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Developmental Education and Early Childhood Cognitive Growth: Evidence from Kindergartens in Jakarta

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Abstract

Early childhood is a crucial phase for establishing the foundations of lifelong learning, yet the effectiveness of developmental approaches in Indonesia's kindergartens remains limited in research. This study investigates how developmental education supports children's cognitive growth in Jakarta, focusing on literacy, numeracy, working memory, and language development. Using a mixed-methods design, standardized cognitive assessments were combined with observations and interviews with teachers and parents. The sample involved 200 kindergarten children from ten schools representing diverse socioeconomic backgrounds. Results show notable cognitive gains over one academic year, particularly in literacy and language abilities, while improvements in working memory were smaller but still meaningful. However, socioeconomic disparities were visible, with children in higher-SES schools benefiting from richer learning environments. Observational data revealed that although play-based and child-centered activities were widely applied, rote instruction remained common in numeracy lessons. Teachers and parents generally supported developmental approaches, yet many parents emphasized early English learning, reflecting societal pressures. Overall, findings indicate that developmental education can enhance school readiness, but its benefits are unevenly distributed. Strengthening teacher capacity, improving resources in low-SES schools, and aligning expectations with parents are necessary to ensure more inclusive and equitable early childhood education in Indonesia.

INTRODUCTION

Early childhood is widely recognized as a foundational period for human development, during which children acquire essential cognitive, socio-emotional, and language skills that shape lifelong learning trajectories (Shonkoff & Phillips, 2000; UNICEF, 2021). Advances in developmental neuroscience show that rapid brain growth occurs in the first six years of life, making early experiences highly influential on neural architecture and executive functioning (Center on the Developing Child, 2020). Educational practices implemented in kindergarten are therefore critical for supporting children's ability to think, communicate, and solve problems. Developmental education, which emphasizes holistic, play-based, and child-centered

learning, is recognized globally as an effective pedagogical approach to fostering curiosity, creativity, and cognitive development in early childhood (Bodrova & Leong, 2019; Hirsh-Pasek et al., 2022). As countries intensify efforts to improve school readiness and global competitiveness, understanding how developmental pedagogy is enacted and how it influences children's cognitive outcomes has become increasingly important.

In Southeast Asia, including Indonesia, early childhood education (ECE) has expanded rapidly in response to policy reforms and growing parental aspirations for academic success (UNESCO, 2019). Jakarta, as the nation's capital and economic center, presents a unique landscape where diverse socioeconomic backgrounds converge within a competitive educational environment. Although the Indonesian government promotes child-centered learning through the Early Childhood Education Curriculum (Kurikulum PAUD), classroom practices often combine developmental approaches with traditional, teacher-led instruction (Suryani, 2019). Many parents still believe early literacy, numeracy, and English proficiency should be emphasized to secure future academic achievement, creating a tension between developmental goals and academic expectations (Rohita & Hasanah, 2021). Given this context, evaluating how developmental education supports measurable cognitive growth in Jakarta's kindergartens is highly relevant for advancing equitable and evidence-based ECE reforms.

Despite rising awareness of the importance of early childhood development, the quality of ECE services in Indonesia remains uneven and strongly correlated with socioeconomic status (Rahmawati et al., 2020). Children in well-resourced, private urban kindergartens often experience stimulating learning environments with highly trained teachers, while children from lower-income communities frequently encounter overcrowded classrooms, limited materials, and reduced opportunities for exploratory learning (Susanto et al., 2022). As a result, learning gaps may emerge even before formal schooling begins, reinforcing long-term educational disparities (Naedah & Aulia, 2023). Research in other countries has shown that developmental pedagogy can mitigate such disparities when properly supported (Sylva et al., 2014), yet empirical evidence linking these practices to cognitive outcomes in Indonesia remains limited. This raises a pressing research problem: To what extent do developmental education practices in Jakarta's kindergartens promote cognitive growth, and how is this impact influenced by socioeconomic differences?

