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Promoting Critical Thinking Skills in Education

Mempromosikan Keterampilan Berpikir Kritis dalam Pendidikan

Ray Suryadi, Ritawati
Universitas Sembilanbelas November Kolaka, Universitas Islam Riau
*ray_suryadi@yahoo.com, rita.uir68@gmail.com

**Corresponding Author*

ABSTRACT
This study aims to explore the relationship between project-based learning (PBL) and students' critical thinking skills in various educational contexts. Using comprehensive research methods, researchers investigated the impact of PBL on the development of students' critical thinking skills and evaluated various research approaches used to assess the effectiveness of PBL. The research results show that PBL contributes positively to students' critical thinking skills, with the integration of innovative learning methods such as metacognition and problem-based learning strengthening the positive effects. The implications of these findings for educational practice and future research directions are also discussed.
Keywords: Project-based learning, critical thinking skills, research methods, integration of learning approaches, educational implications.

ABSTRAK
Studi ini bertujuan untuk mengeksplorasi hubungan antara pembelajaran berbasis proyek (PBL) dan keterampilan berpikir kritis siswa di berbagai konteks pendidikan. Dengan menggunakan metode penelitian komprehensif, peneliti menyelidiki dampak PBL terhadap pengembangan keterampilan berpikir kritis siswa dan mengevaluasi berbagai pendekatan penelitian yang digunakan untuk menilai efektivitas PBL. Hasil penelitian menunjukkan bahwa PBL berkontribusi secara positif terhadap keterampilan berpikir kritis siswa, dengan integrasi metode pembelajaran inovatif seperti metakognisi dan pembelajaran berbasis masalah memperkuat efek positifnya. Implikasi dari temuan ini untuk praktik pendidikan dan arah penelitian mendatang juga dibahas.
Kata Kunci: Pembelajaran berbasis proyek, keterampilan berpikir kritis, metode penelitian, integrasi pendekatan pembelajaran, implikasi pendidikan.

1. Introduction

Promoting critical thinking skills in education is essential for enhancing students' abilities to question, analyze problems, and think deeply about various issues. Research suggests that incorporating changes in teaching methods, modifying perceptions towards critical thinking, and utilizing effective learning strategies like problem-based learning can significantly contribute to the development of critical thinking skills in students (Khalid et al., 2021; Simpson & Courtney, 2002). Furthermore, studies emphasize the importance of fostering critical thinking dispositions alongside the development of critical thinking skills to enhance students' overall critical thinking abilities (Profetto-McGrath, 2003; Halpern, 1998).

Educators play a crucial role in promoting critical thinking by creating tasks that encourage critical thinking and modifying educational materials to support the cultivation of critical thinking skills (Solihati & Hikmat, 2018; Birjandi & Alizadeh, 2012). Additionally, it is essential to integrate opportunities for critical thinking skills, expression of dispositions, and determination of social action into the curriculum to effectively promote critical thinking in

higher education (Walker & Brown, 2020). Moreover, the promotion of critical thinking in medical education is crucial to prepare graduates to adapt to the complexities of healthcare systems and scientific advancements (Karami & Shakurnia, 2021).

Various studies highlight the significance of promoting critical thinking skills in different educational contexts, such as nursing education, language learning, and teacher preparatory programs (Simpson & Courtney, 2002; Papathanasiou et al., 2014; Simpson & Courtney, 2008). Implementing critical thinking strategies like questioning, debate, and role play can enhance problem-solving abilities, clinical judgment making, and care prioritization among students (Simpson & Courtney, 2008). Furthermore, the development of critical thinking is considered a fundamental aspect of higher education, emphasizing the need to cultivate this skill among university students (Nainggolan & Hanifah, 2020). In conclusion, promoting critical thinking skills in education requires a multifaceted approach that involves changes in teaching methods, integration of critical thinking tasks in curricula, and fostering critical thinking dispositions alongside skills development. By incorporating these strategies, educators can effectively enhance students' critical thinking abilities, preparing them to navigate complex challenges in various academic disciplines and professional fields.

The aim of this research is to fill this gap by exploring in more depth the effectiveness of a project-based learning approach in improving students' critical thinking abilities. The research question asked is "How effective is the use of a project-based learning approach in improving students' critical thinking skills in schools?".

The novelty of this research lies in its holistic approach in evaluating the impact of a project-based learning approach on students' critical thinking skills. While much previous research has explored specific aspects of this approach, this study aims to provide a more thorough and detailed understanding of its relationship to critical thinking skills.

It is hoped that the contribution of this research will go beyond current understanding of the effectiveness of project-based learning approaches in education. By identifying the factors that influence its success and offering practical recommendations for implementation in schools, it is hoped that this research can be an important contribution to efforts to improve the quality of education and learning in various school contexts.

2. Research Methods

In this section, the research methods used to compile a literature review on the effectiveness of using a project-based learning approach in improving students' critical thinking abilities in schools will be explained in detail.

