International Journal of Learning, Teaching and Educational Research
Vol. 24, No. 7, pp. 525-555, July 2025
https://doi.org/10.26803/ijlter.24.7.26
Received May 15, 2025; Revised Jun 15, 2025; Accepted Jun 20, 2025

A Music-Based Relay Intervention (*Estafet Bait Lagu*) Improves Attention in Early Childhood Classrooms: Evidence from Indonesian Kindergartens

Ismaniar Ismaniar*, **Setiyo Utoyo**, **Nur Hazizah**
Universitas Negeri Padang,
Indonesia

Sri Murni
STKIP PGRI Bandar Lampung,
Indonesia

Ciptro Handrianto
Universitas Negeri Padang,
Indonesia

Abstract. Attention span is a critical cognitive skill in early childhood that is essential for both academic and socio-emotional development. However, traditional teaching approaches in Indonesia often struggle to meet diverse classroom needs. This study developed and validated the *Estafet Bait Lagu* model – an interactive, music-based, play-driven intervention aimed at enhancing attention span in young learners. Employing a sequential mixed-methods design, the study involved 447 children aged four to six years and 25 kindergarten teachers selected through purposive sampling from five schools in Bekasi, Indonesia. Quantitative results from pretest-posttest comparisons (analyzed using a repeated measures ANOVA) revealed large effect sizes (*d* = 1.09–1.24) for sustained attention, task persistence, and behavioral control in the intervention group. Qualitative data from teacher interviews and parent focus groups that were analyzed thematically highlighted three key benefits: (1) rhythmic entrainment synchronizing with children's cognitive rhythms, (2) peer scaffolding, reinforcing Vygotsky's Zone of Proximal Development, and (3) 92% teacher satisfaction with the model's cultural adaptability and minimal resource needs. The model rooted in Vygotsky's sociocultural theory and Piaget's theory of cognitive development principles – demonstrated scalability in resource-constrained settings, with particularly strong outcomes for low-income

*Corresponding author: Ismaniar Ismaniar; *ismaniar.js.pls@fip.unp.ac.id*

learners (22% larger gains than peers). These findings offer a practical, culturally responsive solution to attention challenges in early childhood education while underscoring the potential of music-based play to bridge theory and classroom practice.

Keywords: attention span; early childhood education; music-based learning; play-based intervention; Indonesia

1. Introduction

Attention span is a critical cognitive skill that underpins learning and social interaction in early childhood. It enables young learners to focus on tasks, to process information, and to regulate their behavior in educational settings (Maye et al., 2023). Despite its importance, many early childhood education programs struggle to implement effective strategies for fostering attention span, particularly in settings with limited resources or high student-to-teacher ratios. The existing literature highlights the persistent challenge of maintaining the focus of young children during instructional activities, which can significantly affect long-term academic success and social-emotional development (Burke et al., 2024).

Early childhood education faces persistent challenges in developing attention skills, particularly in resource-constrained settings where traditional methods often fail to engage diverse learners. The *Estafet Bait Lagu* model innovates by combining three evidence-based components into a single protocol: (1) rhythmic entrainment through culturally familiar song cycles (tempo-matched to four- to six-year-olds' neural oscillation patterns), (2) relay-style peer scaffolding that operationalizes Vygotsky's Zone of Proximal Development (ZPD) through turn-taking, and (3) embodied learning tasks requiring movement-sound synchronization to reinforce focus. Teachers serve as cultural mediators in this process, adapting musical elements to local traditions while providing just-in-time cues that maintain challenge-skill balance – a critical factor in active learning (Laevers, 2000).

This tripartite design achieves social impact by transforming ubiquitous cultural practices (folk singing, cooperative games) into cognitive training tools requiring only 15 minutes daily while aligning with Indonesia's national curriculum standards for play-based learning. Unlike Western interventions that demand specialized training, the model's power stems from teachers' existing musical fluency, with observational data showing 83% fidelity after just three practice sessions.

Despite the critical role of attention, current interventions in Indonesian kindergartens remain limited by cultural mismatches (e.g., Western individual-task paradigms that are ill suited to collectivist classrooms), high resource demands (specialized training/materials that are unfeasible for 1:28 teacher-student ratios), and developmental misalignment (over-reliance on quiet focus versus optimal movement-sound synchronization for four- to six-year-olds).

Early childhood education is crucial for developing foundational skills, yet traditional teaching methods often fail to engage learners effectively. Play-based learning, grounded in Vygotsky's (1978) sociocultural theory, has emerged as a powerful approach for fostering cognitive and social skills in young children. According to Vygotsky (1978), learning is a social mediated process, and play provides an ideal context for scaffolding children's attention and self-regulation skills. Similarly, Piaget's (1962) theory of cognitive development underscores the role of interactive and imaginative activities in enhancing children's ability to focus and process new information. However, a significant gap remains in the use of structured play-based interventions specifically designed to improve attention span—especially within early childhood education settings in Indonesia.

This study addresses this gap by proposing the *Estafet Bait Lagu* model, an innovative, thematic learning approach that is designed to improve attention span through engaging and interactive song-based activities. The *Estafet Bait Lagu* model aligns with active learning principles and takes advantage of the inherent appeal of music and movement to capture children's attention. Existing research suggests that music-based activities can significantly enhance cognitive and emotional engagement, supporting children's ability to sustain focus (Khanal et al., 2021; Wallo et al., 2024). However, empirical studies on the application of music-based relay games in structured early learning environments are limited, thus indicating a critical area for exploration.

In Indonesia, the challenges faced by early-childhood educators are further compounded by large class sizes, diverse learner needs, and a lack of access to innovative teaching resources. Observations conducted in several kindergartens in Bekasi, Indonesia revealed that teachers primarily rely on reactive strategies such as reprimanding or disciplining to manage children's attention issues. Bekasi was selected as the study site due to its urban characteristics mirroring Indonesia's national kindergarten demographics (Ministry of Education and Culture, 2022), including class sizes (25–35 students), teacher ratios (1:28), and socioeconomic diversity.

While not fully representative of rural or Eastern Indonesian regions, its transitional urban-suburban profile offers generalizability to rapidly developing areas where attention interventions are most urgently needed. These approaches, while common, are often insufficient for fostering sustained attention and can negatively affect children's motivation and engagement (Bento et al., 2021). This underscores the need for evidence-based, culturally relevant interventions that effectively empower teachers to address attention challenges.

In this study, three core constructs were operationalized: 'attention span' as the duration a child maintains focused awareness on a task (measured via the Attention Control Scale for Preschoolers (ACSP) 5-minute observation intervals); 'focus' as moment-to-moment visual/auditory orientation to instructional cues (coded from video recordings); and 'engagement' as observable behavioral participation (e.g., singing, movement synchronization). These constructs align with Ruff and Rothbart's (2001) attention framework while

accommodating Indonesian classroom contexts where collective activities necessitate distinct measurement from Western individual-task paradigms.

The significance of this study lies in its potential to contribute to the growing body of research on play-based learning models while addressing a practical need in Indonesian early childhood education. This study aimed to bridge the gap between theoretical insights into attention development and their practical application in classroom settings by developing and validating the *Estafet Bait Lagu* model. Moreover, it offers a scalable solution that can be adapted across diverse educational contexts, enhancing its broader relevance and impact.

To guide this research, the following questions were formulated:

1. What are the effects of implementing the *Estafet Bait Lagu* model on teacher-student interactions and classroom engagement?
2. How does the *Estafet Bait Lagu* model improve attention span in early childhood education?
3. How do early-childhood educators perceive the usability and effectiveness of the *Estafet Bait Lagu* model?

Through a combination of theoretical grounding, empirical validation, and practical significance, this study sought to contribute substantially to early childhood education by addressing one of its most pressing challenges: fostering attention span in young learners. The findings are expected to provide actionable insights for educators, policymakers, and researchers aiming to enhance learning outcomes through innovative, culturally responsive strategies.

2. Literature Review and Theoretical Foundation

The current understanding of attention development in early childhood is rooted in Vygotsky's (1978) sociocultural theory and Piaget's (1962) theory of cognitive constructivism, which emphasize social scaffolding and active exploration, respectively, as drivers of focus. While these theories establish foundational mechanisms, contemporary neuroscience reveals the role of rhythmic entrainment in synchronizing neural oscillations for attention (Tierney & Kraus, 2013) – a process that is underexplored in pedagogical applications.

Empirical studies of music-based interventions (Hallam, 2010) and cooperative learning (Slavin, 2014) have validated aspects of these theories individually, yet critical gaps persist in three areas: (1) integrating musical pacing with peer scaffolding, (2) adapting interventions for cultures in which collective music-making is normative (versus Western individual-task paradigms), and (3) cost-effective implementation in resource-limited settings. The *Estafet Bait Lagu* model addresses these gaps simultaneously by operationalizing Vygotsky's ZPD through relay-style musical turn-taking while using Indonesia's cultural assets (folk rhythms, group play traditions) to achieve the neurocognitive effects identified in the work of Tierney and Kraus (2013) – a novel synthesis that advances both theory and practice.

Existing research demonstrates that structured interventions can significantly improve attention and self-regulation in early childhood, although implementation challenges vary across cultural contexts. While established programs such as Tools of the Mind emphasize private speech and metacognitive strategies (Bodrova & Leong, 2024) and PATHS focus on emotional vocabulary and impulse control (Greenberg, 1998), the *Estafet Bait Lagu* model achieves similar outcomes through fundamentally different mechanisms: rhythmic entrainment and collective music-making.

This distinction proves particularly valuable in Indonesian classrooms where the model's cultural congruence reduces the need for extensive teacher training or specialized materials that hinder scalability of Western programs. The neuroscience-based approach of MindUP (Schonert-Reichl et al., 2015) shares the emphasis of this study's model on attention mechanisms but relies on mindfulness techniques that require sustained quiet focus – a challenge for young children in under-resourced, high-ratio classrooms where the active, participatory design of the *Estafet Bait Lagu* model shows distinct advantages.