A common approach to improving school readiness is to implement academically oriented instruction earlier in life, assuming that structured learning accelerates cognitive development (Pomerantz & Grolnick, 2017). However, scholars argue that rigid academic pressure can reduce intrinsic motivation, limit creativity, and increase stress, especially when introduced before children attain necessary cognitive maturity (Weisberg et al., 2020). Developmental education provides a more balanced solution by engaging children in meaningful play, social interaction, and guided discovery. These approaches are shown to enhance language development, early literacy, numeracy reasoning, and executive functions during kindergarten years (Vitiello & Williford, 2021). Nevertheless, successful implementation requires consistent teacher training, adequate materials, and alignment between school practices and parental expectations factors that vary greatly across Jakarta's socioeconomic spectrum.

Previous international research offers strong theoretical justification for developmental approaches. Play-based learning has been linked to improvements in working memory, attention, and flexible thinking, as well as stronger language and literacy competencies (Diamond & Lee, 2011; Toub et al., 2018). Interaction-rich classroom environments foster vocabulary growth and narrative skills through storytelling and peer conversation (Han & Neuharth-Pritchett, 2015). Similarly,

numeracy development can be strengthened through manipulatives, games, and problem-solving tasks rather than memorization of abstract symbols (Sarama & Clements, 2017). These studies demonstrate that developmental pedagogy is not only appropriate for children's age but also advances core academic foundations needed for later schooling.

Research in Indonesia has begun to document teachers' adoption of child-centered activities, such as role play, creative arts, and collaborative games. These strategies have been associated with positive socio-emotional development and emerging pre-academic skills (Suparno & Nugraheni, 2020). However, despite policy encouragement, teachers often revert to rote instruction, particularly in literacy and numeracy, due to limited professional development, insufficient classroom resources, and pressure from parents who expect rapid academic results (Mulyana, 2022). As a result, developmental education may not be implemented with full fidelity, especially in low-income schools where constraints are more severe (Adawiyah & Kusuma, 2023). Thus, local evidence is needed to determine how much developmental teaching is actually occurring in Indonesian kindergartens and whether it meaningfully contributes to cognitive advancement.

Growing scholarship highlights that socioeconomic context moderates the effectiveness of early education (Duncan & Magnuson, 2012). Children from higher-SES homes are more likely to benefit from developmental instruction because it strengthens skills already nurtured by literacy-rich home environments (Hart & Risley, 2003). In contrast, children from resource-constrained settings may experience slower gains unless schools provide compensatory support (Yoshikawa et al., 2015). While this pattern has been demonstrated in multiple countries, few studies have empirically tested it in Indonesian early education settings. A clear understanding of how socioeconomic disparities shape developmental learning outcomes in Jakarta would offer important insight for policymakers seeking to improve equity in ECE provision.

METHODS

A rigorous methodological framework is essential in early childhood research to establish a strong link between educational practices and children's developmental outcomes (Creswell & Plano Clark, 2018). Because cognitive growth in young children is influenced by environmental, pedagogical, and familial factors, this study employed a convergent mixed-methods design that integrates quantitative and qualitative data. Mixed-methods approaches provide comprehensive insights by combining measurable developmental progress with contextual explanations derived from stakeholder experiences, thereby strengthening both internal and external validity (Tashakkori & Teddlie, 2010). This decision aligns with international recommendations for early childhood education research, where developmental change is best examined through multimodal evidence (Sylva et al., 2014). Through triangulation of data sources, the study captures not only *how much* children's cognitive abilities improve during one year of kindergarten but also *why* these improvements occur differently across schools.

