



Early Detection of Cognitive Developmental Difficulties and Classroom Intervention

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Abstract

Early childhood cognitive development provides an important foundation for attention, working memory, symbolic understanding, problem solving, and later learning. This qualitative case study explored observable indicators of possible cognitive developmental difficulty, barriers to early identification and support, and classroom responses at PPAUDIT Lukmanul Hakim Limboto, Gorontalo. Data were derived from participatory observation in Group A1 and in-depth interviews with the headteacher, teachers, and parents/caregivers. Data were analysed using the interactive model of Miles, Huberman, and Saldaña through data condensation, data display, and conclusion drawing/verification. Findings were organised into three themes. First, classroom observations repeatedly described rapid loss of attention, low concentration, difficulty following group rules and sequential instructions, unstable engagement, and difficulty recognising numerical and alphabetic symbols. Second, interview summaries indicated differences between school and home in interpreting developmental concerns, limited parental understanding, resistance to accepting additional support, inconsistent home stimulation, and problematic gadget use. Third, the source narrative described stronger engagement during short, structured, movement-and-song activities and when teachers used visual cues, concrete examples, task segmentation, positive reinforcement, and predictable transitions. Because the available study documentation does not preserve child-level frequency counts, verbatim interview quotations, a standardised pre-post measure, or a controlled comparison, the findings are reported as qualitative patterns rather than prevalence estimates or evidence of causal effectiveness. The study supports systematic educational observation, careful school-home communication, and developmentally appropriate classroom support, while highlighting the need for more rigorously documented intervention studies.

Introduction

Cognitive development in early childhood provides the foundation for later learning, problem solving, symbolic understanding, attention, and the regulation of behaviour. During this period, children gradually learn to recognise objects and patterns, use language to organise experience, understand simple numerical and spatial relations, and connect new information with existing knowledge. These abilities develop through the interaction of biological maturation, nutrition, language exposure, play, and responsive social stimulation rather than through a single factor (Ningtyas et al., 2026; Mualem et al., 2024; Passos, 2023). Research on early childhood learning therefore emphasises the importance of developmentally appropriate activities that allow children to learn through concrete experience, repetition, and interaction (Ishariani1 et al., 2025; Ndai et al., 2023; Nurwijayant, 2025).

Attention and executive processes are especially important because children must be able to hold information temporarily, inhibit irrelevant responses, shift between tasks, and follow simple sequences before they can participate consistently in more complex classroom activities (González-del-Castillo & Barbero-Alcocer, 2025). Early childhood is also a period of substantial neural plasticity, so repeated experiences can strengthen functional learning patterns. Nevertheless, developmental variation is considerable at this age. A child who has difficulty sustaining attention, following instructions, or recognising symbols should therefore not automatically be labelled as having a clinical disorder. Such behaviours are better treated initially as indicators that require systematic observation, contextual interpretation, and, when necessary, referral for further assessment (Rohmah, 2025; Hulu et al., 2025; Dahlan et al., 2025).

The quality of the child's immediate environment can either support or complicate these developmental processes. At school, routines, clear instructions, concrete learning materials, and supportive teacher–child interaction can reduce unnecessary processing demands. At home, responsive communication, shared play, story reading, and repeated opportunities to complete simple tasks can extend the learning process beyond classroom hours. Caregiver understanding is therefore central to the continuity of stimulation, particularly when a child needs additional support (Afifah, 2026; Hilário et al., 2025; La Rosa et al., 2024). Family interaction patterns and heavy gadget use may also affect the amount of direct communication and play available to the child, making collaboration between educators and caregivers important when concerns are observed (Fauziyyah et al., 2026; Kinant, 2025; Zaini et al., 2025).

In Indonesia, early childhood education settings vary considerably in resources, teacher preparation, family involvement, and access to developmental support (Lestiawati et al., 2025; Maulani et al., 2026). These differences can influence how quickly learning difficulties are noticed and how consistently follow-up support is provided. The challenge is not only to identify children who appear to struggle but also to distinguish transient developmental variation from patterns that persist across activities and contexts. Educational institutions in local communities therefore have an important role in documenting observable behaviour, communicating with families, and organising appropriate classroom accommodation without prematurely assigning diagnostic labels (Ulya et al., 2026; Rohayani et al., 2023; Cetinbas, 2026; Ober, 2024).

A growing body of literature has examined play-based and movement-oriented approaches for supporting early cognitive and learning skills. Loose-parts activities have been used to encourage classification, problem solving, and flexible exploration (Rifqiah et al., 2026), while movement-based exercises such as Brain Gym have been investigated in relation to cognitive outcomes in young children (Ishariani et al., 2025). Studies of early literacy and parental perceptions likewise demonstrate the importance of structured, engaging learning experiences and family participation during the preschool period (Crim et al., 2024; Rosepti et al., 2024). Other intervention literature highlights the value of consistent routines, positive reinforcement, and adjustment of task demands when children show withdrawal or learning difficulty (Rahma et al., 2026). These studies provide useful intervention principles, but their findings cannot be assumed to apply automatically to every local educational context.

