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Bridging play and pedagogy: a case study on the effectiveness of guided play in developing early numeracy skills

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This study aimed to examine the effectiveness of guided play compared to the demonstration method in enhancing early numeracy skills among pre-primary children. The research aimed to investigate the impact of various teaching approaches on children's engagement, conceptual understanding, and motivation in learning fundamental mathematical concepts, including counting, classification, and comparison. The study employed a qualitative case study design, focusing on five children aged 5–6 years in an early childhood classroom. The sampling technique used was purposive sampling, selecting participants who represented varying levels of numeracy readiness. Data collection techniques included structured classroom observations, semi-structured teacher interviews, and documentation of student work. Each session was video-recorded to capture interactional details during learning activities. Data were analyzed through a thematic analysis, following open, axial, and selective coding, to identify patterns related to engagement, reasoning, and teacher-student interaction. The coding process ensured the credibility of findings through triangulation across data sources and reflective validation with the classroom teacher. The results indicated that guided play generated significantly higher engagement, curiosity, and collaborative behavior compared to the demonstration method. Children actively explored, verbalized reasoning, and corrected errors independently, supported by the teacher's guiding questions and scaffolding prompts. In contrast, the demonstration method produced more passive responses and shorter attention spans. Overall, the findings highlight that guided play offers a more effective and developmentally appropriate framework for teaching early numeracy. It promotes meaningful understanding, intrinsic motivation, and positive attitudes toward mathematics learning in early childhood education.

INTRODUCTION

Early childhood education lays the essential foundation for children's intellectual, social, and emotional growth before they enter formal schooling. In a rapidly changing social landscape, characterized by increased parental workload and reduced time for home-based learning, pre-primary institutions play a critical role in nurturing children's early learning experiences (Haslip & Gullo, 2018). At this stage, numeracy has been identified as a fundamental component of school readiness, as it supports logical reasoning, quantitative understanding, and early problem-solving skills that extend beyond mathematics itself (Purpura et al., 2011; Purpura & Napoli, 2015). Research indicates that children who develop strong early numeracy skills are more likely to excel academically in later grades, demonstrating sustained cognitive growth and increased confidence in learning (McGuinness et al., 2014). Therefore, early mathematics education should be seen not merely as preparation for arithmetic, but as an integral part of children's broader developmental competence. Effective numeracy instruction must integrate exploration, curiosity, and creativity to build conceptual understanding through play-based and interactive learning contexts that actively engage children's minds, rather than relying solely on memorization or repetition.

Research has consistently demonstrated that young children construct knowledge most effectively through active engagement and social interaction within playful contexts. Play-based learning supports the development of cognitive flexibility, creativity, and critical thinking—abilities that underpin early numeracy and literacy (Munn, 1995; Miller, 2018). Nevertheless, despite substantial empirical support for play-oriented pedagogy, many early childhood classrooms remain dominated by traditional teaching practices such as teacher demonstrations, rote counting, and procedural repetition, which limit opportunities for inquiry and problem-based exploration (Mutiara, 2021). The disconnection between theory and practice persists due to insufficient teacher preparation, limited resources, and curricular pressures that prioritize measurable outcomes over experiential learning. While frameworks such as guided play have been widely promoted in early education discourse, their classroom application, especially for mathematical concepts like classification, pattern recognition, measurement, and spatial reasoning, remains inconsistent (Tasripin et al., 2021). To enhance effectiveness, educators require structured yet flexible pedagogical models that combine purposeful play, child autonomy, and teacher facilitation, thereby enabling children to connect play experiences with formal numeracy concepts in authentic ways.