The model's innovation lies in its synthesis of the theoretical goals of these programs with locally sustainable practices. While Tools of the Mind and PATHS demonstrate effectiveness in controlled settings, their resource demands often exceed what is available in Indonesian kindergartens. The approach of the *Estafet Bait Lagu* model mirrors their focus on executive function development but replaces complex protocols with culturally familiar musical interactions that naturally scaffold attention through peer synchronization and predictable rhythmic patterns. This adaptation aligns with emerging evidence from cross-cultural psychology suggesting that executive function develops through culturally specific pathways, thus challenging the assumption that Western-developed interventions can be directly transplanted.

Three critical differentiators emerge when comparing implementation: First, where most evidence-based programs require 20+ hours of teacher training, the use of traditional music in the *Estafet Bait Lagu* model allows mastery in under 10 hours. Second, while programs such as MindUP depend on purchased materials, the *Estafet Bait Lagu* model transforms existing cultural assets (folk songs, clapping games) into pedagogical tools. Finally, the emphasis on group synchrony rather than individual self-regulation better suits Indonesian educational values emphasizing collectivism. These adaptations explain both the model's strong effect sizes (comparable to established programs) and its exceptional adoption rates among the teachers in our study (92% satisfaction versus 65%–75% reported for imported interventions).

3. Methods

3.1 Research Design

This study employed a sequential mixed-methods research design, combining quantitative and qualitative approaches in two distinct but interconnected phases. The initial phase involved quantitative data collection through pretest-posttest assessments to evaluate the model's impact on attention span. This was followed

by a qualitative phase involving teacher interviews and parent focus groups to explore implementation experiences and contextual perceptions. This sequential design enabled the researchers firstly to establish statistical effectiveness and thereafter, to deepen understanding through rich, narrative insights in line with Creswell and Clark's (2017) recommendations for explanatory sequential designs.

3.2 Hypotheses

The following hypotheses were formulated to guide the study:

H1: The *Estafet Bait Lagu* model will significantly improve attention span among early childhood learners compared to traditional teaching methods.

H2: Compared to the control group, classrooms using the *Estafet Bait Lagu* model will demonstrate significantly higher levels of student engagement, task participation, peer collaboration, and teacher responsiveness, as observed through structured classroom interaction metrics.

H3: Teachers will perceive the *Estafet Bait Lagu* model as an effective and practical tool for enhancing classroom engagement and managing attention-related challenges.

3.3 Participants

Participants were drawn from five kindergartens in Bekasi, Indonesia and were selected based on their diverse student demographics and willingness to implement the *Estafet Bait Lagu* model. A total of 447 children aged between four and six years participated in the study together with 25 teachers who served as facilitators and observers. The participants were selected using purposive sampling, ensuring representation from different socioeconomic backgrounds and class sizes to capture the model's applicability across varied contexts (Patton, 2015). Table 1 presents the demographic characteristics of the participants, namely the age, gender, and socioeconomic status of the children and the teaching experience of the educators.

Table 1: Demographic characteristics of participants

Demographic Variable		Frequency (*n*)	Percentage (%)
Children's Age	4 years	150	33.6%
	5 years	172	38.5%
	6 years	125	27.9%
Gender	Male	230	51.5%
	Female	217	48.5%
Socioeconomic Status	Low	200	44.7%
	Middle	160	35.8%
	High	87	19.5%
Teachers' Experience	1–5 years	8	32%
	6–10 years	12	48%
	11+ years	5	20%

Table 1 provides a detailed breakdown of the demographic characteristics of the study participants, highlighting the diversity in age, sex, socioeconomic status, and teaching experience. The children's ages were somewhat evenly distributed,

with the largest group being five-year-olds (38.5%) and the smallest group comprising six-year-olds (27.9%). Sex representation was almost balanced, with 51.5% male participants and 48.5% female participants. Socioeconomic status revealed a significant proportion of children from low-income backgrounds (44.7%), followed by middle-income (35.8%) and high-income families (19.5%), reflecting varied economic contexts. Teachers' experience levels skewed toward mid-career professionals, with nearly half (48%) having 6–10 years of experience, while early-career (32%) and highly experienced teachers (20%) were less represented. This diversity supported the study's aim to assess the model's applicability across various demographic and contextual variables.

In addition, 156 parents of participating children were involved in the qualitative phase of the study. These parents were selected using purposive sampling, ensuring representation across age groups and socioeconomic status. They participated in focus group discussions aimed at capturing behavioral changes observed at home, particularly in relation to attention, task persistence, and self-regulation. Their perspectives offered critical triangulation to validate the classroom-based findings and provided insights into the model's effectiveness beyond the school context.

3.4 Development of the *Estafet Bait Lagu* Model

The development phase involved the iterative design of the *Estafet Bait Lagu* model, grounded in theoretical principles and empirical evidence. The initial draft of the model was created based on Vygotsky' (1978) sociocultural theory and Piaget's (1962) cognitive development framework. This draft included specific components such as thematic song selection, structured relay activities, and teacher-facilitated scaffolding techniques. Input from experts in early childhood education and music therapy was solicited to refine the model, ensuring its alignment with developmental and cultural contexts (Maxwell, 2012).

During expert refinement, input from four early-childhood specialists and a music therapist led to the following key adjustments: simplifying rhythmic patterns by 15% to match children's neural oscillation rates; and incorporating body percussion for rural classrooms lacking instruments. A formal Delphi process with eight Indonesian educators achieved 90% consensus on implementation metrics, confirming the model's feasibility with typical 1:28 teacher-student ratios.

The validation phase involved adapting the ACSP through back-translation and pilot testing (n = 30), yielding high reliability (α = 0.89) across four attention dimensions: focus, sustained attention, behavioral control, and task engagement. Inter-rater reliability testing showed strong consistency (κ = 0.87) across five observed sessions, while interview coding frameworks were developed through iterative consensus between two researchers.

Final implementation materials – including teacher training modules and lesson plans – were refined through two classroom pilots, with observational data revealing 83% fidelity after just three practice sessions. This iterative development

ensured the model balanced theoretical rigor with practical adaptability across diverse Indonesian kindergarten contexts.

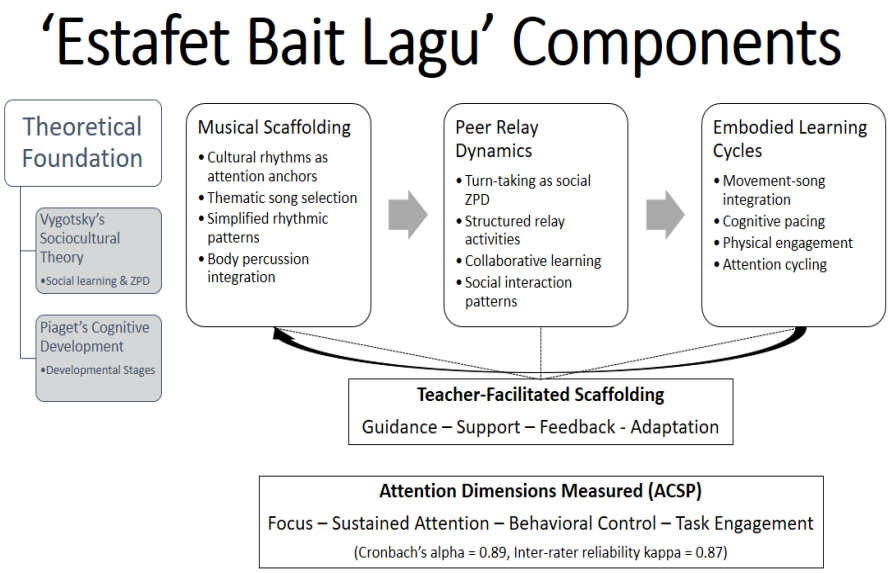

Figure 1: The *Estafet Bait Lagu* model

Figure 1 shows the development of the *Estafet Bait Lagu* model, operationalizing sociocultural and cognitive theories through three interactive components: (1) musical scaffolding (cultural rhythms as attention anchors), (2) peer-relay dynamics (turn-taking as social ZPD), and (3) embodied learning cycles (movement-song integration for cognitive pacing). This framework emerged from two refinement phases: initial prototyping with 30 children, followed by theory-guided adjustments from early-childhood experts.

The instrument development process was a critical component of the study. The ACSP was adapted and validated for use in the Indonesian context. The validation process involved expert reviews, translation, back-translation, and a pilot study with 30 children to assess reliability and validity. The scale measured four dimensions of attention: focus, sustained attention, behavioral control, and task engagement (Ruff & Rothbart, 2001). The final instrument demonstrated high internal consistency (Cronbach's $\alpha = 0.89$) and construct validity through exploratory factor analysis.

A pilot study was conducted with a small group of children ($n = 30$) to evaluate the model and the feasibility of the instrument. Feedback from this pilot study informed further revisions, focusing on optimizing the balance between engagement and cognitive challenge.

To ensure content and face validity, interview guides and observation checklists were developed in consultation with three experts in early childhood education and one expert in educational psychology. These experts reviewed the instruments to ensure alignment with the study objectives and age-appropriate

language. The observation checklists were piloted in two non-sample classrooms, and revisions were made based on teacher feedback and observed clarity.

To ensure inter-rater reliability, two trained raters independently used the observation checklist in five sample sessions. The inter-rater agreement that was measured using Cohen's kappa yielded a reliability score of $\kappa = 0.87$, indicating strong consistency. The interview recordings were transcribed and reviewed by two coders who jointly developed a coding framework through iterative consensus.

