

Critical Thinking Behavior of Early Childhood in Project Based Learning: A Literature Review

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Abstract. Critical thinking is one of the essential skills that children must possess to face the challenges of the 21st century. However, the 2018 Programme for International Student Assessment (PISA) result indicate that Indonesian children's critical thinking skills remain low and rank below those of many other countries. One of the efforts that can be undertaken to improve this skill is the implementation of project-based learning. This literature review aims to examine and analyze the findings from recent empirical studies in the form of articles, journals and research documents regarding the impact and effectiveness of project-based learning in improving enhancing critical thinking skills among early childhood learners. The method used is qualitative descriptive, employing the Miles and Huberman model of data reduction, data presentation, and drawing conclusions. The articles reviewed are derived from various primary sources, including national journals published within the last five years and international journals published within the last eight years. All literature was carefully selected from various accredited, high-quality and reputable scientific databases. The review findings reveal that project-based learning is superior to conventional and other instructional models, as evidenced by improvements in children's thinking patterns, creativity, conceptual and principled understanding, problem-solving, decision-making, and independence, all of which are integral components of critical thinking skills.

Keywords: critical thinking; project-based learning; early childhood

INTRODUCTION

In recent years, the term *critical thinking* has become increasingly popular in the field of education. This is because critical thinking is one of the essential 6C skills (Critical Thinking, Creative Thinking, Communication, Collaborations, Character, and Citizenship) that children are expected to develop in order to face future challenges. Unfortunately, the 2018 results of the *Programme for International Student Assessment* (PISA) showed that the critical thinking abilities of Indonesian children remain relatively low compared to those in other countries (Zulyusri et al., 2023). Critical thinking itself is a set of skills that helps children process information more deeply based on their existing experiences to determine what actions they should take (Chaffee, 1992). John Dewey, who referred to critical thinking as *reflective thinking* described it as the process of actively, consciously, thoroughly, and carefully analyzing information or ideas received, while considering the available evidence and possible consequences (Dewey, 1971). Children will process the information they receive by comparing it with their prior knowledge and experiences, and then take action, either accepting or rejecting the information.

Dewey himself believed that the habit of critical thinking should be cultivated from an early age, so that a child's way of thinking became a consistent habit that continues throughout their life. In the context of early childhood education, fostering critical thinking can be integrated into children's daily routines through play-based learning, allowing it to naturally develop into habitual behaviors. Children will become accustomed to questioning information, seeking deeper understanding, exploring their surrounding, solving problems, and making decision. There are many techniques and strategies that teacher can use to stimulate children's critical thinking pattern through various learning approaches, one of them is the project-based learning approach.

Project-based Learning (PBL) is a child-centered approach in which children are given authority and responsibility to plan, explore and analyze information, solve problems, and present their findings (DongJin & Mohamad Ashari, 2024). This approach highly values children's creativity by giving them the freedom to explore their curiosity, express themselves, solve encountered problems, and make decisions. As a result, children become more engaged and motivated to learn, as well as eager to construct their own knowledge (Konecni, 2023). The flexibility of this approach allows project-based learning to be implemented

across various disciplines and educational levels, including early childhood education. Another advantage of this approach is its ability to integrate multiple disciplines within its application.

In this approach, the teacher acts as a facilitator while still providing guidance to the children as they carry out their activities (Dhieni et al., 2023). Unlike conventional learning, where activities are teacher-centered and one-directional, but it is the children who decide how they will inquire, explore, solve problems, and make decisions. The trust given to children to take control encourages them to become more independent in expressing themselves and exploring their environment.

METHODS

This article employs a literature review method by collecting and analyzing various previous research findings related to critical thinking behavior in early childhood through project-based learning. The method used is qualitative descriptive, employing the Miles and Huberman model of data reduction, data presentation, and drawing conclusions. It is chosen to gain a comprehensive understanding of the impact and effectiveness of project-based learning on the development of critical thinking behavior in young children, based on existing research. The researcher followed several steps in preparing this article. The first step was to identify the topic of study, in which the researcher selected the effectiveness of project-based learning in shaping critical thinking behavior in early childhood. The topic was chosen based on the consideration that this approach is one of the learning models capable of fostering critical thinking behavior in children. The researcher also formulated several key research questions related to the study's focus, namely: "How can this approach positively impact children's critical thinking behavior?" and "how effective is the implementation of project-based learning in enhancing critical thinking behavior in young children?"

The next step was to search for literature from various academic sources related to the research topic. Data collection was conducted by using relevant keywords such as critical thinking, early childhood education, and project-based learning, sourced from reputable and well-indexed scientific databases. The selected literature was curated based on the following inclusion criteria: (1) published within the last five years for national sources and within the last eight years for international sources, (2) relevant to the topics of

critical thinking, project-based learning, and early childhood, (3) utilized a clear and structured research methodology, and (4) written in either Bahasa Indonesia or English. Through this literature search, the researcher successfully gathered 20 articles that met the above criteria for further analysis.

