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Enhancing Early Childhood Literacy through Collaborative Learning: A Case Study in Non-Formal Education at biMBA AIUEO Jember

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Abstract
Indonesia faces critical early literacy challenges, with 55% of children unable to read simple text by age 10, highlighting the need for innovative pedagogical interventions, particularly in non-formal education sectors. This qualitative case study explores the implementation and effectiveness of an integrated collaborative learning framework that combines fun learning, small-step systems, and individualized approaches to enhance early childhood literacy at biMBA AIUEO Jember, a non-formal education center. Data were collected from 15 participants (a unit head, two motivators, three parents, and nine children aged 3–6) through semi-structured interviews, systematic classroom observation over three months, and document analysis. Data were analyzed using Miles and Huberman's (1994) interactive model with thematic coding and member checking for validity. Findings reveal four major themes: structured progression through individualized learning levels enhanced literacy acquisition; play-based engagement sustained motivation across developmental variations; adaptive facilitation addressed diverse learning needs within resource constraints; and measurable literacy growth was evident in writing complexity and reading fluency despite individual differences. The integrated framework proved effective in supporting literacy development under limited-resource conditions, though implementation challenges emerged, including uneven learner progress, limited facilitator capacity, and material scarcity. These findings underscore the global relevance of adapting collaborative learning frameworks to strengthen early literacy in resource-constrained, non-formal settings. The study extends collaborative learning theory through the concept of constrained collaboration, demonstrating that meaningful literacy growth can occur when pedagogical models are contextually grounded rather than imported from affluent systems. However, as a single-site and short-term case study, the findings have limited generalizability. Future research should employ mixed methods and longitudinal designs across diverse contexts to measure long-term literacy outcomes and scalability. Ultimately, improving early literacy in marginalized communities requires creative adaptation to local realities, affirming that quality learning can thrive even within material constraints through committed, context-responsive facilitation.

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Introduction

Indonesia exemplifies a global crisis affecting developing nations, where approximately 250 million children worldwide cannot read proficiently despite attending school (Antoninis et al., 2023). The learning Poverty Index indicates that 55% of Indonesian 10-year-olds cannot read and understand simple text, a figure that rises to 70% in rural areas (Bank, 2020). This literacy deficit perpetuates intergenerational poverty cycles, limiting social mobility and economic development (Hanushek & Woessmann, 2023). The crisis is particularly acute in non-formal education sectors, which serve approximately 2.5 million Indonesian children from marginalized communities who lack access to quality formal schooling (Rakyat, 2023).

Early childhood represents a critical window for literacy development, during which neural plasticity enables rapid language acquisition between the ages of 3 and 6 (Kuhl, 2014).

However, traditional didactic approaches prevalent in Indonesian early education, characterized by rote memorization and teacher-centered instruction, fail to leverage children's natural learning mechanisms (Yulia & Suryani, 2022). International evidence suggests that collaborative learning methods, which emphasize peer interaction, scaffolded support, and active construction, are effective for knowledge. Knowledge can significantly enhance literacy outcomes (Johnson & Johnson, 2010; Slavin, 1995). However, limited research examines how such methods translate to non-formal educational contexts in developing countries, where resource constraints, diverse student populations, and limited teacher training present unique implementation challenges (Almeida & Morais, 2025; Parker et al., 2022; Stevens et al., 2023).

Collaborative learning draws from Vygotsky's socio-cultural theory, emphasizing that cognitive development occurs through social interaction within the zone of proximal development. Contemporary interpretations extend this framework through Communities of Practice theory (Wenger-Trayner et al., 2020), suggesting learning emerges from legitimate peripheral participation in social contexts. For early literacy, this implies children construct reading and writing competencies through meaningful interactions with peers and facilitators, rather than passive reception of instruction (Christie & Roskos, 2006; Roskos, 2017).

