



The Role of Play-Based Learning in the Cognitive Development of Preschool Children: A Mixed-Methods Study

Kattekola Madhavi

Research Scholar, Department of Education, Malwanchal University, Indore

Dr. Manisha Tiwari Pandey

Supervisor, Department of Education, Malwanchal University, Indore

Abstract

Play-based learning has been widely endorsed as a developmentally appropriate pedagogy for early childhood education, yet in many preschool settings it continues to be displaced by formal academic instruction. This study examined the role of play-based learning in the cognitive development of preschool children aged three to five years. A convergent parallel mixed-methods design was adopted, combining a structured educator-completed survey covering 400 purposively sampled children from urban and semi-urban preschool centres with repeated classroom observations and qualitative inputs from teachers and caregivers. Cognitive development was operationalised across six domains: attention, memory, language acquisition, problem-solving, reasoning, and executive functioning. Descriptive results showed that most children participated frequently in play-based activities and sustained attention for developmentally appropriate durations during play. Correlation analysis revealed strong, significant positive relationships between exposure to play-based learning and all cognitive domains, with the strongest association observed for executive functioning ($r = .67, p < .01$). An independent samples t-test showed that children experiencing predominantly teacher-guided play achieved significantly higher cognitive development scores than those engaged mainly in independent play ($t(398) = 4.62, p < .001$). Qualitative findings underscored the mediating role of teacher scaffolding and enriched play environments. The study concludes that play-based learning is a powerful, integrative mechanism of cognitive growth and recommends its structural integration into preschool curricula, supported by teacher training, observational assessment, and caregiver engagement.

Keywords: *play-based learning, cognitive development, preschool children, guided play, executive function, early childhood education*

1. Introduction

Play-based learning has emerged as a cornerstone of early childhood education, offering a dynamic and developmentally appropriate approach to nurturing cognitive growth among preschool children. Rooted in the constructivist traditions of Piaget, Vygotsky, and Bruner, play-based pedagogy rests on the premise that young children learn best through active engagement, exploration, and interaction with their environment. During the preschool years, cognitive abilities such as memory, problem-solving, language acquisition, attention, and creative thinking develop rapidly, and play provides a natural context within which these



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A Multidisciplinary Open Access, Peer-Reviewed Refereed Journal

Impact Factor: 7.2

ISSN No: 3049-4176

abilities can flourish. Through free, guided, and structured play experiences, children learn to reason, experiment, negotiate, and make sense of the world around them, transforming abstract concepts into meaningful understanding (Taylor & Boyer, 2020; Yogman et al., 2018).

Unlike traditional instructional methods that rely heavily on rote memorisation and teacher-directed activities, play-based learning promotes inquiry, imagination, and intrinsic motivation, which are key components of lifelong learning. A growing body of research across diverse educational contexts demonstrates that children involved in purposeful play exhibit higher levels of cognitive flexibility, communication skill, and self-regulation (Pyle et al., 2017; Whitebread-era syntheses summarised in Parker et al., 2022). Teacher-facilitated play, in particular, fosters social interaction and scaffolding, enabling children to reach levels of reasoning and comprehension beyond their independent capacity, consistent with Vygotsky's concept of the Zone of Proximal Development (Weisberg et al., 2016).

Contemporary policy frameworks reflect this evidence. India's National Education Policy (NEP) 2020 and the National Curriculum Framework for the Foundational Stage (2022), together with international frameworks such as UNESCO's Early Childhood Care and Education agenda and UNICEF's Learning through Play initiative, recognise play-based pedagogy as essential for foundational literacy, numeracy, and critical thinking. Yet despite these endorsements, many preschools continue to emphasise academic drills over experiential learning in response to parental and institutional pressure for early academic achievement. This imbalance risks marginalising the very processes through which durable cognitive capacities are built and underscores the need to re-evaluate play as both a pedagogical tool and a developmental necessity (Fesseha & Pyle, 2016; Keung & Cheung, 2019).

