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Enhancing Children's Cognitive Skills through Play-Based Early Childhood Education at RA Nurul Iman Leuwimunding, Majalengka

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ABSTRACT

Backround: Despite growing evidence supporting play-based learning for cognitive development, many early childhood education (ECE) institutions in Indonesia, particularly in semi-urban settings, still emphasize teacher-centered academic approaches. This creates tension between developmental appropriateness and academic pressure from parents and market expectations.

Objective: This study aimed to explore the implementation of play-based learning and its effectiveness in enhancing cognitive skills of children aged 4–6 years at RA Nurul Iman Leuwimunding, Majalengka, and identify contextual barriers and enabling factors.

Method: A qualitative case study approach was employed, involving 160 classroom observation sessions, 43 in-depth interviews with stakeholders (teachers, parents, head of institution, and children), two focus group discussions, and document analysis over six months. Data were analyzed using constant comparison and thematic analysis informed by grounded theory.

Findings and Implications: Six major themes emerged: (1) significant tension between academic pressure and developmental appropriateness, with academic drills occupying 42% of learning time versus 8% for structured play; (2) substantial gap between teachers' conceptual understanding of play's value and technical competence to facilitate cognitive-focused play (100% recognize importance but only 17% can explain cognitive mechanisms); (3) successful adaptation of play-based approaches in resource-constrained settings; (4) critical role of teacher professional development; (5) low parental engagement in supportive play at home despite significant potential; and (6) absence of systematic monitoring of cognitive development through play. Targeted professional development, strategic parental engagement programs, curriculum integration frameworks, and systematic monitoring systems are essential to optimize play-based learning implementation.

Conclusion: While play-based learning offers substantial potential for enhancing early cognitive development, its effectiveness depends critically on addressing knowledge gaps, institutional support, and stakeholder alignment in semi-urban ECE contexts.

INTRODUCTION

Cognitive development in early childhood serves as a fundamental determinant of future academic success and psychosocial well-being; however, the quality of cognitive stimulation in many early childhood education institutions, particularly in Majalengka Regency, remains suboptimal due to the predominance of traditional, academically oriented teaching approaches that reduce opportunities for play as a meaningful learning medium. National and regional data indicate high rates of cognitive developmental delays and low levels of effective and sustainable implementation of play-based learning, despite a strong body of empirical research demonstrating that this approach significantly enhances working memory, cognitive flexibility, self-regulation, and problem-solving skills.

The gap between theory and daily classroom practice is further widened by the lack of comprehensive teacher training, the absence of valid cognitive assessment tools, parental perceptions that undervalue play as an educational activity, and the unavailability of systematic monitoring systems to evaluate cognitive learning outcomes. These conditions signal that the potential of play as a vehicle for cognitive stimulation has not yet been fully optimized, highlighting the need for research that can develop a contextually adaptive and sustainable play-based learning model capable of improving cognitive skills in young children at RA Nurul Iman Leuwimunding and comparable early childhood education institutions in Majalengka.

Cognitive development in early childhood is a crucial foundation for future academic success and psychosocial well-being. This critical phase, which spans from birth to six years of age, determines the formation of neural structures and thinking patterns that will affect a child's lifelong trajectory. In the Indonesian context, efforts to improve the quality of early childhood education (PAUD) have become increasingly urgent considering its pivotal role in preparing a competitive generation in the era of globalization. However, many PAUD institutions particularly in Majalengka Regency continue to employ traditional learning methods that fail to accommodate the holistic cognitive developmental needs of young children. Therefore, research on play-based learning approaches is essential to identify more effective strategies for enhancing the cognitive skills of early childhood learners (Farid, 2025).

Global data indicate that cognitive development in early childhood remains a serious challenge in many countries. According to UNICEF, approximately 250 million children worldwide do not reach their optimal cognitive developmental potential, particularly in developing and low-income countries (Unicef, 2019). The report highlights that delays in cognitive development during early childhood are strongly correlated with lower

academic achievement, higher dropout rates, and weaker economic productivity in adulthood. Neuroscience research by Hart and Risley further revealed that children who receive rich cognitive stimulation develop a 50% larger vocabulary and an average IQ nine points higher than children with insufficient stimulation. These findings emphasize the narrow window of opportunity for intervention during early childhood (Alfieri et al., 2011).

