

Strengthening Pos PAUD Educators' Capacity through Participatory Training in Meaningful Play-Based Learning

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Article History

Received : 01 July 2026

Revised : 27 July 2026

Accepted : 03 August 2026

Published : 13 August 2026

Abstract

Community-based early childhood education posts (Pos PAUD) rely on volunteer educators who must translate developmental principles into feasible daily practices. This community engagement program examined score changes following participatory training in meaningful play-based learning for 60 educators from 30 Pos PAUD centres in West Semarang, Indonesia. Four facilitators delivered five sessions totalling 360 minutes on 17 April 2026. The training combined concept explanation, case discussion, simulation, guided activity design, observation practice, and reflection. A one-group pretest-post-test evaluation assessed five competency domains on a 0–25 scale. Domain means increased from 16.93–17.10 at pretest to 24.22–24.23 at post-test. Mean gains ranged from 7.12 to 7.28 points, normalized gains ranged from .901 to .905, and paired-samples tests were significant for every domain, $t(59) = 36.55–42.45$, $p < .001$, with Cohen's $d_z = 4.72–5.48$. Difference scores departed from normality; however, Wilcoxon signed-rank sensitivity analyses produced the same conclusion (all $p < .001$). Approximately 31.7%–33.3% of participants reached the maximum post-test score, indicating a ceiling effect. The findings provide preliminary evidence that the training was followed by substantial improvements in assessed knowledge and planning capacity. Nevertheless, causal attribution is limited by the absence of a comparison group, unavailable item-level psychometric evidence, possible testing effects, and the lack of follow-up observations of classroom practice or child outcomes.

Keywords: community early childhood education; educator capacity; meaningful learning; participatory training; play-based learning



Introduction

Early childhood education quality is shaped not only by curriculum and infrastructure but also by educators' capacity to interpret children's developmental needs and transform them into responsive interactions, learning activities, and authentic assessment practices. This issue is particularly important in community-based services such as Pos PAUD, where volunteer educators often have heterogeneous educational backgrounds, limited teaching resources, and unequal access to sustained professional development. Recent evidence indicates that professional learning, teacher preparation, and context-sensitive pedagogical knowledge significantly influence instructional quality, teacher confidence, and classroom effectiveness (Brunsek dkk., 2020; Egert dkk., 2020; Lee dkk., 2025). Similar concerns have also been reported in the Indonesian context, where strengthening teachers' pedagogical competence through continuous professional development contributes to improving educational quality (Mahfuz dkk., 2022). These findings underscore the need to design professional learning programs that are responsive to the material constraints and daily responsibilities of community-based educators.

Play-based learning remains a cornerstone of developmentally appropriate early childhood education because it enables children to explore, communicate, negotiate, solve problems, and regulate their behaviour through meaningful experiences. Recent reviews and empirical studies demonstrate that well-designed play experiences support children's holistic development, executive functioning, early mathematical thinking, social-emotional competence, and active participation in learning (Baker dkk., 2023; Larsen dkk., 2025; Lunga dkk., 2022; Taylor & Boyer, 2020). Guided play is particularly effective when educators maintain children's agency while intentionally scaffolding learning toward specific developmental goals (Boysen dkk., 2022; Skene dkk., 2022). Evidence from Indonesian early childhood education likewise suggests that meaningful and enjoyable learning experiences encourage children's active participation and holistic development (Attika dkk., 2021). Consequently, play should be viewed as a pedagogical continuum rather than a dichotomy between free play and teacher-directed instruction.

Translating this principle into practice remains challenging. Early childhood educators often hold diverse beliefs about the nature of play, the appropriate level of adult guidance, and the extent to which academic goals can be integrated without diminishing children's autonomy (Baker dkk., 2023; A. Cheung dkk., 2022; Hesterman & Targowska, 2020). Classroom observations continue to reveal discrepancies between educators' beliefs about play-based pedagogy and their actual instructional practices, particularly in goal-oriented learning contexts (Pyle dkk., 2020; Pyle, Danniels, dkk., 2022; Wickstrom & Pyle, 2025). Consequently, educators require more than conceptual understanding; they need opportunities to analyse authentic cases, rehearse facilitation strategies, collaboratively design learning environments, and receive constructive feedback to balance children's agency with intentional pedagogical support (Pramling Samuelsson & Björklund, 2023).

