ThufuLA: Jurnal Inovasi Pendidikan Guru Raudhatul Athfal
Volume 13 issue 2, 2025
http://dx.doi.org/10.21043/thufula.v13i2.34527
https://journal.iainkudus.ac.id/index.php/thufula
p-ISSN 2355-0163 | e-ISSN 2502-3845

STIMULATING PROBLEM-SOLVING SKILLS IN EARLY CHILDHOOD: A QUALITATIVE THEMATIC LITERATURE REVIEW OF LEARNING STRATEGIES

Namira Ramadana[1]✉, Nur Hayati[2]
[1]*Universitas Negeri Yogyakarta, Address, Jl. Colombo No.1, Karang Malang, Caturtunggal, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta, Indonesia*
[2]*Universitas Negeri Yogyakarta, Address, Jl. Colombo No.1, Karang Malang, Caturtunggal, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta, Indonesia*
✉*Correspondence:* namiraramadana.2024@student.uny.ac.id

Abstract: *Problem-solving skills are essential 21st-century competencies needed to equip children for navigating an increasingly complex global landscape. However, comprehensive syntheses of effective learning strategies that align with the Indonesian ECE context remain limited in recent research. This study is a qualitative literature review using a synthetic–thematic approach conducted through systematic searches on Google Scholar, ERIC, DOAJ, and ResearchGate, with inclusion criteria covering publications from 2020–2025, relevance to early childhood problem-solving development, and empirical grounding. Twenty-one articles that met the criteria were analyzed using Braun and Clarke's thematic analysis procedures. The results show that consistently effective strategies include the STEAM approach, project-based learning, simple science experiments, traditional games, and constructive play—all of which promote exploration, causal reasoning, creativity, and collaboration. Key challenges include limited teacher competence, insufficient exploratory facilities, and low levels of family engagement. Theoretically, the findings reinforce the importance of constructivist and sociocultural perspectives in the development of problem-solving skills, while practically, they highlight the urgency of strengthening teacher capacity and designing stimulus-rich learning environments. The novelty of this*

study lies in its comprehensive integration of multiple pedagogical approaches within a single analytical framework sensitive to the Indonesian context. Overall, this review provides an important conceptual foundation and strategic direction for future research and ECE practices aimed at enhancing problem-solving abilities in young children.

Keywords: *Early childhood education, Project-based learning, STEAM-based learning, Traditional games, Young children's problem solving.*

A. Introduction

Problem-solving ability is an essential skill that must be developed from an early age, particularly in navigating the dynamics of the 21st century, which demand flexible thinking, creativity, and adaptability (Rosyida et al., 2025). In the context of early childhood education (ECE), this ability is not solely related to cognitive development but also plays a crucial role in shaping children's social, emotional, and moral competencies through meaningful interactions and learning experiences (Papalia et al., 2023).

However, current ECE practices in Indonesia indicate that learning activities are still primarily focused on basic academic skills, such as reading, writing, and arithmetic. A report by the Ministry of Education, Culture, Research, and Technology (Kemdikbudristek, 2022) found that more than 70% of ECE institutions continue to prioritize academic drills over exploratory activities that stimulate higher-order thinking skills. This condition reinforces the need for a paradigm shift toward more constructivist, creative, and child-relevant approaches. Learning should be designed based on the principles of developmentally appropriate practice (DAP), meaning that it must align with children's developmental stages, interests, and socio-cultural contexts (Berk, 2022).

A growing body of research shows that exploration-based, play-centered, and collaborative activities enable children to identify problems, make predictions, and independently make decisions (Dewi & Sutriyani, 2024). Approaches such as STEAM (Science, Technology, Engineering, Arts, and Mathematics) and project-based learning have been proven effective in developing critical and

creative thinking through hands-on experiences (Dewi & Sutriyani, 2024). In addition, integrating traditional games and musical activities, such as percussion-based music, can stimulate children's cognitive, social, and emotional development in a holistic way.

Despite these recommendations, implementation in Indonesia still faces several challenges. First, limited teacher understanding of creative learning strategies often results in the continued reliance on lecture-based methods and routine academic activities (Ikha & Ariyati, 2024). Second, the lack of adequate facilities such as exploration spaces, learning materials, and well-designed play environments hinders the execution of investigative activities that can foster problem-solving skills (Damanik et al., 2024). Third, low levels of family involvement weaken the continuity of problem-solving stimulation at home, as many parents still perceive education as solely the teacher's responsibility (Hardaningtyas & Prihantoro, 2024).

At this point, a more precise articulation of the research gap is needed. Previous studies have not yet comprehensively identified or synthesized the most effective learning strategies for stimulating problem-solving abilities in young children based on the latest empirical findings (2020–2025). Furthermore, limited research has explored the integration of various approaches, such as STEAM, traditional games, the arts, and project-based learning, within the diverse contexts of ECE in Indonesia.

Therefore, this study is essential. This article aims to analyze various strategies for developing learning activities that effectively stimulate problem-solving skills in early childhood in Indonesia through a qualitative literature review approach. The findings of this study are expected to contribute both theoretically and practically to the development of ECE practices that nurture children's critical, creative, and adaptive thinking in alignment with 21st-century demands.

B. Method

This study employs a qualitative literature review using thematic analysis to provide an in-depth understanding of learning strategies that stimulate problem-solving skills in early childhood education (ECE) in Indonesia. This method was chosen because it allows the integration of previous research findings, resulting

in a comprehensive conceptual overview. A qualitative literature review provides researchers with flexibility to identify patterns, relationships, and trends within the literature, thereby offering insights into how constructivist, exploratory, and collaborative approaches are implemented in the ECE context.