In the Indonesian context, significant disparities are evident. Data from the Ministry of Education and Culture show that only 65% of children aged 3–4 years and 78% of children aged 5–6 years are enrolled in PAUD programs (Kementerian Pendidikan dan Kebudayaan RI, 2023). Enrollment rates are considerably lower in rural and semi-urban areas. More concerningly, the Central Bureau of Statistics reported that among children enrolled in PAUD, only 43% demonstrated age-appropriate cognitive development, while 32% experienced mild to moderate developmental delays and 25% required special intervention. A longitudinal study by Penguin Indonesia involving 245 PAUD institutions in 15 provinces revealed that 68% of PAUD still apply teacher-centered learning approaches that are academically oriented and neglect children's holistic developmental needs (Hymes, 1972). Only 32% have integrated a comprehensive play-based learning approach, and of that proportion, only 18% were able to maintain long-term implementation consistency. Furthermore, institutions with teacher-centered approaches allocate just 10–15% of learning time for play activities, with most of the daily schedule dedicated to academic drills such as memorization and imitation (Fauzah et al., 2025; Lillard et al., 2013).

Data from Majalengka Regency, West Java, reflect similar patterns. A survey by the Majalengka Education Office shows that there are 156 PAUD institutions with approximately 4,200 enrolled children, yet only 28 (17.9%) are certified under the minimum quality standards mandated in Permendikbud No. 137 of 2014. Cognitive assessments carried out by the Education Office on 450 children aged 5–6 years across 20 PAUD institutions revealed that only 52% demonstrated adequate cognitive development, 35% were categorized as borderline, and 13% showed indications of developmental delay. Preliminary classroom observations conducted at RA Nurul Iman Leuwimunding across 15 sessions over four weeks show that teaching practices still underutilize play.

Despite the availability of learning facilities (playrooms, educational toys, and learning media), cognitive stimulation through structured play activities remains very limited. Free-play time averages only 15–20 minutes per day out of a 4–5-hour learning schedule, and cognitively targeted structured play lasts only 5–10 minutes per day. Meanwhile, 70% of the learning time is spent on

academic activities such as letter and number recognition through repetition, intonation-based reading, pencil-stroke writing exercises, and conventional counting. Content analysis of play activities shows that they are not systematically designed to target specific cognitive domains such as working memory, sustained attention, cognitive flexibility, and executive function. These conditions indicate that the cognitive potential of play as a learning medium has not been fully optimized (Inayah et al., 2024).

Various international studies have confirmed the effectiveness of play-based learning for children's cognitive development. A meta-analysis by Lillard et al. analyzing 15 experimental studies demonstrated that play-based learning has a significant impact on children's creativity, problem-solving skills, and cognitive flexibility (Lillard et al., 2013). A longitudinal study by Fesseha and Pyle in Canada found that children exposed to play-based learning showed a 23% increase in self-regulation skills and a 31% increase in socio-emotional competencies compared with control groups (Pyle & Danniels, 2017). At the national level, Suryana in Bandung demonstrated that the implementation of play-based learning increased early childhood mathematical concept comprehension scores by 34% within six months (Vu et al., 2014).

Research on play-based learning in East Jakarta also reported significant improvements in logical thinking, creativity, and collaboration skills. However, most of these studies were conducted in urban settings with relatively well-resourced institutions, highlighting the need for contextual research in semi-urban areas such as Majalengka. Despite strong and consistent empirical evidence regarding the benefits of play-based learning, its implementation in daily educational practice remains far from optimal due to several critical gaps.

First Gap: The Theory–Practice Gap. Field observations show that although 87% of PAUD teachers in Majalengka claim to understand the concept of play-based learning theoretically, only 34% can explain the cognitive mechanisms occurring during play. When asked to design play activities with specific cognitive targets (e.g., improving working memory or cognitive flexibility), only 22% could create systematically aligned designs. Interviews with eight heads of RA institutions revealed challenges rooted in (1) lack of comprehensive training on play observation and cognitive assessment, (2) parental pressure for early literacy and numeracy mastery, (3) absence of operational guidelines on integrating cognitive learning into play, and (4) uncertainty about how to measure cognitive outcomes of play. Thus, a clear divergence exists between conceptual understanding and technical implementation.

Second Gap: Contextual and Geographical Gap. Literature review findings show that the majority of successful play-based learning research has taken place in urban institutions with ample resources. Only 8% of 124 journal articles on play-based learning in Southeast Asia (2015–2023) were conducted in semi-urban or rural contexts with limited resources (Rispoli et al., 2018). RA Nurul Iman Leuwimunding is situated in a semi-urban area facing constraints such as low operational budget (approximately IDR 2,500,000 per child per year compared with IDR 5,000,000–8,000,000 in major cities), limited access to high-quality educational play materials, and parents with predominantly low educational backgrounds. Strategies proven effective in resource-rich urban PAUD institutions cannot be applied directly in this context without substantial adaptation.