Assessment presents an additional challenge because evidence of children's learning during play is often embedded in their interactions, language, strategies, and representations rather than conventional written tasks. Contemporary research highlights the importance of aligning learning objectives, authentic observation, documentation, and pedagogical decision-making while preserving children's autonomy during play (DeLuca, Pyle, Braund, dkk., 2020; DeLuca, Pyle, Valiquette, dkk., 2020; Pyle, Danniels, dkk., 2022; Pyle, DeLuca, dkk., 2022). Teachers must also employ differentiated strategies that promote inclusion and meaningful participation for children with diverse developmental characteristics (Larsen

dkk., 2025; Pyle, Danniels, dkk., 2022). These findings reinforce the importance of treating monitoring and evaluation as an essential pedagogical competency rather than merely an administrative responsibility.

Professional development is more likely to improve teaching practice when it combines focused content, active learning, modelling, rehearsal, feedback, reflection, and implementation support. Meta-analyses and systematic reviews consistently demonstrate positive effects of professional development on instructional quality, although outcomes vary according to program intensity, coaching, contextual relevance, and implementation fidelity (Brunsek dkk., 2020; W. C. Cheung dkk., 2023; Egert dkk., 2020; Lee dkk., 2025). Studies specifically examining play-based learning further indicate that educators' beliefs, pedagogical knowledge, and opportunities to apply new practices are critical mechanisms for sustainable instructional improvement (A. Cheung dkk., 2022; Keung & Fung, 2020). These findings support the importance of designing professional development programs that are contextual, collaborative, and practice-oriented for community-based early childhood educators.

Against this background, the present community engagement program addressed five competencies identified through collaborative needs assessment with partner institutions: understanding early childhood characteristics, meaningful learning, play-based learning, educational play activity design, and monitoring and evaluation. The program integrated conceptual input, contextual case discussions, simulation, guided instructional design, observation practice, and structured reflection into a brief participatory training model adapted to the realities of community-based educators. The program aimed to strengthen Pos PAUD educators' capacity to design and facilitate meaningful play-based learning. The evaluation sought to quantify within-participant competency gains across the five domains, examine distributional assumptions and effect sizes, and identify methodological limitations that should inform subsequent mentoring and future evaluation. Because the design did not include a comparison group, the findings are intended to provide preliminary evidence of program outcomes rather than causal evidence of program effectiveness.

Research Method

Program Design and Participants

This community engagement program used participatory training with a one-group pretest-post-test evaluation. The training was conducted on 17 April 2026 at the West Semarang District Hall. It comprised five sessions totalling eight 45-minute instructional periods (360 minutes). Four facilitators delivered content aligned with their areas of expertise. The participants were 60 active Pos PAUD educators representing 30 centres in West Semarang District. Participants were recruited through coordination with the partner network and completed an initial quiz concerning meaningful learning, learning management, and instructional planning. All participants completed the pretest, five training sessions, guided practice, reflection, and post-test, producing a 100% completion rate.

Participation was voluntary. Before the activities, participants received information about the program, the use of their scores for aggregate evaluation, and the protection of personal information. The analytical dataset contained anonymous respondent numbers only. No institutional ethics approval number was available in the program documentation; therefore, the activity is reported as a program evaluation rather than as a controlled human-subject experiment. The design compared repeated measurements from the same participants and did not control for external events, repeated testing, maturation, or regression to the mean.

Training Procedure

The program proceeded in four stages. First, participants completed the pretest to map baseline capacity. Second, facilitators presented and discussed early childhood characteristics, meaningful learning, principles of play-based learning, educational play activity design, and authentic monitoring and evaluation. Third, participants worked in guided groups to simulate facilitation strategies, design activities using safe low-cost materials and local resources, and practice recording observable evidence of children's development. Fourth, participants completed the post-test and participated in structured reflection on implementation opportunities, constraints, and mentoring needs. Table 1 summarizes the alignment among the five evaluated domains, indicators, and training activities.

Table 1. Competency domains, evaluation indicators, and training activities

Competency domain	Evaluation indicator	Training activity
Early childhood characteristics	Explains how young children learn through concrete experience, exploration, interaction, and play.	Concept presentation and discussion of developmental cases.
Meaningful learning	Identifies learning that is contextual, active, socially connected, and relevant to children's experiences.	Discussion of contextual examples from Pos PAUD practice.
Play-based learning	Distinguishes forms of play and adult support across the play continuum.	Simulation of play facilitation and reflection on the educator's role.
Educational play activities	Designs activities with developmental goals, safe materials, inclusion, and a feasible sequence.	Guided preparation and peer review of play activity plans.
Monitoring and evaluation	Uses observation, concise recording, and reflection to document children's learning during play.	Practice with anecdotal notes and developmental indicators.

