

Cognitive Development Patterns Among Preschool Children In Low-Resource Settings In Nigeria.

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Abstract: *Early childhood is a critical period for cognitive development, during which foundational skills such as language, problem-solving, memory, and executive functioning are rapidly formed. However, children in low-resource settings often face environmental and structural constraints that limit optimal cognitive growth. This study investigated cognitive development patterns among preschool children in low-resource settings in Nigeria, with specific focus on teacher instructional practices, home learning environments, and resource constraints. A descriptive survey research design was adopted, involving a population of 2,000 preschool teachers, from which a stratified random sample of 800 teachers was drawn. Data were collected using a researcher-developed instrument titled Cognitive Development Patterns Questionnaire (CDPQ) and analysed using mean and standard deviation. Findings revealed that teacher instructional practices such as play-based learning and interactive engagement moderately support cognitive development, although inadequate instructional materials and limited individualized attention remain major challenges. Results also showed that home learning environments particularly parental involvement and reading practices significantly influence cognitive outcomes, despite limited access to learning materials and educational media in many homes. Furthermore, severe resource constraints, including inadequate infrastructure, overcrowded classrooms, insufficient funding, and limited teacher training, were identified as critical barriers to effective cognitive development support. The study concludes that while both teachers and parents play meaningful roles in fostering early cognitive development, persistent structural and resource-related challenges significantly hinder optimal outcomes. The study recommends targeted policy interventions, improved teacher professional development, enhanced parental engagement, and increased investment in early childhood education infrastructure to promote equitable cognitive development in low-resource Nigerian settings.*

Keywords: Cognitive Development Patterns; Preschool Children; Low-Resource Settings.

Introduction

Early childhood represents a critical period of brain growth and cognitive organization, with rapid development occurring between birth and age eight (Shonkoff & Phillips, 2000). This phase establishes foundational cognitive processes such as memory, problem-solving, language, and executive function that predict later academic achievement and socio-emotional wellbeing (Center on the Developing Child, 2024). Globally, quality early childhood experiences are recognized as essential drivers of lifelong learning and human capital development (UNICEF, 2023; OECD, 2024). In low-resource environments, however, children frequently confront disadvantages that limit access to stimulating learning environments, quality pedagogy, and sustained parental engagement (Engle et al., 2025).

Cognitive development patterns are shaped by the interaction of multiple ecological factors. Bronfenbrenner's socioecological model highlights the role of family, school, community, and broader policy contexts in shaping developmental trajectories (Bronfenbrenner, 1979). Empirical evidence from sub-Saharan Africa demonstrates that children exposed to stimulating home environments and enriched preschool instruction exhibit higher levels of language and problem-solving skills (Enelamah et al., 2023; Wolf et al., 2025). Conversely, food insecurity, limited educational materials, and low teacher training quality are consistently associated with delayed cognitive progress (Ujah et al., 2025; Izuagie, 2025).

In Nigeria, rapid expansion of Early Childhood Education (ECE) enrollment has not consistently translated into equitable developmental outcomes. Variations in infrastructure, teacher capacity, parental literacy, and access to learning materials produce heterogeneous cognitive growth patterns among preschoolers (Obijiofor et al., 2024; Kontagora Int'l Journal of Educational Research, 2025). Studies show correlations between home reading activities and children's language development, underscoring the importance of familial support (Eseyin & Benjamin, 2025). Yet most available research in Nigeria has focused on limited geographic areas, leaving national patterns in low-resource communities underexplored (Niger Postgraduate Medical Journal, 2024). Without comprehensive evidence, policymakers and educators lack the insights necessary to design context-specific interventions that support cognitive readiness for primary schooling (UNESCO, 2023; World Bank, 2024).

Understanding how cognitive development unfolds in low-resource Nigerian settings is therefore both a scientific necessity and a policy imperative, informing strategies that reduce early learning disparities and promote equitable educational attainment (Heckman, 2024; Barnett et al., 2025). This study responds to this need by examining patterns of cognitive growth among preschool children across multiple low-resource communities in Nigeria.

Statement of the Problem

Despite increasing recognition of early childhood as a formative phase for lifelong learning, significant disparities persist in the cognitive development of preschool children in low-resource Nigerian settings. National and regional assessments reveal that a sizeable proportion of children enter primary school with underdeveloped language, reasoning, and executive function skills, conditions linked to limited exposure to stimulating environments and educational supports during the preschool years (Ujah et al., 2025; Obijiofor et al., 2024). While global research emphasizes that rich home learning environments and high-quality preschool instruction accelerate cognitive progress (Center on the Developing Child, 2024; UNICEF, 2023), children in economically disadvantaged Nigerian communities often lack such supportive contexts (Engle et al., 2025; Izuagie, 2025).