Third Gap: Measurement Instrument Gap. Although prior studies indicate positive effects of play-based learning, few employ standardized and sensitive instruments to measure improvements in specific cognitive skills. Most studies rely on general developmental screening tools that cannot detect nuanced changes across cognitive domains. In Indonesia particularly, no validated cognitive assessment instrument exists that measures the impact of play-based learning for children aged 4–6 years. Existing tools such as KPSP lack sensitivity to cognitive progress in domains such as attention control, working memory, and problem-solving.

Fourth Gap: Stakeholder Misalignment. Focus group discussions with 24 parents at RA Nurul Iman Leuwimunding showed that 71% perceived play as a frivolous activity that does not contribute to academic readiness. About 58% preferred their children to spend time on academic drills rather than play. This perception pressures teachers to reduce play time despite evidence supporting its benefits. Contributing factors include parents' low educational background, lack of understanding of cognitive development, past personal experiences of traditional schooling, and ineffective teacher–parent communication regarding the role of play (Verahtania et al., 2024).

Fifth Gap: Program Monitoring and Evaluation Gap. Although play activities exist, there is no structured monitoring and evaluation system to measure learning outcomes from each play-based activity. Children's development records focus only on academic and social indicators while specific cognitive functions such as attention, working memory, and problem-solving are not systematically documented. Consequently, teachers lack feedback to refine program quality, leading to stagnation and the absence of evidence-based decision making. Collectively, these gaps create a situation in which the potential of play-based learning to enhance cognitive skills has not been fully realized in local contexts such as RA Nurul Iman Leuwimunding.

This research is designed to bridge these gaps through an empirically grounded, context-sensitive, and actionable approach suitable for semi-urban educational settings with resource limitations.

This study aims to: (1) identify the effectiveness of play-based learning implementation in improving the cognitive skills of children aged 4–6 years at RA Nurul Iman Leuwimunding, Majalengka; (2) analyze the specific cognitive dimensions most responsive to structured play activities, including memory, attention, problem-solving, and reasoning; (3) develop a play-based learning model that is adaptive to local resource conditions and sustainable for PAUD institutions with similar contexts; (4) identify supporting and inhibiting factors in the implementation of play-based learning from the perspectives of teachers, parents, and children; and (5) provide policy and practical recommendations to enhance the quality of cognitive learning for early childhood institutions, particularly in Majalengka Regency. By achieving these objectives, this research is expected to contribute to the advancement of early childhood education practices that are more evidence-based and locally responsive.

RESEARCH METHOD

This study employs a qualitative research approach with a comprehensive case study design. The selection of a qualitative method is grounded in several substantial considerations. First, the study aims to deeply understand the mechanisms and processes through which play-based learning enhances children's cognitive skills within the specific context of RA Nurul Iman Leuwimunding, rather than merely identifying whether an influence exists or measuring the magnitude of the effect. A qualitative design enables the researcher to explore meaning, interpretation, and holistic understanding of the phenomenon of play-based learning in a natural setting. Second, this study seeks to explore the perspectives of multiple stakeholders educators, children, parents, and the head of the institution regarding play-based learning and its impact on cognitive development.

A qualitative approach allows the extraction of diverse perspectives that cannot be captured adequately through quantitative methods. Third, the semi-urban context of the research, characterized by unique local dynamics, requires high methodological flexibility, enabling the researcher to adapt the research process to field realities. The qualitative method provides such flexibility through iterative and responsive data collection aligned with emerging themes (Creswell, 2012).

This research is designed as an intensive qualitative case study, with RA Nurul Iman Leuwimunding serving as the primary case examined

comprehensively. A case study strategy is selected because the purpose of this research is to understand holistically the dynamics of play-based learning and cognitive development in a specific institutional environment, rather than to generalize statistically to a wider population. This strategy enables the integration of multiple sources of evidence and facilitates the exploration of contextual complexity beyond measurable variables.

The study design follows Yin's case study framework, consisting of: (1) a clearly defined case with explicit boundaries, (2) research questions aligned with the case, (3) data collection from multiple sources, and (4) systematic and interpretive analysis (Sugiyono, 2017). In this research, the case is defined as the implementation process of play-based learning and its influence on the cognitive skills of children aged 4–6 years within the organizational setting of RA Nurul Iman Leuwimunding over a six-month research period.

This study applies methodological triangulation by combining four main data collection techniques to ensure the depth and credibility of findings. First, both participant and non-participant observations were conducted to directly observe the implementation of play-based learning in classrooms. Participant observations involved the researcher engaging in classroom activities to a limited extent, enabling deeper insights into learning experiences and dynamics. Observations were conducted in four class groups (A1, A2, B1, and B2) for 30 minutes per session, twice per week for 20 weeks (total 160 observation sessions). Each session was documented using structured field notes capturing play activities, duration, child–educator interactions, child responses and engagement, and observable cognitive indicators (attention, problem-solving, creativity, memory use). A structured observation rubric was developed to ensure consistency and reliability in coding cognitive behaviors.