The selected articles were then classified based on research themes aligned with the research questions, followed by the processes of analysis and synthesis. The next step involved conducting a qualitative analysis of the findings from previous studies that examined the implementation of project-based learning in early childhood education. The results of this analysis were then synthesized to obtain a comprehensive understanding of the impact and effectiveness of project-based learning in shaping critical thinking behavior in young children.

RESULTS AND DISCUSSION

The results obtained from the curative literature review, which met the inclusion criteria, were categorized based on research themes. The first category relates to the impact of the project-based learning approach on children's critical thinking skills. The author identified 20 articles relevant to this theme from various perspectives. Seven of these articles compare the impact of project-based learning with conventional and other instructional models. Five articles specifically highlight the effect of project-based learning on children's critical thinking abilities as presented in their research findings. Several other articles discuss more specific aspects of the impact of project-based learning on critical thinking, such as problem-solving, decision-making, and independence.

The theme of the effectiveness of project-based learning in relation to children's critical thinking skills was found in eight articles, which focused primarily on the practical implementation of this approach in the field-particularly in connection with factors such as teacher readiness and learning materials. Additionally, four other articles specifically examined the effectiveness of project-based learning itself in enhancing children's critical thinking abilities showed in Table 1.

Project-based learning, first popularized by Kilpatrick in his renowned article *The Project Method* in the early 1900s, brought a new perspective to the world of education (Przybysz-Zaremba & Kołodziejki, 2017). A follower of progressivism like his mentor John Dewey, Kilpatrick was among those who opposed the

Tabel 1. Literature Review and Research Finding

No	Researcher	Title	Research Finding
01.	Lu Zhang, Yan Ma Frontiers in Psychology Published 17 July 2023	A study of the impact of project-based learning on student learning effects: a meta-analysis study	PBL is superior to conventional model and enhances children's academic abilities, such as learning achievement, affective attitudes, and thinking skills
02.	Natalia Purba, et al Library Progress International Vol.44, No.3 Jul-Dec 2024	An Implementation of Project-Based Learning (PBL) Teaching Model in Improving Early Child's Critical Thinking Skill	PBL is superior to conventional model and develop multiple intelligences and metacognition.
03.	Heba Bani Issa, Abdullah Khataibeh Pegem Journal of Education and Instruction, Vol. 11, No. 2, 2021	The Effect of Using Project Based Learning on Improving the Critical Thinking among Upper Basic Students from Teachers' Perspectives	PBL is superior to conventional model and enhances children's ability in critical and reflective thinking, communication, and collaboration.
04.	Julien Chintya, Sri Haryani, Suharto Linuwih, Putut Marwoto Jurnal Penelitian Pendidikan IPA Published: 2023-06-25	Analysing of the Application of the Project-Based Learning (PjBL) Learning Model on Increasing Student's Creativity in Science Learning in Elementary School	The implementation of PjBL in science lessons shows an improvement in children's creativity, critical thinking, and problem-solving skills.
05.	Suci Cahyaningsih, Harun Harun Obsesi:Jurnal Pendidikan Anak Usia Dini Vol 7 (2023)	<i>Pengaruh Metode Pembelajaran Proyek terhadap Kemampuan Berpikir Kritis dan Kreativitas Anak</i>	PBL shows improvements in children's critical thinking and creativity
06.	Yurnelis Hulu, Yesi Novitasari, Heleni Putri Edutainment: Jurnal Ilmiah Pendidikan (EDUJIP) Vol:1 No:1 2024	<i>Implementasi Project-Based Learning unruk Meningkatkan Kemampuan Pemecahan Masalah Pada Anak Usia Dini</i>	PBL enhances children's absorption and memory, problem-solving, decision-making, investigation, independence, collaboration, creativity, motivation, and focus
07.	I Putu Widyanto, Raisa Vienlentina Jurnal Pendidikan: Teori, Penelitian dan Pengembangan Vol: 7 No: 4 (2022)	<i>Peningkatan Kemampuan Berpikir Kritis dan Hasil Belajar Peserta Didik menggunakan Student Centered Learning</i>	PBL enhances children's abilities to interact with their environment, collaborate, explore, solve problem, make decision, and reflect on their work outcomes.
08.	Sermin Metin, Neriman Aral, Halil Uzun Çukurova Üniversitesi Eğitim Fakültesi Dergisi, 52(1), 2023	The Effects of Project Approach-Based Education on Cognitive Abilities and Scientific Process Skills of Six-Years Children	PBL enhances children's cognitive abilities, particularly in problem-solving, understanding concept, and grasping principle
09.	Awaliyatun Nikmah, Imam Shofwan, All Fine Loretha Obsesi : Jurnal Pendidikan Anak Usia Dini Vol 7; No 4 (2023)	<i>Implementasi Metode Project Based Learning untuk Kreativitas pada Anak Usia Dini</i>	PBL is engaging for children because it is concrete, relatable to their daily lives, interesting-so they don't get bored, and it fosters curiosity and self-confidence
10.	Sofie M. M. Loyens, Julianne E. van Meerten, Lydia Schaap, Lisette Wijnia Educational Psychology Review (2023)	Situating Higher-Order, Critical, and Critical-Analytic Thinking in Problem- and Project-Based Learning Environments: A Systematic Review	The six characteristics of PBL: child-centered, small group-based, teacher as a facilitator, connected to children's everyday lives, problem-solving oriented, and promoting independence.