Recent meta-analyses demonstrate collaborative approaches yield effect sizes of 0.42-0.59 for literacy outcomes compared to traditional instruction (Puzio & Colby, 2013). However, these studies predominantly examine formal Western educational contexts, leaving critical gaps in understanding how collaborative methods function within non-formal settings characteristic of Global South education systems (Fishberg, 2023; Gobena et al., 2024; Zhou et al., 2025). The limited existing research suggests successful adaptation requires careful consideration of local cultural norms, available resources, and facilitator capabilities (Abadzi, 2006; Nehez & Håkansson Lindqvist, 2024; Norman, 2023; Perera et al., 2020). This research gap presents a critical opportunity to examine how collaborative learning principles translate into practice within large-scale non-formal educational contexts in the Global South, as exemplified by Indonesia's biMBA AIUEO network.

biMBA AIUEO represents Indonesia's largest non-formal early childhood education network, serving over 150.000 children annually through 500 centers nationwide (AIUEO, 2021). Their pedagogical model integrates three methodological components theoretically aligned with contemporary learning science (AIUEO, 2022): (1) fun learning methods leveraging play-based pedagogy shown to enhance motivation and retention (Hirsh-Pasek et al., 2004); (2) small step systems reflecting principles of cognitive load theory and scaffolded instruction (Sweller et al., 1998); and (3) individual systems acknowledging variation and differentiated instruction needs (Tomlinson, 2017).

Despite widespread implementation, no peer-reviewed studies have systematically examined this model's effectiveness or implementation processes (Junita & Putrie, 2021; Meha & Hengelina, 2017; Pangestu et al., 2022; Salsabila & Kurniawan, 2022). Preliminary observations at biMBA AIUEO Jember revealed striking disparities in literacy development trajectories, with some three-year-olds demonstrating reading abilities surpassing those of five-year-olds who had been enrolled longer. This variation suggests complex interactions among pedagogical methods, individual differences, and contextual factors that require systematic investigation.

While collaborative learning's benefits in formal education are well-documented, three critical knowledge gaps persist (Hmelo-Silver et al., 2017): (1) limited understanding of implementation processes in resource-constrained non-formal settings; (2) absence of empirical evidence regarding integrated multi-method collaborative frameworks; and (3) lack of contextually-grounded insight from Southeast Asian educational contexts. This study addresses these gaps through an in-depth investigation of collaborative method implementation at biMBA AIUEO Jember, examining both processes and outcomes while attending to contextual facilitators and barriers.

This study's specific objectives are to : (1) document the implementation process of integrated collaborative methods in non-formal early childhood education; (2) identify

emergent patterns in children's literacy development under this pedagogical approach; (3) examine contextual factors influencing implementation effectiveness; and (4) generate theoretical insights regarding collaborative learning adaptation in resource-limited settings. By addressing these objectives, this research contributes to broader debates about educational innovation in developing contexts while providing practical guidance for practitioners working in similar settings.

Methods

Research Design

This study employed an interpretive qualitative design (Stake, 2013), grounded in constructivist epistemology, acknowledging that educational phenomena are socially constructed and context-dependent (Creswell & Poth, 2016). Case study methodology was selected for its capacity to capture complex, bounded phenomena within real-world context-mechanism-outcome configurations, which are poorly understood (K Robert, 2018). The interpretative approach enabled the exploration of multiple stakeholder perspectives while remaining sensitive to local meaning-making processes, which are essential for understanding educational practices in non-Western contexts (Merriam & Grenier, 2019).

Research setting and context

This research was conducted at biMBA AIUEO Jember, East Java, Indonesia, a non-formal early childhood education center serving a socioeconomically diverse population, with 35% of families earning below the minimum wage (Statistic, 2023). The center enrolls 47 children aged 3-6 years, with class sizes of 4-6 students per motivator (facilitator), substantially lower than the national average of 15:1 in formal kindergartens. This setting was purposively selected as a "typical case" (Patton, 2014) representing mid-sized non-formal education centers in urban Indonesian contexts, balancing accessibility with theoretical relevance for understanding the implementation of collaborative methods.

The center's physical infrastructure comprises two classrooms (approximately 20 m2 each) equipped with basic learning materials, including alphabet cards, storybooks, coloring materials, and modular learning packets. Financial constraints limit access to technology, with No. Computers or tablets are not available, requiring entirely analog pedagogical approaches. These material conditions reflect typical resource availability in Indonesian non-formal education, thereby enhancing the transferability of the findings to similar contexts (Miles & Jozefowicz-Simbeni, 2010).