The data sources for this study consist of national and international journal articles, academic books, and relevant research reports published between 2020 and 2025. Strict inclusion criteria were applied, including alignment with the topic of early childhood problem-solving, the presence of exploratory learning strategies such as STEAM, project-based learning, traditional games, or experimental activities, and relevance to the Indonesian ECE context. Only full-text literature with significant empirical or conceptual contributions was included. Literature searches were conducted through Google Scholar, ERIC, DOAJ, and ResearchGate using predetermined keywords to ensure broad and representative coverage.

The literature selection process followed the PRISMA flow, which includes the stages of identification, screening, eligibility assessment, and inclusion. In the identification stage, 62 documents were retrieved from various databases. Initial screening based on titles and abstracts reduced this number to 34 relevant documents. The eligibility stage involved thorough reading and methodological evaluation, resulting in 21 articles that met the final inclusion criteria. This structured selection procedure ensured that the analyzed literature was not only relevant but also met adequate academic quality standards.

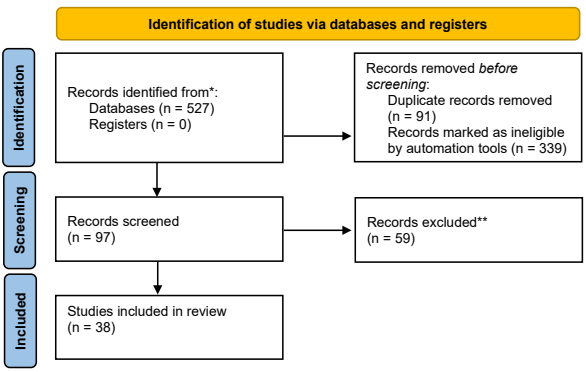

Figure 1. Study Selection Flowchart (PRISMA 2020)

Data analysis was conducted using the six-phase thematic analysis framework proposed by Braun and Clarke (2021), which involves a systematic and iterative process of data familiarization, initial code generation, theme development, theme review, theme definition and naming, and report production. The familiarization stage was carried out by thoroughly reading all selected literature to understand the issues, concepts, and contexts discussed in previous studies. At this stage, the researcher documented preliminary ideas that could serve as the basis for coding. Second, initial codes were generated from important information in the literature, including types of learning strategies, supporting factors, implementation challenges, and outcomes related to children's developmental progress.

The third step, searching for themes, involved grouping the codes into potential themes that reflect conceptual patterns within the data, such as STEAM implementation, play-based learning, scientific exploration, and parent–teacher collaboration. Once the initial themes were identified, the fourth step, reviewing themes, was conducted by examining each theme's consistency with the overall literature. Overlapping or less representative themes were revised to ensure conceptual clarity and accuracy.

The fifth step, defining and naming themes, resulted in more specific operational definitions and theme labels—such as "exploratory-experiential approaches," "constructive and traditional play media," or "ecosystem-based learning collaboration." The final step, producing the report, involved synthesizing the analysis into a narrative that illustrates the relationships between cognitive development theories, exploratory learning strategies, and contextual factors such as learning environments, facilities, and family support that influence the development of problem-solving skills in young children.

This study does not aim to generate statistical generalizations; instead, it seeks to enrich theoretical and practical understanding of the various learning strategies proven effective in stimulating problem-solving abilities in early childhood. Therefore, the findings of this review are expected to serve as a valuable reference for teachers, ECE practitioners, researchers, and policymakers in developing creative, adaptive, and contextually relevant learning activities

that align with the developmental needs of children in Indonesia.

C. Result and Discussion

After analyzing several relevant articles, several findings were identified regarding strategies for developing learning activities to stimulate problem-solving skills in early childhood, as presented in the following table.

Tabel 1. Article Display

No	Authors	Title	Research Method	Key Findings	Relevance to Early Childhood Problem Solving
1	{Citation}	Stimulation of Cognitive Development through Traditional Games	Descriptive qualitative	Traditional games stimulate logical thinking, memory, strategy, and collaboration.	Highly relevant; traditional games train strategic thinking and decision-making.
2	Amelia & Aisya (2021)	Project-Based Learning (PjBL) Model in Early Childhood Education	Literature study (qualitative)	PjBL increases curiosity, critical thinking, and responsibility.	Relevant; children learn to solve real-life problems through contextual projects.
3	Sativa et al. (2024)	Analysis of STEAM Approach Implementation in Early Childhood Education	Descriptive qualitative	STEAM enhances critical, creative, and exploratory thinking.	Highly relevant; supports problem-solving through experimentation and interdisciplinary integration.

4	Syofiyanti, Rachmawati & Dewi (2025)	Traditional Games as Educational Media for Developing Children's Social and Cognitive Abilities	Descriptive qualitative (observation & interview)	Traditional games strengthen analytical and social skills.	Highly relevant; teaches strategy, adaptation, and collaboration in solving problems.
5	Huda et al., (2024)	Implementing STEAM to Develop Children's Problem-Solving Abilities	Systematic Literature Review (SLR) examining STEAM-related literature in the context of early childhood education (ECE).	STEAM enhances creativity, critical thinking, problem-solving, collaboration, exploration, and motivation to learn through interdisciplinary and hands-on learning activities.	STEAM develops scientific reasoning, creative exploration, social collaboration, and multidisciplinary problem-solving strategies from an early age.
6	Adawiah & Hani (2024)	Improving Critical Thinking through Simple Experiments in ECE	Descriptive qualitative	Experiments train causal reasoning and hypothesis testing.	Relevant; experiments serve as a form of scientific problem solving.
7	Nursarofah (2022)	Contextual Learning with the Merdeka Belajar Approach in ECE	Literature study	Contextual learning promotes independent thinking and reflection.	Highly relevant; provides children with space to solve real-life problems.
8	Hardaningtyas & Prihantoro (2024)	Teacher–Parent Collaboration in Supporting Children's Critical Thinking	Descriptive qualitative	Collaboration strengthens critical thinking and consistency in learning stimulation.	Highly relevant; expands problem-solving opportunities at home and school.