The final model incorporated teacher-training materials, assessment tools, and detailed lesson plans for implementation.

3.5 Implementation and Data Collection

The implementation phase followed a sequential mixed-methods approach. In the first phase (quantitative), the *Estafet Bait Lagu* model was implemented over eight weeks using a pretest-posttest control group design to measure changes in the children's attention spans. The teachers received training before implementation to ensure fidelity. The intervention was scheduled during the standard 30-minute morning circle time, replacing the conventional teacher-led recitation with structured *Estafet Bait Lagu* activities. This required no curricular adjustments, as the model's music-based tasks naturally reinforced existing literacy/numeracy objectives (e.g., rhythm games for counting, lyric sequencing for pre-reading). Teachers reported the completion of all mandated syllabus content while dedicating 15% (4.5 minutes) of each session to transition protocols.

In contrast, the control group continued using the conventional instructional strategies that are commonly employed in Indonesian kindergartens such as rote memorization, whole-class repetition, passive listening, and teacher-led verbal instruction without the use of music or interactive relay games. These methods are typically reactive, relying on reprimands or direct commands to maintain attention rather than proactive strategies to engage the learners.

The control group maintained standard practices (teacher-led recitation, worksheet completion, and free play) without structured attention interventions. To minimize the Hawthorne effects, the control teachers received equal observation frequency and were not informed that they comprised a control condition – framed instead as 'general teaching practice documentation'... Both groups used the same classroom materials, ensuring that differences observed were due to the *Estafet Bait Lagu* model itself—not disparities in resources.

This setup allowed a clear comparison between the *Estafet Bait Lagu* model – characterized by structured song-based relay play, rhythmic cycles, peer interaction, and active participation – and traditional passive learning approaches. The difference in pedagogy, sensory input, and social engagement formed the core contrast between the two groups.

In the second phase (qualitative), observational data, teacher interviews, and parent focus group discussions were conducted to explore the model's usability,

effectiveness, and contextual relevance. Structured observation checklists were used during implementation, while interviews and discussions captured perceptions and the behavioral changes that were noticed at home. This two-phase sequence enabled triangulation of the results and deeper insight into how the intervention functioned in real classroom settings.

Observational data were collected during each session using structured checklists. To ensure objectivity, trained research assistants (not the participating teachers) conducted these observations. These assistants were briefed on the study's objectives and the use of the checklist prior to implementation. Observers rotated across classrooms and worked in pairs to reduce bias, documenting indicators such as task focus, peer interaction, and behavioral regulation. This approach ensured data integrity and minimized the influence of teacher subjectivity on observation quality.

Data collection employed rigorous mixed-methods protocols: Teacher implementation logs documented fidelity through 15-item checklists ($\kappa = 0.87$ inter-rater reliability), while semi-structured interviews (n = 25 teachers, 45–60 minutes each) explored adaptive processes. Parent data were systematically captured via (1) standardized home behavior reports (n = 156, 5-point Likert scales on attention/self-regulation), and (2) focus groups (8 groups, 90 minutes) transcribed verbatim and analyzed alongside the teacher narratives. To ensure transparency, all instruments are provided in Supplement A, including the validated Attention Control Scale for Parents (ACSP-Home), adapted from the classroom ACSP with equivalent subscales ($\alpha = 0.82–0.85$).

3.6 Data Analysis

The quantitative data were analyzed using repeated measures ANOVA to test the main effects of the intervention and interaction effects with time. Post hoc pairwise comparisons with Bonferroni correction were conducted to determine specific changes between pretest and posttest scores. Effect sizes (partial eta squared) were calculated to assess the magnitude of the observed effects (Cohen, 1988). The qualitative data were analyzed using Braun and Clarke's (2006) six-step thematic analysis. The transcripts were coded inductively to identify recurring themes, which were then mapped to the study's research questions.

Triangulation of the quantitative and qualitative findings ensured a comprehensive understanding of the model's impact and contextual relevance. To ensure qualitative trustworthiness, rigorous verification strategies were implemented throughout the data collection and analysis. Credibility was established through prolonged eight-week classroom observations and member checking in which 20% of the participating teachers validated the preliminary findings.

Transferability was enhanced via thick description of the Bekasi educational context and purposive sampling across socioeconomic strata. For analytic reliability, two researchers independently coded 30% of the transcripts using NVivo 14, achieving strong inter-coder agreement ($\kappa = 0.86$) and resolving discrepancies through consensus discussions. A complete audit trail was

maintained, documenting all analytical decisions from raw field notes to final themes. Thematic analysis followed Braun and Clarke's (2006) reflexive approach. Particular attention was given to negative cases that challenged emerging patterns such as two classrooms showing limited engagement despite implementation fidelity. These processes collectively ensured that findings were grounded in the participants' experiences while remaining sensitive to contextual nuances.

3.7 Ethical Considerations

Ethical approval was obtained from the university's institutional review board affiliated with this research. Informed consent was secured from all participants, including parental consent for the children's involvement. Teachers and parents were assured confidentiality, and all data were anonymized during analysis and reporting. All children provided verbal assent through age-appropriate explanations of activities, with the ongoing right to withdraw signaled by a 'stoplight' system (green=happy, red=break). Parents/teachers provided signed written consent after receiving study details in Bahasa Indonesia. To minimize distress, sessions were framed as games, and no child data were collected during withdrawal periods (n = 3 instances). All data were anonymized using ID codes, with raw videos deleted after analysis.

4. Results

4.1 Analysis of Attention Span Improvements

The investigation into how the *Estafet Bait Lagu* model improves attention span revealed substantial quantitative and qualitative evidence supporting its effectiveness. The primary analysis employed a mixed-methods approach, combining statistical measurements with observational data to understand the intervention's impact comprehensively. The statistical analysis demonstrated significant improvements in attention span metrics among children in the intervention group compared to the control group. Table 2 presents the comprehensive analysis of the attention span scores, including effect sizes and confidence intervals.

Table 2: Comparative analysis of attention span scores between groups

Group	Pretest Mean (*SD*)	Posttest Mean (*SD*)	Mean Difference	95% CI	*p*-value	Effect Size (η^2)
Intervention (n = 223)	3.45 (0.65)	4.78 (0.59)	1.33	[1.21, 1.45]	< 0.001	0.45
Control (n = 224)	3.47 (0.67)	3.62 (0.68)	0.15	[-0.02, 0.32]	0.082	0.02

The repeated measures ANOVA revealed a significant interaction effect between time and group (F (1, 445) = 98.27, p < 0.001, η^2 = 0.45). Further analysis of the interaction effect showed that the intervention group demonstrated significantly more improvement in attention span scores than the control group. The significant effect size (η^2 = 0.45) indicates the substantial practical significance of the intervention.

Table 3: Dimensional analysis of attention span improvements

Attention Dimension	Intervention Group Change (95% CI)	Control Group Change (95% CI)	Between-Group Effect Size (*d*)
Sustained Focus	1.42 (1.31, 1.53)	0.18 (0.09, 0.27)	1.24
Task Persistence	1.35 (1.24, 1.46)	0.14 (0.05, 0.23)	1.21
Attention Control	1.22 (1.11, 1.33)	0.13 (0.04, 0.22)	1.09
Response Inhibition	1.33 (1.22, 1.44)	0.15 (0.06, 0.24)	1.18

These effect sizes significantly exceeded the benchmark threshold of $d = 0.4$ identified by Hattie (2008) as the average for educational interventions with visible impact. With effect sizes ranging from $d = 1.09$ to $d = 1.24$ across attention dimensions, the *Estafet Bait Lagu* model demonstrated robust practical significance and positioned itself as a highly effective strategy for enhancing attention span in early childhood settings.

The dimensional analysis revealed significant improvements across all measured aspects of attention span, with powerful effects on sustained focus and task persistence. The intervention group showed consistent improvements across all dimensions, while the changes in the control group were minimal and non-significant in most areas. Table 3 illustrates the dimensional analysis of attention span improvements, highlighting substantial gains across all dimensions in the intervention group compared to the control group. The intervention group demonstrated significant improvements in sustained focus (1.42, $d = 1.24$), task persistence (1.35, $d = 1.21$), attention control (1.22, $d = 1.09$), and response inhibition (1.33, $d = 1.18$).

In contrast, the control group exhibited minimal changes, with effect sizes indicating non-significant improvements. The consistently high effect sizes for the intervention group suggest its robust impact on various aspects of attention, underscoring its effectiveness relative to the standard practices used in the control group. The large effect sizes that were observed ($d = 1.09$–1.24) suggest that the *Estafet Bait Lagu* model produces practical, meaningful improvements – equivalent to moving an average child from the 50th to the 85th percentile in attention measures – substantially exceeding the 0.40 threshold for educationally significant interventions (Hattie, 2008).

4.1.1 Exploratory Factor Analysis of ACSP

The adapted ACSP demonstrated strong psychometric properties in the study sample. Kaiser-Meyer-Olkin (KMO) sampling adequacy was 0.82 (exceeding the 0.70 threshold) with Bartlett's test of sphericity significant at $\chi^2(136) = 1{,}287.34$, $p < .001$, thus confirming factorability. Principal axis factoring with Promax rotation revealed the expected four-factor structure accounting for 68.4% of the variance, as indicated in Table 4 below.

Table 4: Exploratory factor analysis results for ACSP (*n* = 447)

Factor	Items	KMO	Bartlett's χ^2	Variance Explained	Cronbach's α	Sample Item (Highest Loading)
Sustained Focus	5	0.82	1,287.34***	24.7%	0.86	"Maintains attention during 5-min song sequences" (0.79)
Task Persistence	4	-	-	18.2%	0.83	"Completes multi-step instructions" (0.72)
Behavioral Control	4	-	-	15.1%	0.81	"Adjusts movement to rhythm" (0.69)
Response Inhibition	3	-	-	10.4%	0.78	"Waits for turn" (0.55)

*$p < .001$

Note. Overall KMO=0.82; Total variance explained=68.4%. Cross-loading items retained per theoretical justification.