First, preschool programs in low-resource settings frequently operate with insufficient instructional materials, overcrowded classrooms, and limited teacher professional development (Kontagora Int'l Journal of Educational Research, 2025; World Bank, 2024). These constraints compromise the quality of teacher–child interactions and reduce opportunities for cognitively stimulating activities (Akinrotimi et al., 2025). Second, home environments in many low-resource contexts are characterized by limited access to books, digital media, and structured learning activities, factors that have been shown to predict lower outcomes in language and problem-solving domains (Eseyin & Benjamin, 2025; International Journal of Studies in Education, 2025). Third, socioeconomic stressors such as food insecurity and parental undereducation further interact with educational deficits to constrain children's cognitive potential (Niger Postgraduate Medical Journal, 2024; UNESCO, 2023).

Additionally, current Nigerian research on early cognitive development has largely focused on isolated localities or specific predictor variables, resulting in fragmented evidence that does not capture broad patterns across diverse low-resource settings (Obijiofor et al., 2024). There is limited quantitative data that simultaneously examines instructional practices, home learning environments, and structural resource constraints as they relate to cognitive development outcomes. This gap impedes the ability of educators, curriculum designers, and policymakers to implement evidence-based strategies that address the multifaceted nature of early learning disparities (OECD, 2024; World Bank, 2024; Barnett et al., 2025).

Therefore, the central problem this study addresses is the lack of comprehensive, large-scale evidence on how cognitive development patterns manifest among preschool children in low-resource Nigerian communities, and what combinations of instructional, home, and environmental factors contribute to these patterns. Addressing this problem will support more equitable early learning policies and targeted interventions that enhance cognitive readiness for formal education

Purpose of the Study

The study aims to investigate cognitive development patterns among preschool children in low-resource Nigerian settings by examining instructional practices, home stimulation environments, and resource constraints, and to provide evidence-based recommendations for improving preschool cognitive outcomes.

Research Questions

1. What are the patterns of teacher instructional practices related to cognitive development in low-resource preschools?
2. How does the home learning environment influence cognitive development among preschool children?
3. What resource constraints are associated with cognitive development patterns in low-resource settings?

Methodology

This study employed a descriptive survey research design to examine existing cognitive development patterns among preschool children in low-resource settings in Nigeria, as reflected through teacher instructional practices, home learning environments, and structural resource conditions. The non-experimental design was appropriate for systematically describing prevailing conditions without manipulating variables and is widely used in educational research to capture contextual realities across large populations.

The target population comprised 2,000 preschool teachers drawn from public and private early childhood centres in identified low-resource communities across Nigeria. Using stratified random sampling to ensure proportional geographic representation, a sample of 800 preschool teachers was selected. Preschool teachers were considered suitable respondents due to their continuous interaction with children and informed perspectives on cognitive development and classroom practices.

Data were collected using a researcher-developed instrument, the Cognitive Development Patterns Questionnaire (CDPQ), structured into three clusters aligned with the study's research questions: teacher instructional practices, home learning environment, and resource constraints. Items were rated on a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree), with a mean decision benchmark of 2.50 for interpretation.

The instrument's content and face validity were established through expert review, while reliability was confirmed via pilot testing. Data were analysed using descriptive statistics, specifically mean and standard deviation, to identify prevailing patterns and levels of variability. This approach provided an empirical basis for understanding cognitive development patterns in low-resource preschool contexts and supported evidence-based conclusions.

Data Analysis**Result**

The study's findings are systematically organized and presented in alignment with the research questions, as detailed in Tables 1 through 3.

Research Question 1

What are the patterns of teacher instructional practices related to cognitive development in low-resource preschools?

Table 1: Mean and Standard Deviation of Teacher Instructional Practices

S/N	Instructional Practice	M	SD	Decision
1.	Use of play-based learning strategies.	2.68	0.72	Agreed
2.	Frequency of interactive teacher–child engagement.	2.74	0.69	Agreed
3.	Use of cognitive stimulation activities (puzzles, storytelling).	2.51	0.77	Agreed
4.	Availability of instructional materials.	2.21	0.81	Disagreed
5.	Individualized attention to learners.	2.51	0.75	Disagreed
Cluster Mean		2.51	0.75	Agreed

Key *A = Agree, D = Disagree

Table 1 shows that preschool teachers generally agreed that play-based learning strategies, interactive teacher–child engagement, and cognitive stimulation activities are commonly used to support cognitive development in low-resource preschools, as indicated by mean scores above the decision benchmark of 2.50. However, respondents disagreed that adequate instructional materials and individualized attention to learners are sufficiently available, suggesting notable limitations in classroom resources and teacher capacity. The cluster mean of 2.51 indicates that, overall, instructional practices moderately support cognitive development, though significant gaps remain in material provision and individualized learning support.

Research Question 2

How does the home learning environment influence cognitive development among preschool children?