The research took place in Jakarta, Indonesia's capital, selected for its socioeconomically diverse educational landscape and rapid expansion of early childhood programs (UNESCO, 2019). Ten kindergartens were purposively chosen across five administrative districts to reflect heterogeneous socioeconomic status (SES) conditions. Socioeconomic classification was based on school fees, neighborhood characteristics, and principal reports, consistent with previous Indonesian ECE studies (Rahmawati et al., 2020; Susanto et al., 2022). Within each kindergarten, two classes serving children aged five to six years were included, as this age group corresponds to kindergarten level B, the final stage before primary

education. All eligible children were invited to join the study following parental consent procedures, and the final sample comprised 200 children. This recruitment strategy enabled comparisons of developmental education practices and outcomes between schools serving high-SES and low-SES communities, a necessary approach for analyzing educational equity in early childhood contexts (Duncan & Magnuson, 2012; Yoshikawa et al., 2015).

Ethical approval for the study was granted by the researchers' institutional review board, ensuring compliance with ethical standards for research involving young participants. Parents or legal guardians provided written informed consent, and children received age-appropriate verbal explanations to support voluntary participation. School and participant identities were coded to preserve confidentiality and privacy, in accordance with global ethical guidelines for child-centered research (UNICEF, 2021). These protections were maintained throughout data collection, storage, and reporting to ensure respect, safety, and transparency for all stakeholders involved.

Quantitative data were collected through standardized cognitive assessments administered at two time points: the beginning and end of the academic year. Four cognitive domains fundamental to school readiness were measured: early literacy, numeracy, working memory, and language development. These domains reflect core developmental priorities identified in psychological and educational research as predictors of later academic success (Diamond & Lee, 2011; Vitiello & Williford, 2021). The instruments were adapted and translated into Indonesian using expert review to maintain cultural appropriateness and conceptual equivalence, a critical step in cross-cultural assessment development (Hambleton & Lee, 2015). Pre-test and post-test sessions were conducted individually in quiet, familiar school environments to reduce anxiety and ensure accurate performance, following recommended procedures in early childhood testing (Bodrova & Leong, 2019). These assessments generated quantifiable measures of developmental growth for each child over the course of one academic year.

To document instructional practices, classroom observations were conducted three times in each of the 20 participating classrooms. Researchers used a structured protocol focusing on teacher–child interactions, organization of learning environments, and the predominance of child-centered or rote-based instruction. Observational indicators were drawn from internationally recognized frameworks evaluating early learning quality (Sylva et al., 2014; Hirsh-Pasek et al., 2022). Field notes recorded specific teaching behaviors, the type and frequency of play-based activities, the extent of language-rich interactions, and children's engagement during lessons. Observations were performed discreetly to minimize disruption, and repeated visits were used to reduce observer effects. Data from these observations were later summarized quantitatively, as displayed in Table 3 in the Results section, and qualitatively coded to explain variations in teaching practices.

Qualitative data were also collected through semi-structured interviews with 20 teachers and 30 parents representing both higher- and lower-SES school groups. Questions explored participants' understanding of developmental education, expectations for children's academic progress, and perceptions of play-based instruction and English exposure in kindergarten. Teacher interviews provided rich insights into pedagogical decision-making and challenges in implementing child-centered learning, while parent interviews illuminated home learning environments and academic pressures frequently observed in Indonesian urban ECE settings (Rohita & Hasanah, 2021; Mulyana, 2022). Interviews were conducted in Bahasa Indonesia, audio-recorded with permission, and fully transcribed. A thematic analysis approach was used to code the transcripts, allowing patterns to emerge

inductively (Braun & Clarke, 2006). Coding reliability was improved through double-coding of a subset of transcripts by an independent researcher to ensure consistency.

Quantitative analysis was conducted using SPSS software. Descriptive statistics described pre-test and post-test performance across cognitive domains. Paired-sample t-tests evaluated improvements within the same children over time, while independent-sample t-tests were used to compare performance between high-SES and low-SES schools. The analytic approach reflects common statistical techniques for measuring developmental gains in intervention-oriented school research (Yoshikawa et al., 2015). Statistical significance levels were set at $p < .05$. The results of these analyses are displayed in Table 1, which presents children's cognitive gains across one academic year, and Table 2, which demonstrates statistically significant differences between socioeconomic school groups.