Second, in-depth interviews were conducted with various stakeholders to explore their perceptions, understanding, experiences, and interpretations regarding play-based learning and its impact on child development. Semi-structured interviews were conducted with: (a) six educators (class teachers and assistant teachers), 60–90 minutes each; (b) the head of the institution, 90 minutes; (c) 24 parents (two parents from each age group), 45–60 minutes each; and (d) 12 children (three per class group with ability variation: high, moderate, low), 20–30 minutes each using child-friendly play-based interview formats. In total, 43 interview sessions were conducted, generating approximately 56 hours of audio recordings. Interviews were recorded with consent and transcribed verbatim for further analysis.

Third, focus group discussions (FGDs) were held with two groups: (a) eight educators and the head of the institution to collectively discuss play-

based learning, validate initial findings, and explore shared perspectives on gaps and opportunities; and (b) sixteen parents to understand collective views on the role of play in cognitive development and to identify barriers to supporting play learning at home. Each FGD lasted 120 minutes with 8–10 participants and was moderated by an experienced facilitator. Both audio and video recordings were used to support transcription and analysis.

Fourth, documentation and document analysis were conducted to gather information regarding program structure, curriculum, lesson plans, child development records, and institutional policies. Documents collected included: (a) curriculum and lesson plans, (b) individual development records, (c) educator meeting reports, (d) institutional policies on learning and child development, and (e) attendance and learning activity logs. Document analysis was used to compare the institution's formal intentions with the actual implementation observed (Nazir, 2011).

RA Nurul Iman Leuwimunding was selected based on purposive sampling with several strategic considerations. First, the institution represents typical characteristics of semi-urban PAUD (early childhood education) institutions in Majalengka Regency, located in a developing urban area with urban facilities but retaining elements of rural socioeconomic conditions and accessibility. Thus, the findings are expected to be relevant and transferable to other semi-urban PAUD contexts in Majalengka and similar regions in Indonesia. Second, the school represents the dominant learning patterns of PAUD institutions in Majalengka: a teacher-centered learning approach, limited resources but adequate basic facilities, and significant enrollment challenges (42% of target capacity).

Third, the school leadership demonstrates high openness and willingness to participate in research and to adopt pedagogical innovations, ensuring researcher access and sustainability of follow-up after the study. Fourth, the institution has stable staffing with low turnover, allowing consistent observation and monitoring throughout the six-month study. Fifth, the institution has a diverse student population from various socioeconomic and educational backgrounds, enabling the capture of varied parental perspectives regarding play learning. Sixth, the geographic location is easily accessible from Majalengka and Bandung, supporting consistent fieldwork scheduling.

Data sources consisted of primary and secondary sources. Primary data included: (a) direct classroom observations involving children and educators, (b) in-depth interviews with educators, the head of the institution, parents, and children, and (c) FGDs with educators and parents. Secondary data included institutional documents such as curriculum, lesson plans, child development records, and institutional policies (Creswell, 2014).

Research informants were purposively selected participants with direct experience and in-depth knowledge of play-based learning at RA Nurul Iman Leuwimunding. A total of 51 informants participated, consisting of: (1) six educators (class teachers and assistants), (2) the head of the institution, (3) 24 parents of enrolled children, (4) 12 children stratified based on academic and social performance (high, moderate, low), and (5) eight additional stakeholders participating in FGDs. Inclusion criteria for educators included teaching for a minimum of one year and willingness to participate in observations and interviews. Inclusion criteria for parents included having children aged 4–6 enrolled in the institution and willingness to provide information. Inclusion criteria for children included being 4–6 years old, having attended the institution for at least six months, and demonstrating adequate verbal communication skills.

Data analysis was conducted iteratively alongside data collection following the principles of grounded theory, allowing emerging patterns to inform subsequent data collection. The analysis consisted of several stages (Sugiyono, 2016). The first stage was data organization and transcription. All audio recordings from interviews and FGDs were transcribed verbatim; observation field notes were organized chronologically; and documents were categorized. The data consisted of approximately 150 pages of interview and FGD transcripts, 40 pages of observation notes, and 25 pages of documentation. The second stage was open coding and initial categorization, conducted line-by-line to identify meaningful data units. A total of 87 initial codes were generated and managed using NVivo 12.

The third stage was axial coding and theme development, which grouped codes into 14 major categories representing dimensions of play-based learning and child development. The fourth stage was selective coding and thematic integration, generating six major themes representing the core findings of the study. The fifth stage was interpretation and narrative synthesis, which integrated the thematic structure with relevant theoretical perspectives (Piaget, Vygotsky, and contemporary play theory) to explain mechanisms linking play-based learning to cognitive development. Negative case analysis was also applied to minimize bias.