PPAUDIT Lukmanul Hakim Limboto offers a distinctive setting because classroom learning is organised within an integrated Islamic early childhood education environment (Sholeh et al., 2025; Ahnan'Azzam & Lenny, 2024; Nurfaizal et al., 2024). The original study sought to understand how signs of cognitive difficulty become visible in everyday classroom activity and

how educators and parents respond to them. The local context is important because the effectiveness of support depends not only on the selected activity but also on the way teachers structure instructions, the child's opportunities for direct interaction, the consistency of stimulation at home, and the educational values embedded in the school routine (Erdemir, 2022). The study therefore focuses on naturally occurring educational observations and stakeholder perceptions rather than on clinical diagnosis.

The study addressed three questions: (1) What observable indicators of possible cognitive developmental difficulty emerge during learning activities in Group A1 at PPAUDIT Lukmanul Hakim Limboto? (2) What barriers do educators and parents describe in identifying and supporting children who show these indicators? and (3) What classroom responses appear to support children's attention and engagement? By organising the inquiry around these questions, the study aims to contribute a context-sensitive account of early educational detection and support while maintaining a clear distinction between empirical classroom findings, theoretical interpretation, and recommendations for future practice.

Methods

Research Design and Setting

This study used a qualitative case study design to examine how observable cognitive developmental difficulties were identified and addressed within the everyday learning environment at PPAUDIT Lukmanul Hakim Limboto, Gorontalo. A case study approach was appropriate because the research focused on interactions among children, teachers, parents, classroom routines, and instructional responses within a bounded educational setting. The study did not aim to establish a clinical diagnosis or estimate population prevalence; instead, it sought to understand behavioural indicators and support practices as they appeared in the local school context.

The focal classroom was Group A1, which included children aged 4–5 years. The study setting was selected because it provided direct access to naturally occurring early childhood learning activities and to an integrated Islamic curriculum in which cognitive stimulation, movement, social interaction, and character education were combined in daily practice.

Study Period, Participants, and Selection

Participants comprised children in Group A1 and adult informants who were directly involved in their education, namely the headteacher, class teachers, and parents/caregivers. Children were included because classroom observation was required to identify patterns of attention, response to instructions, participation in group activities, and symbol recognition. Adult informants were included to provide complementary perspectives on developmental expectations, classroom behaviour, home stimulation, and perceived barriers to follow-up support.

Data Collection

Two primary data-collection approaches were used: participatory classroom observation and in-depth interviews. During participatory observation, the researcher was directly involved in teaching and learning activities in Group A1 while documenting children's responses to routine classroom demands. The observational focus included sustained attention, rapid boredom, response to verbal instructions, ability to follow simple sequences and group rules, engagement with educational learning tools, recognition of numerical and alphabetic symbols, behaviour during transitions, and responses to movement-and-song activities. Field notes provided the principal observational record used in the subsequent analysis.

In-depth interviews were conducted with the headteacher, class teachers, and parents/caregivers. The interviews explored participants' understanding of cognitive development, signs of learning difficulty noticed at school or home, responses to children who required repeated instructions or additional support, home stimulation practices, gadget use, communication between school and family, and perceptions of classroom strategies. Interview material and field notes were treated as complementary sources so that classroom observations could be compared with adult interpretations of the same developmental concerns.

Classroom Support and Intervention Exposure

Movement and Song was observed as part of the classroom response to children who had difficulty sustaining attention or remaining engaged in verbally dominated activities. The activity combined simple movement, rhythm, imitation, and short instructions and was integrated into the normal play-based classroom routine. In the source manuscript, children were described as showing stronger attention and emotional engagement during these activities than during monotonous worksheet-based or verbally dense routines. Because the available report does not document a standardised experimental treatment or controlled comparison, Movement and Song is treated here as an observed classroom support strategy rather than as an intervention whose causal effectiveness has been established.

Brain Gym, including Double Doodle and Cross Crawl, was discussed in the original manuscript as a potentially relevant movement-based approach. However, the available Methods do not document a sufficiently specified Brain Gym implementation with identifiable participants, dosage, session frequency, or pre–post outcome assessment. Brain Gym is therefore not reported as an empirically evaluated intervention in the Results; it is considered in the Discussion only as a literature-informed option for future structured evaluation.