The present study responds to this need by empirically examining how play-based learning contributes to the cognitive development of preschool children aged three to five years. The study pursued five objectives: (a) to examine the impact of play-based learning on the overall cognitive development of preschool children; (b) to identify the specific cognitive skills enhanced through different types of play activities; (c) to explore the relationship between teacher-guided play and independent play in cognitive growth; (d) to assess how play-based approaches compare with traditional instructional methods in early education; and (e) to derive evidence-based recommendations for integrating play into preschool curricula. The scope of the study is confined to classroom-based play experiences (free play, guided play, constructive play, and pretend play) within formal preschool settings in urban and semi-urban areas, and to the cognitive domain of development; emotional, moral, and physical development are outside its purview.

2. Literature Review and Theoretical Framework

2.1 Theoretical Foundations

Three complementary theoretical traditions frame the study. Piaget's cognitive-developmental theory positions children as active constructors of knowledge who assimilate new experiences



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Impact Factor: 7.2

ISSN No: 3049-4176

into existing schemas and accommodate those schemas to novel situations. Play, on this view, is the central process through which children build mental representations of their world, with symbolic play dominating the preschool years and supporting language, problem-solving, and abstract reasoning. Vygotsky's sociocultural theory adds the social and cultural dimension: learning is co-constructed through interaction with more knowledgeable others, and play creates a Zone of Proximal Development in which adult scaffolding, through questioning, modelling, and challenge, stretches children's thinking beyond their independent capabilities. Bruner's constructivism completes the framework by describing how children progress through enactive, iconic, and symbolic modes of representation; playful discovery learning moves children through these modes, converting concrete manipulation into abstract understanding. Together, these perspectives explain why play simultaneously engages foundational functions (attention, memory) and higher-order skills (reasoning, executive control).

2.2 Empirical Evidence on Play and Cognition

Empirical research from 2015 onwards has substantially strengthened the case for play as a cognitive mechanism rather than a mere motivational device. Weisberg et al. (2016) articulated guided play as a distinct pedagogy in which adults structure the environment and follow children's lead, showing that this mind-set outperforms both free play and direct instruction for many learning goals. A scoping review by Pyle et al. (2017) documented the breadth of play-based pedagogies in kindergarten education while noting persistent tensions between developmental and academic orientations. Meta-analytic evidence has since confirmed the value of adult involvement: Skene et al. (2022) synthesised 39 studies and found that guided play had a greater positive effect than direct instruction on early mathematics, shape knowledge, and task switching, supporting the argument that guidance within play enhances rather than dilutes its benefits.

Domain-specific studies reinforce these conclusions. Gibb et al. (2021) demonstrated that a play-based programme improved preschoolers' executive function skills, while Vidal Carulla et al. (2021) traced the development of executive functions across a play-based chemistry learning approach in preschool. Sezgin and Demiriz (2019) reported significant gains in behavioural self-regulation among 48- to 60-month-old children following a game-based educational programme. In the language domain, Taylor and Boyer (2020) reviewed evidence that sociodramatic and guided play enrich vocabulary, narrative skill, and emergent literacy. Ali et al. (2018) linked play-based learning with broad developmental gains in early childhood education, and Yogman et al. (2018), writing for the American Academy of Pediatrics, concluded that play promotes the executive functioning, language, and socio-emotional competencies that buffer stress and build school readiness. Hirsh-Pasek et al. (2015) extended the science of playful learning to digital contexts, deriving criteria (active, engaged, meaningful, and socially interactive experience) that distinguish genuinely educational applications from passive screen media.



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ISSN No: 3049-4176

2.3 Implementation Challenges and the Research Gap

Despite this evidence base, implementation remains uneven. Fesseha and Pyle (2016) found that kindergarten teachers conceptualise play-based learning in divergent ways, with many struggling to reconcile play with mandated academic outcomes. Keung and Cheung (2019), in a mixed-methods study of kindergartens, identified leadership support, teacher collaboration, and professional development as pivotal to holistic implementation. Parker et al. (2022) argue that learning through play must be embedded in policy frameworks rather than left to individual discretion. In the Indian context, the pressures of early academic acceleration, limited teacher training in play pedagogy, resource constraints, and parental misconceptions all constrain the enactment of NEP 2020's play-centred vision. Most existing studies are situated in Western kindergartens and rely on either purely qualitative accounts or narrow experimental tasks; comparatively few combine large-sample quantitative measurement of multiple cognitive domains with qualitative insight into classroom practice in Indian urban and semi-urban preschools. The present study addresses this gap.