9	(Nisa & Ulfah, 2025a) kreativitas, dan kemampuan berpikir kritis anak. Namun, pembelajaran konvensional yang minim inovasi cenderung kurang efektif dalam merangsang keterampilan tersebut. Penelitian ini bertujuan untuk mengeksplorasi penerapan pendekatan STEAM (Science, Technology, Engineering, Arts, and Mathematics	STEAM Integration in Recycled-Based Educational Toys	Classroom Action Research (two cycles)	Recycled-material STEAM increases creativity and divergent thinking.	Highly relevant; promotes problem-solving through creative innovation.
10	Shunhaji & Fadiyah (2020)	Effectiveness of Block Educational Tools (APE Balok) for Developing Cognition	Descriptive qualitative	Block play improves classification, logical reasoning, and geometric skills.	Relevant; block play trains spatial problem solving and logical thinking.
11	Nainggolan et al. (2022)	Science Experiment Method through Color Mixing Activities	Descriptive qualitative	Children understand cause-and-effect and simple scientific concepts.	Highly relevant; experiments stimulate critical thinking and problem-solving.

12	Wahyudi et al. (2024)	Holistic Approaches in Early Childhood Education	Qualitative case study	Holistic approaches align cognitive, social, and emotional aspects.	Highly relevant; supports multidimensional problem solving.
13	Yuriansa (2022)	Problem Solving in Early Childhood through Pattern Play	Qualitative case study	Pattern play helps children think logically and communicate.	Highly relevant; encourages systematic thinking.
14	Pertiwi (2025)	Influence of Role Play on Social Skills of ECE Children	Quantitative (pre-experiment)	Role play increases empathy and cooperation.	Highly relevant; strengthens social problem-solving.
15	Juraidah & Hartoyo (2022)	Teacher Roles in Developing Learning Independence	Descriptive qualitative	Teachers act as facilitators to build independence and responsibility for learning.	Relevant; independence is a foundation of problem-solving.
16	Siregar (2023)	Influence of Block Play on Cognitive Development	Quantitative (experiment)	Block play improves spatial reasoning and creativity.	Highly relevant; constructive play enhances logical and spatial problem solving.
17	Sari & Hidayati (2025)	Effectiveness of HOTS-Based STEAM Learning for Developing Problem Solving	Quantitative experiment	HOTS-based STEAM increases higher-order thinking and problem-solving.	Highly relevant; strengthens cognitive and creative abilities.
18	Salamah et al. (2025)	Innovation of Coding Hijaiyah for Stimulating Problem-Solving Skills in Early Childhood	Qualitative descriptive (observation, interview, documentation)	Unplugged coding improves logical, reflective, and strategic problem-solving through symbolic play integrated with Islamic values.	Highly relevant; structured symbolic play fosters algorithmic reasoning.

19	Putri & Hibana (2024)	Creating Safe and Comfortable Learning Environments in ECE	Literature review	Safe physical, social, and psychological environments enhance comfort and learning motivation.	Indirectly relevant; safe environments enable exploration and cognitive risk-taking essential for problem solving.
20	Ikha & Ariyati (2024)	Creative and Innovative Learning Strategies in ECE	Literature review	Creative strategies such as loose parts and edutainment enhance creativity, exploration, and thinking skills.	Relevant; encourages divergent thinking and exploration necessary for problem solving.

1. **STEAM-Based Learning**

The STEAM approach (Science, Technology, Engineering, Arts, and Mathematics) is one of the most consistently proven pedagogical strategies for effectively stimulating problem-solving skills in early childhood. The integration of five disciplines within STEAM encourages multidimensional exploration through hands-on experiences, hypothesis testing, and simple modeling, allowing children's cognitive, social, and creative processes to develop simultaneously (Hadianti, 2023; Sativa et al., 2024). Its interdisciplinary nature exposes children to open-ended challenges that do not have a single correct answer, a condition theoretically aligned with fostering cognitive flexibility and metacognitive abilities.

Research by Sari & Hidayati (2025) shows that STEAM learning infused with Higher Order Thinking Skills (HOTS) not only enhances children's analytical abilities but also encourages them to evaluate alternative solutions and formulate more effective strategies. In project-based learning experiments, children are asked to design simple constructions using loose parts, predict the strength of their structures, and then test and revise their models, reflecting the core principles of the engineering design process. Their findings underscore that STEAM creates a learning environment that supports iterative thinking, or the ability to repeat, refine, and validate solutions

based on feedback, an essential component of problem-solving.

Recent work by Nisa & Ulfah (2025) further confirms that STEAM implementation enhances children's capacity to recognize patterns, organize information, and engage in causal reasoning. For instance, when children conduct simple experiments on motion or magnetism, they formulate hypotheses, observe changes, and draw conclusions based on cause-and-effect relationships. This strengthens scientific reasoning, which forms the foundation of problem-solving. These findings are consistent with Dewi & Sutriyani (2024), who demonstrate that science learning integrated with the arts helps children express ideas creatively, enriching their representations of problems and solutions through visual media, constructions, or music.

