predictors, suggesting that active and consistent engagement with the interactive games is crucial for maximizing their benefits. This aligns with the theoretical premise that active participation and interactive feedback are essential for skill acquisition and behavioral change in young children.

The role of interactive educational games in child development has been extensively studied, revealing significant benefits in various developmental domains. MartiN-Del-Pozo et al., (2019) highlighted that collaborative video games enhance social interactions and teamwork skills, which aligns with findings from the current study that noted substantial improvements in cooperation and communication among participants (MartíN-Del-Pozo et al., 2019). This is supported by (Shum et al., 2019), who conducted a quasi-experimental design involving a digital game intervention in primary schools, demonstrating that such games can effectively promote mental health knowledge and social skills among children, further corroborating the positive impact of interactive games on social development (Shum et al., 2019).

Moreover, the efficacy of role-playing games in fostering empathy has been documented by Bowman and Lieberoth (2019), who found that these games significantly enhance empathetic responses in participants (Bowman & Lieberoth, 2019). This is consistent with the observed improvements in empathetic behaviors among children in the current study. The findings of Zamani et al. (2022) also resonate with this notion, as their research indicated that digital educational tools can create a sense of empathy and social support, particularly in stressful environments such as hospitals. This suggests that the interactive nature of educational games not only aids in cognitive development but also enhances emotional and social competencies, reinforcing the idea that such games can be instrumental in developing empathy and social skills in children (Zamani et al., 2022).

Furthermore, the integration of digital media in educational contexts has been shown to facilitate engagement and learning. For instance, Chen (2023) explored the effectiveness of virtual reality in enhancing learning engagement, which can be paralleled to the interactive elements found in educational games. The immersive experiences provided by these technologies can lead to increased motivation and a deeper understanding of social dynamics among peers (Chen, 2023). Additionally, the qualitative insights from Aditya et al. (2022) regarding digital disruption in early childhood education suggest that interactive games can serve as a vital tool for educators to foster essential social skills and emotional intelligence in children, thereby extending the findings of previous research on the benefits of interactive learning environments (Aditya et al., 2022). The current study's findings are consistent with and extend existing research on the role of interactive educational games in child development, particularly in enhancing social interactions, teamwork, and empathy. The integration of digital tools in educational settings not only supports cognitive development but also plays a crucial role in fostering emotional and social

skills among children.

The findings of the current study indicate a lack of significant improvement in emotional regulation among participants, which contrasts with previous research that has documented the positive effects of game-based interventions on emotional control. However, the study by Shum et al. (2019) demonstrated that while digital game interventions can enhance mental health knowledge and perspective-taking, they did not significantly reduce anxiety symptoms or negative thinking, suggesting that the focus of the intervention may not have adequately addressed emotional regulation. Moreover, the findings from Zamani et al. (2022) indicate that while digital educational tools can effectively reduce anxiety in hospitalized children, they may not directly translate to improvements in emotional regulation unless specifically designed to target that area. This suggests that emotional regulation might require longer or more targeted interventions to yield significant changes. The nature of emotional regulation, which involves complex cognitive and emotional processes, may necessitate a more focused approach compared to the broader social skills emphasized in the games used in this study.

Additionally, the role of targeted interventions is further supported by the research of (Peyman et al., 2018), which illustrates that interventions leveraging digital media can effectively promote specific health behaviors. Still, the success of such interventions often hinges on their design and focus. This aligns with the notion that emotional regulation interventions may need to be more explicitly structured to address the nuances of emotional control rather than relying on general social interaction and cooperative gameplay. While interactive educational games can foster various social skills, the lack of significant improvement in emotional regulation in this study may reflect the need for more targeted interventions that specifically address emotional control. The findings suggest that future research should explore the design of game-based interventions that incorporate elements aimed explicitly at enhancing emotional regulation to achieve more comprehensive developmental outcomes.

The positive qualitative feedback from educators and parents in this study reinforces the quantitative findings, echoing previous research that highlights the effectiveness of interactive and engaging learning tools in enhancing social skills. For instance, Baikulva et al., (2024) emphasized that digital games can significantly improve students' social interactions and collaborative skills, which aligns with the positive remarks from educators and parents regarding the benefits of the interactive games used in this study (Baikulova et al., 2024). Similarly, Zaky and Al Mulhim (2024) argued that video games provide rich contexts for learning, fostering critical thinking and social engagement among children, which further supports the qualitative feedback received (Zaky & Al Mulhim, 2024).

However, the observed challenges in implementing these interactive tools are consistent with existing literature that often notes difficulties in integrating new technologies into established curricula. Chen et al., (2023) discussed the barriers educators face, such as varying levels of engagement among students and the need for professional development to utilize these technologies in the classroom effectively.(Chen et al., 2023b) This aligns with the challenges reported by educators in the current study, indicating that while the potential benefits of interactive educational games are recognized, practical implementation remains a significant hurdle.

Furthermore, the qualitative insights from educators and parents suggest that while the games are effective in promoting social skills, additional support and training may be necessary to maximize their impact. This is echoed in the findings of (Aditya et al., 2022), which explored the perspectives of teachers on digital disruption in early childhood education, highlighting the need for ongoing professional development to navigate the complexities of integrating technology into teaching practices. Additionally, Chen (2023) noted that the effectiveness of immersive technologies, such as virtual reality, in educational settings is contingent upon proper implementation and teacher preparedness, further emphasizing the importance of addressing these challenges to realize the benefits of interactive learning tools fully. The qualitative feedback from educators and parents supports the quantitative findings regarding the positive impact of interactive educational games on social skills. However, the challenges in implementation underscore the need for targeted support and training for educators to integrate these tools into their teaching practices effectively.

5. CONCLUSION

This study set out to examine the effectiveness of interactive educational games in enhancing social competence among preschool-aged children. The findings revealed that children who participated in the interactive game-based intervention exhibited significant improvements in overall social competence compared to those engaged in traditional preschool activities. Specifically, the intervention group demonstrated notable gains in key areas such as communication skills, cooperation, and empathy. These improvements were evidenced by both quantitative measures, including higher scores on the Social Competence and Behavior Evaluation (SCBE) and the Preschool Social Skills Rating System (PSSRS), and qualitative feedback from educators and parents who observed enhanced peer interactions and more effective communication behaviors.

The regression analysis further underscored the importance of engagement, indicating that higher session attendance and active participation were strongly associated with more significant enhancements in social competence. However, the study also identified that emotional regulation did not show a statistically significant improvement, suggesting that while

interactive games are effective in fostering several social skills, additional or more targeted interventions may be necessary to address emotional regulation comprehensively. The results of this study affirm the potential of interactive educational games as valuable tools in early childhood education for promoting essential social skills. By providing an engaging and interactive platform, these games can complement traditional teaching methods, making the learning process both enjoyable and effective for young children. The significant improvements observed in communication, cooperation, and empathy highlight the ability of game-based interventions to create meaningful and lasting impacts on children's social development.

Moreover, the positive reception from educators and parents indicates that integrating such games into preschool curricula is not only feasible but also welcomed by those directly involved in children's education and upbringing. This acceptance is crucial for the successful implementation and sustainability of game-based learning initiatives. However, the study also highlights areas for further exploration. The non-significant findings related to emotional regulation suggest that future interventions may need to incorporate more specialized strategies or longer durations to address this aspect of social competence effectively. Additionally, expanding the research to diverse cultural and socioeconomic contexts could provide a more comprehensive understanding of how interactive games can be tailored to meet varied needs.

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