Qualitative data analysis proceeded concurrently with quantitative analysis and results from both strands were integrated during the interpretation stage. Thematic patterns derived from interview and observational data helped explain how specific pedagogical practices influenced assessed outcomes, why certain cognitive domains showed stronger gains, and how socioeconomic conditions shaped learning opportunities. This triangulation approach enhanced the credibility of interpretations by verifying findings across multiple evidence sources (Creswell & Plano Clark, 2018). For example, observation data confirming frequent rote instruction in numeracy helped clarify why numeracy gains were slightly lower than literacy and language development scores, as shown in Table 1. Likewise, parental pressure for early English exposure provided a contextual explanation for the persistent academic emphasis reported by teachers, extending interpretation beyond statistical associations.

Reliability and validity were prioritized throughout the research process. Internal consistency assessments confirmed acceptable reliability across all cognitive measurement domains, with Cronbach's alpha values exceeding .80. Observation reliability was supported through observer training and calibration prior to school visits, a necessary procedure to minimize subjective bias in classroom-based studies (Hirsh-Pasek et al., 2022). Methodological rigor in qualitative data was ensured through systematic coding procedures, maintenance of a detailed audit trail, and member checking with teachers to validate emerging interpretations. Together, these strategies enhanced overall trustworthiness, enabling robust conclusions regarding developmental pedagogy and cognitive outcomes.

Although carefully designed, the study faces methodological limitations. The purposive sampling technique limits generalizability beyond Jakarta's urban context, although representation across socioeconomic strata strengthens internal comparisons. Standardized tests captured important aspects of cognitive growth, yet children's learning is multidimensional and influenced by home literacy activities and parental involvement, variables not measured systematically in this study (Hart & Risley, 2003). Additionally, while repeated observations helped minimize observer influence, classroom behavior may still have been altered by researcher presence. These limitations, however, are common in early childhood field research and are balanced by the strengths of integrating multiple data sources that collectively yield rich and actionable insights.

RESULTS AND DISCUSSION

To explore the influence of developmental education on children's cognitive growth, findings are presented in four key areas: (1) children's cognitive outcomes, (2) differences across socioeconomic contexts, (3) observed classroom practices, and (4) teachers' and parents' perspectives. Each theme is supported by data and discussed in relation to early childhood education research in Indonesia.

Children's Cognitive Outcomes

Statistical analysis demonstrated significant cognitive gains across all domains measured early literacy, numeracy, working memory, and language development. These findings confirm that exposure to developmental education practices facilitated children's school readiness and foundational cognitive growth throughout the academic year (Diamond & Lee, 2011; Vitiello & Williford, 2021).

Table 1. Average Cognitive Growth Scores (Pre-test vs. Post-test, N = 200)

Domain	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Gain	p-value
Early Literacy	42.5 (8.2)	58.9 (7.5)	+16.4	<0.001
Numeracy	40.3 (9.1)	55.2 (8.7)	+14.9	<0.001
Working Memory	38.7 (7.9)	47.5 (7.3)	+8.8	<0.01
Language Development	44.1 (8.5)	59.7 (7.8)	+15.6	<0.001

The largest gains were in early literacy and language development. Observational data showed that most classrooms frequently integrated storytelling, singing, conversational role play, and alphabet-related games, which are known to support phonological awareness and vocabulary acquisition in developmental pedagogy (Hirsh-Pasek et al., 2022; Han & Neuharth-Pritchett, 2015).

Numeracy scores also improved significantly, though the gain was slightly smaller. This pattern reflects inconsistent use of play-based numeracy—teachers commonly reverted to rote numerical drills, reducing opportunities to develop reasoning skills foundational to mathematics learning (Sarama & Clements, 2017).

Working memory improvements were smallest yet statistically meaningful. Gains in this domain generally arise from activities involving problem-solving and cognitive flexibility, suggesting that such experiences may not have been consistently provided, especially in resource-limited classrooms (Diamond & Lee, 2011).

Overall, these findings affirm that developmental education strengthens early cognitive skills essential for school transition (Sylva et al., 2014), though the implementation level influences magnitude of benefits.