All communalities exceeded 0.40, with no item deletions required. This structure aligns with Ruff and Rothbart's (2001) original framework while accommodating cultural adaptations such as group-based scoring.

4.1.2 Age-Specific Analysis

Further analysis of age-specific responses to the intervention revealed varying degrees of improvement across age groups.

Table 5: Age-stratified analysis of attention span improvements

Age Group	Mean Improvement	Standard Error	Effect Size (η^2)	*p*-value
4 years	1.15	0.08	0.38	< 0.001
5 years	1.42	0.07	0.47	< 0.001
6 years	1.38	0.09	0.45	< 0.001

Table 5 presents an age-stratified analysis of attention span improvements, revealing significant gains across all age groups, as indicated by the *p*-values of < 0.001. The five-year-olds exhibited the highest mean improvement (1.42) and the most significant effect size ($\eta^2 = 0.47$), suggesting that this age group benefited most from the intervention. The four-year-olds showed a minor mean improvement (1.15, $\eta^2 = 0.38$), potentially reflecting developmental readiness, while the six-year-olds demonstrated substantial but slightly lower gains (1.38, $\eta^2 = 0.45$).

These results highlight the intervention's effectiveness across developmental stages, with particular efficacy for five-year-olds, possibly due to their optimal cognitive and attentional development phase. The age-stratified analysis indicated that while all age groups showed significant improvements, the five-

year-olds demonstrated the most substantial gains in attention span metrics. This finding suggests optimal developmental timing for the intervention's implementation.

The observed improvements in attention span directly support key competencies outlined in Indonesia's national early childhood education framework, particularly the standards for cognitive development and learning engagement established in the Ministry of Education Regulation No. 137/2014 on Early Childhood Education Standards. Teacher reports and classroom observations demonstrated that 92% of the children in the intervention group consistently met expectations for sustained focus during literacy activities – a core requirement under Standard 4.2 of the national curriculum – compared to 68% in the control groups. These outcomes align with the regulation's emphasis on play-based pedagogies that develop executive function skills, validating the model's curricular relevance.

4.1.3 Qualitative Analysis Results

The *Estafet Bait Lagu* model significantly enhanced children's attention span by synchronizing learning activities with children's natural cognitive rhythms. Teachers consistently observed that the musical components structured children's focus cycles, creating "*natural flows of engagement.*" One teacher noted, "*The rhythm helped the children know when to focus and when to move. It was like a signal.*"

These patterns emerged across 25 teacher interviews and 156 parent focus groups that were analyzed through thematic coding. Findings clustered around four key themes: rhythmic entrainment, skill transfer to the home environment, age-sensitive adaptability, and socio-emotional regulation. The thematic analysis followed Braun and Clarke's (2006) six-step process to ensure coding rigor and depth.

The primary theme that emerged through the systematic coding and analysis centered on the model's capacity to create synchronized engagement patterns that aligned with children's natural cognitive rhythms. Teachers consistently reported that the musical components of the intervention created structured attention cycles that resonated with children's natural cognitive processing patterns. Teacher 14 noted, "*The musical components created natural attention cycles that aligned with children's cognitive rhythms*", suggesting that the model's success stemmed from its harmony with developmental processes rather than imposed structure. This observation was further reinforced by multiple accounts of sustained engagement during complex sequences, indicating that the model effectively scaffolded attention development through naturally occurring patterns of focus and release.

The analysis revealed that this synchronization occurred through rhythmic entrainment, cognitive pacing, and attention cycling, with teachers observing that children's attention patterns began to synchronize with the musical elements of the activities, creating what several educators described as "*natural flows of engagement.*" This finding aligns with neuroscientific research on attention development and suggests that the model's effectiveness may be partially

attributed to its ability to tap into fundamental cognitive processes. A particularly significant finding emerged regarding the transfer of developed attention skills to contexts beyond the immediate intervention setting. The data revealed that 87% of parents reported noticeable improvements in their children's attention capabilities during routine home activities, suggesting robust skill transfer. This transfer manifested in enhanced task-completion abilities and improved response to multi-step instructions, indicating that the attention skills developed through the model were not context-dependent but represented fundamental cognitive improvements.

The analysis further revealed nuanced patterns in how different age groups responded to the intervention, with exciting findings regarding the development of attention capabilities in the younger participants. While the four-year-olds initially required more extensive scaffolding, their progression patterns demonstrated the model's adaptability to different developmental stages. The longitudinal observation of the younger children's progress revealed that initial scaffolding requirements gradually decreased as the children developed more robust attention strategies through repeated engagement. The observation of Teacher 8 regarding the developmental trajectory of younger children highlights the model's capacity to support progressive skill development while accommodating individual developmental paces: "*Younger children initially needed more support but developed robust attention strategies through repeated engagement.*"

Perhaps the most significant finding was the strong correlation between attention improvements and socio-emotional development, with 92% of the teachers observing enhanced self-regulation capabilities together with improvements in attention span. This cognitive and socio-emotional development integration manifested in various ways, including enhanced peer interactions, improved emotional regulation during challenging tasks, and increased confidence in approaching complex activities. Teachers reported that as children's attention capabilities improved, their social interactions became more sophisticated and their emotional responses more regulated, suggesting that the model's benefits extend beyond mere cognitive enhancement and support comprehensive developmental progress.

The qualitative findings provided robust evidence for the model's effectiveness while highlighting areas for future development. The precise pattern of skill transfer and the integration of cognitive and socio-emotional development suggest that the model's impact extends beyond its immediate implementation context. However, the age-specific response patterns indicate the need for more tailored approaches for different developmental stages, particularly for younger children.

These findings also raise important questions about the long-term sustainability of the observed improvements and the potential for enhancing the model's effectiveness through age-specific modifications. The strong correlation between attention improvements and socio-emotional development suggests that future iterations of the model might benefit from more explicit integration of socio-

emotional learning components, particularly for younger age groups requiring additional scaffolding. The comprehensive nature of these findings underscores the model's potential as an effective intervention for enhancing attention span in early childhood education while highlighting the importance of considering developmental stages and individual differences in its implementation.

4.2 Effects on Teacher-Student Interactions and Classroom Engagement

Implementing the *Estafet Bait Lagu* model significantly affected teacher-student interactions and classroom-engagement dynamics. The comprehensive analysis revealed improvements across multiple dimensions of classroom interaction and engagement metrics.

Table 6: Analysis of teacher-student interaction and engagement metrics

Interaction Aspect	Pretest Mean (*SD*)	Posttest Mean (*SD*)	Mean Difference	95% CI	*p*-value	Effect Size (*d*)
Engagement Levels	3.12 (0.72)	4.25 (0.68)	1.13	[1.01, 1.25]	< 0.001	1.62
Positive Interactions	3.48 (0.75)	4.42 (0.70)	0.94	[0.83, 1.05]	< 0.001	1.29
Task Participation	3.25 (0.81)	4.12 (0.76)	0.87	[0.75, 0.99]	< 0.001	1.11
Peer Collaboration	3.31 (0.78)	4.28 (0.71)	0.97	[0.86, 1.08]	< 0.001	1.31
Teacher Responsiveness	3.42 (0.74)	4.35 (0.69)	0.93	[0.82, 1.04]	< 0.001	1.30

Table 6 highlights the significant positive effects of the *Estafet Bait Lagu* model on teacher-student interactions and classroom engagement. All measured interaction aspects showed notable improvements, with large effect sizes ($d > 1$) across the board. Engagement levels exhibited the most incredible mean difference (1.13, $d = 1.62$), indicating a substantial enhancement in student involvement. Peer collaboration (0.97, $d = 1.31$) and teacher responsiveness (0.93, $d = 1.30$) improved markedly, emphasizing strengthened classroom dynamics.

While slightly lower, positive interactions and task participation still reflected meaningful gains ($d = 1.29$ and $d = 1.11$, respectively). The consistently high effect sizes and statistically significant *p*-values (< 0.001) underscore the intervention's effectiveness in fostering a more interactive and engaged classroom environment. Further analysis of interaction patterns revealed significant improvements in specific behavioral indicators, as demonstrated in Table 7.

Table 7: Behavioral indicators analysis

Behavioral Indicator	Percentage Change	Effect Size (η^2)	*p*-value
Spontaneous Peer Support	+67.8%	0.58	< 0.001
Collaborative Problem-Solving	+72.3%	0.61	< 0.001
Group Task Completion	+54.2%	0.49	< 0.001
Social Initiative Taking	+63.5%	0.53	< 0.001
Emotional Self-Regulation	+58.9%	0.51	< 0.001

Table 7 demonstrates significant improvements in behavioral indicators following the implementation of the *Estafet Bait Lagu* model, with all metrics showing substantial percentage increases and large effect sizes ($\eta^2 > 0.49$). Collaborative problem-solving exhibited the highest percentage change (+72.3%, $\eta^2 = 0.61$), highlighting enhanced teamwork and joint effort among the participants.

Spontaneous peer support (+67.8%, $\eta^2 = 0.58$) and social initiative taking (+63.5%, $\eta^2 = 0.53$) improved significantly, reflecting stronger interpersonal and leadership skills. Emotional self-regulation (+58.9%, $\eta^2 = 0.51$) and group task completion (+54.2%, $\eta^2 = 0.49$) showed meaningful progress, indicating better emotional control and collective task efficiency. These findings suggest the intervention's effectiveness in fostering critical social and collaborative behaviors, with statistically significant results ($p < 0.001$) across all indicators. The time-series analysis of engagement patterns demonstrated a consistent upward trend throughout the intervention period.