Data Analysis and Trustworthiness

Data were analysed using the interactive model developed by Miles, Huberman, and Saldaña (Miles et al., 2014). Analysis proceeded iteratively through data condensation, data display, and conclusion drawing/verification. Field-note and interview-transcript segments were first reviewed for content relevant to the research questions. Initial codes were then grouped into three higher-order themes that had emerged in the source analysis: (1) indicators of developmental difficulty, (2) barriers to detection and support, and (3) intervention or classroom-response patterns. Within each theme, observational evidence was compared with statements from teachers, the headteacher, and parents/caregivers to identify convergence and divergence across sources.

Source triangulation was pursued by comparing perspectives from the headteacher, teachers, and parents/caregivers, while method triangulation involved comparing interview material with classroom observation. Conclusions were retained when they were consistent with the available evidence and were revised when observations and interview accounts did not support the same interpretation. The revised Results section therefore distinguishes directly observed classroom patterns from stakeholder perceptions and from recommendations derived from the literature.

Ethical Considerations and Researcher Reflexivity

Because the study involved young children and family members, ethical reporting requires explicit documentation of institutional permission, parental consent, confidentiality, and the protection of children's identities. Participant names should not be used in the Results; quotations should be identified only by non-identifying codes such as Teacher 1 (T1), Parent 1 (P1), or Headteacher (HT), unless the approved protocol specifies another system.

Results and Discussion

The Results are restricted to information described in the manuscript as arising from classroom observation and interviews. Regional stunting prevalence, socio-economic conditions, KPSP screening, and multidisciplinary services are not presented as empirical findings because the available Methods do not document direct measurement or systematic collection of those data. The findings are organised according to the three themes used in the analysis: indicators of developmental difficulty, barriers to detection and support, and classroom intervention responses.

Indicators of Possible Cognitive Developmental Difficulty

Classroom observations in Group A1 documented several recurring patterns that may indicate a need for additional developmental support. The most prominent were rapid boredom and difficulty maintaining concentration during learning activities. Children showing these patterns shifted attention away from the task, required repeated prompts, or stopped participating before the activity was complete. These difficulties were especially visible when activities depended on sustained listening or required children to remember a sequence of instructions.

Difficulty following the rules of group games was another observed pattern. Group activities required children to understand a rule, remember their turn, regulate their behaviour, and coordinate their actions with peers. When attention was unstable, some children appeared to miss parts of the instructions or lose track of the expected sequence. In the source observations, this behaviour was interpreted not simply as non-compliance but as a possible difficulty in sustaining and organising information long enough to act on it.

Sequential tasks also revealed differences in children's engagement. During simple art and classroom activities that involved several steps, some children needed repeated guidance to continue from one stage to the next or stopped before completing the sequence. The same pattern was apparent during transitions, when children had to stop one activity, attend to a new instruction, and begin another task. These observations suggest that the process of completing an activity not only the final product provided useful information about attention, working memory, and task persistence.

The observations further identified difficulty recognising numerical and alphabetic symbols. Some children had difficulty linking graphic symbols with their numerical or phonetic meaning. Because the study did not include a standardised developmental or diagnostic assessment, these behaviours are reported as observable indicators of possible developmental difficulty rather than evidence of a specific cognitive disorder. Educational observation can identify children who may require additional support, but diagnosis would require an appropriately qualified professional and validated assessment procedures.

Table 1. Provisional qualitative pattern summary of observable indicators in Group A1

Indicator	Evidence reconstructed from source narrative	Provisional pattern status
Rapid boredom / low concentration	Attention shifted away from tasks; repeated prompts were described; participation sometimes stopped before completion.	Most prominent / recurrent
Difficulty following group rules or instructions	Children sometimes missed parts of instructions, forgot expected sequences, or lost track of turns during group activities.	Recurrent

Difficulty completing sequential tasks	Some children required repeated guidance to move from one step to the next in simple art or classroom activities.	Recurrent
Difficulty recognising numerical/alphabetic symbols	Some children had difficulty linking graphic symbols with numerical or phonetic meaning.	Observed in some children
Unstable engagement / transition difficulty	Engagement decreased when activities changed or new instructions required children to stop one task and begin another.	Recurrent

Barriers to Early Detection and Continued Support

Interview material indicated a gap between the way developmental concerns were interpreted at school and at home. Teachers observed children across structured group activities and compared their responses with the demands of the classroom, whereas parents interpreted behaviour in the context of everyday family routines. The manuscript describes situations in which signs such as rapid boredom, difficulty following instructions, or easily distracted attention were regarded by some parents as a temporary phase rather than as a reason for additional observation or support.

The interviews also described emotional resistance when parents were informed that their child might require additional assistance. This response was linked in the source narrative to limited knowledge of developmental milestones and to concern about the meaning of developmental difficulty. The finding indicates that communication between teachers and parents is part of the early-identification process. A message framed around observable behaviour and practical support is likely to be more useful than language that implies a diagnosis that the school has not established.