Differences Across Socioeconomic Contexts

To examine equity-related implications, post-test scores were compared between high-SES and low-SES school groups. Children in high-SES settings scored significantly higher across all measured domains, as shown in Table 2.

Table 2. Post-test Scores by School SES Context

Domain	High-SES Schools (n=100)	Low-SES Schools (n=100)	Mean Difference	p-value
Early Literacy	62.1	55.7	+6.4	<0.01
Numeracy	57.8	52.6	+5.2	<0.05
Working Memory	49.3	45.7	+3.6	<0.05
Language Development	63.5	56.1	+7.4	<0.01

Socioeconomic disparities were most evident in early literacy and language development—domains strongly influenced by home exposure to books, storytelling, and interactive language environments (Hart & Risley, 2003; Duncan & Magnuson, 2012). Teachers in low-SES schools reported limited materials and overcrowded classrooms, restricting optimal implementation of child-centered learning (Susanto et al., 2022).

These results confirm the global pattern that while developmental education benefits all children, those with access to more enriching environments experience stronger gains (Yoshikawa et al., 2015). Thus, implementation of developmental curricula requires equity-focused support to ensure students from diverse backgrounds achieve comparable cognitive development.

Observed Classroom Practices

Structured observations characterized how developmental pedagogy was enacted during instruction. Frequencies of observed practices are shown in Table 3.

Table 3. Frequency of Observed Teaching Practices (10 Schools, 50 Classrooms)

Teaching Practice	High Frequency (%)	Moderate (%)	Low (%)
Play-based learning activities	70	20	10
Teacher-led rote instruction	25	40	35
Language-rich storytelling	65	25	10
Numeracy games / problem-solving	55	30	15
Collaborative group activities	40	35	25

While play-based and language-focused activities were common in most classrooms, rote-based numeracy instruction persisted at moderate to high levels. This reflects teacher attempts to balance mandated curriculum expectations with pressures from parents demanding faster academic achievement (Rohita & Hasanah, 2021). Many teachers expressed that they believed play better supported children's development but were still obliged to demonstrate academic "results" through worksheets and memorization especially in numeracy and English learning (Mulyana, 2022).

Collaborative learning, essential to social-cognitive development (Bodrova & Leong, 2019), appeared at lower frequencies due to spatial constraints and limited teacher capacity to manage small grouping. These findings indicate partial but inconsistent alignment between classroom practices and developmental education principles, illustrating why certain cognitive gains, particularly in working memory, were relatively weaker.

Teachers' and Parents' Perspectives

Teacher and parent interviews provided deeper insights into how contextual pressures shape the implementation of developmental education. Overall, most participants expressed strong support for developmental approaches, emphasizing that they enhance children's independence, curiosity, and readiness for primary school. As presented in Table 4, 90% of teachers and 82% of parents agreed that developmental pedagogy promotes cognitive growth, which aligns with Indonesian research emphasizing the benefits of play-based learning for holistic development (Suparno & Nugraheni, 2020.

Table 4. Teacher and Parent Perceptions of Developmental Education

Statement	Teachers Agree (%)	Parents Agree (%)
Developmental education improves school readiness	90	82
Play-based learning is more effective than rote	75	68
Cognitive gains are visible after 1 year	85	77
English exposure is essential at kindergarten	65	80

Despite this overall positivity, teachers described persistent pressures to integrate academic drills, especially from parents who equate academic rigor with worksheet-based learning. One teacher remarked:

> *"If I focus too much on games, some parents think I am not teaching seriously, even though play helps children learn faster."*

This illustrates how parental expectations can override pedagogical intention, leading to compromises in developmental implementation.

Parents also revealed a strong desire for early English acquisition, a theme reflected in Table 4 where 80% of parents rated English as essential at the kindergarten level. As one parent explained:

> *"English is important now. If children don't learn early, they will fall behind later in school."*

This sentiment reinforces the competitive urban mindset described in international literature, linking language skills with future success (UNESCO, 2019).