Theoretically, STEAM is firmly grounded in Piagetian constructivism, wherein children build knowledge through active engagement, object manipulation, and environmental exploration. Children learn by doing rather than merely listening, enabling deeper development of mental schemas (Piaget, 1952). STEAM also reflects Bruner's discovery learning, which posits that learning becomes more meaningful when children independently uncover concepts through exploration and problem-solving. From Vygotsky's sociocultural perspective, collaborative STEAM activities provide opportunities for children to work within the zone of proximal development (ZPD) through teacher scaffolding, thus optimizing their higher-order thinking.

Furthermore, STEAM has a transformative role because it connects play-based activities to real-world applications. Children become accustomed to identifying problems in their surroundings, designing creative solutions, and evaluating the effectiveness of those solutions. This process fosters not only critical thinking but also confidence and intrinsic motivation to investigate and experiment. Thus, STEAM is not merely a pedagogical approach; it is a holistic learning framework that prepares children to face the complex challenges of the 21st century.

2. **Project-Based Learning and Experimentation**

Project-based learning (PjBL) and experimental learning are two approaches consistently identified in the literature as effective strategies for stimulating problem-solving skills in early childhood. Conceptually, both approaches position the child as

the central actor in the learning process: children are presented with contextual problems or tasks, asked to design solution steps, engage in experimentation or exploration, and then reflect on their results. The synthesized findings indicate that PjBL enhances intrinsic motivation, planning ability, and reflective thinking dimensions essential to problem solving, while simple scientific experiments strengthen children's ability to understand cause-and-effect relationships through observation and testing (Adawiah & Hani, 2024; Amelia & Aisya, 2021).

From a developmental theory perspective, the mechanisms of PjBL and experimental learning are closely aligned with constructivist and sociocultural principles. Piaget emphasizes that knowledge is constructed through children's active interactions with their environment; thus, projects and experiments provide concrete experiential materials for schema formation (Piaget, 1952). Vygotsky complements this view by highlighting the role of social interaction and scaffolding in helping children move beyond their actual competence toward their potential; the teacher's role as a facilitator in PjBL and experimental activities becomes a key driver in the internalization of problem-solving strategies (Vygotsky, 1978). Bruner's discovery learning framework reinforces the value of self-directed discovery, which in turn supports the development of metacognitive skills necessary for reflecting on and refining problem-solving strategies (Bruner, 1961).

Empirical evidence from local studies and small-scale experimental research demonstrates the positive effects of Project-Based Learning (PjBL). Amelia and Aisya (2021) found that implementing PjBL in early childhood education (ECE) classrooms enhances children's ability to design and complete simple project tasks closely connected to their everyday experiences. Furthermore, Adawiah and Hani (2024) and Nainggolan et al. (2022) report that color experiments and basic scientific activities facilitate children's capacity to formulate predictions, observe changes, and evaluate their own hypotheses—processes that directly correspond to the stages of scientific problem-solving. Moreover, integrating STEAM components into project activities enriches children's representational dimensions (visual, artistic), enabling them to model solutions multimodally and test the viability of their ideas (Nisa & Ulfah, 2025; Sari & Hidayati, 2025).

However, a critical analysis of the literature reveals several substantive limitations that warrant caution in interpreting these findings. First, many studies are descriptive, qualitative, or classroom action research (PTK) with small samples (one or a few classes), meaning that evidence regarding long-term effectiveness and broader generalizability remains weak (e.g., Amelia & Aisya, 2021; Nainggolan et al., 2022; Nisa & Ulfah, 2025). Second, intervention durations in many reports are short, making it unclear whether observed improvements in problem-solving abilities persist over the medium or long term; follow-up assessments are often absent. Third, considerable variation in study designs (qualitative vs. quantitative, different measurement tools) complicates efforts to conduct robust quantitative synthesis or meta-analysis, highlighting the need for future research using larger-scale experimental or quasi-experimental designs to validate the effects (Sari & Hidayati, 2025).

In terms of practical implementation, PjBL and experimental learning require institutional readiness that is often lacking in many ECE settings. Effective project-based teaching requires extended planning time, sufficient materials and resources, and teachers' competence in facilitating dialogue and assessing children's thinking processes—factors that have been reported as limited in several educational contexts (Ikha & Ariyati, 2024; Putri & Hibana, 2024). Therefore, the success of PjBL and experimental programs depends heavily on systemic interventions: continuous teacher training focused on designing open-ended tasks, scaffolding techniques, and process-based assessment; provision of simple learning materials; and curricular time support.

3. Traditional Games and Constructive Games

Traditional games, as examined by Sukmono and Tanto (2022) and Syofiyanti et al (2025), as well as constructive play such as block play (Shunhaji & Fadiyah, 2020; Siregar, 2023), play a significant role in stimulating spatial reasoning, logic, memory, and strategic thinking in early childhood. Traditional games like dakon, for example, require children to predict moves, calculate steps, and formulate strategies to outperform opponents activities that represent forms of social problem solving through negotiation, decision-making, and evaluating the consequences of each action (Sukmono and Tanto, 2022). From a cognitive perspective, these

activities involve anticipating possibilities, comparing alternatives, and revising strategies when outcomes differ from expectations, all of which are essential components of problem-solving skills.