Home stimulation emerged as another recurring issue. Teachers and parents described the importance of repeated opportunities for children to follow simple routines, interact with adults, handle concrete materials, and complete short tasks. The manuscript also identified gadget use as a barrier when screen-based activity displaced direct interaction and play. This finding is consistent with the study's broader emphasis on continuity: strategies used at school are less likely to become stable learning habits if children receive little opportunity to practise similar attention, communication, and turn-taking skills at home.

Table 2. Key Barriers to Early Childhood Learning Support and Their Supporting Evidence

Barrier	Provisional evidence reconstructed from source narrative	Source type described
School-home interpretation gap	Teachers observed difficulties under structured classroom demands, while some parents interpreted similar behaviours as ordinary variation or behaviour.	Teacher/headteacher + parent summaries
Limited developmental literacy / acceptance	The manuscript describes limited knowledge of developmental milestones	Adult interview summaries

	and emotional resistance when additional support was discussed.	
Inconsistent home stimulation	Home routines were described as variable, reducing repetition of short tasks, shared reading, and guided play used to reinforce classroom learning.	Teacher + parent summaries
Problematic gadget use	The narrative identifies gadget dependence as reducing opportunities for direct interaction and sustained offline activity.	Teacher/parent summaries + literature context

Classroom Intervention Responses

The third theme concerned children's responses to changes in the way classroom activities were presented. The source observations consistently described better engagement when teachers reduced the processing demands of an activity. Helpful practices included giving short instructions, presenting one step at a time, modelling the expected action, using concrete objects or visual cues, dividing a task into manageable components, and preparing children for transitions between activities. These practices did not change the learning goal; instead, they changed how information was made accessible to children who were easily distracted or who needed more time to process instructions.

Movement and Song was the most clearly described movement-based strategy in the classroom. The activity combined simple physical movement, rhythm, imitation, and brief verbal cues. Compared with long, verbally dominated or worksheet-based activities, the source narrative described children as more emotionally engaged and more willing to participate during movement-and-song activities. The observation also suggested that alternating brief seated tasks with movement helped some children return attention to the subsequent activity.

The response pattern was not uniform across all children. Some children understood instructions quickly, while others required repetition, demonstration, or a slower pace. Positive reinforcement and a psychologically safe atmosphere were described as important because children who feared making mistakes were more likely to avoid the task. Teachers therefore adjusted the level of support rather than expecting every child to complete the same activity at the same pace. This differentiation was treated as part of classroom accommodation rather than as evidence that all children had the same underlying difficulty.

The available data do not support a causal statement that Movement and Song or Brain Gym was 'more effective' than conventional teaching. No standardised pre-post measure, fixed intervention dosage, or controlled comparison is reported in the source manuscript. The evidence supports a narrower conclusion: children were observed to respond more positively to movement, visual support, concrete examples, shorter activities, and structured transitions in the situations described. Brain Gym is therefore not included here as an empirically tested result.

Table 3. Qualitative Patterns of Child Engagement Across Different Classroom Conditions

Classroom condition	Source-narrative pattern	Interpretation
Long, verbally dominated or worksheet-based activity	Attention was described as less stable; some children required repeated prompts or disengaged before task completion.	Higher processing demand / lower observed engagement
Short, movement-and-song activity	Children were described as more emotionally engaged and more willing to imitate, move, and respond to brief cues.	Qualitative improvement in engagement; not a causal effect estimate
Visual cues, modelling, concrete materials, task segmentation	Children appeared better able to follow the activity when instructions were simplified and external supports were available.	Supportive classroom accommodation
Predictable transitions and positive reinforcement	The narrative associates clearer transitions and supportive feedback with smoother participation and reduced disruption.	Contextual support; requires prospective verification

Interpreting the Observed Indicators

The findings show why early educational detection should focus on repeated behavioural patterns across tasks rather than on a single performance outcome. Rapid loss of attention, difficulty holding a sequence of instructions, inconsistent participation in group rules, and difficulty recognising symbols all affect the child's ability to engage with learning. These behaviours are compatible with challenges in attention, working memory, cognitive flexibility, and information processing, which are still developing during early childhood (Rohmah, 2025; Hulu et al., 2025). At the same time, the present study does not provide a clinical assessment, so the observations should not be used to diagnose a cognitive developmental disorder. The more defensible interpretation is that they identify children who may benefit from structured support and, where concerns persist, further developmental assessment.

This distinction is important because early childhood development is variable. A child may perform differently depending on fatigue, familiarity with the task, language demands, environmental distraction, or the way instructions are delivered. The observation that some difficulties became less pronounced when activities were simplified or visually supported suggests that classroom demands interact with the child's emerging cognitive regulation. Developmentally appropriate practice therefore requires teachers to observe how children approach a task, not only whether they produce the expected answer (Ndai et al., 2023; Nurwijayant, 2025).