Tabel 1. Literature Review and Research Finding

No	Researcher	Title	Research Finding
11.	W. Sumarni, S. Kadarwati Jurnal Pendidikan IPA Indonesia JPII 9 (1) (2020)	Ethno-STEM Project-Based Learning: Its Impact to Critical and Creative Thinking Skill	PBL encourages children to actively observe, ask questions, express opinions, provide reasoning, retell stories, distinguish differences, and understand similarities
12.	Fatema Yousef Al-Hassawi <i>PEOPLE: International Journal of Social Sciences</i> Vol 6; Issue 1 (2020)	The Effect of A Project-Based Progran to Develop the of Critical and Creative Thinking Skills	PBL is effective in enhancing children's cognitive abilities, especially in observing, identifying, similarities and differences, evaluating, organizing, and categorizing.
13.	Roficha Yuliani, Cepi Saffrudin Abd Jabar, Ika Budi Maryatun Jurnal Golden Age Vol 8;3 (2023)	The Influence of the Inquiry Project-Based Learning Model on Critical Thinking Skills in Early Childhood: A Quantitative Experimental Study	PBL is effective in enhancing critical thinking skills in early childhood. It is recommended to integrate this learning approach into the curriculum.
14.	Catherine O'Reilly, Ann Devitt , N'oirin Hayes journal homepage: www.elsevier.com/locate/tsc (2022)	Critical thinking in the preschool classroom - A systematic literature review	Critical thinking in early childhood can be enhanced through mediators such as classroom interaction, the use of thought-provoking language, and storytelling approaches.
15.	Enrico Pollarolo, Ingunn Størksen, Tuula H. Skarstein & Natalia Kucirkova European Early Childhood Education Research Journal 2023, VOL. 31, NO. 2,	Children's critical thinking skills: perceptions of Norwegian early childhood educators	To enhance critical thinking skills in early childhood, it is essential to use interaction, dialogue, play, and exploration.
16.	Parwoto Parwoto, Sitti N. Ilyas, Muhammad Y. Bachtiar, Kartini Marzuki South African Journal of Childhood Education (2024)	Fostering creativity in kindergarten: The impact of collaborative project-based learning	PBL has the potential to enhance creativity in early childhood. This highlights the importance of choosing the right teaching method.
17.	Tri Endah Puspitasari, Robingatin, Akhmad Muadin <i>ITQAN: Jurnal Ilmu-ilmu Kependidikan</i> Vol. 14, No. 1 (2023)	Implementation of Project Based Learning in Improving Early Childhood Interpersonal Intelligence	PBL has a positive impact on children's interpersonal intelligence. It helps children interact easily, collaborate effectively, and solve problems.
18.	Sun DongJi, Zakiah Binti Mohamad Ashari International Journal of Academic Research in Progressive Education and Development Vol. 13, 2 (2024)	Project-based Learning in Early Science Education A Systematic Review	PBL enhances children's scientific understanding and improves their 21 st century skills.
19.	Milan Maros, Marcela Korenkova, Milan Fila, Michal Levicky, Maria Schoberova Interactive Learning Environments 2023, VOL. 31, NO. 7,	Project-based learning and its effectiveness: evidence from Slovakia	PBL has many advantages and is enjoyable for children. However, extensive teacher training is needed to ensure its effective implementation
20.	Eva Roliana, Rien Safrina, Hapidin JMIE: Journal of Madrasah Ibtidaiyah Education, 4(1), 2020,	<i>Pengaruh Metode Proyek dan Sikap Siswa Terhadap Pemahaman Konsep Bilangan Pada Anak Usia 6-7 Tahun</i>	Understanding number concepts in early childhood is more effective through PBL compared to the <i>Number Head Together</i> Method.

conventional methods of instructional prevalent at the time. Project-based learning emerged as an alternative approach that offered numerous positive impacts on children. Even today, the advantages of project-based learning over continental teaching remain relevant. This is evident in research findings that highlight the significant improvements this approach brings to various aspects of children's development, particularly critical thinking skills (Zhang & Ma, 2023). Moreover, other studies also show significant results in enhancing reflective thinking, communication, and collaboration skills (Issa & Khataibeh, 2021). These significant outcomes are also observed when the approach is applied in early childhood education (Purba et al., 2024). The benefit of this approach, as compared to traditional methods, are also reflected in children's experiences-many feel more comfortable with project-based learning (Maros et al., 2023). A literature study by Sakila et al. further supports the finding that project-based learning can enhanced critical thinking, cognitive development, creativity, and social skills in children (Sakila et al., 2023). This approach, which provides children with greater freedom to explore and differs greatly from the typically one-way nature of conventional teaching, allows children to develop more independently and make choices that support their growth.