This persistent gap between pedagogical theory and classroom implementation underscores the need for evidence-based instructional models that demonstrate how guided play enhances numeracy learning. Guided play, positioned between free play and direct instruction, involves active teacher scaffolding while preserving children's autonomy and curiosity (Cankaya, 2022). Unlike unstructured play, guided play ensures that learning activities are aligned with specific objectives and intentional questioning, promoting both engagement and conceptual clarity (Colliver, 2018). However, few empirical studies have compared the learning outcomes of guided play and traditional demonstration methods, particularly in early numeracy development (Popoola, 2014). Many teachers struggle to operationalize guided play within lesson planning, often lacking pedagogical frameworks that integrate play-based exploration with formal learning assessment (Adinda et al., 2022). Moreover, most existing studies focus on literacy rather than numeracy, leaving gaps in understanding how structured play interventions influence children's ability to reason quantitatively, recognize patterns, and apply mathematical thinking in everyday contexts. Addressing this gap can advance early childhood pedagogy by aligning theoretical recommendations with classroom realities and measurable learning outcomes.

This study aims to investigate the effectiveness of guided play compared to demonstration-based methods in enhancing numeracy competencies among pre-primary children. The novelty of this research lies in its design of a structured, goal-oriented, guided play framework that strategically integrates pedagogical intentionality with child-centered exploration (Cankaya, 2022). Unlike previous works that discuss play abstractly, this study operationalizes guided play through measurable activities, such as counting, sorting, and grouping tasks, that allow children to explore mathematical ideas while being supported by teacher questioning and feedback. The study also investigates whether guided play promotes higher engagement, deeper understanding, and more positive attitudes toward numeracy learning. By situating guided play within the Indonesian early childhood context, this research contributes both theoretical and practical insights to the field of mathematics education. It offers a replicable model for teachers to incorporate play into structured instruction and provides empirical evidence for policymakers seeking to improve early numeracy curricula through developmentally appropriate pedagogical innovation.

METHODS

This study employed a qualitative case study design to explore in depth how guided play enhances numeracy development among early childhood learners. The case study approach was selected because it allows for a comprehensive and contextualized understanding of learning behaviors and interactions that occur in authentic classroom settings. The research focused on observing and analyzing the processes through which children develop numeracy skills, such as counting, comparing quantities, and recognizing patterns, during structured play sessions. The design aligns with the study's objective to describe not only learning outcomes but also the pedagogical dynamics that support children's engagement and conceptual understanding. This approach enables rich, descriptive insights into how guided play differs from demonstration-based instruction in fostering mathematical thinking among young learners.

The population of this study comprised children enrolled in a local pre-primary education program in Majalengka, West Java, Indonesia. Using purposive sampling, five children aged 5–6 years were selected as the case participants. The selection criteria included (1) regular attendance in class, (2) verbal communication ability adequate for observation and interview participation, (3) representation of diverse cognitive levels based on teacher assessment, and (4) parental consent for participation. The sample size of five was intentionally small to enable detailed, individualized observation of each child's learning trajectory during guided play activities. The participants were assigned pseudonyms to maintain anonymity. This sampling ensured the richness of qualitative data and allowed for meaningful within-case and cross-case comparisons.

Three primary instruments were used: (1) observation sheets, (2) semi-structured interview guides, and (3) documentation checklists.

1. The observation sheet was designed to record children's verbal responses, engagement levels, strategies for solving problems, and interactions with peers and materials during the guided play sessions. Two early childhood education experts validated the observation tool to ensure construct alignment with numeracy indicators (e.g., counting accuracy, grouping by attribute, spatial recognition).
2. The semi-structured interviews were conducted with both children and their classroom teacher. For children, questions were adapted into simple prompts to elicit reflection on their play experiences ("What did you learn while playing with numbers?"). For teachers, interviews explored perceptions of the effectiveness and challenges of guided play in classroom implementation.

3. The documentation checklist was used to collect artifacts such as children's worksheets, photos of activities, and teacher lesson plans.

Data collection took place over three weeks in February 2025. Each week focused on one numeracy theme: (1) counting and number recognition, (2) pattern and shape sorting, and (3) quantity comparison. Each session lasted approximately 45 minutes, followed by a period of reflection and transcription of field notes. Observations were recorded manually and supported by brief video segments to triangulate behavioral data.