Learning Environment and Classroom Support

The observed benefits of short instructions, modelling, visual cues, concrete materials, task segmentation, and predictable transitions are consistent with the principle that young children learn most effectively through direct and manageable experiences. Loose-parts and other manipulative activities provide opportunities to classify, compare, arrange, and test

relationships without relying entirely on verbal explanation (Rifqiah et al., 2026). Similarly, a consistent classroom sequence can reduce the amount of new information that a child must hold in working memory. The purpose of such accommodation is not to lower expectations, but to make the learning objective accessible while children build more stable attention and self-regulation.

Movement and Song may be useful within this framework because it combines physical activity, rhythm, imitation, and social participation. In the present case, the source observations describe stronger engagement during movement-oriented and varied activities than during monotonous or verbally dense routines. This qualitative pattern is compatible with literature examining movement and cognitive learning, including studies of Brain Gym and broader integration of brain function in educational activity (Ishariani1 et al., 2025; Dahlan et al., 2025). However, evidence from other studies cannot substitute for intervention data in the present case. Brain Gym should therefore be considered a candidate strategy for future structured evaluation rather than an intervention already proven effective at PPAUDIT Lukmanul Hakim.

The same caution applies to claims about long-term academic effects. Early literacy studies and parental-perception research suggest that structured stimulation during the preschool years can support readiness for later learning (Crim et al., 2024; Rosepti et al., 2024), but this case study did not follow children into primary school or measure standardised academic outcomes. Its contribution is narrower: it documents how particular classroom formats were associated with observable differences in attention and engagement in the immediate educational setting.

Family Involvement and Barriers to Continuity

The school-home gap identified in the interviews has practical importance. Teachers can observe children under structured learning demands, while parents see them in familiar routines where the same difficulty may be less visible. Caregiver understanding of developmental stimulation influences whether school recommendations are continued consistently at home (Afifah, 2026; Whitaker et al., 2023; Rakotomanana et al., 2023; Quetsch et al., 2022). Communication should therefore begin with concrete observations for example, the child needs repeated prompts to complete a two-step activity rather than with an unverified diagnostic label. This approach may reduce defensive reactions and give parents a clear action they can practise with the child.

Gadget use was described as a practical barrier when it reduced opportunities for direct interaction and play. The literature cited in the original manuscript also links gadget use to changes in family interaction patterns (Fauziyyah et al., 2026). The implication is not simply to prohibit screens but to help families replace some screen time with feasible alternatives: short shared reading, sorting household objects, turn-taking games, drawing, movement, and simple routines that require the child to listen and respond. A supportive family environment can also reduce caregiver anxiety and strengthen parent-child interaction when developmental concerns arise (Kinant, 2025; Zaini et al., 2025; Robinson, 2023; Gumasing & Castro, 2023). Consistency between school and home remains important because environmental support can influence motivation and engagement in learning (M. Suud & Rivai, 2022).

Integrated Islamic Curriculum and Contextual Implications

The integrated Islamic character of the school provides a context in which movement, song, routines, and social learning can be linked with familiar values and classroom practices. This contextual integration may increase meaning and predictability for children, but the present data do not permit the effect of the Islamic component itself to be isolated. The contribution of the setting is therefore best understood as showing how developmental support can be

embedded within an existing institutional culture rather than as demonstrating that one curriculum model is superior to another (Biswas et al., 2025; Dzaiy & Abdullah, 2024).

The original manuscript also discussed stunting, socio-economic constraints, KPSP screening, and multidisciplinary services. These issues may be important in the broader developmental context, but Reviewer 2 correctly requires a distinction between contextual discussion and primary findings. No child-level anthropometric assessment, household-income measurement, documented KPSP administration, or multidisciplinary-service data are specified in the Methods available for this revision. Accordingly, these factors should not be used to explain the observed behaviour as though they were measured in this case. Future research could incorporate nutritional assessment, validated developmental screening, and documented referral pathways when those variables are part of the research design.

Where children continue to show difficulties despite classroom accommodation, systematic follow-up is warranted. A school-based support plan can document the specific behaviour of concern, the strategy tried, the child's response, and whether the pattern is consistent across settings. This type of documentation can improve communication with parents and provide useful information if referral becomes necessary. Intervention literature also supports repeated, structured, and supportive practice rather than one-off activities (Rahma et al., 2026; Arajulu, 2026).