Constructive play, particularly block play, encourages children to build structures through trial and error and design revision. Shunhaji and Fadiyah (2020) demonstrate that systematic use of block-based learning materials enhances children's classification abilities, understanding of part-whole relationships, and spatial reasoning. Siregar (2023) further notes that children who frequently engage in block play show better problem-solving in balance, form, and size. Such activities align with the concept of cognitive flexibility the ability to think divergently and adaptively when facing changes or errors during construction. Children learn that failure (such as a collapsed structure) is not an endpoint but new information that guides them toward more effective strategies.

From a contemporary pedagogical standpoint, both traditional and constructive play can be integrated with the STEAM approach, enriching children's problem-solving experiences. Nisa and Ulfah (2025) report that when children use recycled materials as constructive play tools, they not only develop fine motor and spatial skills but also learn to design, measure, and evaluate structural strength processes that mirror the engineering design cycle. Thus, constructive play is not merely a motor activity but a medium for cultivating scientific and creative thinking aligned with 21st-century skill demands.

At the same time, both traditional and constructive play play a crucial role in the development of social and emotional competencies closely associated with problem-solving skills. Syofiyanti et al. (2025) found that children's participation in group-based traditional games enhances their ability to collaborate, resolve conflicts, and adhere to mutually agreed-upon rules. Within this context, children practice regulating emotions when losing, taking turns, and negotiating with peers. These socio-emotional competencies are directly linked to social problem-solving, defined as the ability to respond adaptively and constructively to challenging social situations. In other words, traditional and constructive play function as natural and meaningful contexts for fostering children's social coping skills in real-life interactions.

Theoretically, these findings reinforce the constructivist perspective that play constitutes a primary context through which children construct knowledge via active interaction with objects and others. Traditional games offer rule-based structures and social roles that enable children to explore strategies within defined boundaries. At the same time, constructive play provides open-ended opportunities for children to design, test, and modify their own solutions. Taken together, these forms of play foster logical, creative, and reflective thinking, which represent the core foundations of problem-solving abilities in early childhood.

4. **Environmental and Social Factors**

Physical and social environmental factors consistently emerge as primary determinants of problem-solving abilities in early childhood. The literature shows that environments that are safe, flexible, and rich in stimuli not only provide objects for exploration but also facilitate complex cognitive behaviors such as experimenting, revising hypotheses, and reflecting on outcome processes that underpin scientific problem solving (Putri & Hibana, 2024)involving both physical and psychological aspects. A safe environment includes strong and secure buildings, first aid equipment (P3K. ECE classrooms equipped with distinct exploration zones (e.g., science, art, construction areas) exhibit higher frequencies of exploratory activities than uniform, centralized classroom layouts. This finding indicates that classroom configuration is a conditional prerequisite for cognitive processes supporting problem-solving.

Materially, the availability of educational play materials and manipulatives, whether purchased or based on local resources, correlates positively with the development of children's logical and spatial reasoning (Shunhaji & Fadiyah, 2020; Siregar, 2023). Studies on block play and loose parts show that when children have access to manipulable objects, they more frequently engage in design experiments, test simple hypotheses, and practice iterative strategies (Ikha & Ariyati, 2024). However, a critical analysis of the literature reveals that many studies merely describe correlations between the availability of materials and cognitive outcomes, without controlling for contextual variables such as teacher–child ratios, quality of pedagogical guidance, and family socioeconomic status, which may moderate the impact of

facilities on problem-solving abilities.

The social dimension of the environment, including the quality of teacher–child interactions, peer collaboration, and classroom culture, plays a crucial role in children's transition from actual to potential developmental levels (Vygotsky, 1978). Teachers who provide appropriate scaffolding encourage children to use more complex thinking strategies; conversely, environments that are overly structured or excessively protective can hinder children's initiation of exploration (Juraidah and Hartoyo, 2022; Hardaningtyas and Prihantoro, 2024). Wahyudi et al., (2024) highlight that holistic approaches combining emotional and cognitive support increase children's likelihood of taking cognitive risks such as trying alternative solutions, which ultimately enriches their repertoire of problem-solving strategies. This analysis positions the teacher not merely as a provider of material but as a designer of learning ecosystems that condition productive social interactions.

Community and family factors also significantly contribute to the continuity of problem-solving stimulation. Hardaningtyas & Prihantoro (2024) found that structured school–parent partnership programs increase the frequency of exploratory activities at home and strengthen the transfer of skills from school to domestic contexts. However, existing evidence also reveals heterogeneity: family involvement is strongly influenced by socioeconomic capital, parental education, and access to home learning resources. Consequently, interventions focusing solely on providing materials at school without considering home contexts risk producing limited and unsustainable impacts.

Cultural context and local innovations further moderate the effectiveness of learning environments. Studies on traditional games and local practices show that using cultural resources as learning materials enhances contextual relevance and motivates children to engage in problem-solving tasks. In contrast, contemporary innovations such as Coding Hijaiyah expand the learning environment into digital and religious domains, fostering early algorithmic thinking provided that technological access and family support are present (Salamah et al., 2025). Critical analysis warns that without infrastructural policies and teacher training, the adoption of digital innovations may widen disparities between learning environments.

Empirical limitations across the analyzed studies are apparent. Many employ case-study or classroom action research (PTK) designs with localized samples, short intervention durations, and highly variable outcome measures, which restrict the generalizability of findings (Amelia & Aisya, 2021; Nainggolan et al., 2022). Furthermore, the literature lacks longitudinal studies assessing the sustainability of environmental effects on problem-solving abilities over the medium and long term. Methodologically, stronger evidence is needed through experimental or quasi-experimental studies, standardized measures for higher-order thinking skills (HOTS), and more systematic analyses of moderators and mediators.