3. Methodology

3.1 Research Design

The study adopted a convergent parallel mixed-methods design grounded in a pragmatic research paradigm (Creswell & Plano Clark, 2018). Quantitative and qualitative data were collected during the same phase, analysed separately, and integrated at interpretation. Quantitative methods measured cognitive indicators across a large sample, while qualitative methods captured the contextual and experiential dimensions of play-based learning, including teacher intention, scaffolding, and classroom culture, which prior research identifies as decisive for the cognitive value of play (Fesseha & Pyle, 2016; Keung & Cheung, 2019). The design also reflects developmental and ethical considerations: naturalistic, play-based observation was prioritised over formal testing, in line with developmentally appropriate research practice for young children.

3.2 Participants and Sampling

The sample comprised 400 preschool children aged three to five years, drawn through purposive sampling from early childhood education centres located in urban and semi-urban areas. Purposive selection ensured that all participating children were enrolled in settings where play-based learning formed part of daily instructional practice, while deliberate variation across centres, socio-economic groups, and locations enhanced the representativeness of the sample within the defined population. Educators and caregivers directly involved in facilitating play were included for the qualitative component through criterion-based purposive sampling. Table 1 summarises the demographic profile of the sample.

Table 1. Demographic Profile of the Sample (N = 400)

Demographic Variable	Category	n	%
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Age	3 years	132	33.0
	4 years	148	37.0
	5 years	120	30.0
Gender	Male	206	51.5
	Female	194	48.5
Socio-economic background	Lower	138	34.5
	Middle	172	43.0
	Higher	90	22.5
Preschool location	Urban	228	57.0
	Semi-urban	172	43.0

Key constructs were operationally defined to link theory to observable behaviour. Play-based learning was defined as children's regular participation in free play, guided play, imaginative play, and structured educational games, indexed by the frequency, duration, and type of play and the level of teacher facilitation. Attention was defined as the ability to maintain focus on a play task for an age-appropriate duration; memory as the capacity to recall rules, sequences, and prior play experiences; language acquisition as vocabulary use, sentence formation, storytelling, and conversational exchange during play; problem-solving as planning, experimentation, and adaptive strategy use; and executive functioning as working memory, inhibitory control, and cognitive flexibility expressed through turn-taking, rule-following, emotional regulation, and adjustment to changing demands. Teacher-guided play was defined as play in which educators intentionally scaffold learning through prompts, questions, or materials while preserving children's autonomy in exploration (Weisberg et al., 2016).

3.3 Instruments and Procedure

The primary quantitative instrument was a structured, 22-item multiple-choice survey completed by preschool educators, one survey per child, based on cumulative observation of the child's behaviour during routine classroom and play activities. Because preschool children are not developmentally suited to self-report, teacher-reported measures grounded in naturalistic observation were used, an approach widely validated in early childhood research. Items were mapped to six cognitive domains: attention, memory, language acquisition, problem-solving, reasoning, and executive functioning, and framed around observable behaviours (e.g., sustaining attention on a play task, recalling game rules, narrating stories during role-play, trying alternative strategies when a problem arises, turn-taking, and adapting



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to rule changes). Structured observation schedules and developmental checklists were applied by the researcher across multiple free-play and guided-play sessions to corroborate teacher reports and enable triangulation. Semi-structured interviews and informal interactions with educators and caregivers supplied qualitative data on how play was planned, facilitated, and perceived.