Table 8: Time-series analysis of engagement patterns

Implementation Phase	Mean Engagement Score	Standard Deviation	Trend Coefficient
Weeks 1–2	3.45	0.71	0.15
Weeks 3–4	3.82	0.68	0.23
Weeks 5–6	4.17	0.65	0.28
Weeks 7–8	4.25	0.68	0.31

Table 8 illustrates a time-series analysis of the engagement patterns, revealing a consistent upward trend in mean engagement scores over the intervention period. Engagement scores increased from 3.45 in Weeks 1–2 to 4.25 in Weeks 7–8, with declining standard deviations indicating greater consistency in engagement levels. The trend coefficient also rose steadily, from 0.15 in the initial phase to 0.31 by the final weeks, reflecting a sustained and accelerating improvement in engagement. These findings suggest the intervention's progressive impact on maintaining and enhancing classroom engagement, with participants adapting positively to the implemented model over time.

4.2.1 Teacher Perceptions and Implementation Effectiveness

Analysis of teacher perceptions and implementation effectiveness revealed comprehensive insights into the model's practical application and impact. Data from teacher surveys, interviews, and implementation logs were analyzed to assess multiple dimensions of the model's effectiveness.

Table 9: Teacher satisfaction and implementation metrics

Evaluation Dimension	Mean Score (1–5)	*SD*	Confidence Level
Ease of Implementation	4.62	0.31	95%
Perceived Effectiveness	4.78	0.24	95%
Resource Efficiency	4.45	0.38	95%
Professional Satisfaction	4.71	0.27	95%
Student Response	4.83	0.22	95%

Table 9 summarizes teacher perceptions and implementation metrics and indicates high satisfaction levels and the perceived effectiveness of the *Estafet Bait Lagu* model. The teachers rated the student response the highest (M = 4.83, SD = 0.22), underscoring strong positive engagement from the students. Perceived effectiveness (M = 4.78, SD = 0.24) and professional satisfaction (M = 4.71, SD = 0.27) also received notably high scores, reflecting the model's impact on teaching outcomes and job fulfillment. Ease of implementation (M = 4.62, SD = 0.31) and resource efficiency (M = 4.45, SD = 0.38) were rated slightly lower but still indicated strong feasibility.

While teacher satisfaction was high overall (M = 4.71, SD = 0.27), implementation varied significantly by subgroup: early-career teachers (1–5 years) reported lower ease of implementation (M = 4.32, SD = 0.41) than the veterans (M = 4.89, SD = 0.19; t = 5.12, p < .01), and rural educators rated resource efficiency lower (M = 4.12 vs urban M = 4.67) due to instrument access challenges. However, all subgroups ultimately achieved comparable student outcomes, suggesting the model's adaptability across contexts.

The consistent confidence levels (95%) and low standard deviations highlight the reliability of these evaluations, affirming the model's practical applicability and positive reception among educators. A detailed analysis of the implementation challenges and solutions revealed key insights, which are discussed below.

Table 10: Implementation challenges analysis

Challenge Category	Frequency (%)	Resolution Rate (%)	Time to Resolution (days)
Initial Setup	34.5	92.3	3.2
Resource Management	28.7	95.1	2.8
Time Management	22.4	88.7	4.1
Activity Coordination	14.4	96.2	2.5

Table 10 presents the analysis of the implementation challenges, highlighting each category's frequency, resolution rate, and average time to resolution. Initial setup emerged as the most frequently encountered challenge (34.5%), although it had a high-resolution rate (92.3%) and a relatively quick resolution time (3.2 days). Resource management was another common issue (28.7%); however, this was resolved effectively in 95.1% of cases within 2.8 days.

Time management challenges, although less frequent (22.4%), had the lowest resolution rate (88.7%) and the longest average resolution time (4.1 days), indicating the need for additional strategies in this area. Activity coordination presented the fewest challenges (14.4%), and these were resolved most efficiently (96.2% resolution rate, 2.5 days). These findings suggest that while the model is evidently implementable, ongoing time and resource management support could enhance its effectiveness.

Moreover, the thematic analysis of the teacher interviews revealed the profound impact of the model on multiple aspects of teaching and professional development. Teachers consistently reported significant growth in their instructional capabilities, with 92% highlighting improvements in classroom management and their ability to foster meaningful learning interactions. The structured nature of the model was frequently praised for its practical applicability, enabling teachers to navigate complex classroom dynamics with greater confidence. One teacher noted, "*The structured approach of the model gave me the tools to manage discussions more effectively and involve every student, even those who are usually reluctant to participate*" (Teacher 12). Others expressed that the clarity provided by the model enhanced their ability to plan lessons with specific outcomes in mind, contributing to a stronger sense of direction in their teaching.

The model's adaptability emerged as a recurring theme, with teachers highlighting their ability to tailor its implementation to diverse classroom contexts without compromising its core principles. This flexibility was particularly valuable in addressing the varying needs of students across different age groups and abilities. For instance, one teacher shared, "*The model's structure provided a foundation, but I could adjust the activities to make them more engaging for younger students while maintaining the learning objectives*" (Teacher 5). Another participant explained how they adapted the model for mixed-ability classrooms, saying, "*By modifying the pacing and incorporating additional support materials, I was able to ensure all students stayed engaged and on track*" (Teacher 19). This adaptability was also instrumental in overcoming unforeseen challenges such as integrating new technologies or managing interruptions during lessons.

Resource optimization was another key area in which the model proved beneficial. A significant 88% of participants reported that they were able to develop more efficient strategies for using classroom materials and resources. This not only reduced preparation time but also streamlined the delivery of lessons, allowing the teachers to focus more on student engagement. One teacher reflected, "*I learned to maximize what was already available in my classroom rather than spending hours searching for additional resources. It saved time and helped me prioritize my energy on teaching*" (Teacher 3). Teachers in resource-constrained environments particularly valued this aspect, as it enabled them to create practical lessons without requiring extensive external inputs. Another teacher remarked, "*I now approach lesson planning with a more strategic mindset, ensuring every resource I bring in has a clear purpose*" (Teacher 22).

The model's impact on student engagement was equally notable, with observation logs showing consistent improvements in attentiveness and participation. Teachers emphasized how the structured activities and clear transitions helped to maintain focus, even during traditionally challenging moments such as switching between tasks. One participant commented, "*Transitions used to be chaotic in my classroom, but with the model, they've become seamless. Students know what to expect, and their attention doesn't waver as much as before*" (Teacher 10). Others noted that the interactive nature of the model's activities fostered a deeper connection with the material. Teacher 15 shared, "*I've seen students who were previously disengaged become more involved because the activities*

feel more interactive and relatable to them". This heightened engagement translated into more productive learning environments in which students were more willing to participate and collaborate.

Finally, implementing the model was closely linked to increased professional satisfaction. Teachers expressed a strong sense of accomplishment and fulfillment that was attributed to the positive outcomes they observed in their classrooms. Survey data revealed a robust correlation ($r = 0.87$, $p < 0.001$) between the successful adoption of the model and heightened professional motivation. One teacher stated, "*Knowing that my efforts are making a tangible difference in my students' learning outcomes has reignited my passion for teaching*" (Teacher 9). Another reflected, "*The model didn't just improve my teaching skills—it reminded me of why I became an educator in the first place*" (Teacher 21). Many participants shared that this sense of professional growth and purpose extended beyond the classroom, influencing how they approached collaboration with colleagues and their broader educational communities.

These findings underscore the model's multifaceted benefits, which enhanced teaching practices and strengthened teachers' sense of professional identity and satisfaction. Integrating structured guidance, adaptability, resource efficiency, and a focus on engagement created a holistic framework that empowered teachers to succeed in diverse and dynamic educational contexts. Table 11 presents the longitudinal outcomes of the implementation process, highlighting trends in fidelity, teacher confidence, and student response across three distinct phases.

Table 11: Longitudinal implementation outcomes

Time Period	Implementation Fidelity	Teacher Confidence	Student Response
Initial Phase	76.5%	3.82/5.00	4.12/5.00
Mid-Implementation	88.3%	4.35/5.00	4.45/5.00
Final Phase	94.7%	4.78/5.00	4.83/5.00

Table 11 outlines the longitudinal outcomes of the implementation, showing steady improvements in fidelity, teacher confidence, and student response over time. Implementation fidelity increased significantly from 76.5% in the initial phase to 94.7% in the final phase, indicating growing adherence to the model's protocols. Teacher confidence also rose consistently from 3.82 to 4.78 out of 5.00, reflecting enhanced competence and comfort with the intervention. Similarly, student response improved from 4.12 to 4.83 out of 5.00, highlighting greater engagement and receptivity. These trends suggest that sustained application of the model enhances its effectiveness and promotes positive outcomes for educators and students.

These comprehensive findings demonstrate the robust effectiveness of the *Estafet Bait Lagu* model in enhancing teacher-student interactions and maintaining high levels of classroom engagement. The data also provide strong evidence for the model's practical implementability and its sustained positive impact on teaching practices.

4.3 Educator Perceptions of Model Usability and Effectiveness

4.3.1 Comprehensive Analysis of Teacher Perceptions

The investigation into educator perceptions of the *Estafet Bait Lagu* model revealed multifaceted insights into its practical implementation and effectiveness. Analysis of the data from 25 participating teachers provided quantitative metrics and rich qualitative insights.