As presented in Table 1, the training was structured around five interrelated competency domains that represent a progression from conceptual understanding to practical implementation and reflective evaluation. The first domain, early childhood characteristics, provides the foundational knowledge needed to understand how young children learn through concrete experiences, exploration, interaction, and play. This foundation supports the meaningful learning domain, which emphasizes the ability of educators to connect learning activities with children's experiences, social environments, and developmental contexts.

The play-based learning domain subsequently focuses on educators' ability to distinguish different forms of play and determine appropriate levels of adult involvement across the play continuum. These competencies are applied in the educational play activities domain, in which participants design developmentally appropriate, inclusive, safe, and feasible play experiences. Finally, the monitoring and evaluation domain equips educators with observation, documentation, and reflective skills to assess children's learning processes during play. Each evaluation indicator was directly aligned with a corresponding training activity to ensure that the intended competencies were not only introduced conceptually but also practised through discussion, simulation, collaborative planning, peer review, and observation exercises.

Evaluation Instrument

The program documentation described a 25-item written instrument covering the five competency domains. The supplied spreadsheet contained one pretest and one post-test total for each domain, with 25 as the maximum score. Higher scores represented stronger knowledge or planning capacity. The indicators addressed how young children learn through concrete experience, features of meaningful learning, distinctions across the play continuum, the design of safe activities with developmental goals, and simple observation and documentation procedures. Item-level responses, the detailed answer key or rubric, expert content-validity ratings, and reliability coefficients were not available. Consequently, psychometric properties could not be independently recalculated, and the scores were interpreted as internal program-evaluation indicators rather than standardized competency measures.

Data Analysis

Analyses were conducted on the original 0–25 domain scores for all 60 participants. Descriptive statistics included means, standard deviations, mean paired differences, 95% confidence intervals, and the proportion attaining the maximum post-test score. Normalized gain was calculated from group means as $g = (M_{\text{post}} - M_{\text{pre}}) / (25 - M_{\text{pre}})$. The normality of paired differences was assessed using the Shapiro-Wilk test. Because every domain showed a significant departure from normality and substantial post-test ceiling concentration, paired-samples *t* tests were retained for comparability and estimation, while one-sided Wilcoxon signed-rank tests were added as sensitivity analyses. Cohen's *d_z* was calculated as the mean paired difference divided by the standard deviation of paired differences. Statistical significance was evaluated at $\alpha = .05$, but interpretation emphasized estimates, distributional limitations, and design constraints rather than *p* values alone (Funder & Ozer, 2019).

Results and Discussion

Across all five domains, post-test scores were higher than pretest scores for every participant. Baseline means were tightly clustered between 16.93 and 17.10, whereas post-test means ranged from 24.22 to 24.23 on the 25-point scale. Mean paired gains ranged from 7.12 to 7.28 points. At the composite level, the total score across the five domains increased from $M = 85.07$ ($SD = 5.15$) to $M = 121.10$ ($SD = 3.80$), with a mean gain of 36.03 points, 95% CI [34.30, 37.77], $t(59) = 41.60$, $p < .001$, $d_z = 5.37$, and normalized gain = .902.

Table 2. Descriptive statistics and normalized gains by competency domain

Domain	M pre	SD pre	M post	SD post	Mean gain	N-gain	Ceiling (%)
Early childhood characteristics	17.02	1.11	24.22	0.76	7.20	.902	31.7
Meaningful learning	17.05	1.13	24.22	0.76	7.17	.901	31.7
Play-based learning	16.93	1.09	24.22	0.76	7.28	.903	31.7
Educational play activities	17.10	1.19	24.22	0.76	7.12	.901	31.7
Monitoring and evaluation	16.97	1.02	24.23	0.77	7.27	.905	33.3

As shown in Table 2, participants demonstrated substantial improvements across all five competency domains following the training. The mean pre-test scores ranged from 16.93 to 17.10 out of a maximum score of 25, whereas the mean post-test scores increased to between 24.22 and 24.23. The largest absolute mean gain was observed in the play-based learning domain (7.28 points), followed by monitoring and evaluation (7.27 points) and early childhood characteristics (7.20 points). Meaningful

learning and educational play activities also showed considerable improvements, with mean gains of 7.17 and 7.12 points, respectively.

