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Author(s):	Anna AWOPETU (Ph.D)
Affiliation(s):	Department of Counselling Psychology, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Nigeria (BOUESTI)
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Corresponding Author:	Anna AWOPETU (Ph.D)
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SCAFFOLDING EARLY NUMERACY SKILLS IN NIGERIAN PRE-SCHOOLS: AN INVESTIGATION OF TEACHERS' GUIDED PLAY STRATEGIES AND CLASSROOM PRACTICES

Anna AWOPETU (Ph.D)
Department of Counselling Psychology,
Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Nigeria (BOUESTI)

ABSTRACT

The foundation of mathematical proficiency is established during the early childhood years, with early numeracy skills serving as robust predictors of later academic success. In the context of Nigerian pre-schools, the pedagogical shift towards play-based learning necessitates an understanding of how teachers facilitate mathematical concepts. This article investigates the scaffolding strategies and guided play practices employed by pre-school teachers in Nigeria to enhance early numeracy skills. Drawing upon Vygotsky's Zone of Proximal Development (ZPD), the study examines the spectrum of play, distinguishing guided play from direct instruction and free play. While the Nigerian National Policy on Education advocates for play-based curricula, a gap remains between policy formulation and classroom implementation. Through a comprehensive review of literature and an analysis of classroom dynamics, this paper identifies prevalent scaffolding techniques—such as questioning, modeling, and the use of concrete materials—while also highlighting the challenges posed by resource constraints and inadequate teacher training. The findings suggest that although teachers recognize the value of play, the effective integration of guided play for numeracy development is often hindered by systemic barriers. The article concludes with recommendations for targeted professional development, resource allocation, and curriculum refinement to support teachers in creating mathematically rich, play-based environments that foster the holistic development of Nigerian children.

Keywords: Early Numeracy, Scaffolding, Guided Play, Pre-school Education, Nigerian Educational System, Zone of Proximal Development, Teacher Practices.

INTRODUCTION

The acquisition of early numeracy skills is increasingly recognized as a critical milestone in a child's cognitive development, serving as a powerful predictor of both later mathematical achievement and overall academic success (Duncan et al., 2007:1428; Raghubar & Barnes, 2017:329). Early numeracy encompasses a range of competencies, including counting, number recognition, understanding of spatial relationships, and the ability to compare and manipulate quantities (Aunola et al., 2004:699). Given the profound implications of these foundational skills, early childhood education systems globally are re-evaluating pedagogical approaches to optimize mathematical learning during the pre-school years.

A significant shift in this educational paradigm is the emphasis on play-based learning. Guided play, in particular, has emerged as an effective pedagogical strategy that balances child-directed exploration with adult-supported learning objectives (Petersson & Weldemariam, 2022:714). This approach aligns closely with Lev Vygotsky's sociocultural theory, specifically the concept of the Zone of Proximal Development (ZPD) and the instructional mechanism of scaffolding (Vygotsky, 1978:86). Scaffolding involves the provision of structured

support by a more knowledgeable individual—such as a teacher—to help a child achieve a task or understand a concept that they could not master independently (Shabani et al., 2010:237).

In Nigeria, the early childhood education landscape is evolving. The Nigerian National Policy on Education recognizes pre-primary education as a crucial starting point for child development, advocating for the use of play as a primary method of instruction (Obiweluozor, 2015:1). The formal system includes Kindergarten for children aged two to four and Nursery for those aged four to six, with a compulsory one-year pre-primary education prior to entering primary school. Despite these policy directives, the implementation of play-based curricula and effective scaffolding strategies in Nigerian classrooms remains inconsistent (Owojori, 2021:2).

The core problem lies in the disconnect between policy intentions and actual classroom practices. Many Nigerian pre-schools continue to rely heavily on rote memorization and direct instruction, particularly in mathematics, missing valuable opportunities to engage children through guided play (Obiweluozor, 2015:3). This reliance on traditional teaching methods is often exacerbated by systemic challenges, including large class sizes, inadequate instructional materials, and a lack of specialized training for early childhood educators in pedagogical scaffolding (Owojori, 2021:4).

This article aims to investigate the strategies used by Nigerian pre-school teachers to scaffold early numeracy skills through guided play. By examining current classroom practices, the study seeks to understand how teachers navigate the complexities of early mathematics education within the Nigerian context. The investigation is guided by the following objectives: to identify the prevalent scaffolding techniques employed by teachers, to assess the extent to which guided play is integrated into numeracy instruction, and to explore the challenges teachers face in implementing these pedagogical strategies.