Research subject

Participants were selected using a purposive sampling technique based on specific criteria considered most suitable for understanding the research focus (Abdussamad, 2021). Key informants include the Head of Unit (n=1), who is responsible for program oversight and policy implementation; two motivators; and three parents (mothers) as supporting informants who willingly provide an external perspective on their children's literacy development. The inclusion criteria for the key informant are at least 1 year of experience in the current role, direct involvement in implementing collaborative methods, and willingness to participate in interviews and observations. In addition, 9 children (all children) have become the subject of the observation. This sample size aligns with case study recommendations for achieving informational redundancy while maintaining manageability.

Data collection procedures

Data collection employed methodological triangulation across three techniques over twelve weeks (September to November 2024). The first phase is systematic observation, conducted in weeks 1-8, using the Early Language and Literacy Classroom Observation (ELLCO-R) (Smith et al., 2008). Observations occurred twice weekly, capturing complete learning cycles. Field note documented in the observation are (1) physical environment and material usage, (2) facilitator-child interactions, e.g, frequency, quality, and instructional strategies, (3) literacy behaviours,

e.g, letter recognition, writing attempts, and reading behaviours, and (4) peer interactions during collaborative activities.

The second phase consists of semi-structured interviews conducted in weeks 5-10. The individual interview, lasting 45-75 minutes, was conducted in Bahasa Indonesia, audio-recorded, and transcribed verbatim. Interview guides were developed through a literature review and validated by a community education lecturer. It explored: implementation processes and decision-making, perceived effectiveness and outcome indicators, challenges and adaptive strategies, and contextual influences on practice.

The third phase is document analysis, conducted from weeks 1 to 12. This systematic review of institutional documents includes: curriculum guidelines and lesson plans; student progress portfolios showing writing samples; attendance and assessment records; and training materials and implementation guides.

Data analysis techniques

Data analysis was conducted following Miles' interactive model, which emphasizes four concurrent and iterative components that work simultaneously throughout the analytical process (Braun & Clarke, 2021). The first component, data collection, involved systematically gathering observation notes, interview transcripts, and documentary evidence to ensure comprehensive capture of all relevant information from multiple sources. The second component, data reduction, encompasses the rigorous process of selecting, focusing, simplifying, and transforming raw data through systematic coding and categorization, enabling researchers to identify meaningful patterns and themes while maintaining data integrity. The third component, data display, involved organizing and presenting reduced data through various formats, including matrices, charts, and narrative descriptions, to facilitate effective pattern recognition and enhance analytical clarity. The final component, conclusion drawing and verification, focused on developing robust conclusions through systematic pattern identification and explanation-building, with findings verified through member-checking procedures with key informants to ensure the accuracy and credibility of interpretations. This interactive, analytical approach allowed continuous refinement of understanding throughout the research process, with each component informing and strengthening the others to produce comprehensive and reliable findings on the implementation and effectiveness of the collaborative method in early childhood literacy development.

Result

Negotiated progression-balancing structure and flexibility

The small step system's implementation revealed complex negotiations between standardized progression and individual variation. While the framework prescribed four levels with specific literacy milestones, observation documented significant deviation from linear advancement:

Structural framework: The curriculum outlined clear progressions: level 1 (vowel recognition, 4-letter words), level 2 (5-6-letter words with consonant clusters), level 3 (sentence construction), and level 4 (paragraph comprehension). However, motivator A explained the reality:

> "The level exists on paper, but children do not follow it neatly. Student A (age 4) officially remains level 1 but already writes 6-letter words. Meanwhile, student B (age 5) at level 2 still struggles with vowels. We maintain level labels for parent communication, but teach each child what they are ready for".

Observation confirmed this flexible interpretation. During a typical session, four children, nominally at level 2, engaged with distinctly different materials: one traced letters, another read simple sentences, and two worked on consonant blends. This differentiation reflected facilitators' tacit knowledge about individual readiness rather than formal assessment.