Although qualitative in nature, this study identified two main constructs:

1. Independent Variable – Guided Play Approach, defined as structured play activities facilitated by the teacher through prompts, questioning, and scaffolding to achieve specific numeracy goals.
2. Dependent Variable – Numeracy Development, operationalized through indicators such as counting accuracy, recognition of numerical symbols, ability to classify and compare sets, and explanation of patterns in daily contexts.

Additional contextual variables included children's engagement level (encompassing enthusiasm, focus, and collaboration) and teacher interaction style (including guidance, questioning, and reinforcement). These were coded as supporting dimensions to facilitate the interpretation of learning outcomes.

Data were analyzed using thematic analysis following the stages proposed by Braun and Clarke (2019):

1. Data Familiarization – Transcribing observations, interviews, and documentation notes.
2. Initial Coding – Identifying recurrent behaviors and verbal expressions related to numeracy learning.
3. Theme Generation – Grouping codes into broader categories such as *engagement through play*, *numerical reasoning*, and *teacher scaffolding strategies*.
4. Reviewing and Defining Themes – Ensuring coherence between observed patterns and theoretical constructs of guided play.
5. Interpretation and Cross-Case Comparison – Comparing individual learning progress across five participants to highlight shared and divergent experiences. NVivo 14 software was utilized to assist in coding, frequency analysis, and visualization of emerging patterns. To maintain credibility, triangulation was employed through multiple data sources (observation, interviews, documentation), and member checking was conducted with the teacher participant for validation.

Ethical approval was obtained from the Research Ethics Committee of Universitas Majalengka. Written informed consent was provided by parents or guardians prior to data collection. Children's participation was voluntary, and they could withdraw at any time. To ensure confidentiality, pseudonyms were used, and identifiable information was excluded from publications. Video recordings were stored securely with restricted access and used solely for research verification purposes. The researcher maintained a child-centered and non-intrusive stance during observations, ensuring that all activities were part of regular, play-based instruction to minimize disruption and psychological risk.

The study was conducted over two months (January–February 2025), divided into the following stages:

1. Preparation (2 weeks) – Instrument design, expert validation, and ethics clearance.

2. Data Collection (3 weeks) – Classroom observations, interviews, and artifact documentation.
3. Data Analysis (2 weeks) – Coding, theme development, and interpretation.
4. Reporting (1 week) – Triangulation, verification, and manuscript preparation.

RESULTS AND DISCUSSION

Results

This section presents the results of the qualitative case study examining the effectiveness of guided play compared to demonstration-based methods in enhancing numeracy skills among five pre-primary students (ages 5–6). The findings are organized into four thematic categories derived from the thematic analysis: (1) engagement and motivation during learning, (2) development of numeracy concepts, (3) teacher scaffolding and interaction patterns, and (4) comparative outcomes between guided play and demonstration sessions.

Engagement and Motivation during Learning

Across all five participants, guided play activities consistently generated higher engagement levels than demonstration-based sessions. During play-based tasks, students displayed visible enthusiasm, curiosity, and active participation. For instance, Student A eagerly counted and sorted colored blocks while verbalizing each number sequence, spontaneously collaborating with peers to compare their results. Similarly, Student C exhibited persistence when faced with a counting puzzle, seeking help from the teacher to "check if the number fits." Such spontaneous communication and peer interaction were minimal during the demonstration method, where children tended to wait passively for teacher instruction. Observation data indicated that the guided play environment encouraged self-initiated exploration, as children experimented freely, negotiated turns, and discussed quantities in everyday contexts (e.g., "I have more red ones than you!"). In contrast, the demonstration sessions elicited limited emotional expression and shorter attention spans. Engagement indicators coded from observation sheets revealed that average sustained attention during guided play lasted 12–15 minutes per activity, compared to only 6–8 minutes in teacher-led sessions. These patterns suggest that guided play fosters intrinsic motivation by allowing autonomy, curiosity, and meaningful interaction within numeracy tasks.