Study Limitations and Future Research

Several limitations should guide interpretation. First, this is a single-site qualitative case study, so the findings are context-specific and are not intended to estimate prevalence or establish generalisable causal effects. Second, the source manuscript available for this revision does not preserve exact child-level frequency counts, complete participant metadata, observation/interview duration, verbatim interview excerpts, or a documented saturation log. These omissions restrict the precision with which the reviewers' requests for n/N values, representative quotations, and procedural detail can be answered. Third, Movement and Song was described as a classroom response rather than as a fully standardised intervention with fixed dosage and pre–post measurement, while Brain Gym was discussed more strongly in the original text than the documented Methods support. Fourth, stunting, socio-economic constraints, KPSP screening, and multidisciplinary services were not documented as participant-level primary data and are therefore treated only as contextual or future-practice considerations. These limitations are reported explicitly to avoid retrospective fabrication of evidence.

Future work should therefore combine rich qualitative observation with transparent participant reporting, validated developmental measures, clearly specified intervention procedures, and longitudinal follow-up. A mixed-methods design could examine whether changes in attention, response to instructions, task completion, and symbol recognition persist over time and whether similar patterns are observed at home. Such work would provide stronger evidence for selecting and adapting interventions while preserving the context-sensitive strengths of qualitative inquiry.

Conclusion

This case study indicates that early educational detection at PPAUDIT Lukmanul Hakim Limboto should begin with systematic observation of how children attend, follow instructions, manage task sequences, participate in group activities, and recognise basic symbols. The observed patterns rapid loss of attention, repeated need for prompting, difficulty following

group rules or sequential activities, unstable engagement, and symbol-recognition difficulty should be treated as indicators for additional support rather than as clinical diagnoses.

The findings also highlight the importance of continuity between school and home. Teachers can make classroom demands more accessible through short instructions, modelling, visual and concrete support, task segmentation, predictable transitions, positive reinforcement, and appropriately varied movement-and-song activities. Parents can reinforce similar skills through brief, repeated interaction at home. In this study, these strategies were associated with more positive observable engagement, but the available evidence does not justify a causal claim that Movement and Song or Brain Gym is more effective than conventional teaching.

Accordingly, the study's main contribution is a context-sensitive qualitative account of how possible cognitive developmental difficulties become visible in everyday early-childhood learning and how classroom structure, movement, visual support, and school-home continuity may influence children's engagement. The present evidence supports cautious educational interpretation rather than diagnosis or causal claims. A definitive evaluation of intervention effectiveness will require verified participant counts, fully documented procedures, verbatim qualitative evidence, and prospective pre-post or longitudinal measurement.

References

- Afifah, A. N. (2026). Caregivers' level of understanding in stimulating the cognitive and social-emotional development of young children at the TPA in Gunungpati Sub-district. *Indonesian Journal of Early Childhood: Jurnal Dunia Anak Usia Dini*, 8(1), 9–24. <https://doi.org/10.35473/ijec.v8i1.4155>
- Ahnan'Azzam, D., & Leany, M. (2024). Childhood education and popular Islam: Islamic psychology as a pattern of early childhood education in the authoritative affinity of popular Islam. *Al-Athfal: Jurnal Pendidikan Anak*, 10(2), 179-190. <https://doi.org/10.14421/al-athfal.2024.102-07>
- Arajulu, G. A. (2026). Lifestyle Modification for the Prevention and Management of Elevated Blood Pressure and Hypertension in Adults: A Systematic Review. *Journal of Public Health, Policy, and Society*, 3(3), 204-214. <https://doi.org/10.54117/6vvh6e62>
- Biswas, B., Sarkar, S., Akomodi, J. O., & Bellevicine, C. (2025). Organizational culture for sustainable healthcare: An NLP-ML-SEM framework with the Sustainability Culture Alignment Index (SCAI). *International Journal of Applied Resilience and Sustainability*, 1(1), 176-195. <https://doi.org/10.70593/deepsci.0101010>
- Cetinbas, E. (2026). The Paradox of Diagnosis in Education Settings. In *Challenging Exclusionary Pressures in Education: How Inclusion Becomes Exclusion* (pp. 223-241). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-032-07769-1_11
- Crim, C., Hawkins, J., Thornton, J., Rosof, H. B., Copley, J., Wildová, R., Kropáčková, J., Hayyu, H. F., Wulansari, B. Y., Mutaqin, M. A., Bustari, N., Rosepti, P., Niasari, C., Chaerunnisa, R., Edition, S., Childhood, E., & Butar, L. (2024). Enhancing early literacy: The impact of the Hubbul Ilmii book on reading skills in Malaysian children aged 5–6 years. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, Spring(1), 237–245. <https://doi.org/10.26858/tematik.v10i1.59593>
- Dahlan, D., Lahmi, A., & Hakim, R. (2025). Integration of brain function in the education and learning process. *Al-Muaddib*, 7(2), 265–278. <https://doi.org/10.46773/muaddib.v7i2.1628>