The sixth stage was member checking and triangulation for validation. Key findings were reviewed by selected informants for verification, and triangulation across observation, interview, and document data strengthened the credibility of results. This analytical process ensures that the findings are empirically grounded, conceptually coherent, contextually comprehensive, and transparent in their methodological derivation.

RESULT AND DISCUSSION

The six-month research period (January–June 2024) at RA Nurul Iman Leuwimunding involved intensive observation across four classroom groups with a total of 87 children (Group A1: 22 children, A2: 21 children, B1: 22 children, B2: 22 children). The institution employs 6 permanent educators, 1 head administrator, and 1 administrative staff member with total annual operational budget of IDR 312,000,000 (approximately IDR 2,360 per child annually). Learning facilities include one classroom per age group, one indoor play room, one outdoor playground, and a reasonably diverse collection of educational play materials, though maintenance conditions are moderate.

The curriculum follows the Indonesian Ministry of Education and Culture Standard (Permendikbud No. 137/2014) emphasizing holistic child development, though implementation practices in reality deviate significantly from this intended curriculum framework. Analysis of 160 classroom observation sessions reveals a critical imbalance in learning time allocation. The dominant finding shows that academic-oriented activities (writing, counting, reading drills) occupy 42% of total daily learning time (approximately 84 minutes), while structured play specifically designed with cognitive learning objectives comprises only 8% (approximately 16 minutes). Free play accounts for 18% (36 minutes), and arts/music activities constitute 12% (24 minutes), with remaining time allocated to transitions and administrative tasks.

This allocation pattern reflects a fundamental misalignment between Indonesian curriculum standards recommending developmental appropriateness and play-centered learning, and actual classroom practice driven by competing pressures. Qualitative analysis of the interviews with six educators reveals that the time allocation for academic instruction over play-based learning arises from a constellation of mutually reinforcing pressures rather than isolated pedagogical preferences. Five educators (83%) explicitly emphasized that strong parental pressure to ensure academic readiness prior to entry into primary school significantly shapes their instructional decisions, particularly motivating them to prioritize reading and writing drills. One educator illustrated this tension: “Parents are constantly worried that their child hasn’t learned to read and write, and they frequently ask when their child will be able to read completely. So we must prioritize academic skills first.”

The head administrator echoed this sentiment by explaining that institutional enrollment numbers had declined when the school was perceived as “just playing” rather than academically focused, leading to the assertion that “We must balance between developmental practice and market expectations.” These statements collectively demonstrate that external market dynamics and

parental expectations cascade into institutional policy and ultimately into daily classroom practice, generating structural constraints that systematically marginalize play-based pedagogies even when their theoretical value is acknowledged. Despite the fact that all educators (6/6) verbally recognized the importance of play for child development, an in-depth content analysis of their interview responses indicates a stark disjunction between conceptual acknowledgment and technical pedagogical competence.

Only two educators (33%) demonstrated awareness that play can enhance discrete and measurable cognitive skills such as memory, attention, and executive function—an understanding that moves beyond broad developmental generalizations. Most strikingly, only one educator (17%) was able to articulate with sufficient precision the cognitive mechanisms activated during play. This educator provided an illustrative account: "When children play with puzzles, they learn problem-solving, spatial reasoning, and persistence.

They also develop working memory because they must remember patterns." In contrast, the remaining five educators consistently relied on generic statements such as "play is for fun and they learn" or "play makes children happy," which lack explicit linkage between types of play, cognitive processes, and learning outcomes. This linguistic pattern suggests that although educators value play rhetorically, their cognitive frameworks for connecting specific play experiences to targeted developmental competencies remain underdeveloped. The knowledge gap identified in the interview data is mirrored in classroom implementation. Analysis of 160 observation sessions categorizing play activities by structural type and associated cognitive activation levels reveals substantial variation in pedagogical quality. Very structured play (teacher-directed with rigid rules) occurred in 34 sessions (21%) and predominantly elicited lower-order cognitive responses such as recalling information and following instructions.

Flexibly structured play (teacher-directed but allowing exploration) was observed in 28 sessions (18%) and supported learning processes at the level of understanding and application. Semi-structured play (child-initiated with minimal teacher scaffolding) represented the largest proportion—58 sessions (36%)—and activated higher-order cognition including analysis, innovation, and creative problem-solving. Free play accounted for 40 sessions (25%), with cognitive activation ranging from minimal repetition to sophisticated experimentation depending on child initiative and contextual affordances. Although semi-structured and free play modalities exhibit the highest potential for stimulating complex cognitive engagement, observational evidence indicates that teacher facilitation remains limited and inconsistent,

resulting in missed opportunities to harness play as a deliberate cognitive learning mechanism rather than a background activity.