The practical implications of this analysis operate across multiple levels. At the classroom level, designing flexible learning spaces, using loose parts and local educational materials, and organizing exploration zones are priority steps that can be implemented immediately. At the professional level, teacher training focused on scaffolding techniques, observing thinking processes, and formative assessment is essential to maximize the benefits of the physical environment. At the policy level, equitable resource allocation for ECE infrastructure and family engagement programs, especially in economically disadvantaged regions, is necessary to ensure that problem-solving stimulation does not become a privilege accessible only to select groups.

Theoretically, these findings reinforce Bronfenbrenner's argument that child development occurs within interconnected environmental systems; changes in micro- (e.g., classroom, family) or exo- (e.g., community, policy) systems shape the developmental trajectory of problem-solving skills. Moreover, the synergy of Vygotskian and Piagetian principles, as reflected in the data, underscores the need for environments that support both direct experiential learning and guided social interaction to cultivate higher-order thinking in young children.

Thus, improving the quality of physical and social environments in ECE is not merely a matter of facilities but a systemic intervention requiring curricular support, professional development, and context-responsive policies to foster equitable and sustainable development of children's problem-solving abilities.

5. **Collaboration between Teachers and Parents**

Collaboration between teachers and parents is one of the key determinants in the successful development of problem-solving skills in early childhood. From Bronfenbrenner's ecological systems perspective, children exist within interconnected systems, with home and school forming the two primary microsystems that shape their daily learning experiences. Strong synergy between these environments enables consistency in the values, approaches, and forms of stimulation provided to children, including those related to problem-solving skills. When communication between teachers and parents is open, purposeful, and sustained, children's thinking strategies become more stable because they have opportunities to practice problem-solving across contexts, both at school and at home.

Hardaningtyas & Prihantoro (2024) show that teacher-parent collaboration facilitated through regular meetings, learning communication journals, and family engagement programs positively contributes to the development of children's critical thinking. Parents who understand learning objectives and the strategies used by teachers are better equipped to continue problem-solving stimulation at home, for example, involving children in simple discussions before making decisions, providing opportunities to choose among alternative solutions, or inviting them to reflect on their previous actions. Thus, collaboration is not merely administrative; it becomes a pedagogical instrument that expands the child's learning environment. These findings reinforce Vygotsky's sociocultural view that social interactions with "more knowledgeable others," in this case, teachers and parents, are key mediators in the development of higher-order cognitive functions, including higher-order thinking skills (HOTS).

In fostering learning independence, teacher–parent collaboration also contributes to consistent patterns of guidance and caregiving. Juraidah and Hartoyo (2022) assert that a child's independence in learning and decision-making is shaped not only by classroom learning strategies but also by parenting practices at home. When teachers encourage children to attempt tasks independently before seeking help, and parents apply the same principle at home, children become accustomed to viewing problems as challenges to overcome rather than as obstacles. This

forms an essential foundation for the development of sustainable problem-solving dispositions. Nursarofah (2022) adds that the Merdeka Belajar approach in early childhood education requires parental involvement in providing space for exploration at home, allowing children to connect formal learning experiences with everyday life.

Teacher–parent collaboration is also crucial in the implementation of innovative learning approaches such as STEAM, project-based learning, and technology-based programs. In Salamah et al., (2025) study on Coding Hijaiyah, parental involvement in assisting children with digital media and extending practice strengthens children's algorithmic thinking and symbolic problem-solving. Teachers design the learning scenarios and provide guidance, while parents provide emotional support, time management, and supervision of device use. This pattern of collaboration demonstrates that educational innovations cannot achieve optimal outcomes without family support as an extension of the learning process.

Furthermore, the quality of the social–emotional environment at home and school becomes more aligned when strong communication and cooperation exist between teachers and parents. Wahyudi et al., (2024) emphasize that a holistic approach to early childhood education requires integrating cognitive, social, and emotional dimensions. Children who are accustomed to discussing their feelings and challenges with their parents are better able to regulate their emotions when they encounter problems at school. Meanwhile, teachers who understand family dynamics can tailor their scaffolding strategies to be more empathetic and responsive to each child's needs. In this context, collaboration not only strengthens academic aspects but also serves as a psychosocial protective mechanism, enabling children to develop greater resilience in facing challenges.

However, the literature also identifies challenges in establishing effective collaboration. Several studies report that some parents still position teachers as the sole individuals responsible for children's education, resulting in relatively low involvement in home learning activities. On the other hand, teachers may also lack adequate communication skills to form equitable partnerships with parents, often relying on one-way information delivery rather

than engaging in two-way collaborative dialogue. These findings indicate the need to strengthen teachers' capacity for managing parent–teacher relationships and to develop structured family engagement programs that go beyond ceremonial activities.