LITERATURE REVIEW

Conceptualising Early Numeracy Skills

Early numeracy skills form the cognitive architecture upon which formal mathematical understanding is built. These skills involve both the comprehension and manipulation of symbolic and non-symbolic numbers (Raghubar & Barnes, 2017:330). Non-symbolic magnitude comparison—the ability to visually distinguish between different quantities without relying on numerical symbols—serves as a precursor to understanding symbolic representations, such as Arabic numerals. As children progress, they develop symbolic number skills, which include rote counting, one-to-one correspondence, cardinality, and basic operations like addition and subtraction.

Research underscores the predictive power of these early competencies. Morgan et al. (2009:306) demonstrated that children who exhibit deficiencies in mathematical knowledge at the onset of kindergarten are highly likely to persist in the lowest percentiles of mathematical achievement by the fifth grade. This highlights the critical window of opportunity that the pre-school years present for intervention and skill development. Furthermore, the development of early numeracy is intertwined with general neurocognitive abilities, particularly working memory and language skills, which facilitate the processing of numerical information and the articulation of mathematical concepts (Raghubar & Barnes, 2017:335).

Theoretical Framework

The pedagogical approach to fostering early numeracy is profoundly influenced by Lev Vygotsky's sociocultural theory. Vygotsky posited that learning is a fundamentally social process, occurring through interactions with more knowledgeable others (Vygotsky, 1978:88). Central to this theory is the Zone of Proximal Development (ZPD), defined as the distance between a child's actual developmental level—determined by independent problem-solving—and the level of potential development, determined through problem-solving under adult guidance or in collaboration with more capable peers.

Scaffolding is the instructional application of the ZPD. Introduced by Wood, Bruner, and Ross, scaffolding refers to the temporary, tailored support provided by a teacher that enables a learner to achieve a goal that would otherwise be beyond their unassisted efforts (Malik, 2017:2). In the context of early childhood education, scaffolding is not merely about providing answers; it involves a dynamic process of modeling, asking prompting questions, offering hints, and gradually withdrawing support as the child's competence increases (Gillespie & Greenberg, 2017:66). Effective scaffolding in numeracy might involve a teacher guiding a child to use physical manipulatives to solve a counting problem, thereby bridging the gap between concrete objects and abstract numerical concepts.

Guided Play as a Pedagogical Strategy

Play is universally recognized as the primary medium through which young children learn and make sense of the world. However, the pedagogical application of play exists on a continuum, ranging from free, unstructured play to highly structured, adult-directed activities. Guided play occupies a strategic middle ground on this continuum. It is characterized by child agency and autonomy within a learning environment that has been intentionally designed or curated by an adult to achieve specific educational goals (Petersson & Weldemariam, 2022:715).

In guided play, the teacher's role is that of a facilitator rather than a director. The teacher scaffolds learning by introducing materials, asking open-ended questions, and participating in the play to extend the child's thinking. For mathematics education, guided play has been shown to outperform direct instruction in preschool settings. It provides a rich, engaging context where children can explore mathematical ideas—such as sorting, patterning, and measuring—meaningfully and joyfully. For instance, a teacher might introduce a set of blocks and encourage children to build towers, subtly introducing concepts of height, quantity, and spatial reasoning through conversational prompts.

Teacher Practices and Challenges in the Nigerian Context

The Nigerian educational framework explicitly supports early childhood education, emphasizing its role as the foundation for lifelong learning. The National Policy on Education mandates that the method of teaching in pre-primary institutions should principally be through play (Obiweluozor, 2015:2). However, translating this policy into effective classroom practice presents significant challenges.

A primary obstacle is the prevailing pedagogical culture, which often favors teacher-centered, didactic instruction over child-centered, play-based approaches. In many Nigerian pre-schools, there is a strong emphasis on rote learning, with children expected to memorise numbers and recite counting sequences without necessarily developing a conceptual understanding of numeracy (Owojori, 2021:5). This approach is frequently driven by parental expectations for tangible academic outputs, such as the ability to write numbers, rather than an appreciation for the developmental processes of early learning.

Furthermore, the implementation of guided play and scaffolding is hindered by systemic resource constraints. Many pre-primary classrooms in Nigeria suffer from overcrowding, making individualized scaffolding and interactive play difficult to manage. There is also a widespread shortage of appropriate instructional materials and manipulatives necessary for concrete mathematical exploration (Obiweluozor, 2015:4). Additionally, the professional development of early childhood educators is often inadequate. Many teachers lack specialized training in early childhood pedagogy, leaving them ill-equipped to design effective guided play experiences or to employ nuanced scaffolding techniques within the ZPD (Owojori, 2021:6).