Table 1 synthesizes the multiple barriers impeding optimal implementation of play-based cognitive development identified through in-depth interviews with educators.

Table 1. Primary Barriers to Play-Based Learning Implementation

Barrier Category	Specific Barrier	Frequency (n=6 Teachers)
Knowladge and Skills	Limited Understanding of play-specivic cognitive mechanisms	5
Institutional Pressures	Acadmic expectations from parents and market	6
Professional Development	Insufficient training in play based learning pedagogy	6

The most severe barrier is academic pressure from parental expectations (4.8 severity rating), followed closely by insufficient professional development (4.5) and knowledge gaps regarding cognitive mechanisms (4.2). Notably, these represent institutional and human capital barriers rather than merely material resource limitations. The finding that the most constraining barrier is external expectation alignment rather than internal capacity directly implicates the ecosystem surrounding the institution as the primary locus of intervention.

Deeper analysis reveals that educators experience acute tension between professional ideals and institutional realities. Multiple educators articulated frustration with their current practice patterns. One educator stated: "I want children to play more, but parents complain that their child comes home without having learned to write. We are stressed by this dilemma. Additionally, we don't know exactly what to observe during play to determine whether a child's cognitive development is adequate." This statement encapsulates three distinct barriers: (1) external pressure from uninformed parental expectations; (2) institutional anxiety about market positioning; and (3) lack of technical tools for systematic observation and assessment. The absence of systematic cognitive monitoring means educators cannot generate evidence to counter parental academic concerns or demonstrate play's developmental efficacy. This creates a vicious cycle where lack of evidence perpetuates academic pressure, which further marginalizes play.

Contextual Adaptations and Resource Optimization

Despite financial constraints (approximately $2,360 per child annually compared to $5,000–8,000 in large urban ECE centers), RA Nurul Iman Leuwimunding has developed creative adaptation strategies. Observation and interviews identified five primary adaptation approaches: (1) systematic reuse and recycling of waste materials plastic bottles become sensory play materials, cardboard boxes serve as construction and hiding game materials, scrap paper supports art activities implemented in 87% of observed play sessions with minimal cost and moderate-to-high child engagement (67%); (2) outdoor play optimization maximizing natural spaces and materials (sand, soil, stones, leaves) for large motor development, implemented in 100% of outdoor sessions with high engagement (78%); (3) mixed-age play grouping combining children from different age groups, implemented in 60% of activities to leverage peer modeling and social scaffolding with moderate social-emotional benefits; (4) community engagement incorporating parent and community volunteers for co-facilitation in 25% of activities with minimal cost but limited consistency; and (5) teacher-made educational manipulatives developed by educators themselves (cards, sorting materials, blocks) in 45% of activities with monthly material costs of approximately IDR 50,000–100,000.

These adaptations demonstrate resourcefulness and creative problem-solving capacity. However, implementation remains largely ad-hoc rather than systematically integrated into formal curriculum planning. Analysis of 20 daily lesson plans revealed that only 30% explicitly incorporated adaptation strategies in a coordinated manner aligned with curriculum objectives. Most implementation depends on individual teacher initiative rather than institutional systems. This suggests that while the capacity for resource-optimal practice exists, the institutional infrastructure for systematic implementation remains underdeveloped. With structured systems and explicit incentives, these adaptations could be significantly expanded and formalized.

When asked what support would most improve their play-based implementation, all six educators identified specific professional development needs. Mekanisme kognitif dan play-based learning theory ranked as the highest priority (100%, priority score 5.0), with educators requesting understanding of developmental theories (Piaget, Vygotsky, contemporary), linking specific play activities to cognitive outcomes, and recognizing cognitive milestones during play. Observation and assessment skills ranked second (100%, score 4.8), with educators requesting systematic observation techniques, behavioral recording and analysis methods, and assessment-

guided activity design. Facilitating play for maximum cognitive learning ranked third (83%, score 4.5), requesting questioning techniques for cognitive stimulation, guidance for balancing structured and free play, and scaffolding strategies. Communication with parents about play's value ranked fourth (83%, score 4.2).

The universality of these needs across all educators, combined with their high severity ratings, indicates that targeted professional development represents a high-impact intervention point. Currently, all six educators reported never receiving formal training specifically addressing play-based learning pedagogy or cognitive observation during play. One educator stated: "If I understood better how cognition works during play and had tools to observe and document it, I would feel much more confident designing intentional play activities and explaining their value to parents with evidence."

Analysis of focus group discussions with 24 parents reveals that 46% view academics as more important than play despite recognizing play's importance, while only 38% prioritize play as a primary mechanism for cognitive development. When asked about activities they conduct with their child at home, 88% reported prioritizing academic drills (mean frequency 4.8x weekly, mean duration 28 minutes), while only 21% engage in structured play with cognitive intent (1.2x weekly, 12 minutes). Screen time significantly dominates engagement patterns (4.2x weekly, 85 minutes mean duration) in 79% of families.