Table 2: Mean and Standard Deviation of Home Learning Environment Factors

S/N	Home Learning Factor	M	SD	Decision
1.	Parental involvement in learning activities.	2.83	0.66	Agreed
2.	Availability of books and learning materials at home.	2.47	0.73	Disagreed
3.	Home reading and storytelling practices.	2.71	0.68	Agreed
4.	Parental support for homework and learning.	2.89	0.61	Agreed
5.	Exposure to educational media.	2.42	0.70	Disagreed
Cluster Mean		2.66	0.68	Agreed

Key *A = Agree, D = Disagree

Results in Table 2 reveal that the home learning environment plays a significant role in influencing cognitive development among preschool children. Teachers agreed that parental involvement, home reading and storytelling practices, and parental support for learning activities positively contribute to cognitive growth. Conversely, the availability of books and learning materials and exposure to educational media at home were rated below the benchmark, indicating limited access to cognitive learning resources in many households. The cluster mean of 2.66 confirms that home learning environments generally support cognitive development, albeit with resource-related constraints.

Research Question 3

What resource constraints are associated with cognitive development patterns in low-resource settings?

Table 3: Mean and Standard Deviation of Resource Constraints

S/N	Resource Constraint	M	SD	Decision
1.	Inadequate classroom infrastructure	3.41	0.58	Agreed
2.	Shortage of learning materials	3.52	0.54	Agreed
3.	Limited teacher professional training	3.38	0.61	Agreed
4.	Overcrowded classrooms	3.27	0.64	Agreed
5.	Insufficient government funding	3.46	0.59	Agreed
Cluster Mean		3.41	0.59	Agreed

Key *A = Agree, D = Disagree

Table 3 indicates strong agreement among respondents that resource constraints significantly affect cognitive development patterns in low-resource preschool settings. High mean scores across all items show that inadequate infrastructure, shortage of learning materials, limited teacher training, overcrowded classrooms, and insufficient government funding are pervasive challenges. The cluster mean of 3.41 reflects a high level of consensus that these constraints substantially hinder effective cognitive development support for preschool children.

Discussion

The findings of this study provide empirical insight into the multifaceted factors influencing cognitive development patterns among preschool children in low-resource settings in Nigeria. Results from Research Question 1 indicate that while teachers employ cognitively supportive practices such as play-based learning and interactive engagement, the effectiveness of these strategies is constrained by inadequate instructional materials and limited capacity for individualized attention. This suggests that pedagogical effort alone is insufficient without adequate structural support, reinforcing evidence that quality early childhood education requires both skilled instruction and enabling learning environments.

Findings related to Research Question 2 demonstrate that the home learning environment plays a significant role in shaping children's cognitive development. High levels of parental involvement and engagement in reading and learning activities were found to positively influence cognitive outcomes. However, limited access to books and educational media highlights persistent socioeconomic disparities that restrict children's exposure to diverse cognitive stimuli. This underscores the importance of strengthening home-school partnerships to enhance early learning experiences.

Results addressing Research Question 3 reveal that resource constraints exert the strongest influence on cognitive development patterns. High mean scores across all indicators confirm that infrastructural deficits, overcrowded classrooms, insufficient funding, and inadequate teacher training are pervasive challenges in low-resource preschool settings. These constraints not only limit instructional quality but also exacerbate developmental inequalities among children.

Overall, the findings align with ecological and developmental theories that emphasize the interconnected roles of school, home, and broader socioeconomic contexts in early cognitive development.

Conclusion

This study concludes that cognitive development patterns among preschool children in low-resource Nigerian settings are shaped by a complex interaction of instructional practices, home learning environments, and systemic resource constraints. While teachers and parents demonstrate meaningful efforts to support early cognitive growth, persistent deficiencies in educational resources, infrastructure, and funding significantly undermine these efforts. The evidence suggests that improving cognitive outcomes in early childhood requires comprehensive, multisectoral interventions that address both pedagogical quality and structural inequities. Without deliberate investment in early childhood education systems, children in low-resource communities are likely to continue experiencing developmental disadvantages that affect their long-term educational trajectories.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. **Government and educational stakeholders should increase funding for early childhood education**, with priority given to improving classroom infrastructure, reducing overcrowding, and providing adequate instructional materials in low-resource settings.
2. **Continuous professional development programmes should be implemented for preschool teachers**, focusing on child-centred pedagogy, differentiated instruction, and cognitive stimulation strategies.
3. **Parental engagement initiatives should be strengthened**, including community-based programmes that promote home reading, storytelling, and low-cost learning activities.
4. **Policy frameworks should integrate home and school support systems**, ensuring that early childhood interventions address both educational and socioeconomic factors affecting cognitive development.
5. **Future research should adopt longitudinal and child-assessment-based approaches** to further examine developmental outcomes and inform evidence-based early childhood education policies.

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