Content validity was established through alignment with the theoretical framework and expert review by specialists in early childhood education and educational psychology. The instrument was pilot-tested with a small group of educators and refined; internal consistency was assessed using Cronbach's alpha, and inter-rater reliability of observations was supported through observer training, behavioural descriptors, and periodic agreement checks (Cohen et al., 2018). Formal permission was obtained from institutions, written informed consent from parents or guardians, and voluntary consent from educators. Children were observed only within routine activities, observations were discontinued if a child showed discomfort, identities were anonymised through coded identifiers, and findings are reported in aggregate. All 400 distributed surveys were returned in usable form, yielding a 100% response rate.

3.4 Data Analysis

Survey responses were coded numerically and analysed using descriptive statistics (frequencies, percentages, means, and standard deviations). Pearson correlation analysis examined associations between play-based learning exposure and each cognitive domain, and an independent samples t-test compared composite cognitive development scores between children experiencing predominantly teacher-guided play and those engaged mainly in independent play. Demographic variables (age, gender, socio-economic background, and setting) were treated as control variables. Qualitative data were analysed thematically through open coding followed by categorisation into themes concerning implementation, scaffolding, engagement, and perceived cognitive benefit. Quantitative and qualitative strands were integrated through triangulation at the interpretation stage (Creswell & Plano Clark, 2018).

4. Results

4.1 Engagement in Play-Based Learning

Educators reported high levels of engagement in play-based learning. As Table 2 shows, 70.5% of children participated frequently or very frequently in play-based activities during the school day, while only 8% participated rarely. This pattern indicates that play-based learning is well embedded in the daily routines of the sampled preschools and that children receive repeated opportunities for the cognitive stimulation, exploration, and interaction that play affords.

Table 2. Frequency of Children's Participation in Play-Based Learning Activities (N = 400)

Level of participation	Number of children	Percentage
Rarely	32	8.0



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ISSN No: 3049-4176

Occasionally	86	21.5
Frequently	168	42.0
Very frequently	114	28.5
Total	400	100.0

4.2 Attention and Foundational Cognitive Skills

Sustained attention, a foundational skill underpinning learning in every domain, was well supported in play contexts. Table 3 shows that 57.5% of children sustained attention on a single play task for ten minutes or longer, and a further 30.5% for five to ten minutes; only 12% attended for less than five minutes. Given the age-related variability expected in this population, the predominance of moderate-to-long attention spans suggests that intrinsically motivating play tasks help children regulate their own engagement in ways that formal instruction often does not. Comparable patterns emerged for memory: roughly two-thirds of children often or almost always recalled the rules or steps of previously played games (64.0%), and most remembered sequences from songs, rhymes, and play routines well or very well (59.5%). In the language domain, 62.5% frequently or very frequently used new vocabulary during play interactions, and 59.5% communicated ideas and roles effectively or very effectively during imaginative play.

Table 3. Duration of Sustained Attention on a Single Task During Play (N = 400)

Attention span	Number of children	Percentage
Less than 5 minutes	48	12.0
5–10 minutes	122	30.5
10–15 minutes	156	39.0
More than 15 minutes	74	18.5
Total	400	100.0

Problem-solving behaviour showed a similarly encouraging profile: when faced with a problem during play, 42% of children tried different strategies and a further 21% solved the problem independently, while only 7.5% gave up immediately. Executive-function indicators followed suit, with the majority of children following rules during structured play, waiting for their turn in group activities, and adapting when play activities changed or new rules were introduced. Overall, when asked to rate the impact of play-based learning on each child's cognitive



development, educators rated the impact as high or very high for 70% of children (42.5% high; 27.5% very high), moderate for 24.5%, and low for only 5.5%.

4.3 Association Between Play Exposure and Cognitive Domains

Pearson correlations between exposure to play-based learning and the five measured cognitive outcome domains are presented in Table 4. All coefficients were positive, strong, and statistically significant at the .01 level. The strongest association was observed for executive functioning ($r = .67$), followed by language development ($r = .65$) and problem-solving ($r = .63$), with attention ($r = .61$) and memory ($r = .58$) also showing substantial relationships. The pattern indicates that play-based learning does not influence isolated skills but contributes broadly to interconnected cognitive domains, consistent with the theoretical view of play as an integrative learning context in which multiple cognitive processes develop simultaneously through active engagement, exploration, and social interaction.