METHODOLOGY

Research Design

To investigate the scaffolding strategies and classroom practices of Nigerian pre-school teachers, a qualitative research design was employed. This approach was selected because it allows for an in-depth exploration of the complex, context-dependent nature of teaching and learning interactions. Qualitative

methodology facilitates the observation of nuanced pedagogical behaviors and the collection of rich, descriptive data regarding teachers' beliefs and experiences.

Participants and Setting

The study was conducted in selected pre-primary schools within an urban and peri-urban setting in Southwestern Nigeria. A purposive sampling technique was utilized to select 15 early childhood educators currently teaching in Kindergarten and Nursery classrooms (catering to children aged 3 to 5 years). The selected schools represented a mix of public and private institutions to capture a diverse range of resource availability and pedagogical environments.

Data Collection Instruments

Data were gathered using three primary instruments: classroom observations, semi-structured interviews, and document analysis. Classroom observations were conducted during scheduled mathematics or numeracy sessions. An observation protocol, aligned with the principles of scaffolding and guided play, was used to document teacher-child interactions, the use of instructional materials, and the structure of the learning activities. In-depth interviews were conducted with the participating teachers to explore their understanding of early numeracy, their pedagogical beliefs regarding play, and the challenges they face in implementing scaffolding strategies. Teachers' lesson plans and curriculum guidelines were reviewed to assess the extent to which play-based activities and scaffolding techniques were formally planned and integrated into the instructional design.

Data Analysis

The collected data were analyzed using thematic analysis. Observation notes and interview transcripts were coded to identify recurring patterns and themes related to scaffolding techniques, play practices, and systemic challenges. The analysis was guided by the theoretical framework of the ZPD, focusing on instances where teachers provided support to bridge the gap between children's current abilities and potential learning outcomes.

RESULTS

Prevalence and Types of Guided Play

The observational data revealed a significant variance in the implementation of play-based learning across the sampled classrooms. While all teachers acknowledged the importance of play in early childhood education during interviews, the actual integration of guided play for numeracy instruction was limited. In the majority of classrooms, particularly in public schools, direct instruction and rote recitation dominated the numeracy sessions. Children were frequently observed repeating number sequences in unison or copying numbers from the chalkboard. However, instances of guided play were observed primarily in well-resourced private schools. In these settings, teachers used manipulatives such as counting beads, geometric shapes, and locally sourced materials (e.g., bottle caps and seeds) to create playful learning scenarios. For example, one teacher organized a "market" activity where children used play money and sorted items by quantity and size, effectively integrating counting and spatial awareness into a meaningful context.

Scaffolding Strategies Employed

When scaffolding did occur, teachers employed a variety of strategies to support children's numeracy development. The most frequently observed techniques included modeling, where teachers demonstrated the desired action, such as physically moving objects one by one while counting aloud, to illustrate one-to-one correspondence. Teachers used both closed and open-ended questions to prompt mathematical thinking. Questions like "How many blocks do we have here?" or "What happens if we add one more?" were common. When a child struggled with a task, such as identifying a specific number, teachers provided verbal or visual cues to guide them toward the correct answer without directly solving the problem for them. The introduction

of physical objects was a crucial scaffolding tool, allowing children to transition from concrete manipulation to abstract numerical understanding.

Classroom Environment and Resources

The physical environment and availability of resources significantly impacted the teachers' ability to facilitate guided play and scaffolding. Classrooms with a high student-to-teacher ratio (often exceeding 1:40 in public schools) presented formidable challenges. In such environments, teachers reported that individualized scaffolding was nearly impossible, leading to a reliance on whole-class, teacher-directed instruction to maintain control. Resource scarcity was another critical theme. Many teachers noted a lack of commercially produced educational toys and manipulatives. While some educators demonstrated resourcefulness by creating teaching aids from local, low-cost materials, others cited the lack of resources as a primary reason for their inability to implement play-based numeracy activities.

Teacher Perspectives

During the interviews, teachers expressed a tension between their pedagogical knowledge and the practical realities of their classrooms. Many articulated a clear understanding of the benefits of play and scaffolding but felt pressured by parental expectations to produce visible academic results, such as completed worksheets. One teacher noted, "Parents want to see that their child can write numbers up to 100. If they just play with blocks, the parents think they are not learning." This pressure often compelled teachers to prioritize rote learning over exploratory, guided play. Furthermore, several teachers highlighted a need for continuous professional development specifically focused on practical strategies for implementing play-based mathematics in resource-constrained settings.