The normalized gain values were consistently high across all domains, ranging from .901 to .905. The highest normalized gain was found in monitoring and evaluation ($g = .905$), followed by play-based learning ($g = .903$) and early childhood characteristics ($g = .902$). These findings indicate that participants achieved more than 90% of the maximum possible improvement relative to their initial scores. The small standard deviations at post-test ($SD = 0.76$ – 0.77), compared with those at pre-test ($SD = 1.02$ – 1.19), also suggest that participants' competency scores became more homogeneous after the training.

Nevertheless, approximately one-third of the participants achieved the maximum post-test score. The ceiling percentages ranged from 31.7% in four competency domains to 33.3% in monitoring and evaluation. This pattern indicates a possible ceiling effect, suggesting that the assessment instrument may have had limited sensitivity in distinguishing competency levels among participants who performed at the upper end of the scale. Therefore, although the results indicate substantial competency gains, the high post-test scores and ceiling percentages should be considered when interpreting the magnitude of the training outcomes.

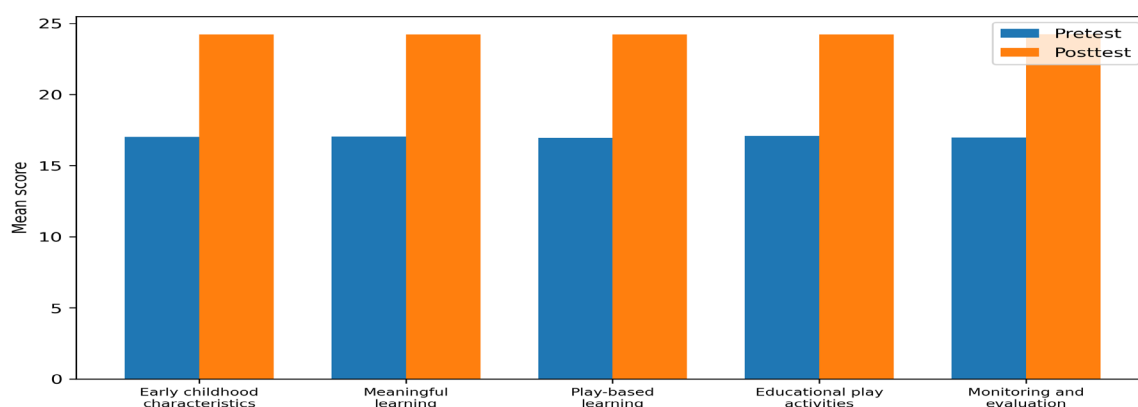


Figure 1. Mean pretest and post-test scores across the five competency domains

Normalized gains were consistently high (.901–.905), with the largest mean paired increase in play-based learning (7.28 points) and the smallest in educational play activity design (7.12 points). Nevertheless, post-test variability was highly compressed: SDs were approximately 0.76 in every domain, and 31.7%–33.3% of participants attained the maximum score. The ceiling concentration indicates that the instrument had limited capacity to differentiate higher levels of post training performance.

Table 3. Distributional checks and paired-samples test results

Domain	Shapiro Wilk	t(59)	p	95% CI for mean gain	Cohen's d_{z}
Early childhood characteristics	.892	39.50	< .001	[6.84, 7.56]	5.10
Meaningful learning	.879	39.20	< .001	[6.80, 7.53]	5.06
Play-based learning	.898	42.05	< .001	[6.94, 7.63]	5.43
Educational play activities	.883	36.55	< .001	[6.73, 7.51]	4.72
Monitoring and evaluation	.895	42.45	< .001	[6.92, 7.61]	5.48

Table 3 presents the distributional checks and paired-samples comparisons of participants' pre-test and post-test scores across the five competency domains. The Shapiro–Wilk tests were statistically significant for all domains, with W values ranging from .879 to .898 and $p < .001$, indicating that the gain scores deviated from a normal distribution. Because the normality assumption was not fully satisfied, Wilcoxon signed-rank tests were also conducted as sensitivity analyses to verify the robustness of the paired-samples t -test results.