Progression challenges: Document analysis revealed that 40% of children required repetition of a level, contradicting institutional narratives of smooth achievement. The unit head acknowledged:

"Parents expect continuous progress. When children plateau or regress, they question our methods. We have learned to frame repetition as 'strengthening foundations' rather than failure."

Field notes documented a revealing incident: a mother complained that her son remained at level 1 after 6 months, while a younger peer had advanced to level 2. The motivator's response balanced empathy with education about developmental variation, illustrating constant negotiation between standardized expectations and individual realities.

Playful engagement – managing joy and learning tensions

The fun learning implementation demonstrated a sophisticated balance between engagement and instructional objectives. For engagement strategies, observation documented diverse techniques for maintaining children's attention: morning circles with action songs incorporating letter movements, letter-hunting games where children found hidden vowels, story time with participatory sound effects, and reward systems using stickers for completed tasks.

Children displayed high engagement during these activities, with an average on-task behaviour of 73% during playful segments versus 45% during traditional instruction periods. Three-year-old student (student c) exemplified this pattern, maintaining focus for 20 minutes during singing activities but becoming restless after 5 minutes of writing practice.

However, sustaining "fun" proved challenging. Motivator B reflected that "not every concept can be made entertaining. Teaching proper pencil or letter formation requires repetition that becomes boring. We try making it playful, but sometimes children must simply practice".

Observation revealed facilitators' strategic code-switching between playful and serious modes. When five-year-old (student D) resisted writing practice, Motivator A initially attempted gamification ("Let us race to write 'MAMA'"), but eventually shifted to firm direction ("Student D, we need to finish this before playing").

Parent perspectives added complexity. A mother expressed concern:

"Sometimes I worry they are playing too much. The formal school nearby makes children sit and study properly. Will my daughter be prepared for real school?"

This comment reflects broader tensions between progressive pedagogy and traditional expectations in Indonesian education contexts.

Individual recognition-possibilities and constraints

The individual systems implementation revealed both transformative potential and practical limitations. First, successful differentiation. Facilitators demonstrated remarkable attention to individual differences. Field notes documented Motivator B simultaneously managing student E tracing sandpaper letters for tactile learning, student F building words with magnetic letters, student G writing sentences in her journal, and student H reading a picture book aloud.

This differentiation emerged from intimate knowledge built through daily interaction. Motivator A explained:

"After two weeks, I know student E learns through touch, student F needs visual cues, student G works independently, and student H requires constant validation. This knowledge shapes how I approach each child."

Second, resource and training constraints. However, individual system implementation faced significant constraints. With limited materials, facilitators often improvised-creating handmade flashcards, repurposing packaging as learning aids, or drawing letters in sand when paper ran out. The unit head acknowledged: "Ideally, each child would have personalized materials matching their learning style. In reality, we share one set of letter cards among six children."

Moreover, facilitators' capacity for differentiation varied. While Motivator A demonstrated sophisticated adaptive strategies, Motivator B (less experienced) defaulted to whole-group instruction when overwhelmed. Neither had formal special education training, limiting their ability to support children with potential learning differences.

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Literacy manifestations-progression, variations, and questions

Observable literacy development occurred, though with greater complexity than initially reported. First, documented progress: Portfolio analysis revealed measurable improvements across the cohort, with letter recognition increasing from 7 to 19 letters over three months, and writing development, where progression from scribbles to recognizable letters (67% of children. At the same time, the emergent reading shows that 44% demonstrated phonemic awareness development.

The most striking case involved a three-year-old student who progressed from no letter recognition to writing her name and simple words within ten weeks. Her mother reported: "She now 'read' everything – street signs, food packages, books. Even if she is not actually reading, she understands that symbols carry meaning."

The third is variations and plateaus: However, progress proved highly variable. Statistical mapping revealed three distinct trajectories: (1) rapid progression, 30%: steady, consistent advancement, (2) plateau pattern, 45% initial progress followed by stagnation, and (3) clinical pattern, 25% alternating periods of advancement and regression.