However, findings also reveal substantial opportunity for intervention. When presented with research evidence about play's cognitive benefits, 81% of parents expressed interest in engaging in more intentional play with their children at home. When asked about barriers, 67% identified lack of concrete guidance about "how to play effectively for cognitive development" as the primary constraint. One parent stated: "I want to play more with my child, but I'm not sure what kind of play would help their cognitive development. I'm more confident with academic activities because I learned these myself." This suggests that parental engagement in play-based approaches remains limited not by lack of motivation but by insufficient guidance and evidence-based information.

The finding that 71% of parents perceive play as "frivolous" versus academically productive reflects the cultural context in which academic acceleration and early literacy/numeracy are highly valued. However, the demonstrated openness to evidence-based reframing indicates that systematic parent education programs coupling research evidence with practical guidance could substantially shift engagement patterns. This

represents a leverage point for amplifying play-based learning effects through family-level reinforcement.

Analysis of institutional documentation reveals a critical infrastructure gap. Current monitoring systems formally document academic skill achievement (writing, reading, numeracy) with high structural formality in report cards. Social-emotional development is partially documented in anecdotal records with medium formality (Mukhlisin et al., 2024). However, specific cognitive skill development (working memory, sustained attention, problem-solving, executive function, cognitive flexibility) is minimally documented with low formality. Most significantly, systematic observation of play quality, cognitive behavior manifestation during play, and specific activity effectiveness tracking are entirely absent from institutional practice.

The head administrator acknowledged this gap: "We don't have clear data about whether the play we conduct effectively increases children's cognitive skills. We only know from general observation, not systematically." This absence of systematic data creates multiple problems: (1) it prevents educators from generating evidence to counter parental academic pressure; (2) it precludes evidence-based decision-making for play activity design and refinement; (3) it limits institutional accountability for developmental outcomes; and (4) it prevents longitudinal tracking of play intervention effectiveness. The establishment of systematic monitoring represents both an urgent need and a strategic intervention opportunity for institutional improvement.

Discussion

Theoretical Interpretation and Practice Implications

The empirical findings reveal a complex interplay of systemic forces that shape play-based learning implementation in early childhood education settings, demonstrating remarkable alignment with Bronfenbrenner's ecological systems theory. This theoretical framework provides a lens through which to understand how various contextual layers interact to influence pedagogical practice at the classroom level.

At the macrosystem level, deeply embedded cultural values create a foundational orientation toward academic achievement and early literacy acquisition. These cultural beliefs operate as invisible yet powerful forces that permeate societal expectations about the purpose and outcomes of early childhood education. In many contexts, there exists a prevailing cultural narrative that positions early academic preparation particularly in literacy and numeracy as the primary indicator of educational quality and future success. This cultural emphasis on measurable academic outcomes creates what might

be termed a "downward pressure" on all subsequent system levels, establishing parameters within which educational decisions are made. The exosystem layer translates these broad cultural values into more concrete structural pressures. Labor market demands for academically prepared workers create institutional imperatives that filter down to educational settings. Parents, responding to perceived employment market requirements and competitive educational pathways, develop expectations that their children will acquire specific academic competencies during the early childhood years. These parental expectations are not arbitrary but represent rational responses to broader economic and social structures. The exosystem thus serves as a transmission mechanism, converting abstract cultural values into tangible institutional pressures that early childhood centers must navigate (Imron Rosadi, 2021).

At the mesosystem level, the quality and nature of family-institution communication patterns become critical. The alignment or misalignment between home and institutional educational philosophies directly influences what transpires in classrooms. When communication channels effectively bridge family expectations and institutional practice, there exists potential for mutual education and expectation adjustment. However, when communication is limited or unidirectional, institutional practice tends to conform to perceived rather than negotiated family expectations. The mesosystem represents a potential intervention point where dialogue might reshape mutual understanding about developmentally appropriate practice (Alfieri et al., 2011). These multiple system levels converge at the microsystem the classroom itself where educators make daily decisions about time allocation, activity selection, and pedagogical approach. The quantitative data revealing specific time allocation patterns represents the visible manifestation of these cascading influences. When educators allocate limited time to play-based activities despite recognizing their developmental value, this decision reflects not merely individual preference but the accumulated weight of pressures from all ecological levels. Parental expectations rooted in macrosystem cultural beliefs flow through exosystem labor market concerns, are mediated by mesosystem communication patterns, and ultimately manifest in microsystem classroom practice.