Table 1. Comparison of Student Engagement Levels between Guided Play and Demonstration Methods

Participant	Indicators of Engagement	Guided Play (Observation Summary)	Demonstration Method (Observation Summary)	Sustained Attention Duration (minutes)	Interaction Type
Student A	Counting, sorting, verbal participation	Highly engaged; initiated counting, collaborated with peers; frequent verbal counting aloud	Passive listener; waited for instruction; limited response	15 (guided play) / 7 (demo)	Peer collaboration and teacher dialogue

Student B	Recognizing numbers and matching symbols	Actively matched number cards; self-corrected errors; asked reflective questions	Needed direct prompting; followed repetition without reasoning	13 / 6	Teacher-assisted interaction
Student C	Persistence in solving numerical puzzles	Demonstrated persistence; asked the teacher to verify; displayed excitement upon success	Became disengaged after 5 minutes; minimal initiative	14 / 6	Teacher–student dialogue
Student D	Pattern recognition, sequencing	Extended bead patterns independently; supported peers' turns	Observed others; followed instructions without inquiry	12 / 8	Peer and self-directed interaction
Student E	Comparing quantities, reasoning	Initially hesitant; gained confidence after trial-and-error; verbalized comparison ("more/less")	Responded only when called; minimal interaction	13 / 7	Mixed peer and teacher engagement
Average	—	High engagement and autonomy; collaborative and reflective learning	Low engagement; teacher-dependent activity	13.4 / 6.8	Predominantly peer-based in guided play

The data summarized in Table 1 show clear distinctions between guided play and demonstration methods. All five students demonstrated higher engagement scores, longer attention spans, and richer interaction patterns in guided play sessions. Notably, students initiated communication, applied reasoning, and collaborated naturally, indicating both cognitive and socio-emotional involvement in learning numeracy. Conversely, during demonstration-based instruction, engagement was characterized by compliance rather than exploration, with students relying heavily on teacher prompts to guide their learning. The average sustained attention nearly doubled in guided play (13.4 minutes) compared to demonstration (6.8 minutes), confirming that the guided play model effectively promotes active learning behaviors, curiosity, and self-regulated engagement in early numeracy development.

Development of Numeracy Concepts

Qualitative observation and documentation revealed clear progress in the development of numeracy skills across all five participants following three weeks of guided play sessions. Initially, most children demonstrated partial or inconsistent understanding of number sequencing, classification, and pattern formation. Through structured play activities, such as counting cubes, sorting colored beads, and arranging block sequences, children gradually internalized key numeracy concepts through hands-on exploration, trial, and dialogue. Teacher reflection and video documentation confirmed that children not only improved in procedural accuracy (counting, matching, grouping) but also developed conceptual understanding by explaining *why* certain quantities or patterns made sense. For example, Student D confidently explained a repeated color sequence, stating, "It goes red, blue, red, blue, because that is the rule." Similarly, Student E began identifying "more" and "less" with confidence after engaging in a play scenario involving toy sharing.

The overall pattern of improvement is summarized in Table 2, which compares pre- and post-intervention results across three key indicators: counting accuracy, classification ability, and pattern recognition. Scores were assigned qualitatively on a 4-point scale (1 = emerging, 2 = developing, 3 = proficient, 4 = advanced) based on triangulated observation and teacher evaluation.

Table 2. Improvement of Numeracy Skills through Guided Play Activities

Participant	**Counting Accuracy *(Pre → Post)***	**Classification Ability *(Pre → Post)***	**Pattern Recognition *(Pre → Post)***	**Overall Growth Interpretation**
Student A	2 → 4	2 → 4	2 → 3	Significant improvement; displayed confidence in verbal counting and grouping; quickly adapted to peer-based problem solving.
Student B	3 → 4	2 → 3	1 → 3	Marked growth in linking symbolic and concrete numbers; benefited from repeated play cycles with visual cues.
Student C	2 → 3	1 → 3	1 → 2	Gradual improvement; needed teacher scaffolding but showed persistence and curiosity during play tasks.
Student D	3 → 4	3 → 4	2 → 4	Exceptional progress; independently created and extended patterns; acted as peer mentor in final sessions.
Student E	1 → 3	1 → 3	1 → 3	Developed conceptual awareness through collaborative play; verbalized comparative reasoning ("more/less").