Five-year-old student F exemplified the plateau pattern, rapidly advancing to level 2, then showing no progress for six weeks despite consistent attendance. Motivator B speculated that;

> "Sometimes children need time to consolidate learning. Student F might appear stuck, but internally, he is processing. Alternatively, maybe our approach does not match his needs. Honestly, we do not always know"

Finally, the ambiguous outcomes. Critically, definitions of literacy "improvement" remained contested. While facilitators celebrated mechanical skills (letter formation, phonics), parents prioritized functional abilities (reading signs, writing names). This definitional ambiguity complicated outcome assessment, raising questions about what constitutes meaningful literacy development in early childhood.

Discussion

Theoretical contribution: expanding on collaborative learning theory

This study's findings extend collaborative learning theory by revealing how implementation in resource-constrained non-formal settings necessitates theoretical reconceptualization. While Vygotsky's (1978) concept of the zone of proximal development assumes relatively predictable and individualized scaffolding sequences, our data demonstrate that effective collaboration in diverse early childhood settings requires dynamic ZPD navigation—a process of continuous recalibration of instructional support based on moment-to-moment assessment across multiple, simultaneously operating developmental zones within the same classroom. This represents a contextual adaptation of scaffolding practice that emphasizes real-time responsiveness and flexible orchestration under material and instructional constraints.

The integration of three distinct methodological streams (fun learning, small steps, individual systems) challenges linear conceptualizations of collaborative pedagogy. Rather than viewing these as separate approaches, findings suggest they function as "methodological braiding"—interviewing strands that strengthen or compensate for one another in response to contextual demands. This contrasts with Slavin's (1995) sequential model of collaborative implementation, suggesting that in resource-limited settings, simultaneous multi-method deployment may be more adaptive than progressive introduction of singular approaches.

Particularly significant is the emergence of what we term "constrained collaboration," collaborative learning adapted to material scarcity. Unlike resource-rich environments where collaboration involves abundant manipulatives, technology, and specialized spaces (Johnson & Johnson, 2010), biMBA facilitators created collaborative opportunities through. Creative resource sharing, peer teaching, and verbal interaction. This finding suggests collaborative learning theory must account for materiality's role in shaping pedagogical possibilities, extending socio-material perspectives in education (Fenwick et al., 2015).

Practical Implications: Navigating Implementation Tensions

The documented tension between standardized progression frameworks and individual variation holds critical implications for early childhood literacy programs. While small-step systems provide the necessary structure for facilitators with limited formal training, rigid adherence undermines responsive teaching, which is essential for diverse learners. Programs might benefit from "flexible fidelity" approaches—maintaining core progressions while explicitly authorizing contextualization (Castro et al., 2004; Dovrat, 2024).

The fun learning component's implementation challenges suggest reconsidering "engagement" in early literacy. Rather than pursuing constant entertainment, findings indicate strategic alternation between playful exploration and focused practice may be more sustainable and effective. This aligns with recent research on "productive struggle" in early learning, which shows that moderate challenge enhances learning despite temporary disengagement (Kapur & Bielaczyc, 2012; Young et al., 2024).

Individual system implementation revealed a critical paradox: recognizing individual differences requires sophisticated pedagogical knowledge often absent in non-formal education facilitators. While formal teacher education emphasizes differentiation, non-formal educators typically receive minimal training (Marusynets, 2019). This suggests an urgent need for accessible professional development focused on recognizing and responding to learning variations within resource constraints. Micro-credentialing or peer learning networks might offer scalable solutions (Darling-Hammond et al., 2017).

Contextual consideration: culture, resources, and expectations

The findings illuminate how Indonesian cultural contexts shape the implementation of collaborative learning. Parents' preference for visible academic progress over process-oriented learning reflects broader Asian educational values prioritizing measurable achievement (Ma, 2025). This creates implementation tensions as facilitators navigate between progressive pedagogies and traditional expectations. Programs might benefit from explicit parent education about early literacy development, helping families understand that playful engagement and formal learning are not mutually exclusive.

Resource constraints emerged not merely as implementation barriers but as pedagogical shapers. Limited materials necessitated creative adaptation, potentially fostering facilitator innovation and child resourcefulness. This resonates with the "innovation under constraint" literature, suggesting that resource scarcity can catalyze creative problem-solving (Baker, 2005). However, this should not romanticize deprivation – children deserve access to quality learning materials, and policy must address systemic underfunding of non-formal education.