The paired-samples t -tests showed statistically significant increases in scores across all competency domains, with $t(59)$ values ranging from 36.55 to 42.45 and all p values below .001. The 95% confidence intervals for the mean gains did not include zero, indicating that the observed improvements were consistently positive. The largest test statistic was found in the monitoring and evaluation domain, $t(59) = 42.45$, followed by play-based learning, $t(59) = 42.05$. Educational play activities produced the lowest test statistic, $t(59) = 36.55$, although the improvement remained statistically significant.

The effect sizes were exceptionally large, with Cohen's d_{z} values ranging from 4.72 to 5.48. The largest effect was observed in monitoring and evaluation ($d_{z} = 5.48$), followed by play-based learning ($d_{z} = 5.43$), while educational play activities showed the smallest, although still substantial, effect ($d_{z} = 4.72$). The Wilcoxon signed-rank sensitivity analyses yielded consistent findings: all 60 participants demonstrated positive post-test-minus-pre-test differences in every competency domain, and all comparisons were statistically significant at $p < .001$. These findings indicate that the increases in competency scores were consistent across participants and remained statistically robust under both parametric and nonparametric analyses.

Discussion

The findings demonstrate a consistent improvement in participants' competencies following the training, as reflected by the uniformly higher post-test scores across all five domains. The consistency of the gains, high normalized gain values, and convergent results from both parametric and non-parametric analyses indicate that the observed improvement was not driven by only a small subgroup of participants. Nevertheless, the substantial ceiling effect and the absence of item-level psychometric evidence suggest that the exceptionally large effect sizes should be interpreted cautiously. Such large effects may reflect the effectiveness of the intervention, but they may also be influenced by restricted score variability, close alignment between assessment items and training content, repeated exposure to similar tasks, or limitations of the measurement instrument (Funder & Ozer, 2019).

The gains in understanding early childhood characteristics and meaningful learning are consistent with recent evidence demonstrating that play becomes educationally meaningful when educators intentionally connect children's interests, social interaction, and exploration with clear developmental objectives (Baker dkk., 2023; Boysen dkk., 2022; Lunga dkk., 2022; Skene dkk., 2022). (Letourneau & Sobel, 2020; Pyle, Danniels, dkk., 2022) Research also shows that young children themselves often perceive play and learning as interconnected rather than distinct experiences (Letourneau & Sobel, 2020; Pyle, Danniels, dkk., 2022). For Pos PAUD educators, contextual case-based examples using familiar and low-cost materials may therefore have facilitated a more concrete understanding of child development principles. However, this interpretation remains tentative because the present evaluation did not include classroom observations or process measures capable of explaining how participants applied their newly acquired knowledge. Similar findings have also been reported in Indonesian early childhood education, where child-centred learning approaches encourage meaningful learning experiences and strengthen

collaboration between educators and families to support children's holistic development (Attika dkk., 2021).

The improvement in play-based learning knowledge is consistent with contemporary literature emphasizing that effective play pedagogy requires educators to understand the continuum between free play, guided play, collaboratively directed play, and teacher-directed learning. Educators' pedagogical beliefs strongly influence how they balance children's autonomy with intentional instructional support (Baker dkk., 2023; A. Cheung dkk., 2022; Hesterman & Targowska, 2020). The simulation and guided reflection incorporated into the present training directly addressed these conceptual challenges. Nevertheless, previous classroom studies indicate that positive beliefs about play-based learning do not necessarily translate into effective classroom implementation, particularly in mathematics and other goal-oriented learning contexts (DeLuca, Pyle, Valiquette, dkk., 2020; Pyle, DeLuca, dkk., 2022; Pyle dkk., 2020; Wickstrom & Pyle, 2025). Accordingly, follow-up classroom observations remain necessary before concluding that participants have successfully transferred their knowledge into instructional practice.

Educational play activity design requires educators to integrate developmental objectives, child safety, material availability, sequencing, inclusion, and appropriate adult support. The substantial gains observed after the training suggest that participants became more capable of identifying and designing developmentally appropriate play activities. This finding aligns with recent evidence indicating that pedagogical knowledge, curriculum capacity, and structured professional learning strengthen educators' ability to integrate learning objectives into play-based experiences (A. Cheung dkk., 2022; Lee dkk., 2025). The emphasis on affordable and locally available materials also reflects the practical realities of community-based Pos PAUD services. Nevertheless, competence in designing activities should not be equated with effective classroom implementation. Future evaluations should therefore examine children's participation, teacher responsiveness, inclusion, and the quality of classroom interactions through direct observation.