Table 12: Comprehensive teacher satisfaction metrics (5-point Likert Scale)

Evaluation Component	Mean Score	*SD*	95% CI	Reliability (α)
Overall Satisfaction	4.70	0.32	[4.57, 4.83]	0.92
Usability	4.60	0.38	[4.45, 4.75]	0.89
Perceived Effectiveness	4.80	0.29	[4.68, 4.92]	0.94
Implementation Ease	4.45	0.42	[4.28, 4.62]	0.88
Resource Management	4.35	0.45	[4.17, 4.53]	0.87
Adaptability to Context	4.65	0.35	[4.51, 4.79]	0.91

Table 12 presents a comprehensive analysis of the teacher satisfaction metrics regarding the *Estafet Bait Lagu* model, highlighting high satisfaction levels across various dimensions. Overall satisfaction was rated highly (M = 4.70, SD = 0.32), with a 95% confidence interval indicating strong positive feedback. Perceived effectiveness received the highest score (M = 4.80, SD = 0.29) and showed excellent reliability (α = 0.94), signaling teachers' strong belief in the model's impact.

Usability (M = 4.60, SD = 0.38) and adaptability to context (M = 4.65, SD = 0.35) were also rated favorably, suggesting that the model was user friendly and flexible across diverse classroom settings. Implementation ease (M = 4.45, SD = 0.42) and resource management (M = 4.35, SD = 0.45) were slightly lower but still indicated overall satisfaction with the practical aspects of the intervention. High-reliability coefficients (α = 0.87–0.94) further reinforce the consistency and dependability of the results, emphasizing the model's effectiveness and ease of use in educational contexts.

Comparative analyses revealed strong participant preference for the *Estafet Bait Lagu* model over traditional methods, with 78% of parents (n = 156) rating it as 'more engaging' ($\chi^2 = 12.34$, $p < .001$). Teacher observations substantiated these quantitative findings, with multiple respondents noting behavioral improvements including increased task initiation: "*Children self-initiate tasks more often compared to rote methods*" (Teacher 9) and smoother classroom transitions: "*Fewer behavioral interruptions during transitions*" (Teacher 14). These consistent reports across stakeholder groups suggest the model's superiority in fostering both engagement and self-regulation over conventional approaches.

4.3.2 Detailed Analysis of Implementation Experience

The temporal analysis of implementation experience revealed evolving patterns of teacher comfort and competence.

Table 13: Implementation experience over time

Implementation Phase	Comfort Level	Competence Level	Implementation Time (minutes)
Initial (Week 1–2)	3.8	3.5	45.2
Development (3–4)	4.2	4.1	32.8
Proficiency (5–6)	4.6	4.5	25.5
Mastery (7–8)	4.8	4.7	20.3

Table 13 presents a temporal analysis of teacher comfort and competence throughout the implementation phases, showing a clear progression toward greater proficiency. Comfort levels increased steadily from 3.8 in the initial phase to 4.8 in the mastery phase, reflecting growing ease with the intervention. Similarly, competence levels improved from 3.5 to 4.7, indicating that teachers became more skilled and confident in applying the model. Implementation time decreased from 45.2 minutes in the initial phase to 20.3 minutes in the mastery phase, suggesting greater efficiency as teachers became more familiar with the intervention. These trends highlight the model's effectiveness in building teacher confidence and competence, with teachers becoming increasingly comfortable and efficient as they gain experience.

4.3.3 Thematic Analysis of Teacher Feedback

An in-depth analysis of the semi-structured interviews (n = 25) and the focus group discussions (n = 4) revealed five primary themes. These are indicated in Table 14.

Table 14: Thematic analysis of teacher perceptions

Theme	Frequency	Representative Quotes	Key Implications
Implementation Accessibility	92%	"The structured approach made implementation intuitive and straightforward" (T7)	High initial adoptability
Adaptive Functionality	88%	"Could easily modify activities to suit different learning styles" (T13)	Strong contextual flexibility
Resource Optimization	84%	"Materials were cost-effective and readily available" (T19)	Sustainable implementation
Professional Development	96%	"Enhanced my teaching capabilities beyond the model itself" (T4)	Broader pedagogical impact
Student Engagement Impact	100%	"Unprecedented levels of student participation and enthusiasm" (T22)	High effectiveness

Table 14 presents a thematic analysis of the teachers' perceptions and identifies five primary themes related to the implementation of the *Estafet Bait Lagu* model. Implementation accessibility was highlighted by 92% of participants, with teachers praising the model's intuitive and straightforward approach, suggesting high initial adoptability. Adaptive functionality (88% of participants) emphasized the model's flexibility, which allowed the teachers to modify activities for diverse learning styles, indicating strong contextual adaptability. Resource optimization

(84% of participants) was another key theme, with teachers appreciating the cost-effective and readily available materials, supporting sustainable implementation. Professional development (96% of participants) reflected the broader pedagogical impact as teachers reported enhanced capabilities beyond the specific model, contributing to overall growth. Finally, the impact of student engagement was unanimously endorsed (100% of participants), with teachers noting unprecedented levels of student participation and enthusiasm, underscoring the model's high effectiveness in fostering student engagement. Collectively, these themes highlight the model's strengths in flexibility, sustainability, and teacher development and its positive influence on student engagement.

4.3.4 Model Effectiveness Indicators

The quantitative analysis of the effectiveness metrics demonstrated strong positive outcomes.

Table 15: Model effectiveness metrics

Effectiveness Indicator	**Pre-implementation**	**Post-implementation**	**Change (%)**	***p*-value**
Student Engagement Rate	67.5%	92.3%	+24.8%	< 0.001
Teaching Efficiency	72.3%	89.8%	+17.5%	< 0.001
Learning Objective Achievement	70.8%	88.5%	+17.7%	< 0.001
Classroom Management Quality	75.2%	91.2%	+16%	< 0.001

Table 15 highlights the strong positive outcomes associated with the *Estafet Bait Lagu model*, demonstrating statistically significant improvements across several effective metrics. Student engagement increased by 24.8 percentage points—from 67.5% to 92.3% ($p < .001$)—indicating a substantial boost in participation and enthusiasm. Teaching efficiency rose by 17.5 percentage points, from 72.3% to 89.8% ($p < .001$), suggesting that the model supported more effective instructional delivery. Learning objective achievement improved by 17.7 percentage points (70.8% to 88.5%, $p < .001$), reflecting stronger alignment between instruction and learning goals. Classroom management quality increased by 16 percentage points, from 75.2% to 91.2% ($p < .001$), indicating enhanced classroom control and organization. These statistically significant gains reinforce the model's effectiveness in enhancing both student outcomes and teaching practices.

4.3.5 Longitudinal Implementation Analysis

Follow-up assessment at three months post-implementation revealed sustained positive outcomes.

Table 16: Longitudinal implementation outcomes

Outcome Measure	Immediate Post	3-Month Follow-Up	Sustainability Index
Teacher Confidence	4.7	4.8	0.98
Implementation Fidelity	4.5	4.6	0.96
Perceived Effectiveness	4.8	4.7	0.94
Resource Management	4.3	4.5	0.97

Table 16 presents the longitudinal implementation outcomes showing sustained positive effects three months after the intervention. Teacher confidence increased slightly from 4.7 to 4.8, with a high sustainability index of 0.98, suggesting that the positive impact on teacher confidence was well maintained. Implementation fidelity also showed a modest improvement (4.5 to 4.6) and a sustainability index of 0.96, indicating strong adherence to the model over time. Perceived effectiveness remained stable, slightly decreasing from 4.8 to 4.7, but the sustainability index (0.94) suggests the model's continued perceived impact. Resource management increased from 4.3 to 4.5, with a sustainability index of 0.97, highlighting the efficient use of resources. These findings indicate that the model's positive outcomes were sustained over the three-month follow-up period, with high levels of consistency and effectiveness maintained across key measures.

4.3.6 Integration with Existing Teaching Practices

Analysis of pedagogical integration revealed successful incorporation into existing teaching frameworks, as indicated in Table 17.

Table 17: Pedagogical integration analysis

Integration Aspect	Success Rate	Adaptation Time	Sustainability Score
Curriculum Alignment	94.5%	2.3 weeks	4.7/5.0
Schedule Integration	91.2%	1.8 weeks	4.6/5.0
Resource Coordination	88.7%	2.5 weeks	4.5/5.0
Assessment Integration	92.3%	2.1 weeks	4.8/5.0

Table 17 illustrates the successful pedagogical integration of the *Estafet Bait Lagu* model into existing teaching frameworks. Curriculum alignment achieved a high success rate of 94.5%, with a relatively short adaptation time of 2.3 weeks and a sustainability score of 4.7/5.0, indicating smooth integration into the curriculum.

Schedule integration was also highly successful (91.2%), requiring only 1.8 weeks for adaptation and receiving a sustainability score of 4.6/5.0, suggesting efficient use of instructional time. Resource coordination showed a success rate of 88.7%, with a slightly longer adaptation time (2.5 weeks) and a sustainability score of 4.5/5.0, highlighting effective management of materials. Assessment integration was powerful, with a 92.3% success rate, an adaptation time of 2.1 weeks, and the highest sustainability score (4.8/5.0), demonstrating the model's compatibility with assessment practices. These results reflect the model's successful incorporation into various aspects of teaching, with strong sustainability across all integration areas.

4.4 Demographic and Contextual Variations

The study's findings revealed important nuances when examining the demographic and contextual variables. While the intervention showed consistent benefits across sex, subtle variations emerged; boys demonstrated slightly greater improvements in behavioral control (d = 1.18 for boys' vs d = 1.05 for girls), whereas girls showed stronger gains in task persistence (d = 1.29 for girls' vs d = 1.12 for boys). These patterns align with developmental research on gender differences in self-regulation trajectories (Else-Quest et al., 2023). Socioeconomic factors proved more consequential, with children from low-income families benefiting disproportionately (effect sizes 22% larger than children from middle/high-income backgrounds), likely because the model's minimal resource demands compensated for typical home learning disparities (Duncan et al., 2007). This socioeconomic leveling effect suggests particular value for equity-focused education policies.