The documented variation in literacy trajectories challenges assumptions about the universality of early childhood development. While Western developmental psychology posits relatively predictable sequences (Neuman, 2021), our findings suggest greater fluidity in multilingual, resource-variable contexts. This support calls for "Southern epistemologies" in early childhood research that center on non-Western development patterns (Nsamenang, 1995).

Limitations and reflexivity

Several limitations constrain this study's findings. The single-site design, while enabling deep exploration, limits transferability. biMBA AIUEO Jember's relatively well-established program and motivated facilitators may not represent typical non-formal education settings. Future multi-site studies should examine the implementation of collaborative methods across varied institutional capacities.

The three-month observation period captured initial implementation but not long-term outcomes. Children's literacy trajectories might shift with extended exposure, and facilitator practices may evolve with experience. Longitudinal research tracking cohorts through transition to formal schooling would illuminate the collaborative method's sustained impact.

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Our qualitative approach prioritized deep understanding over measurable outcomes. While this revealed implementation complexities, it cannot establish causal relationships between collaborative methods and literacy development. Mixed-methods research incorporating standardized literacy assessments would strengthen evidence for effectiveness while maintaining contextual sensitivity.

Researcher positionality also influenced findings. As education researchers with constructivist orientations, we may have been predisposed to recognize collaborative learning's benefits while underemphasizing potential drawbacks. Despite reflexive practices, complete neutrality remains impossible. Future research might benefit from team diversity, including researchers with varied theoretical commitments.

Future directions

This study opens several avenues for future research. Comparative studies across different non-formal education models would illuminate how institutional factors shape the implementation of collaborative learning. Examining cultural variations in collaborative pedagogy across Southeast Asian contexts could reveal whether findings reflect specifically Indonesian dynamics or broader regional patterns.

Methodologically, developing contextually appropriate literacy assessment tools remains critical. Current instruments, designed for formal education settings, may not capture learning occurring through collaborative methods in non-formal contexts. Participatory research approaches involving facilitators and communities in assessment design could yield more relevant measures.

The relationship between facilitator development and implementation quality deserves focused investigation. Understanding how facilitators with limited formal education develop expertise in collaborative pedagogy could inform professional development approaches. The potential of digital technologies to support facilitator learning in resource-constrained settings warrants exploration.

Finally, policy research should examine how collaborative methods in non-formal education might inform reform of the formal system. If resource-constrained environments can successfully implement collaborative learning, what prevents adoption in better-resourced formal schools? Understanding these barriers could catalyze systematic educational improvement.

Conclusion

This study demonstrated that ethnoparenting-based training, designed within the framework of local cultural values in Karangsari Village, effectively improved parents' knowledge of early childhood nutrition. The significant increase in post-training scores reflects how integrating scientific nutrition education with traditional practices, such as the Manca Snack, can bridge cultural familiarity and modern health understanding. The findings affirm the theoretical relevance of Social Learning Theory and Ecological Systems Theory, showing that parental modeling and cultural context jointly influence learning processes and nutritional behaviors. The ethnoparenting approach thus provides a culturally grounded framework that strengthens family participation in promoting healthy eating habits among young children.

In practical terms, this intervention underscores the importance of community-based, culturally responsive strategies in health and education programs. The involvement of local traditions, such as the ered net practice and parental engagement activities, enhanced the cultural relevance and acceptance of the training. Despite limited resources and participation, the intervention demonstrated measurable success in increasing parental awareness of balanced nutrition. Therefore, integrating ethnoparenting-based training into early childhood care and education (ECCE) initiatives can support national efforts to improve family health literacy and reduce malnutrition. This culturally contextualized model offers valuable insights

for future programs seeking to combine education, health, and local wisdom to promote sustainable child development.

Declarations

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All authors contributed equally and approved the final manuscript.

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References

Abadzi, H. (2006). *Efficient learning for people with low incomes: Insights from the frontier of cognitive neuroscience*. World Bank Publications.

AIUEO. (2022). *Tentang biMBA AIUEO*.

AIUEO, T. D. (2021). *Program implementation guidelines 2021*.