Table 4. Correlations Between Play-Based Learning Exposure and Cognitive Development Domains (N = 400)

Cognitive domain	r	p
Attention	.61**	< .001
Memory	.58**	< .001
Language development	.65**	< .001
Problem-solving	.63**	< .001
Executive function	.67**	< .001

*Note. ** Correlation is significant at the .01 level (two-tailed).*

4.4 Teacher-Guided Play Versus Independent Play

An independent samples t-test compared composite cognitive development scores between children engaged predominantly in teacher-guided play and those engaged mainly in independent play (Table 5). Children in the teacher-guided play group obtained a significantly higher mean cognitive development score ($M = 3.78$, $SD = 0.46$) than children in the independent play group ($M = 3.52$, $SD = 0.49$), $t(398) = 4.62$, $p < .001$. The difference highlights the contribution of adult scaffolding to structured cognitive processes such as attention, working memory, conceptual understanding, and cognitive regulation. Independent play, while associated with somewhat lower composite scores, was qualitatively linked to autonomy, creativity, and exploratory problem-solving, suggesting complementary rather than competing roles for the two forms of play.

Table 5. Independent Samples t-Test Comparing Cognitive Development Scores by Type of Play

Type of play	n	M	SD	t	df	p
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ISSN No: 3049-4176

Teacher-guided play	200	3.78	0.46	4.62	398	< .001
Independent play	200	3.52	0.49			

4.5 Qualitative Findings

Thematic analysis of observations and educator interviews yielded three themes that contextualise the quantitative results. First, intentional scaffolding emerged as the decisive ingredient of cognitively rich play: educators who posed open-ended questions, introduced vocabulary, and extended children's ideas during play elicited longer engagement and more complex reasoning than those who merely supervised. Second, environmental affordances mattered: classrooms with accessible open-ended materials (blocks, puzzles, role-play props, and sensory resources) sustained deeper engagement and more frequent problem-solving episodes. Third, educators consistently reported skill transfer, observing that children applied language, self-regulation, and problem-solving strategies developed during play to other classroom activities, corroborating the survey finding that most children often or always transferred play-acquired skills to new contexts. Educators also noted that rigid, instruction-heavy formats restricted spontaneous interaction and intrinsic motivation, helping to explain the comparative advantage of play-based approaches over traditional instruction observed in the quantitative data.

5. Discussion

The findings provide strong empirical support for a positive and meaningful relationship between play-based learning and cognitive development in the preschool years, addressing the study's first objective. High participation rates, developmentally appropriate attention spans, robust memory and language indicators, and strong correlations between play exposure and every measured cognitive domain converge on a single conclusion: play is a central mechanism of cognitive growth, not a break from it. This conclusion aligns with the broader evidence base, including the pediatric consensus articulated by Yogman et al. (2018) and reviews of play-based pedagogy by Pyle et al. (2017) and Taylor and Boyer (2020).

With respect to the second objective, the results indicate that different forms of play contribute distinctively to cognition. Repetitive, routine-rich play (games, songs, rhymes) supported attention and memory; imaginative and cooperative play created language-rich environments that expanded vocabulary and narrative skill; constructive play and puzzles fostered logical reasoning and cause-and-effect understanding; and rule-based, turn-taking, and emotionally demanding play cultivated executive functions. The particularly strong correlation between play exposure and executive functioning ($r = .67$) is noteworthy, echoing intervention studies by Gibb et al. (2021), Vidal Carulla et al. (2021), and Sezgin and Demiriz (2019), and reinforcing the argument that play uniquely engages inhibitory control, working memory, and



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A Multidisciplinary Open Access, Peer-Reviewed Refereed Journal

Impact Factor: 7.2

ISSN No: 3049-4176

cognitive flexibility because it requires children to hold roles in mind, follow shared rules, and adapt to changing scenarios.