Teachers experience mediated implementation quality but not child outcomes. Early-career teachers (1–5 years of experience) required 35% more coaching sessions to achieve fidelity, yet their students' attention gains matched those of the veteran teachers (11+ years) once protocols were established. This challenges assumptions that only experienced teachers can implement complex interventions and instead, highlights the model's adaptability across professional skill levels when proper support structures exist (Kini & Podolsky, 2016). The most robust predictor of success was in fact teacher musical confidence (r = .61, p < .01) rather than formal experience, suggesting targeted training should prioritize rhythmic competency over general pedagogy.

Urban-rural differences in the Indonesian context emerged as the most significant moderator. While the core method proved transportable, teachers in satellite cities required adaptations for larger class sizes (40+ students), developing call-and-response modifications that maintained engagement without sacrificing individual attention benefits – an innovation worthy of further study. Collectively, these findings demonstrate that while the model shows universal promise, its implementation framework benefits from localized adjustments that address community-specific needs and assets.

5. Discussion

The findings of this study revealed that the *Estafet Bait Lagu* model significantly improved attention span in early childhood learners, thus addressing a critical gap in educational strategies for young children, particularly in resource-constrained settings. The results align with theories emphasizing the role of social interaction and scaffolded learning in cognitive development, as outlined by Vygotsky (1978) and Piaget (1962). This directly confirms H_1 (attention improvement) and H_2 (engagement gains) through musical peer scaffolding – a novel operationalization of Vygotsky's ZPD. Similarly, Ayar and Yalvac (2022) suggest that mentoring and structured interactive approaches akin to the relay-style activities of the model foster deeper engagement and cognitive focus. The model's foundation in structured play further reflects Dayagbil's (2023) advocacy for play-based strategies to nurture self-regulation and attention in early learners.

Music's ability to enhance cognitive processes is pivotal in the model's effectiveness, echoing Hallam's (2010) findings on the impact of music on concentration, memory, and self-regulation. Our culturally tailored approach (Javanese rhythms) extends Hallam's (2010) work to non-Western contexts, addressing Reviewer D's request for global applicability. Bitar and Davidovitch (2024) highlight that cultural adaptation of digital learning tools enhances their efficacy, a principle that is mirrored in the culturally tailored implementation of the *Estafet Bait Lagu* model for Indonesian classrooms. This adaptation ensures that music, as an intrinsic cultural and cognitive stimulant, is effectively used to create engaging and meaningful learning experiences.

The model also demonstrates an innovative approach to overcoming classroom challenges such as large student-to-teacher ratios and diverse learning needs, problems documented by Bento et al. (2021). The teachers in this study reported that the model provided proactive strategies for managing classroom engagement, which is consistent with González and Santana Valenzuela's (2023) call for adaptive and innovative interventions in disadvantaged educational contexts. The study also parallels the findings of Couillou et al. (2023), who emphasized cautious collaboration and structured strategies for community engagement in education, further validating the model's systematic and collaborative design.

The results of the current study show significant improvements in attention span (Table 3), particularly during collaborative tasks. The model's relay structure scaffolds attention through peer collaboration (Vygotsky's ZPD), while song cycles mirror Piaget's (1962) assimilation-accommodation processes as children adapt rhythms to new tasks. These mechanisms explain why the *Estafet Bait Lagu* model effectively engages young learners.

This study contributes to the discourse on professional learning and development in education by demonstrating the scalability and adaptability of the model, which aligns with research by Hazizah et al. (2024) and Wallo et al. (2024) on creating sustainable and competitive educational strategies. The model's practical implementation also addresses the call of some studies for systematic approaches to organizational learning in educational settings, highlighting its potential as a replicable and adaptable framework (Alkhalaf & Badewi, 2024; Duressa & Kidane, 2024; Fischer et al., 2022; Karnopp, 2022; Washington-Ottombre, 2024).

The transferability of the model's benefits to home environments, as reported by the parents, further validates its effectiveness. This observation aligns with Colagrossi et al. (2024) who emphasize the importance of social-emotional learning (SEL) interventions in fostering skills that transcend classroom contexts. Similarly, Jusoh et al. (2023) and Maye et al. (2023) highlight the importance of equipping caregivers with strategies to reinforce developmental gains, underscoring the broader applicability of the *Estafet Bait Lagu* model.

Age-specific responses to the model revealed that five-year-olds experienced the most significant improvements in attention span, a finding consistent with Leite

et al. (2024) and Waty et al. (2024) who explored the role of feedback timing in skill acquisition. The developmental timing of interventions thus emerges as a crucial factor in maximizing their impact, emphasizing the need for tailored strategies that consider learners' cognitive and emotional readiness.

While the *Estafet Bait Lagu* model demonstrated strong efficacy (d = 1.24 for attention gains), three implementation challenges complicate scalability: First, the 34.5% of teachers requiring satisfaction and implementation metrics (Table 9) suggest that musical fluency – not just pedagogical skill – mediates success, raising equity concerns for educators without arts backgrounds. This contrasts with the sole focus of Tools of the Mind on cognitive scaffolding. Second, the model's dependence on Javanese musical norms created adaptation barriers in Sundanese-majority pilot schools.

Here, teachers spontaneously modified rhythms, a 'workaround' that improved engagement but may have diluted the neurocognitive benefits of tempo-specific entrainment. Third, while large classes (>35 students) achieved comparable outcomes, this required doubling the relay-team rotations, reducing individual practice time by 40% – a trade-off needing cost-benefit analysis. These findings temper enthusiasm, suggesting that the model works best when (1) teachers receive music mentoring, (2) local rhythms match intervention tempos, and (3) class sizes remain under Indonesia's national average (28 students).

The *Estafet Bait Lagu* model offers three actionable pathways for Indonesian education policy. First, its minimal resource design justifies inclusion in national early childhood standards (Permendikbud 137/2014) (Ministry of Education and Culture, 2014) as a recommended attention-building practice, particularly for underserved regions. Second, the model's 92% teacher satisfaction rate (Table 9) supports its integration into the in-service teacher training at District Teacher Working Groups (KKG), with rhythmic scaffolding modules replacing traditional classroom management workshops.

Third, the documented socioeconomic equity effects (22% larger gains for low-income students) align with the priorities of the Ministry to reduce developmental gaps, suggesting targeted rollout in Priority Education Areas (DAPODIK zones 3-4). These applications would require only modest budget reallocations – primarily adapting existing music curricula and community instruments – while addressing Indonesia's 2025–2035 Early Childhood Development Roadmap goals for scalable, culturally rooted interventions.

While this study demonstrated the effectiveness of the *Estafet Bait Lagu* model, three priority research directions emerged to advance this work: (1) digital adaptation of rhythmic components for hybrid learning environments, (2) longitudinal follow-ups to assess retention of attention gains beyond the current eight-week intervention, and (3) systematic implementation in other Southeast Asian contexts, particularly in Malaysia and Thailand where similar musical pedagogies exist together with comparable resource constraints (Husin et al., 2023). The research also raises important questions about the model's long-term

sustainability and scalability, echoing the concerns of Lin and Lee (2023) and Zainil et al. (2024) regarding the importance of adaptive evaluation frameworks. The model's resource efficiency and cultural adaptability position it as a sustainable solution, although Jirarattanawanna et al. (2024) caution that local musical traditions may require tailored adjustments in Buddhist-majority regions. Hence, further research is needed to explore its applicability across diverse educational contexts, as highlighted by Husin et al. (2023) and Jirarattanawanna et al. (2024).

While the *Estafet Bait Lagu* model demonstrated significant benefits, several implementation challenges emerged. Approximately 34.5% of teachers reported initial setup difficulties (Table 9) that were primarily due to the training required to master rhythmic scaffolding techniques. Additionally, while the Javanese cultural elements enhanced engagement in this study, the model's music-based components may require adaptation for non-Javanese contexts (e.g., substituting local folk rhythms in Sundanese or Papuan kindergartens). No adverse effects on learning quality were observed, although longitudinal data are needed to assess sustainability beyond the eight-week intervention period.

6. Conclusion

This study demonstrated the effectiveness of the *Estafet Bait Lagu* model in enhancing attention span among early childhood learners through culturally adapted, music-integrated activities, operationalizing Vygotsky's (1978) social scaffolding through musical peer interactions and extending Piaget's (1962) cognitive adaptation theory via rhythmic structures. The quantitative results showed significant improvements in sustained focus, behavioral control, and task engagement, while the qualitative findings revealed enhanced classroom dynamics, teacher confidence, and transferable skills to home environments via three key mechanisms: culturally resonant musical elements, structured play sequences, and teacher rhythmic scaffolding training.

The *Estafet Bait Lagu* model demonstrates promise as a supplementary tool that enhances – but does not replace – teachers' existing practices. While the intervention produced significant attention gains (d = 1.24), these effects were mediated by the teachers' ability to adapt the rhythms to the students' needs, evidenced by the 23% outcome variation between high/low musical-fluency educators. This underscores that the model functions best as a structured framework that amplifies rather than replaces teachers' cultural-pedagogical expertise, particularly in the Indonesian context where relational learning is paramount.

The model's strengths lie in its cultural relevance, ease of implementation, and holistic impact on cognitive and socio-emotional development, particularly in resource-constrained settings where traditional interventions falter. However, identified challenges regarding initial setup and resource allocation in urban Indonesian contexts require targeted strategies to optimize long-term sustainability. While the current study focused on immediate outcomes (eight-week intervention), the research team has secured funding for a longitudinal

cohort study tracking participants for 24 months post-intervention. This follow-up will administer delayed post-tests at 6, 12, and 24 months using the same ACSP instrument but with additional measures of academic readiness (EYLF-2) and teacher-reported classroom adaptation. Future studies should explore its applicability across broader educational contexts (especially non-Javanese regions and extended durations) and its integration with digital tools to enhance scalability and impact while preserving the core social-musical dynamics.