Almeida, F., & Morais, J. (2025). Non-formal education as a response to social problems in developing countries. *E-Learning and Digital Media*, *22*(2), 122–138.

Antoninis, M., Alcott, B., Al Hadheri, S., April, D., Fouad Barakat, B., Barrios Rivera, M., Baskakova, Y., Barry, M., Bekkouche, Y., & Caro Vasquez, D. (2023). Global Education Monitoring Report 2023: Technology in education: A tool on whose terms?

Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative science quarterly*, *50(3), 329–366*.

Bank, W. (2020). *Learning poverty in Indonesia*. W. B. Group.

Braun, V., & Clarke, V. (2021). Thematic analysis: A practical guide.

Castro, F. G., Barrera Jr, M., & Martinez Jr, C. R. (2004). The cultural adaptation of prevention interventions: Resolving tensions between fidelity and fit. *Prevention science*, *5*(1), 41–45.

Christie, J. F., & Roskos, K. A. (2006). Standards, science, and the role of play in early literacy education. *Play learning: How play motivates and enhances children's cognitive and social-emotional growth*, 57–73.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage Publications.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. *Learning Policy Institute*.

Dovrat, E. (2024). *A Descriptive Multiple Case Study of the Factors and Practices of Sustainability in Co-Designed Virtual Exchanges*, Lancaster University (United Kingdom).

Fenwick, T., Edwards, R., & Sawchuk, P. (2015). *Emerging approaches to educational research: Tracing the socio-material*. Routledge.

Fishberg, R. (2023). Inequality beyond representation in European research funding.

Gobena, E. B., Hean, S., Heaslip, V., & Studsrød, I. (2024). The challenge of western-influenced notions of knowledge and research training: lessons for decolonizing the research process and researcher education. *Journal of Ethnic & Cultural Diversity in Social Work*, *33*(5), 276–287.

Hanushek, E. A., & Woessmann, L. (2023). *The knowledge capital of nations: Education and the economics of growth*. MIT Press.

Hirsh-Pasek, K., Golinkoff, R. M., & Eyer, D. (2004). *Einstein never used flash cards: How our children really learn--and why they need to play more and memorize less*. Rodale Books.
Hmelo-Silver, C., Jeong, H., Faulkner, R., & Hartley, K. (2017). Computer-supported collaborative learning in STEM domains: Towards a meta-synthesis.
Johnson, D. W., & Johnson, R. T. (2010). Cooperative learning and conflict resolution: Essential 21st century skills. *21st century skills: Rethinking how students learn*, 201–219.
Junita, R., & Putrie, C. A. R. (2021). Upaya pengenalan warna dengan menggunakan media permainan kartu warna pada anak bimba aiueo graha kalimas 4 tambun. *Research and Development Journal of Education*, *7*(2), 525-531.
K Robert, Y. (2018). Case study research and applications design and methods.
Kapur, M., & Bielaczyc, K. (2012). Designing for productive failure. *Journal of the Learning Sciences*, *21*(1), 45-83.
Kuhl, P. K. (2014). Early language learning and the social brain. Cold Spring Harbor symposia on quantitative biology,
Ma, L., Yang, W., Shen, J., Zhang, W., Wang, X., & Fang, X. (2025). Parent-Teacher Cooperation and Adolescent Academic Development: Understanding the Dynamic Pattern through a Panel Network Approach. *Journal of Youth and Adolescence*, *1–23*.
Marusynets, M., Slabko, V., & Strelnik, O. (2019). Formal and non-formal education in the differentiation of intrinsic properties. *Освітній дискурс*, *7(15), 76–89.*
Meha, N., & Hengelina, H. (2017). Pengaruh penggunaan media kartu kata bergambar terhadap kemampuan membaca permulaan anak usia 5-6 tahun di bimba aiueo unit alinda bekasi utara. *Yaa Bunayya: Jurnal Pendidikan Anak Usia Dini*, *1*(1), 21-26.
Merriam, S. B., & Grenier, R. S. (2019). *Qualitative research in practice: Examples for discussion and analysis*. John Wiley & Sons.
Miles, B. W., & Jozefowicz-Simbeni, D. M. H. (2010). Naturalistic inquiry. *The Handbook of Social Work Research Methods*, 415-425.
Miles, M. B. (1994). Qualitative data analysis: An expanded sourcebook. *Thousand Oaks*.
Nehez, J., & Håkansson Lindqvist, M. (2024). External facilitators' practical work for school improvement: de-professionalising or developing improvement capacity? *Journal of educational change*, *25*(4), 803-823.
Neuman, S. B., & Danielson, K. (2021). Enacting content-rich curriculum in early childhood: The role of teacher knowledge and pedagogy. Early Education and Development. *32(3), 443–458.*
Norman, A. (2023). Educational technology for reading instruction in developing countries: A systematic literature review. *Review of Education*, *11*(3), e3423.
Nsamenang, A. B. (1995). Theories of developmental psychology for a cultural perspective: A viewpoint from Africa. Psychology and Developing Societies. *7(1), 1–19.*
Pangestu, F. G., Suri, G. E., Fitri, M., Dewi, P. A., & Widjayatri, R. D. (2022). Strategi Pembelajaran Fun Learning Di Bimba Aiueo Di Kota Cilegon. *Jurnal Anak Usia Dini Holistik Integratif (AUDHI)*, *5*(1), 8–14.
Parker, R., Thomsen, B. S., & Berry, A. (2022). Learning through play at school–A framework for policy and practice. Frontiers in Education,
Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage Publications.
Perera, C., Salamanca-Sanabria, A., Caballero-Bernal, J., Feldman, L., Hansen, M., Bird, M., Hansen, P., Dinesen, C., Wiedemann, N., & Vallières, F. (2020). No implementation without cultural adaptation: a process for culturally adapting low-intensity psychological interventions in humanitarian settings. *Conflict and health*, *14*(1), 46.
Puzio, K., & Colby, G. T. (2013). Cooperative learning and literacy: A meta-analytic review. *Journal of Research on Educational Effectiveness*, *6*(4), 339–360.
Rakyat, D. S. K. (2023). *Statistik Pendidikan 2023*. B. P. Statistik.
Roskos, K. A. (2017). Play and literacy in early childhood: Research from multiple perspectives.

