

Early Childhood Education Quality and Learning Outcomes: A Quantitative Study of Preschool Children

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Abstract

Early childhood education (ECE) is widely acknowledged as a critical foundation for children's cognitive, social, and emotional development. However, empirical evidence from developing contexts remains limited. This study quantitatively examines the relationship between early childhood education quality and learning outcomes among preschool children. Using a cross-sectional survey design, data were collected from 320 preschool children and 48 teachers across public and private early childhood centers. Measures included classroom learning environment, teacher-child interaction, instructional practices, and children's cognitive and socio-emotional outcomes. Data were analyzed using descriptive statistics, correlation, and multiple regression analysis. Results revealed significant positive relationships between ECE quality indicators and children's learning outcomes, with teacher-child interaction emerging as the strongest predictor. The study underscores the importance of improving instructional quality and teacher preparation in early childhood settings. Implications for policy, practice, and future research are discussed.

Keywords: early childhood education, learning outcomes, teacher-child interaction, preschool quality,

1. Introduction

Early childhood education represents a crucial stage in the educational trajectory of children, laying the groundwork for later academic achievement and social adjustment. Research has consistently shown that experiences during early childhood influence brain development, learning capacity, and future educational success (Shonkoff & Phillips, 2000). Consequently, governments and international organizations increasingly emphasize investment in early childhood education as a strategy for human capital development.

Despite this recognition, access to quality early childhood education remains uneven, particularly in developing countries. Many early learning centers struggle with inadequate learning materials, limited teacher training, and overcrowded classrooms (UNESCO, 2023). While existing studies confirm the long-term benefits of early education, fewer quantitative studies empirically examine how specific quality indicators predict children's learning outcomes within preschool settings.

This study addresses this gap by quantitatively investigating the relationship between early childhood education quality and children's cognitive and socio-emotional learning outcomes.

2. Literature Review

2.1 Early Childhood Education Quality

ECE quality is commonly conceptualized through structural and process dimensions. Structural quality includes class size, teacher qualifications, and learning materials, while process quality focuses on interactions, instructional strategies, and emotional support (Mashburn et al., 2008). Empirical evidence suggests that process quality has a stronger influence on child outcomes than structural factors alone.

2.2 Teacher-Child Interaction

Teacher-child interaction is a central mechanism through which learning occurs in early childhood classrooms. Studies using observational and survey methods consistently show that responsive, supportive, and cognitively stimulating interactions are associated with improved language, numeracy, and social skills (Hamre et al., 2014). In developing contexts, teacher behavior often compensates for limited resources, highlighting its importance.

2.3 Learning Outcomes in Early Childhood

Learning outcomes in early childhood extend beyond academic skills to include social competence, self-regulation, and emotional development. Quantitative studies demonstrate that children who attend high-quality preschool programs perform better in early literacy and numeracy assessments and show fewer behavioral problems (Denham et al., 2012; Yoshikawa et al., 2013).

3. Methodology

3.1 Research Design

A **quantitative cross-sectional survey design** was adopted for this study.

3.2 Population and Sample

The population comprised preschool children enrolled in registered early childhood education centers. A sample of 320 children (ages 4-5) and 48 teachers was selected using stratified random sampling to ensure representation of public and private centers.

3.3 Instruments

Data were collected using three standardized instruments:

- 1. Early Childhood Education Quality Scale (ECEQS)**

- Classroom environment

- Instructional practices
- Teacher-child interaction

2. **Preschool Learning Outcomes Scale (PLOS)**

- Cognitive outcomes (literacy and numeracy)
- Socio-emotional outcomes

3. **Teacher Background Questionnaire**

Cronbach's alpha coefficients ranged from 0.78 to 0.91, indicating acceptable reliability.

3.4 **Data Analysis**

Data were analyzed using SPSS. Statistical techniques included descriptive statistics, Pearson correlation, and multiple regression analysis at a 0.05 significance level.

4. **Results**

4.1 **Descriptive Statistics**

Table 1: Descriptive Statistics of Study Variables

Variable	Mean	SD
Classroom Environment	3.42	0.61
Instructional Practices	3.55	0.58
Teacher–Child Interaction	3.68	0.54
Cognitive Outcomes	3.46	0.63
Socio-Emotional Outcomes	3.59	0.57

Table 1 show the mean scores indicate a moderate to high level of ECE quality and learning outcomes across sampled centers, with teacher–child interaction recording the highest mean.

4.2 Correlation Analysis

Table 2: Correlation Matrix

Variable	1	2	3	4
1. Classroom Environment	1			
2. Instructional Practices	.54**	1		
3. Teacher–Child Interaction	.61**	.66**	1	
4. Learning Outcomes	.48**	.57**	.69**	1

Note: $p < .01$

All ECE quality indicators showed significant positive relationships with children’s learning outcomes. Teacher-child interaction demonstrated the strongest correlation.

4.3 Regression Analysis

Table 3: Multiple Regression Predicting Learning Outcomes

Predictor	B	β	t	p
Classroom Environment	0.18	.21	3.42	.001
Instructional Practices	0.24	.29	4.56	.000
Teacher–Child Interaction	0.39	.45	6.98	.000

$R^2 = 0.58$, $F(3,316) = 145.27$, $p < .001$

The model explained 58% of the variance in children’s learning outcomes. Teacher-child interaction emerged as the strongest predictor, followed by instructional practices and classroom environment.

5. Discussion

The findings confirm that early childhood education quality significantly predicts children's learning outcomes. Consistent with previous studies (Hamre et al., 2014; Mashburn et al., 2008), teacher-child interaction was the most influential factor, emphasizing the importance of responsive and supportive pedagogy in early learning environments.

The strong predictive power of instructional practices suggests that developmentally appropriate teaching strategies enhance both cognitive and socio-emotional development. These results align with empirical evidence showing that early interventions are most effective when they combine structured learning with emotional support (Yoshikawa et al., 2013).

In developing contexts, where material resources may be limited, investing in teacher professional development may yield substantial benefits for early childhood learning outcomes.

6. Conclusion

This quantitative study provides empirical evidence that early childhood education quality plays a critical role in shaping children's learning outcomes. Teacher-child interaction, instructional practices, and classroom environment significantly predict cognitive and socio-emotional development among preschool children. Policymakers and practitioners should prioritize teacher training, classroom support, and quality monitoring systems to strengthen early childhood education. Future research should employ longitudinal designs to examine long-term effects of early education quality.

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