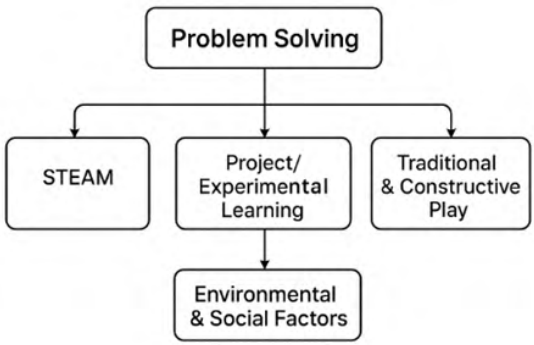

Figure 2. Conceptual Model of Early Childhood Problem Solving

The conceptual model developed in this study illustrates that early childhood problem-solving abilities develop through dynamic interactions among various learning approaches and supporting factors within the child's learning environment. At the core of the model, problem-solving is positioned as the primary ability to be stimulated, explained through three main thematic approaches: the STEAM approach, project- and experiment-based learning, and traditional and constructive play. These three approaches complement one another, as each contributes uniquely to children's cognitive, social, emotional, and creative development.

The STEAM approach serves as a foundational framework that integrates science, technology, engineering, the arts, and mathematics in an exploratory context. Through STEAM, children are encouraged to observe, test, and discover cause–and–effect relationships, thereby developing critical, analytical, and creative thinking skills simultaneously. This approach also requires collaboration among children, enabling problem-solving to occur through discussion, joint reasoning, and social negotiation.

Meanwhile, project-based and experimental learning provide authentic, contextual, and real-world problem-solving experiences. In this approach, children actively engage in planning, conducting experiments, discovering results, and reflecting on their processes. These activities strengthen mechanisms of discovery learning

and inquiry-based learning, aligning with Piaget's and Bruner's theories that emphasize the importance of direct exploration in constructing new cognitive structures.

The third approach—traditional and constructive play—supports the formation of social problem-solving skills. Through block play, traditional games, role-play, and other collaborative activities, children learn to resolve conflicts, share roles, and formulate strategies when facing social challenges. Play activities also enhance cognitive flexibility, creativity, and emotional regulation throughout the problem-solving process.

These three learning approaches are closely connected to environmental and social factors that underpin successful problem-solving development. A learning environment that is safe, supportive, and stimulating, and that allows children to experiment without fear of failure, has been shown to increase children's confidence in making decisions. The teacher's role as facilitator, the parent's role as guide, and the community's role as a source of authentic experiences all contribute to the continuity of problem-solving stimulation at home and at school.

Thus, the conceptual model demonstrates that the development of problem-solving skills in early childhood does not occur in isolation but through the integration of STEAM-based approaches, project and experimental activities, and traditional and constructive play, all reinforced by a supportive social environment. This thematic relationship reflects a holistic, constructivist, and sociocultural approach that positions the child as an active learner engaged in discovering and managing solutions to the challenges they encounter.

D. Conclusion

This review shows that early childhood problem-solving skills develop most effectively through constructivist, contextual, and collaborative learning experiences. Approaches such as STEAM, project- and experiment-based learning, and traditional and constructive play have been shown to effectively stimulate children's critical, creative, and reflective thinking. These findings highlight that problem-solving is not solely rooted in cognitive ability but is also shaped by social and emotional factors, as well as by the quality of learning environments that support

exploration and independence. Practically, the results of this review encourage teachers to design more exploratory learning activities, provide ample opportunities for experimentation, and strengthen their role as facilitators in the learning process. Policymakers are advised to ensure adequate learning resources, continuous teacher training, and consistent mechanisms for family involvement. Future research is recommended to examine the effectiveness of specific learning strategies through more comprehensive empirical studies, explore their application across diverse contexts, and develop implementation guidelines that early childhood education institutions can widely adopt.

References

Adawiah, R., & Hani, E. (2024). Upaya Meningkatkan Kemampuan Berpikir Kritis Melalui Pembelajaran Sains Pada Anak Usia 4-5 Tahun. E-JURNAL AKSIOMA AL-ASAS, 5(1). https://ejurnal.latansamashiro.ac.id/index.php/JAA/article/view/1339

Amelia, N., & Aisya, N. (2021). Model pembelajaran berbasis proyek (project based learning) dan penerapannya pada anak usia dini di TK IT Al-Farabi. BUHUTS AL ATHFAL: Jurnal Pendidikan Dan Anak Usia Dini, 1(2), 181–199.

Braun, V., & Clarke, V. (2021). Thematic analysis: A practical guide. https://www.torrossa.com/it/resources/an/5282292

Damanik, M. R. A., Hasibuan, H. B., & Nasution, R. A. (2024). Pengaruh Pendekatan Eksplorasi Lingkungan Terhadap Pengetahuan Sains Anak Usia Dini di Raudhatul Athfal Ar Rahmah Medan. Khirani: Jurnal Pendidikan Anak Usia Dini, 2(3), 153–167.

Dewi, S. N., & Sutriyani, W. (2024). Efektivitas Model Pembelajaran STEAM (Science, Technology, Engineering, Art, and Mathematics) terhadap Hasil Belajar Matematika Sekolah Dasar. Jurnal Syntax Admiration, 5(7), 2752–2759.

Hadianti, A. N. (2023). Penerapan Steam Untuk Mengembangkan Kemampuan Anak Dalam Menyelesaikan Masalah. Prosiding Seminar Nasional PGPAUD UPI Kampus Purwakarta, 2(1), 20–25.

Hardaningtyas, K., & Prihantoro, M. T. (2024a). KOLABORASI ORANG TUA DAN GURU DALAM MENDUKUNG PERKEMBANGAN KEMAMPUAN BERPIKIR KRITIS ANAK. Al-ATHFAL: Jurnal Pendidikan Anak, 5(2), 325–335.