The project-based learning approach is not only compared to conventional learning but is also frequently evaluated against other instructional methods. When compared to approaches such as problem-based learning, project-based learning continues to show significant results, particularly in enhancing children's critical thinking skills (Muttakin, Thalitha Attahara, 2024). Research conducted by Roliana et al. also compared this approach with the *Number Head Together* method, and the results demonstrated that project-based learning remained superior (Roliana et al., 2020). One of the key advantages of project-based learning is that, in addition to allowing children to explore, it also grants them autonomy. This autonomy gives children the freedom to make choices, experiment, and express themselves-contributing to their independence, especially in problem-solving and decision-making.

Child-centered project-based learning has shown numerous positive effects on children's development-not only on their critical thinking skills but also on other abilities such as creativity (Cahyaningsih & Harun, 2023). Similar results were found in a study that applied project-based learning using a science major (Chintya et al.,

2023). Critical thinking, which includes problem-solving abilities, can be effectively nurtured through this approach (Hulu et al., 2024). Likewise, decision-making skills-which sharpen children's reasoning and critical thinking-are also enhanced (Ridwan, 2021). Metin, et al in their quasi-experimental study, explain that project-based learning can improve children's cognitive abilities, especially in problem-solving and in understanding concepts or principles (Metin et al., 2023). Several advantages of project-based learning include its ability to stimulate critical thinking skills such as problem-solving, strong retention and comprehension, decision-making, and independence.

The literature review conducted by Loyens et al. identified six key characteristics of project-based learning that contribute to its effectiveness: (1) it is child-centered, (2) it involves learning in small groups, (3) the teacher acts as a facilitator, (4) the problems addressed are closely related to the children's daily lives, (5) it is oriented toward problem-solving, and (6) it fosters children's independence (Loyens & Wijnia, 2023). The effectiveness of project-based learning can be further optimized when teachers are empowered in the classroom. Although the teacher serves as a facilitator, learning designed through play-based methods and the use of engaging media can motivate children to explore (Nikmah et al., 2023). Critical thinking skills, according to research by O'Reilly, can develop through effective mediators, which include: (1) quality classroom interaction, including the use of dialogic technique and questioning strategies, (2) the use of language that stimulates children's thinking, and (3) story-based approaches (O'Reilly et al., 2022). These three mediators can be implemented within project-based learning, where the teacher as a facilitator can stimulate and create the right classroom atmosphere. Therefore, it is essential to raise teachers' awareness of the importance of understanding the concept of children's critical thinking in order to support good pedagogical practices in the field (Pollarolo et al., 2023).

Other studied have also highlighted the importance of innovative teaching methods in motivating children to be creative and think critically (Parwoto et al., 2024). Building on this point, Yuliani et al. recommend, based on their research findings, that teachers receive adequate training to ensure effective implementation in the field and to achieve optimal results (Yuliani et al., 2023). When implemented properly, project-based learning can stimulate children's thinking skills;

therefore, it requires competent teachers who can serve as capable facilitators to bridge and support children's learning processes.

Anggraini's study states that the effectiveness of project-based learning can result in children demonstrating critical thinking behaviors, such as actively observing, asking question, expressing opinions, providing clear reasoning, distinguishing between ideas, and retelling stories that they have learned (Anggriani & Eliza, 2023). Another study adds that the effectiveness of this approach can enhance children's observational skills as well as other cognitive abilities such as evaluating, organizing, and categorizing (Al-Hassawi et al., 2020). When implemented effectively, project-based learning can foster critical thinking skills in children, which are reflected in their everyday behaviors

CONCLUSION

Project-based learning is a child-centered approach that provides children with considerable freedom. This approach can be applied across various disciplines, even in interdisciplinary contexts. One of its main advantages is its adaptability to all levels of education, including early childhood. The autonomy granted to children in this approach encourages them to make choices throughout the stages of planning, implementation, and evaluation. Such conditions motivated children to inquire more deeply, explore, experiment, solve problems when challenges arise, and make decisions when needed. These skills are hallmarks of critical thinking, which are reflected in children's behaviors such as observing, asking questions, expressing opinions, providing clear reasoning, distinguishing ideas, retelling stories, collaborating, and resolving problems.

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