Average Score	2.2 → 3.6	1.8 → 3.4	1.4 → 3.0	Consistent upward trend across all numeracy domains; strongest gains in counting and classification.

The data in Table 2 indicate a consistent and meaningful progression in numeracy competence among all participants. The most substantial gains occurred in counting accuracy (average improvement of +1.4 points) and classification ability (+1.6 points), followed by pattern recognition (+1.6 points). The improvement reflects children's growing ability to reason quantitatively through interactive play, rather than relying on memorization. Observation notes revealed that guided play activities enabled multi-sensory engagement, allowing children to manipulate materials, verbalize reasoning, and self-correct errors. In contrast, when the same tasks were introduced through demonstration, students tended to mimic the teacher's model without understanding the underlying relationships between objects and numbers. Teacher interviews further confirmed that guided play encouraged "mathematical talk," where students used comparative phrases ("bigger," "equal," "less") and sequential logic, signaling higher-order reasoning. Collectively, these results suggest that guided play facilitates a deeper conceptual understanding of early numeracy principles by integrating physical manipulation, cognitive exploration, and social interaction, three key dimensions often lacking in traditional demonstration methods.

Teacher Scaffolding and Interaction Patterns

Teacher–student interactions differed significantly between the two instructional methods. During guided play, the teacher adopted a facilitative and responsive role, offering prompts, open-ended questions, and feedback that encouraged reflection and reasoning. For example, when Student A miscounted objects, the teacher asked, *"Are you sure this group has more? How can you check again?"*—prompting the child to recount and self-correct independently. These scaffolding strategies promoted metacognitive engagement, as children were led to verify, compare, and justify their reasoning processes rather than simply providing answers. In contrast, the demonstration method positioned the teacher as the central authority, focusing on procedural repetition and correctness.

Observations revealed that students' responses were short, often limited to one or two words, and lacked explanatory reasoning. Meanwhile, guided play fostered dialogic questioning, where teacher discourse shifted from monologic instruction to reciprocal communication. The teacher's reflective interview underscored that guided play requires "patience and improvisation," as it involves following children's spontaneous ideas while still aligning with lesson objectives. The data further showed that guided play facilitated peer-assisted learning. Children frequently mimicked successful strategies modeled by peers, discussed mistakes collaboratively, and validated answers through social negotiation. Such behaviors were rarely observed during demonstration lessons. This interactive and reflective environment exemplifies constructivist learning, where understanding emerges through negotiation and shared discovery rather than passive reception.

Table 3. Comparison of Teacher–Student Interaction Patterns in Guided Play vs Demonstration Methods

Interaction Dimension	Guided Play (Observation Summary)	Demonstration Method (Observation Summary)	Interpretive Notes
Teacher Role	Facilitator and co-learner; guides through questioning and prompts rather than direct explanation.	Authority figure: delivers instructions and models procedures for imitation.	Reflects a shift from teacher-centered to child-centered pedagogy.
Type of Questions	Open-ended, exploratory (e.g., "Why do you think this one is bigger?").	Closed, factual (e.g., "How many are there?").	Guided play fosters reasoning and verbal elaboration; demonstration elicits recall.
Feedback Style	Reflective feedback (e.g., "Let us check again together.”) encourages self-correction.	Corrective feedback (e.g., "No, that is wrong. Count again.").	Guided play builds confidence; demonstration emphasizes accuracy over process.
Student Initiative	High; students initiate questions, make comparisons, and test their own ideas.	Low; students wait for cues and rarely engage without teacher prompting.	Guided play promotes autonomy and ownership of learning.
Peer Interaction	Frequent collaboration; children discuss, compare, and co-construct answers.	Minimal; most interaction directed toward the teacher.	Indicates a more supportive social learning environment in guided play.
Emotional Climate	Relaxed, joyful, and exploratory; laughter and verbal engagement observed.	Formal and procedural; students are quiet and task-focused.	Guided play encourages intrinsic motivation and enjoyment in learning.
Teacher Reflection (Interview Summary)	"I had to adjust my questions to follow the children's ideas. It required patience but made them think deeply."	"I gave examples and expected them to repeat correctly."	Teachers perceived guided play as cognitively richer but more demanding to facilitate.