- Dzaiy, A. H. S., & Abdullah, S. A. (2024). The use of active learning strategies to foster effective teaching in higher education institutions. *Zanco Journal of Human Sciences*, 28(4), 328-351. <https://doi.org/10.21271/zjhs.28.2.11>
- Erdemir, E. (2022). Home-based early education for refugee and local children via mothers: a model of contextually sensitive early intervention. *Journal of Child and Family Studies*, 31(4), 1121-1144. <https://psycnet.apa.org/doi/10.1007/s10826-021-02197-7>
- Fauziyyah, R. R., Jubaedah, Y., & Arlianty, L. S. (2026). The effect of gadget use on family interaction from a family ecology perspective. *Triwikrama: Multidisciplinary Journal of Social Sciences*, 11(11), 1–8. <https://doi.org/10.9963/wthzgv91>
- González-del-Castillo, J., & Barbero-Alcocer, I. (2025). Effects of school-based physical activity programs on executive function development in children: a systematic review. *Frontiers in Psychology*, 16, 1658101. <https://doi.org/10.3389/fpsyg.2025.1658101>
- Gumasing, M. J. J., & Castro, F. M. F. (2023). Determining ergonomic appraisal factors affecting the learning motivation and academic performance of students during online classes. *Sustainability*, 15(3), 1970. <https://doi.org/10.3390/su15031970>
- Hilário, J. S. M., Pancieri, L., Lima, R. A. G. D., Melo, E. M. O. P. D., & Mello, D. F. D. (2025). Parenting and stimulation for child development at home: perspectives from Nurturing Care. *Revista Latino-Americana de Enfermagem*, 33, e4611. <https://doi.org/10.1590/1518-8345.7554.4611>
- Hulu, A., Purba, R., Hutagalung, Y., Lase, A., Panggabean, D., & Lase, I. (2025). Cognitive development in early childhood ages 4–6 years at Bina Kreatif Nursery School. *Pediaqu: Journal of Social Education and Humanities*, 4(1), 2228–2233. <https://doi.org/10.35931/pediaqu.v4i1>
- Ishariani, L., Siswoariwibowo, A., & Milhati. (2025). The effectiveness of Brain Gym Double Doodle and Cross Crawl on the cognitive development of children aged 4–5 years. *Journal of Health and Medical Service (JAKK)*, 4(2), 230–241. <https://doi.org/10.55018/jakk.v4i2.90>
- Kinant, I. P. (2025). The effect of the family environment on the psychosocial aspects of children at Masyitoh IV Kindergarten, Surakarta. *Jurnal Talenta Psikologi*, 14(1), 25–30. <https://doi.org/10.47942/talenta.v14i1.2011>
- La Rosa, V. L., Geraci, A., Iacono, A., & Commodari, E. (2024). Affective touch in preterm infant development: neurobiological mechanisms and implications for child–caregiver attachment and neonatal care. *Children*, 11(11), 1407. <https://doi.org/10.3390/children11111407>
- Lestawati, I. M., Wiranata, I. G. L. A., & Mahendra, M. W. (2025). Comparative Paradigms in Early Childhood Educator Professional Development: Systematic Review and Implications for Indonesia. *Studies in Learning and Teaching*, 6(3), 716-729. <https://doi.org/10.46627/silet.v6i3.752>
- Maulani, S., Puspita, S. M., Ruswandi, A., Susanti, C., Astiti, W. T., Hamidah, S. N., & Munayah, N. (2026). Teacher Strategies and Parental Involvement in Supporting the Transition from Early Childhood Education to Primary School in West Java: A Survey Study. *Journal of General Education and Humanities*, 5(2), 2999-3010.

- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). SAGE Publications.
- Mualem, R., Morales-Quezada, L., Farraj, R. H., Shance, S., Bernshtein, D. H., Cohen, S., ... & Biswas, S. (2024). Econeurobiology and brain development in children: key factors affecting development, behavioral outcomes, and school interventions. *Frontiers in public health*, 12, 1376075. <https://doi.org/10.3389/fpubh.2024.1376075>
- Ndai, A., Gowa, L. W., Wio, M. I., Ndiu, Y., Wea, L., & Uge, R. K. (2023). Using various media. *Jurnal Citra Pendidikan Anak (JCPA)*, 2(3), 670–676. <https://doi.org/10.38048/jcpa.v2i3.1588>
- Ningtyas, A. R., Warsah, I., Amrillah, H. T., & Utami, E. L. (2026). Early Stimulation in the Psychological Development of Early Childhood: A Comprehensive Literature Review. *Jurnal Caksana: Pendidikan Anak Usia Dini*, 9(1), 221-236. <https://doi.org/10.31326/jcpaud.v9i1.2790>
- Nurfaisal, N., Sunengko, S., & Abbas, M. F. F. (2024). Effective Curriculum Management in Islamic Primary Education: A Case Study of Integrated Islamic Schools. *Al-Ishlah: Jurnal Pendidikan*, 16(4), 4578-4587. <https://doi.org/10.35445/alishlah.v16i4.6211>
- Nurwijayant, W. (2025). Cognitive development in early childhood. *Jurnal Medika Hutama*, 6(3), 4223–4227.
- Ober, L. (2024). *An Evaluation of the Process for Assigning Standardized Testing Accommodations for Students With Autism* (Doctoral dissertation, Gardner-Webb University).
- Passos, A. P. D. (2023). Integration of Motor, Cognitive, Nutritional, Metabolic, and Epigenetic Influence Variables Related to Early Childhood as a Tool to Promote Child Development at Kindergarten Schools. In *Recent Perspectives on Preschool Education and Care*. IntechOpen. <https://doi.org/10.5772/intechopen.113145>
- Quetsch, L. B., Jackson, C. B., Onovbiona, H., & Bradley, R. (2022). Caregiver decision-making on young child schooling/care in the face of COVID-19: The influence of child, caregiver, and systemic factors. *Children and Youth Services Review*, 136, 106437. <https://doi.org/10.1016/j.childyouth.2022.106437>
- Rahma, S., Arini, D. W., & Meywanthi, I. (2026). Psychological intervention programme for addressing withdrawal behaviour and learning difficulties in primary school pupils. *EDUCAZIONE: Multidisciplinary Journal*, 2(2), 203–209. <https://doi.org/10.37985/educazione.v2i2>
- Rakotomanana, H., Hildebrand, D., Gates, G. E., Thomas, D. G., Fawbush, F., & Stoecker, B. J. (2023). Home stimulation, development, and nutritional status of children under 2 years of age in the highlands of Madagascar. *Journal of Health, Population and Nutrition*, 42(1), 59. <https://doi.org/10.1186/s41043-023-00399-x>
- Rifqiah, Z., Djamali, M. F., & Sugiarto, M. A. (2026). Enhancing cognitive abilities through the use of loose parts at Nurul Ulum Lampeji Nursery School for children aged 5–6 years. *Pendas: Journal of Primary Education*, 11(2).
- Robinson, K. A. (2023). Motivational climate theory: Disentangling definitions and roles of classroom motivational support, climate, and microclimates. *Educational Psychologist*, 58(2), 92-110. <https://doi.org/10.1080/00461520.2023.2198011>

- Rohayani, F., Murniati, W., Sari, T., & Fitri, A. R. (2023). Permissive parenting styles and their impact on young children: Theory and issues. *Islamic EduKids: Journal of Early Childhood Education*, 5(1), 25–38.
- Rohmah, U. (2025). Development and education of cognitive abilities in early childhood. *Jurnal Obsesi: Journal of Early Childhood Education*, 9(1), 130–138. <https://doi.org/10.31004/obsesi.v9i1.5918>
- Rosepti, P., Niasari, C., & Chaerunnisa, R. (2024). Exploring parents' perceptions of early literacy development in early childhood education. *TEMATIK: Journal of Thought and Research in Early Childhood Education*, 10(1), 1. <https://doi.org/10.26858/tematik.v10i1.59593>
- Sholeh, M. I., Habibulloh, M., Al Farisy, F., & binti Ab Rahman, S. F. (2025). Integration of Islamic values and local culture in early childhood education curriculum. *Jurnal Al Burhan*, 5(1), 126-142. <https://doi.org/10.58988/jab.v5i1.433>
- Suud, F. M., & Rivai, M. I. (2022). The role of the environment in enhancing primary school pupils' motivation to learn in Banjarnegara. *JCOMENT (Journal of Community Empowerment)*, 3(2), 64–76. <https://doi.org/10.55314/jcoment.v3i2.238>
- Ulya, I., Widjanarko, M., & Lestari, I. (2026). Challenges and phenomena in children's development in deep learning at primary education level. *Journal of Community Service and Educational Research*, 4(3), 17091–17096. <https://doi.org/10.31004/jerkin.v4i3.4690>
- Whitaker, A. A., Yoo, P. Y., Vandell, D. L., Duncan, G. J., & Burchinal, M. (2023). Predicting adolescent and young adult outcomes from emotional support and cognitive stimulation offered by preschool-age home and early care and education settings. *Developmental Psychology*, 59(12), 2189. <https://doi.org/10.1037/dev0001576>
- Zaini, M., Dermawan, A. D., & Rinjani, A. A. (2025). The role of the family in the prevention of psychosocial problems in rural and urban areas. *The Indonesian Journal of Health Science*, 17(1), 59–69. <https://doi.org/10.32528/tijhs.v17i1.3202>