Hardaningtyas, K., & Prihantoro, M. T. (2024b). KOLABORASI ORANG TUA DAN GURU DALAM MENDUKUNG PERKEMBANGAN KEMAMPUAN BERPIKIR KRITIS ANAK. Al-ATHFAL: Jurnal Pendidikan Anak, 5(2), 325–335.

Huda, D. N., Mulyana, E. H., & Rahman, T. (2024). Pendekatan STEAM untuk pendidikan anak usia dini. Jurnal PAUD Agapedia, 8(2), 191–198.

Ikha, T., & Ariyati, T. (2024). Strategi Pembelajaran Kreatif dan Inovatif di Lembaga Pendidikan Anak Usia Dini. Kiddo: Jurnal Pendidikan Islam Anak Usia Dini, 611–624. https://doi.org/10.19105/kiddo.v1i1.12785

Juraidah, J., & Hartoyo, A. (2022). Peran Guru Dalam Menumbuhkembangkan Kemandirnan Belajar Dan Kemampuan Berpikir Kritis Siswa Sekolah Dasar Melalui Proyek Penguatan Profil Pelajar Pancasila. Jurnal Pendidikan Dasar Perkhasa: Jurnal Penelitian Pendidikan Dasar, 8(2), 105–118.

Nainggolan, L. L., Simanjuntak, J., Anggraini, E. S., & Virganta, A. L. (2022). Analisis Metode Eksperimen Sains Melalui Kegiatan Pencampuran Warna Pada Anak Usia 5-6 Tahun Di TK Taruna Andalan Kecamatan Kerinci TA 2020/2021. Jurnal Usia Dini E-ISSN, 2502, 7239.

Nisa, K., & Ulfah, P. S. (2025). Integrasi Pendekatan STEAM dalam Desain Alat Permainan Edukatif Berbasis Daur Ulang untuk Meningkatkan Kreativitas Anak Usia Dini. Edukasia Jurnal Pendidikan, 2(1), 19–23.

Nursarofah, N. (2022). Meningkatkan kualitas pendidikan anak usia dini melalui pembelajaran kontekstual dengan pendekatan merdeka belajar. Journal Ashil: Jurnal Pendidikan Anak Usia Dini, 2(1), 38–51. https://doi.org/10.33367/piaud.v1i1.2492

Putri, H. A., & Hibana. (2024). Menciptakan Lingkungan Belajar

Aman dan Nyaman di Lembaga Pendidikan Anak Usia Dini. Kiddo: Jurnal Pendidikan Islam Anak Usia Dini, 754–767. https://doi.org/10.19105/kiddo.v1i1.14536

Rosyida, K. M. I., Prahani, B. K., & Kurtuluş, M. A. (2025). Analysis of the Role of STEAM Education in Improving Critical Thinking Skills for Sustainable Development. Journal of Current Studies in SDGs, 1(1), 20–32. https://doi.org/10.63230/jocsis.1.1.9

Salamah, U., Rofi'ah, U. A., Hidayati, N., & Lisaniyah, F. H. (2025). Inovasi Pembelajaran Coding Hijaiyah dalam Menstimulasi Keterampilan Problem-Solving Anak Usia Dini di Era Modern. Journal of Early Childhood and Character Education, 5(1). https://journal.walisongo.ac.id/index.php/joecce/article/view/26500

Sari, W. A. S., & Hidayati, W. (2025). Efektifitas Pembelajaran Steam Berbasis Hots dalam Meningkatkan Kemampuan Problem Solving Anak Usia 5-6 Tahun. Journal Ashil: Jurnal Pendidikan Anak Usia Dini, 5(2), 169–185. https://doi.org/10.33367/piaud.v5i2.7301

Sativa, F. E., Buahana, B. N., & Sriwarthini, N. L. P. N. (2024). Analisis Implementasi Pendekatan STEAM dalam Pembelajaran Anak Usia Dini. Jurnal Ilmiah Profesi Pendidikan, 9(4), 3058–3062. https://doi.org/10.29303/jipp.v9i4.2821

Shunhaji, A., & Fadiyah, N. (2020). Efektivitas alat peraga edukatif (APE) balok dalam mengembangkan kognitif anak usia dini. Alim, 2(1), 1–30.

Siregar, S. K. (2023). Pengaruh bermain balok terhadap perkembangan kognitif anak usia 5-6 tahun di RA Darul Ulum Kota Padangsidimpuan [PhD Thesis, UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan]. http://etd.uinsyahada.ac.id/10738/

Sukmono, N. D., & Tanto, O. D. (2022). Stimulasi Perkembangan Kognitif Anak Melalui Permainan Tradisonal Dakon, Vygotsky Vs Piaget Perspektif. Raudhatul Athfal: Jurnal Pendidikan Islam Anak Usia Dini, 6(2), 67–81. https://doi.org/10.19109/ra.v6i2.14881

Syofiyanti, D., Hasnida, H., & Susanti, P. A. (2025). Permainan Tradisional sebagai Media Edukatif dalam Pengembangan Kognisi dan Sosialisasi Anak Usia Dini: Systematic Literature Review (SLR). Action Research Journal Indonesia (ARJI), 7(3), 2400–2412. https://doi.org/10.61227/arji.v7i3.537

Wahyudi, M., Arisanti, F., & Muttaqin, M. (2024). Pendekatan Holistik Dalam Pendidikan Anak Usia Dini: Menyelaraskan Aspek Kognitif, Emosional dan Sosial. Journal of Early Childhood Education Studies, 4(1), 33–72. https://doi.org/10.54180/joeces.2024.4.1.33-72

This page intentionally left blank