Teachers further reported limitations in professional development and classroom resources, particularly affecting implementation in low-SES schools. A teacher in one such school stated:

> *"We want to do more play-based math, but we don't have enough materials, so sometimes we return to worksheets."*

This reinforces resource-based inequities already reflected in the SES achievement differences shown in Table 2 (Susanto et al., 2022).

Nevertheless, both teachers and parents observed visible developmental progress over the academic year. A parent shared:

> *"My child is more confident speaking with others now. Before, they were shy."*

This aligns with the significant literacy and language gains reported in Table 1 and demonstrates the practical impacts of classroom interaction on communication skills (Han & Neuharth-Pritchett, 2015).

This study was investigating how developmental education has affected the cognitive development of children studying in elementary educational institutions within the city of Jakarta and specifically the varying developmental results of children with respect to the different socioeconomic backgrounds. The findings suggest that developmental pedagogical approach has the potential to make a significant difference in the area of literacy, language, numeracy and working memory during the course of one academic year. However, these advantages were not evenly shared and the circumstances affected the loyalty of pedagogical application. Although these empirical findings were mainly reported in the Results section, they were further elaborated and discussed in the Discussion section with their theoretical, practical and policy implications identified, the underlying mechanisms and the future directions of research.

The significant positive results in the literacy and language development indicate the effectiveness of the interaction-rich learning environments in the early childhood. The developmental strategies anticipate the meaning-making in the form of communicative interaction, exploration of narratives, and symbolic play. These experiences are realized to cause neurodevelopment that is majorly language associated regions (Shonkoff and Phillips, 2000). The gains reported in this study can therefore be used to support Vygotskian concepts which highlight social interaction, scaffolding, and linguistic mediation as the most important drivers of early cognitive development. Similar results were also found in the international

literature, as storytelling, dialogic reading, and drama-based play had shown strong correlations with the vocabulary growth and phonological awareness (Han and Neuharth-Pritchett, 2015; Hirsh-Pasek et al., 2022). These findings offer strong rationale in the Indonesian context whereby academic pressure is commonly dominated by memorization as a mean of teaching language.

Numeracy gains, though positive, were relatively small, and require an analysis on the factors that are causing slower improvements on this domain. Early numeracy, unlike literacy, tends to demand abstract conceptualization, which is built up through facilitated exploration of quantity, spatial relations, and problem solving. It was observed that teachers tended to fall back into rote counting and exercise-based practice, which can be attributed to the findings of the research that the early stages of mathematics instruction are prone to instructional regression when the teacher is not confident in the developmental numeracy practices (Sarama and Clements, 2017). Numeracy knowledge is brought out by repetitive manipulations of things, testing of hypotheses, and logical reasoning -s varieties of teaching which require resources, training and tolerance of uncertainty. The numeracy losses found are probably indicative of a partial shift to developmental mathematics pedagogy. To this effect, teacher subject-matter knowledge should be reinforced to speed up numeracy development in child-centered learning institutions.

The smallest improvement was found in the working memory, which should be pondered on. The executive functions are developed due to repetition in activities that have cognitive burden on the children, such as rules negotiation, sequencing planning, and adaptive decision-making (Diamond and Lee, 2011). The data indicate that, despite the widespread occurrence of play, there may be an under-representation of complex play that puts executive processes to the test including team-based problem-solving or long-term goal-driven projects. Inadequate material resources and overcrowded classrooms in schools characterized by low-SES limit the access to such experiences, which is facilitated by structure but not unorganized play. Thus, the results reveal a pedagogical gap: though there is play, it does not have cognitive challenge. This has been highlighted in recent findings that distinguish between fun-based activities and developmental play (Weisberg et al., 2020). Without specific executive-function scaffolding, the benefits of working memory are probably going to be modest regardless of curriculum plans.