DISCUSSION

The findings of this study illuminate the complex dynamics of scaffolding early numeracy skills within Nigerian pre-schools. The observed practices underscore a persistent gap between the pedagogical ideals of guided play and the realities of classroom implementation. While the theoretical framework of Vygotsky's ZPD provides a robust model for early learning, the application of scaffolding in the observed classrooms was frequently constrained by systemic and cultural factors.

The prevalence of direct instruction and rote memorization over guided play reflects a traditional pedagogical culture that prioritizes didactic teaching. This approach contradicts contemporary research, which asserts that early numeracy is most effectively fostered through interactive, play-based exploration (Petersson & Weldemariam, 2022:716). The reliance on rote learning may equip children with the ability to recite numbers, but it often fails to develop the deep conceptual understanding necessary for long-term mathematical proficiency (Morgan et al., 2009:308).

When guided play and scaffolding were implemented, the strategies aligned well with established best practices. Modeling, questioning, and the use of concrete manipulatives are recognized as effective mechanisms for operating within a child's ZPD (Gillespie & Greenberg, 2017:68). However, the effectiveness of these strategies was heavily dependent on the classroom environment. The study highlights that scaffolding is inherently an individualized or small-group process. In overcrowded Nigerian classrooms, the high student-to-teacher ratio severely limits the teacher's capacity to provide the tailored, responsive support that characterizes effective scaffolding.

The issue of resource availability further complicates the pedagogical landscape. Concrete materials are essential tools for scaffolding early numeracy, serving as a bridge between abstract mathematical concepts and a child's tangible experience. The scarcity of these resources in many Nigerian pre-schools restricts the opportunities for guided play. While the resourcefulness of some teachers in utilizing local materials is commendable, it points to a broader systemic need for adequate provisioning of early childhood classrooms (Obiweluozor, 2015:5).

Moreover, the tension between teacher beliefs and parental expectations highlights the sociocultural context of education in Nigeria. The pressure to produce tangible academic outputs, such as written numbers, drives teachers away from play-based approaches. This suggests that efforts to reform early childhood pedagogy must extend beyond teacher training to include parental education and community engagement regarding the value of play in cognitive development.

IMPLICATIONS FOR PRACTICE AND POLICY

The findings of this investigation have significant implications for educational practice and policy in Nigeria. To bridge the gap between policy intentions and classroom realities, a multifaceted approach is required.

Teacher Professional Development: There is an urgent need for targeted, ongoing professional development for early childhood educators. Training programs should move beyond theoretical discussions of play to provide practical, hands-on strategies for implementing guided play and scaffolding in large, resource-constrained classrooms. Teachers need support in designing mathematically rich play environments and in developing the observational skills necessary to identify and operate within a child's ZPD.

Resource Allocation and Curriculum Design: Educational authorities must prioritize the provisioning of early childhood classrooms with appropriate instructional materials and manipulatives. The curriculum should be refined to explicitly integrate guided play activities for numeracy, providing teachers with clear, actionable lesson frameworks. Encouraging the systematic use of low-cost, locally sourced materials can also mitigate resource shortages.

Managing Class Sizes: To facilitate effective scaffolding, policies regarding student-to-teacher ratios in pre-primary education must be strictly enforced. Smaller class sizes are essential for enabling the individualized interactions that lie at the heart of Vygotsky's pedagogical model.

Parental and Community Engagement: Educational institutions should actively engage with parents to shift perceptions regarding early childhood learning. Workshops and communication strategies that highlight the cognitive benefits of play-based mathematics can help align parental expectations with developmentally appropriate pedagogical practices.

CONCLUSION

Scaffolding early numeracy skills through guided play is a potent pedagogical approach that aligns with the cognitive and developmental needs of pre-school children. In the Nigerian context, while theoretical recognition of play-based learning exists, significant systemic barriers hinder its effective implementation. This investigation reveals that Nigerian pre-school teachers employ a range of scaffolding strategies, yet their efforts are often compromised by large class sizes, inadequate resources, and cultural pressures favoring rote instruction.

To ensure that Nigerian children develop the robust foundational numeracy skills necessary for future academic success, there must be a concerted effort to support early childhood educators. By investing in practical teacher training, improving classroom resources, and fostering a broader cultural appreciation for the value of guided play, the Nigerian educational system can create environments where young learners are effectively scaffolded toward mathematical proficiency. Ultimately, the integration of intentional, play-based scaffolding is essential for the holistic cognitive development of the Nigerian child.

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