Monitoring and evaluation showed improvements comparable to those observed in the other competency domains, although authentic assessment remains one of the most challenging aspects of play-based pedagogy. Effective play-based assessment requires educators to observe children's learning processes, document meaningful evidence, interpret developmental progress, and use assessment findings to inform subsequent instructional decisions (DeLuca, Pyle, Braund, dkk., 2020; Larsen dkk., 2025; Pyle, DeLuca, dkk., 2022, 2022; Wickstrom & Pyle, 2025). While digital technologies may facilitate documentation, they cannot replace educators' professional judgement. Future mentoring programs should therefore incorporate video-based reflection, structured observation protocols, anecdotal records, and collaborative moderation activities to strengthen assessment literacy among Pos PAUD educators.

The participatory design of the present program is consistent with growing evidence that professional development is most effective when educators actively engage in rehearsal, collaborative reflection, feedback, and contextual application of newly acquired knowledge. Meta-analyses and systematic reviews consistently demonstrate that professional learning and instructional coaching improve teaching quality and teacher-child interactions, although their effectiveness depends on program design, implementation fidelity, and contextual relevance (Brunsek dkk., 2020; W. C. Cheung dkk., 2023; Egert dkk., 2020; Lee dkk., 2025). Research involving early childhood educators likewise reports improvements in pedagogical knowledge, motivation, self-efficacy, and instructional competence following sustained professional development (W. C. Cheung dkk., 2023; Tam, 2023). The present study extends this body of evidence by demonstrating similar competency gains among volunteer educators

working in community-based Pos PAUD centres, a population that remains underrepresented in international research.

The findings also highlight broader implications for inclusive and multidomain early childhood education. Educators need to adapt play environments so that children with diverse developmental characteristics can participate meaningfully rather than merely being physically present (Larsen dkk., 2025; Pyle, DeLuca, dkk., 2022). They must also integrate opportunities to foster social-emotional development, self-regulation, early literacy, and culturally responsive participation within play-based activities (A. Cheung dkk., 2022; DeLuca, Pyle, Braund, dkk., 2020; Larsen dkk., 2025; Pyle, DeLuca, dkk., 2022). These demands reinforce the importance of sustained mentoring rather than one-time training. Future follow-up activities should therefore include collaborative lesson planning, observation of implementation fidelity, peer feedback, and practical demonstrations showing how the same low-cost play activity can be adapted for children with different developmental needs and learning goals.

Several limitations should be acknowledged. First, the one-group pretest–posttest design does not permit causal inference because alternative explanations such as history, maturation, testing effects, or regression to the mean cannot be ruled out. Second, the presence of non-normal score distributions and substantial ceiling effects limits the interpretation of the observed effect sizes. Third, only domain-level scores were available, preventing further examination of item validity, reliability, and measurement quality. Fourth, the immediate post-test design does not provide evidence regarding the long-term retention of participants' competencies. Finally, the evaluation did not include classroom observations, implementation fidelity measures, or child outcome data. Future studies should therefore employ validated assessment instruments, delayed follow-up assessments, observational measures of instructional practice, appropriate comparison groups, and mixed-method approaches combining quantitative outcomes with educator interviews and classroom documentation to provide stronger evidence regarding the effectiveness of professional development for community-based early childhood educators.

Conclusion

Participatory training in meaningful play-based learning was followed by substantial improvements in the assessed competencies of 60 Pos PAUD educators from 30 centres in West Semarang. Mean domain scores increased by more than seven points on a 25-point scale, and parametric and nonparametric analyses consistently indicated positive change. The program's practical contribution lies in integrating conceptual input with contextual cases, simulation, activity design, observation practice, and reflection using resources feasible for community settings. However, the findings constitute preliminary program-evaluation evidence rather than proof of causal effectiveness. The single-group design, immediate post-test, unavailable item-level validation evidence, and pronounced ceiling effects limit interpretation, while no data established transfer to classroom practice or benefits for children. Future programs should combine continued mentoring with authentic observation tools, fidelity assessment, delayed measurement, a more discriminating validated instrument, and a suitable comparison condition. Such improvements would determine whether short-term score gains are retained and translated into more responsive, inclusive, and developmentally meaningful play experiences.

Acknowledgments

The authors thank the Institute for Research and Community Engagement of Universitas PGRI Semarang for supporting this community engagement program. Appreciation is extended to the four

facilitators, the Pos PAUD educators and centres in West Semarang District, and all partners who contributed to program coordination, implementation, and evaluation.

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