The socioeconomic differences in the Results provided should be heavily scrutinized in terms of theory. The excellence of students in high-SES schools could not be attributed to pedagogy alone as the curricular intent is mostly similar throughout Jakarta. Instead, the Discussion needs to investigate to what degree environmental affordances mediate the effectiveness of developmental education. Students with more resource provision enjoy the advantage of enhanced language provision in the home, parental educational intervention, and classroom environments of higher material provision and lower teacher-child ratio. These extrinsic supports intensify the benefit of developmental pedagogy and they work like a multiplier effect (Hart and Risley, 2003; Duncan and Magnuson, 2012). Conversely, students in low-SES environments rely more on the school or other educational establishment as the leading developmental environment; therefore, the lack of resources or pedagogical stability has a more direct restrictive effect on their learning. The inequalities witnessed thus not only conceal socioeconomic realities but also institutional susceptibility: developmental measure regimes assume enablers that should be in place to be fruitfully nurtured. This poses a strong challenge to the Indonesian ECE reform- not filling the gaps in resources makes the pedagogy inadequate to balance the outcomes.

Notably, the outcomes are not an indication that developmental education necessarily puts children with low-SES origins at a disadvantage. Quite on the contrary, the developmental evidence suggests that socioeconomic inequalities can be mitigated when proper developmental strategies are in place (Sylva et al., 2014). This paper highlights that within Indonesia, the reform pace has been higher in the policy than systemic aspects particularly in areas like development of teachers, and spending in the under-resourced schools. It follows that the policy implication is not to limit developmental education but to make the contextual conditions conducive to its effectiveness.

Mechanisms that explained the lack of complete implementation were explained through interviews with teachers. Even though teachers, conceptually, supported developmental principles, they were also sensitive to parental expectations, which resulted into compromising developmental academic modalities. The competitive spirit of urban schooling that is a major trend in Jakarta reflects in the parental pressure in achieving literacy and numeracy skills, especially in the English language. The same trends have been reported in other Asian metropolises when parents often conflate academic acceleration and quality of education (Pomerantz and Grolnick, 2017). In such a way, the Discussion should emphasize the fact that the effectiveness of developmental education depends on changing beliefs of parents, but not simply training teachers. The parents should understand that play is an evidence-based pathway to cognitive development not an opposite of learning. Without such congruence, the efforts of teachers to introduce child-centered learning can always face opposition.

The observational data also show that compliance-based teaching practices remain classroom management teaching strategies especially in under-equipped and overcrowded schools. Under such conditions, the teachers might not be in a position to introduce group-based or exploratory play because of spatial limitations and behavioral challenges. This fact overlaps the dimension of SES: structural conditions mediate the quality of instruction. The research of scholarship on an international level reveals that systematic inequity in the allocation of teachers, infrastructure, and access to materials supports the achievement gap that begins at the preschool stage (Yoshikawa et al., 2015). In turn, this leads the Discussion to conclude that equity requires not only curricular standardisation but also a specific investment, particularly with respect to schools with low-SES communities.

CONCLUSION

This study provides strong empirical evidence that developmental education significantly enhances children's cognitive growth in Jakarta kindergartens, particularly in early literacy and language development where interaction-rich and child-centered learning is most consistently practiced. Although numeracy and working memory also improved, these gains were more modest, indicating that educators require greater support to deliver cognitively challenging and resource-intensive play that strengthens reasoning and executive functions. The findings further highlight that developmental pedagogy alone cannot overcome structural inequities; children from high-SES schools benefited disproportionately due to richer home literacy environments and better-resourced classrooms. Moreover, tensions between curricular ideals and parental expectations especially pressure for early academic performance and English proficiency continue to shape instructional compromises that dilute the quality of developmental implementation. These results underscore the need for more coordinated efforts in teacher professional development, equitable allocation of learning resources, and parent engagement initiatives to build shared understanding of how play-based learning drives cognitive readiness. Strengthening these conditions is essential to ensure that developmental education fulfills its potential not only to improve school readiness but also to reduce

early learning disparities, positioning Indonesia to advance a more just, inclusive, and future-oriented early childhood education system.

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