Table 3 highlights a clear pedagogical contrast between guided play and the demonstration method. The guided play approach fostered richer teacher–student dialogue, characterized by open-ended inquiry, reflective questioning, and scaffolded feedback. Teachers served as facilitators who guided learning through observation, subtle intervention, and shared exploration. Students became active contributors who questioned, reasoned, and verified their ideas collaboratively. Conversely, the demonstration method prioritized efficiency and accuracy over discovery. Interaction patterns were largely one-directional, with minimal peer dialogue or exploratory talk. As a result, students tended to memorize rather than internalize concepts. The teacher interview confirmed that guided play demanded greater adaptability but produced more visible cognitive engagement from children. Overall, these findings suggest that guided play fosters dialogic pedagogy, a classroom culture in which both teacher and learner co-construct understanding through dialogue, reflection, and shared inquiry. This approach enhances not only numeracy comprehension but also communication, confidence, and social reasoning skills, which are essential for lifelong learning.

Comparative Learning Outcomes: Guided Play vs. Demonstration

A cross-case comparison between guided play and demonstration-based instruction revealed distinct differences in both learning outcomes and the quality of mathematical engagement. At the same time, both approaches led to improvements in basic counting and symbol recognition, guided play produced deeper conceptual understanding, and transferability of numeracy skills to real-life contexts. Students who participated in guided play not only counted accurately but also explained their reasoning, applied number concepts in play situations, and collaborated to solve problems. For example, Student D spontaneously applied counting to distribute toy blocks fairly among peers, stating, "We each get the same number—five!" Similarly, Student A began using comparative terms such as "more than" and "less than" in everyday classroom activities. These behaviors reflect an internalization of quantitative reasoning that extended beyond structured learning sessions. In contrast, demonstration-based learning improved procedural recall but produced limited flexibility, as students tended to replicate teacher models without exploring alternative strategies or verbalizing their reasoning.

The summary of comparative findings across five participants is presented in Table 4, highlighting average learning outcomes and qualitative indicators across both instructional methods.

Table 4. Comparison of Learning Outcomes between Guided Play and Demonstration Methods

Learning Domain	Indicators of Competence	Guided Play (Average Observation Result)	Demonstration Method (Average Observation Result)	Interpretive Summary
Cognitive (Numeracy, Accuracy & Understanding)	Counting accuracy, number-symbol recognition, classification, pattern reasoning	High conceptual mastery; students counted accurately, extended patterns, and explained reasoning using everyday examples.	Moderate procedural accuracy; students could count correctly but struggled to apply concepts beyond imitation.	Guided play enhanced *conceptual flexibility* and mathematical reasoning.
Affective (Motivation & Engagement)	Attention span, emotional	Highly motivated; showed enjoyment, curiosity, and	Limited engagement; quickly lost focus;	Guided play supported *intrinsic*

	involvement, persistence	willingness to retry errors; average sustained attention 13–15 minutes.	required frequent reminders; attention span 6–8 minutes.	*motivation* and emotional persistence.
Social Interaction	Peer collaboration, communication, and turn-taking	Frequent cooperative behavior; students exchanged ideas, helped peers, and validated answers collectively.	Minimal peer interaction; students relied solely on teacher validation.	Guided play promoted *collaborative learning* consistent with social constructivism.
Language and Expression	Use of mathematical vocabulary (more, less, equal, bigger, smaller)	Active verbalization; children used comparative terms accurately during play; engaged in dialogic questioning.	Rare verbal expression; responses limited to single words or numerical repetition.	Guided play stimulated *mathematical discourse* and communication competence.
Teacher's Pedagogical Observation	Scaffolding opportunities, lesson flow, adaptability	The teacher acted as a facilitator, adjusting prompts dynamically, and noted high cognitive engagement and joy in learning.	Teacher as instructor; maintained control; reported low student-initiated questioning.	Teachers perceived guided play as *more demanding but pedagogically richer*.
Learning Retention (Follow-up Observation)	Recall and transfer of concepts one week after the activity	Four out of five students could recall and apply counting/pattern concepts in new contexts.	2 of 5 students recalled numerical facts but failed to connect them to new tasks.	Guided play supported *longer-term retention* through experiential reinforcement.