Salsabila, A. A., & Kurniawan, H. (2022). Early Childhood Literacy Program At Bimba Aiueo. International Conference of Early Childhood Education in Multiperspectives,

Slavin, R. E. (1995). Cooperative learning: Theory, research, and practice. *Allyn &Bacon*.

Smith, M. W., Brady, J. P., & Clark-Chiarelli, N. (2008). *Early language & literacy classroom observation tool: K-3*. Paul H. Brookes.

Stake, R. E. (2013). *Multiple case study analysis*. Guilford Press.

Statistic, B. (2023). *Regional economic indicators: East Java Province 2023*. B. P. Statistik.

Stevens, K. E., Siraj, I., & Kong, K. (2023). A critical review of the research evidence on early childhood education and care in refugee contexts in low-and middle-income countries. *International Journal of Child Care and Education Policy*, *17*(1), 7.

Sweller, J., Van Merrienboer, J. J., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational psychology review*, *10*(3), 251-296.

Tomlinson, C. A. (2017). *How to differentiate instruction in academically diverse classrooms*. Ascd.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (Vol. 86). Harvard University Press.

Wenger-Trayner, E., Wenger, E., & Wenger-Trayner, B. (2020). *Learning to make a difference: Value creation in social learning spaces*. Cambridge University Press.

Young, J. R., Bevan, D., & Sanders, M. (2024). How Productive Is the Productive Struggle? Lessons Learned from a Scoping Review. *International Journal of Education in Mathematics, Science and Technology*, *12*(2), 470–495.

Yulia, L., & Suryani, Z. (2022). Korelasi pedagogik dan kebijakan pendidikan dalam meningkatkan mutu pendidikan. *Jurnal Kewarganegaraan*, *6*(1), 881-889.

Zhou, T., Cañabate, D., Bubnys, R., Staniküniené, B., & Colomer, J. (2025). Collaborative learning, cooperative learning and reflective learning to foster sustainable development: A scoping review. *Review of Education*, *13*(2), e70065.