The ecological systems perspective offers a crucial insight: sustainable transformation of play-based implementation cannot be achieved through isolated interventions at a single system level. Classroom-level professional development, while necessary, proves insufficient when educators face contradictory pressures from family expectations, institutional enrollment concerns, and broader cultural narratives about educational quality. Instead,

effective change requires coordinated intervention across multiple system levels. At the microsystem level, this means enhanced pedagogical skills; at the mesosystem level, improved family-institution communication and mutual education; and at the macrosystem level, broader cultural reframing of what constitutes quality early education and how it relates to long-term developmental outcomes

This ecological analysis suggests that when families understand play as cognitively rigorous rather than frivolous, when institutions can articulate play's role in school readiness through effective communication, and when broader cultural narratives expand beyond narrow academic metrics to encompass holistic development, the pressure on classroom practice shifts, creating space for developmentally appropriate pedagogy.

Resource Adaptation and Implementation Fidelity

The successful contextual adaptations identified material recycling, outdoor utilization, community engagement demonstrate that play-based learning is not exclusively dependent on expensive commercial resources. However, the ad-hoc implementation pattern suggests that without systematic frameworks, creative adaptations remain underutilized. Rispoli research on intervention adaptation demonstrates that moderate adaptation levels maintain effectiveness, whereas excessive adaptation reduces impact (Rispoli et al., 2018). The adaptations at RA Nurul Iman represent moderate-level adaptation maintaining developmental appropriateness while respecting local constraints. The gap between adaptive capacity and systematic implementation represents an institution-building opportunity.

The demonstrated openness of 81% of parents to shift their engagement toward play-based approaches when provided evidence contradicts deficit-based narratives about parent resistance. Instead, findings suggest that parental behavior reflects rational response to incomplete information within a cultural context valuing academic achievement. Strategic parental engagement programs coupling research evidence with practical guidance, combined with institution-level communication about play-based outcomes, could shift this behavior pattern substantially. This alignment of family and institutional approaches represents one of the most accessible intervention points for strengthening play-based learning implementation (Zickafoose et al., 2024).

The findings generate several direct implications for practice and policy. First, professional development investments must target not just knowledge transfer but behavioral skill development through coached practice and feedback. Second, curriculum policy at district and institutional levels should

specify play allocation targets (25–30% of learning time) with clear articulation of connections to cognitive outcomes. Third, parent communication strategies must systematically document and share cognitive development evidence from play, not only academic achievement data. Fourth, institutional monitoring systems must be expanded to include cognitive development through play using systematic observation protocols. Fifth, district-level quality standards should explicitly require play-based learning components with educator training and monitoring accountability (Lillard et al., 2013).

Internal validity is strengthened through multiple data sources, triangulation, member checking, and data saturation within the case. The findings align with international literature on play-based learning barriers and pedagogy, enhancing credibility (Swallow & Olofson, 2017). Generalizability to other semi-urban ECE settings sharing similar resource constraints and cultural contexts is moderate. The six-month timeframe permitted observation of implementation patterns but not long-term developmental outcome measurement. Quantitative measurement of specific cognitive skill changes would strengthen causal claims. These limitations counsel appropriate caution in generalization while maintaining relevance for similar institutional contexts (Morse & Clark, 2019).

CONCLUSION

The findings of this six-month study demonstrate that RA Nurul Iman Leuwimunding possesses structural potential for effective play-based cognitive development, yet implementation remains constrained by systemic and cultural pressures that reinforce academic-driven learning approaches. Despite educators' conceptual awareness of the importance of play, classroom practices overwhelmingly prioritize reading, writing, and numeracy drills, while cognitively oriented play receives minimal time allocation and limited pedagogical intentionality. The predominant barriers are not material resource shortages, but rather knowledge gaps in linking play to cognitive mechanisms, insufficient professional development, and strong parental expectations for accelerated academic outcomes. The absence of systematic monitoring of cognitive development further limits educators' ability to document play-based learning results and advocate convincingly to parents and institutional stakeholders. These findings highlight that sustainable improvement in the quality of play-based learning requires multilevel interventions that address classroom practice, educator competence, parental mindsets, and institutional systems simultaneously. Priority strategies include professional development focused on practical facilitation skills and cognitive

observation during play, the integration of play-based approaches into structured curriculum planning, and systematic family engagement programs that communicate research-based evidence about play's developmental benefits. At the institutional level, cognitive monitoring tools should be adopted to enable data-driven decision-making and strengthen transparency and accountability. With these supports in place, the creative adaptation capacity already demonstrated by educators such as recycling materials, using natural environments, and involving community members can be systematized to maximize developmental outcomes. Ultimately, the study underscores that play-based learning is not a matter of resource abundance but of informed pedagogy, ecosystem alignment, and shared commitment across educators, families, and administrators.

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