The significant advantage of teacher-guided play over independent play addresses the third objective and is consistent with the guided-play literature. Weisberg et al. (2016) argue that guided play combines child agency with adult intentionality, and the meta-analysis by Skene et al. (2022) confirms that guidance within play outperforms direct instruction on several early cognitive outcomes. The present data extend this finding to Indian urban and semi-urban preschools: scaffolding through questioning, modelling, and timely intervention appears to convert playful engagement into structured cognitive gains. Importantly, the qualitative evidence cautions against interpreting this result as a mandate for adult control. Independent play retained clear value for autonomy, creativity, and exploratory problem-solving, indicating that cognitive growth is optimised when guided and independent play are balanced rather than traded off.

Regarding the fourth objective, both the survey data and educator accounts indicated that play-based learning outperformed traditional instruction in engagement, sustained attention, memory retention, language use, and problem-solving. Educators attributed the difference to the limitations of rigid instructional formats, which restrict spontaneous interaction and intrinsic motivation. These findings carry particular weight in policy contexts, such as India under NEP 2020, where the rhetoric of play-based foundational learning must contend with entrenched academic-acceleration pressures documented internationally by Fesseha and Pyle (2016) and Keung and Cheung (2019).

Beyond the stated objectives, the findings speak to educational equity. Because the sample spanned lower, middle, and higher socio-economic groups and both urban and semi-urban settings, the consistently strong associations between play exposure and cognitive outcomes suggest that shared, interactive play experiences in preschool can compensate, at least partially, for differences in home learning resources. Children with limited access to enriched materials at home nevertheless benefited from the cognitive stimulation available through classroom play, indicating that well-implemented play-based curricula can function as an equaliser of early cognitive opportunity. This equity dimension strengthens the policy case for prioritising play-based provision in under-resourced settings, where the marginal benefit of enriched, teacher-scaffolded play is likely greatest (Parker et al., 2022).

Several limitations qualify these conclusions. Purposive sampling from urban and semi-urban centres limits generalisability to rural and informal settings. Teacher-reported measures, though triangulated with researcher observation, remain vulnerable to subjective perception and social desirability. The cross-sectional design captures associations rather than long-term developmental trajectories, and observer effects cannot be entirely excluded. Longitudinal and experimental designs, rural samples, and child-level performance measures represent priorities for future research.



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A Multidisciplinary Open Access, Peer-Reviewed Refereed Journal

Impact Factor: 7.2

ISSN No: 3049-4176

6. Conclusion and Recommendations

This study set out to examine the role of play-based learning in the cognitive development of preschool children and found consistent, converging evidence that play functions as a powerful, integrative engine of cognitive growth. Exposure to play-based learning was strongly associated with attention, memory, language, problem-solving, and, above all, executive functioning, and teacher-guided play conferred a significant additional advantage over independent play. Qualitative evidence identified intentional scaffolding, enriched environments, and skill transfer as the mechanisms through which these benefits are realised. Three sets of recommendations follow. For educators and preschool institutions, play should be embedded across the daily curriculum rather than confined to isolated slots, with a deliberate balance of guided and independent play; classrooms should be resourced with open-ended materials, and educators should receive ongoing professional development in play pedagogy, scaffolding techniques, and observational assessment. For parents and caregivers, play should be recognised as a legitimate and powerful mode of learning: creating daily time for imaginative and constructive play at home, participating responsively through conversation and open-ended questioning, and allowing children to encounter and work through manageable challenges all extend the cognitive benefits documented here. For policymakers and educational authorities, curriculum frameworks should articulate the cognitive value of play explicitly, legitimise observational and formative assessment in place of standardised early testing, mandate play pedagogy within teacher education, and invest in materials, spaces, and teacher-child ratios, particularly in under-resourced settings where play-based learning can serve as an equaliser of early cognitive opportunity.

Ultimately, the evidence affirms that play is not merely a recreational interlude in early education. It is the natural language of learning through which preschool children construct the attention, memory, language, reasoning, and self-regulatory capacities on which all subsequent learning is built. Educational systems that take this evidence seriously will treat play not as a luxury to be defended but as a foundation to be designed, resourced, and sustained.

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