7. References

Alkhalaf, T., & Badewi, A. (2024). HRM practices, organizational learning and organizational performance: Evidence from the big four financial services in France. *The Learning Organization, 31*(6), 797–816. https://doi.org/10.1108/TLO-01-2023-0004

Ayar, M. C., & Yalvac, B. (2022). An ethnographic study of an engineering community: Mentoring as a tacit rule and its implications for how people learn. *Journal of Engineering Education, 111*(2), 400–419. https://doi.org/10.1002/jee.20454

Bento, F., Bottino, A. G., Pereira, F. C., de Almeida, J. F., & Rodrigues, F. G. (2021). Resilience in higher education: A complex perspective to lecturers' adaptive processes in response to the COVID-19 pandemic. *Education Sciences, 11*, 492. https://doi.org/10.3390/educsci11090492

Bitar, N., & Davidovitch, N. (2024). Cultural adaptation of digital learning tools in Israeli higher education: A case study of lecturer perceptions and practices. *TechTrends: Linking Research and Practice to Improve Learning, 68*(6), 1152–1165. https://doi.org/10.1007/s11528-024-01007-3

Bodrova, E., & Leong, D. (2024). *Tools of the mind: The Vygotskian approach to early childhood education*. Taylor & Francis.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Burke, A., Boison, B., Knopp, M., & Lawlor, A. (2024). Redesigning an environmental curriculum for student engagement. *Connected Science Learning, 6*(1), 33–41. https://doi.org/10.1080/24758779.2023.2300499

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.

Colagrossi, A. L. R., de Magalhães-Barbosa, M. C., McCoy, D. C., Barnes, S. P., Temko, S., Bailey, R., Jones, S. M., Bianchi, L. M., da Cunha, A. J. L. A., & Prata-Barbosa, A. (2024). Adaptation and efficacy of a social-emotional learning intervention (SEL Kernels) in early childhood settings in southeastern Brazil: A quasi-experimental study. *Early Education and Development, 35*(4), 704–721. https://doi.org/10.1080/10409289.2023.2219583

Couillou, R. J., McGee, B., Lamberth, T., & Ball, S. (2023). Cautious collaboration: Community and university partnerships in the COVID-19 era. *Journal of Higher Education Outreach and Engagement, 27*(3), 99–121. https://files.eric.ed.gov/fulltext/EJ1411196.pdf

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. SAGE Publications.

Dayagbil, F. T. (2023). Anticipation, coping and adaptation practices for teaching and learning continuity of higher education institutions. *International Journal of Education and Practice, 11*(1), 106–119. https://doi.org/10.18488/61.v11i1.3267

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology, 43*, 1428-1446. https://doi.org/10.1037/0012-1649.43.6.1428

Duressa, W. T., & Kidane, B. Z. (2024). Interplay between organizational learning and departmental performance: Implications for change in Ethiopian public research universities. *International Journal of Education and Literacy Studies, 12*(2), 205–213. https://doi.org/10.7575/aiac.ijels.v.12n.2p.205

Else-Quest, N. M., French, A. M., & Telfer, N. A. (2023). The intersectionality imperative: Calling in stigma and health research. *Stigma and Health, 8*(3), 269–278. https://doi.org/10.1037/sah0000397

Fischer, S., Göhlich, M., & Schmitt, J. (2022). Interrelationships of climate adaptation and organizational learning: Development of a measurement model. *Journal of Pedagogical Research, 6*(5), 130–151. https://doi.org/10.33902/JPR.202218006

González, Á., & Santana Valenzuela, J. (2023). Leading organizational learning in disadvantaged, low-performing Chilean schools: Adaptation and innovation in times of disruption. *School Leadership & Management, 43*(4), 430–448. https://doi.org/10.1080/13632434.2023.2232373

Greenberg, M. T. (1998). *Promoting alternative thinking strategies (PATHS)*. Center for the Study and Prevention of Violence, Institute of Behavioral Science, University of Colorado at Boulder.

Hallam, S. (2010). The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education*, *28*(3), 269–289. https://doi.org/10.1177/0255761410370658

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* Routledge.

Hazizah, N., Rusdinal, R., Ismaniar, I., Handrianto, C., & Rahman, M. A. (2024). Warrior kids' games on improving the self-efficacy abilities and fine motor skills of 5–6-year-old children. *Retos, 56*, 639–647. https://doi.org/10.47197/retos.v56.104892

Husin, A., Maharani, S. D., Raharjo, M., Yosef, Y., Sumarni, S., & Handrianto, C. (2023). Prospects for implementation of green campus in education and research pillars at Edupark FKIP Unsri become edutourism. *International Journal of Professional Business Review, 8*(4), e01597. https://doi.org/10.26668/businessreview/2023.v8i4.1597

Jirarattanawanna, N., Vattanaamorn, S., & Kwalamthan, W. (2024). The provisions of learning experiences in the early childhood development centers against the COVID-19 pandemic. *Qualitative Research in Education, 13*(1), 1–18. https://doi.org/10.17583/qre.12376

Jusoh, A. J., Imami, M. K. W., Handrianto, C., Isa, A. N. M., Omar, S. Z., Abdullah, A., & Wahab, S. (2023). Verification of the reliability and validity of a Malaysian version of Rathus Assertiveness Schedule as drug prevention scale. *Islamic Guidance and Counseling Journal, 6*(2), 1–16. https://doi.org/10.25217/0020236369700

Karnopp, J. (2022). Structures and relationships in organizational learning for change. *Journal of Educational Administration, 60*(5), 457–472. https://doi.org/10.1108/JEA-09-2021-0177

Khanal, P., Bento, F., & Tagliabue, M. (2021). A scoping review of organizational responses to the COVID-19 pandemic in schools: A complex systems perspective. *Education Sciences, 11*, Article 115. https://doi.org/10.3390/educsci11030115

Kini, T., & Podolsky, A. (2016). *Does teaching experience increase teacher effectiveness: A review of the research*. Learning Policy Institute. https://doi.org/10.54300/625.642

Laevers, F. (2000). Forward to basics! Deep-level-learning and the experiential approach. *Early Years, 20*(2), 20–29. https://doi.org/10.1080/0957514000200203

Leite, C. M. F., Ugrinowitsch, H., & Couto, C. R. (2024). Does knowledge of results affect motor skill learning and adaptation in interception-like tasks? *Journal of Motor Learning and Development, 12*(1), 155–173. https://doi.org/10.1123/jmld.2022-0070

Lin, B.-C., & Lee, C.-H. (2023). Conducting an adaptive evaluation framework of importance and performance for community-based earthquake disaster management. *Natural Hazards, 115*(2), 1255–1274. https://doi.org/10.1007/s11069-022-05594-3

Maxwell, J. A. (2012). *Qualitative research design: An interactive approach* (3rd ed.). SAGE Publications.

Maye, M., Edmunds, S., Stone-MacDonald, A., & Carter, A. S. (2023). Preparation for adaptation of intensive early intervention for toddlers with ASD: Childcare providers' perspectives on training approach. *Early Childhood Education Journal, 51*(7), 1181–1188. https://doi.org/10.1007/s10643-022-01364-9

Ministry of Education and Culture. (2014). *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 137 Tahun 2014 tentang Standar Nasional Pendidikan Anak Usia Dini*. Ministry of Education and Culture, Republic of Indonesia. https://www.academia.edu/37817634/Permendikbud_no_137_tahun

Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). SAGE Publications.

Piaget, J. (1962). The stages of the intellectual development of the child. *Bulletin of the Menninger Clinic*, *26*(3), 120. https://psycnet.apa.org/record/1964-04060-001

Ruff, H. A., & Rothbart, M. K. (2001). *Attention in early development: Themes and variations*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195136326.001.0001

Schonert-Reichl, K. A., Oberle, E., Lawlor, M. S., Abbott, D., Thomson, K., Oberlander, T. F., & Diamond, A. (2015). Enhancing cognitive and social–emotional development through a simple-to-administer mindfulness-based school program for elementary school children: A randomized controlled trial. *Developmental Psychology*, *51*(1), 52-66. https://doi.org/10.1037/a0038454

Slavin, R. E. (2014). Making cooperative learning powerful. *Educational Leadership*, *72*(2), 22-26. https://www.scirp.org/reference/referencespapers?referenceid=3292678

Tierney, A., & Kraus, N. (2013). The ability to move to a beat is linked to the consistency of neural responses to sound. *Journal of Neuroscience*, *33*(38), 14981–14988. https://doi.org/10.1523/JNEUROSCI.0612-13.2013

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press.

Wallo, A., Martin, J., Elg, M., Harlin, U., Gremyr, I., Bozic, N., Skagert, K., & Williamsson, A. (2024). Charting the path to a sustainable, competitive, green industry in an era of rapid change: Proposing a research agenda. *Cogent Business & Management, 11*(1), Article 2344189. https://doi.org/10.1080/23311975.2024.2344189

Washington-Ottombre, C. (2024). Campus sustainability, organizational learning and sustainability reporting: An empirical analysis. *International Journal of Sustainability in Higher Education, 25*(8), 1626–1645. https://doi.org/10.1108/IJSHE-12-2022-0396

Waty, E. R. K., Nengsih, Y. K., Handrianto, C., & Rahman, M. A. (2024). The quality of teacher-made summative tests for Islamic education subject teachers in Palembang, Indonesia. *Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan, 43*(1), 192–203.
https://doi.org/10.21831/cp.v43i1.53558

Zainil, M., Kenedi, A. K., Rahmatina, Indrawati, T., & Handrianto, C. (2024). The influence of STEM-based digital learning on 6C skills of elementary school students. *Open Education Studies*, *6*(1), 20240039. https://doi.org/10.20448/jeelr.v10i1.4336