The data in Table 4 show a clear pedagogical advantage of guided play over demonstration methods in early numeracy learning. Guided play not only improved children's counting and classification accuracy but also fostered higher-order thinking skills, such as explaining reasoning, comparing quantities, and constructing relationships between objects and numbers. In the cognitive domain, guided play led to *deep learning*, where understanding was both conceptual and transferable. In the affective domain, guided play produced higher engagement, persistence, and enjoyment, confirming its role in fostering intrinsic motivation. Socially, students engaged in more peer collaboration and cooperative reasoning, developing communication skills alongside mathematical understanding. In contrast, the demonstration method remained teacher-dependent, limiting opportunities for interaction, autonomy, and reflective dialogue. Teacher interviews corroborated these findings, emphasizing that guided play "made children think and talk more," whereas demonstration lessons "felt faster but less meaningful." These outcomes collectively affirm that guided play offers a more holistic and developmentally appropriate framework for early numeracy education, aligning with constructivist learning theories that emphasize exploration, interaction, and reflective engagement.

Discussion

The findings of this case study reveal that guided play provides a more effective and developmentally appropriate framework for teaching numeracy to pre-primary learners compared to traditional demonstration methods. This result supports the view that guided play, defined as structured play supported by intentional adult facilitation, enables children to engage actively and construct mathematical meaning through discovery and exploration (Weisberg et al., 2016). The integration of structured play and teacher scaffolding enabled children to manipulate materials, test hypotheses, and verbalize their reasoning, resulting in observable curiosity, persistence, and collaboration. Such features were notably absent during demonstration-based instruction, which relied heavily on imitation. This aligns with Cohrssen et al. (2013), who found that purposeful facilitation during play transforms mathematics learning from passive repetition to active construction, allowing children to internalize number concepts through meaningful interaction with objects and peers.

A key factor underlying this improvement is the shift in the teacher's role from instructor to facilitator. In guided play, the teacher becomes a co-learner who prompts reflection through open-ended questions and scaffolding strategies. This pedagogical stance nurtures critical thinking and metacognitive regulation, empowering children to self-correct and justify their reasoning. Nair et al. (2024) emphasized that such scaffolding strategies strengthen pre-numeracy development by stimulating self-explanation and problem-solving behaviors. Similarly, Chatzipanteli et al. (2014) demonstrated that metacognitive prompting in early education enhances children's ability to monitor and adjust their thinking, a key factor in early mathematical understanding. The dialogic questioning observed in this study fostered cognitive flexibility, consistent with findings that flexible reasoning is strongly correlated with higher mathematical performance in young learners (de Santana et al., 2022). The children's shift from procedural repetition to conceptual comprehension represents a developmental milestone in numeracy learning, where understanding *why* numbers work becomes as important as knowing *how* to count (VanDerHeyden et al., 2011; Reigosa-Crespo & Estévez-Pérez, 2023).

The study also shows that guided play enhances emotional engagement and intrinsic motivation, which are often underappreciated in mathematics education. The joyful, exploratory atmosphere of play provided a psychologically safe space for curiosity and persistence to emerge. Children's willingness to continue working through errors reflects the internal drive characteristic of intrinsically motivated learners. This finding aligns with Gottfried et al. (2013), who emphasized the long-term impact of intrinsic motivation on academic success in mathematics. Moreover, as Barnes (2021) notes, emotional enjoyment is a significant predictor of perseverance in mathematical reasoning. Unlike the demonstration method that relies on external approval, guided play encourages self-reinforcing satisfaction through discovery, turning challenges into opportunities for reflection and resilience. Such affective engagement, as observed here, may lay the foundation for positive mathematical dispositions that support lifelong learning confidence (Jordan et al., 2010).

From a social perspective, guided play fosters collaborative interaction and peer-assisted learning, enabling children to learn from one another through shared inquiry. Students exchanged strategies, negotiated turns, and validated ideas collectively—behaviors consistent with socio-constructivist principles of early learning. This aligns with Syrjämäki et al. (2018), who observed that guided play enhances social communication and peer reciprocity, particularly when teachers create dialogic spaces for cooperative exploration. In contrast, demonstration-based instruction limited interactions to teacher–student exchanges, restricting opportunities for co-construction of understanding. The collective discoveries in guided play show that numeracy knowledge emerges not only from individual manipulation but also through shared dialogue and social validation.

Pedagogically, guided play is more demanding yet more rewarding for teachers. It requires adaptive planning, active observation, and spontaneous responsiveness to children's emergent ideas. Teachers must skillfully balance freedom and structure to maintain purposeful exploration while aligning activities with curricular goals. This adaptive facilitation aligns with the "guided discovery" framework proposed by Weisberg et al. (2016), emphasizing that play-based instruction requires educators to possess cognitive and emotional flexibility. Teachers in this study confirmed that guided play "made children think and talk more," indicating a transformation toward dialogic pedagogy where learning is co-constructed rather than transmitted. Such professional engagement echoes Cohrssen et al. (2013), who identified that teachers' capacity to mediate play determines the depth and quality of mathematical understanding children achieve.

Finally, the comparative outcomes between guided play and demonstration underscore a fundamental pedagogical distinction. While demonstrations support procedural accuracy, guided play promotes holistic development by integrating the cognitive, affective, and social dimensions of learning. A child's ability to apply number concepts spontaneously, such as sharing toys equally or comparing quantities, reflects a genuine transfer of learning into real-life contexts. This aligns with the notion that number sense develops through experience and contextual reasoning rather than rote memorization (Jordan et al., 2010). In this sense, guided play bridges the gap between freedom and intentionality, producing learners who are curious, reflective, and self-regulated. As Cohrssen et al. (2013) and Weisberg et al. (2016) assert, play-based mathematics instruction not only enhances conceptual growth but also mirrors the natural ways in which children make sense of the world, through experimentation, dialogue, and joy in discovery.

CONCLUSION

This study investigated the effectiveness of guided play compared to the demonstration method in developing early numeracy skills among pre-primary learners. Using a qualitative case study with five students, the research investigated how various instructional approaches impact engagement, reasoning, and collaboration in numeracy learning. Guided play was designed as a structured yet flexible activity that encouraged exploration and teacher scaffolding, while the demonstration method emphasized imitation and direct explanation. The results showed that guided play fostered higher engagement, curiosity, and conceptual understanding. Children were more active, reflective, and communicative when allowed to manipulate objects and discuss ideas with peers. Teachers' facilitative questioning helped learners self-correct and reason logically, transforming lessons into dialogic and meaningful experiences. Conversely, demonstration-based learning produced procedural accuracy but limited creativity and sustained focus. This study contributes new insight into early childhood mathematics education, showing that guided play bridges the gap between freedom and structure. It promotes not only cognitive understanding but also emotional engagement and social cooperation, key components of holistic learning. The findings affirm that purposeful play enhances reasoning and motivation more effectively than teacher-centered instruction. Practically, teachers are encouraged to adopt guided play as a core pedagogical strategy, integrating questioning, reflection, and collaborative exploration into numeracy lessons. In conclusion, guided play represents a transformative approach to early mathematics, one that nurtures curiosity, confidence, and a deeper understanding that extends beyond rote memorization.

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