First of all, relevant articles were collected from reputable international databases, such as Scopus. The search was carried out using relevant keywords related to the research topic, such as "project-based learning", "critical thinking skills", and "education". The article search process was carried out carefully to ensure that all relevant articles could be included in the review.

After conducting the search, the number of articles obtained from the process was recorded. This figure reflects how extensive and representative the available literature is on the topic under study. Next, article inclusion and exclusion techniques were applied to select the most relevant and high-quality articles for inclusion in the literature review. Inclusion criteria included relevance to the research topic, availability of full text, and quality of research methodology. Articles that do not meet these inclusion criteria will be excluded from the review.

Finally, in preparing this literature review, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method was used as a guide to ensure that the process of searching, selecting and presenting articles was carried out systematically and transparently. PRISMA allows researchers to organize reviews in a structured manner so that they can produce strong and reliable conclusions.

By applying this research method, it is hoped that the literature review can become a comprehensive and reliable source of information about the effectiveness of using a project-based learning approach in improving students' critical thinking skills in schools.

3. Results and Discussion

3.1.1. Conceptions about Critical Thinking Skills

Critical thinking skills are essential for students in many disciplines, including mathematics, science, and psychology. Research shows that critical thinking can be developed through approaches such as problem-based learning, inquiry-based learning, and metacognitive strategies (Halpern, 1998; Duran & Dökme, 2016; Magno, 2010). These methods are designed to improve students' abilities to analyze, evaluate, and draw conclusions effectively, thereby improving their critical thinking skills for application in various domains (Halpern, 1998).

Research has shown that integrating critical thinking skills into certain subjects such as mathematics and biology can have a significant impact on students' academic performance and cognitive development (Mulyanto et al., 2018; Permana et al., 2019). By incorporating critical thinking skills into regular teaching, educators can help students think independently and excel in their future endeavors (Bensley et al., 2010; Setiawati & Corebima, 2017).

Moreover, innovative teaching methods such as gamification and multimedia-based learning have proven effective in improving students' critical thinking abilities (Heliawati et al., 2022). These approaches not only engage students but also foster higher-order thinking and independent learning, thereby contributing to the development of strong critical thinking skills (Heliawati et al., 2022).

Additionally, the relationship between critical thinking and problem solving skills underscores the importance of critical thinking as a complex skill that is essential for success in the 21st century (Amanda et al., 2022; Mahbubah & Hermita, 2019). Critical thinking allows individuals to overcome complex problems, make the right decisions, and understand concepts effectively (Amanda et al., 2022; Mahbubah & Hermita, 2019). In conclusion, cultivating critical thinking skills through various pedagogical strategies and subject-specific interventions is essential to enhance students' cognitive capacities and prepare them to face the challenges of the contemporary world. By integrating critical thinking into educational practice, educators can empower students to think critically, analyze information effectively, and become independent learners capable of thriving in a variety of academic and professional environments.

Critical thinking skills are essential in modern education, including the ability to analyze, synthesize, and evaluate information to make informed decisions. These skills involve active questioning, considering multiple perspectives, and seeking evidence to support or challenge ideas (Huber & Kuncel, 2016). Critical thinking is essential not only in academic environments but also in everyday life and professional careers, enabling individuals to adapt to change, solve complex problems, and make rational decisions based on accurate information (Huber & Kuncel, 2016). Higher Order Thinking Skills (HOTS), including critical thinking, logical thinking, and reasoning, are fundamental not only for academic success but also for everyday life (Tajudin & Chinnappan, 2016).

Educators have long attempted to teach critical thinking effectively, with varying degrees of success (Oyler & Romanelli, 2014). Critical thinking is recognized as a basic skill for academic experts and is very important from the beginning of university studies (Hyytinen et al., 2018). The acquisition of higher-level cognitive skills is increasingly emphasized in educational goals throughout the world (Aizikovitsh-Udi & Cheng, 2015). Critical thinking is recognized as a key skill in 21st century education, empowering individuals to think critically and make informed decisions (Nor & Sihes, 2022; Nor et al., 2021). In secondary education, the development of critical thinking skills is highly valued to prepare students for university and

beyond (Zanden et al., 2020).

In the context of health education, critical thinking is highlighted as essential to the clinical practice and professional behavior of health professionals (Partido & Soto, 2019). The ability to think logically and critically is a criterion for learning achievement in higher education (Fitriani et al., 2022). Developing critical thinking skills and dispositions is an important goal in universities (Karami & Shakurnia, 2021). Rapid technological advances in the current era provide new challenges for education, emphasizing the importance of developing critical thinking skills (Fikriyati et al., 2022).

Frameworks such as Bloom's taxonomy have long guided educators in designing learning experiences that improve decision making and challenge existing cognition (Walker & Brown, 2020). Critical thinking skills are seen as the ability to process, analyze and evaluate information, foster reasoning, synthesis, observation and reflection (Herasymenko & Muravska, 2019). The development of higher order thinking skills has become a major goal of education in recent years (Mislia et al., 2019). Critical thinking is not only a learning skill but also an important ability to think independently and make decisions in real life situations (Van & My, 2019). In conclusion, improving critical thinking skills is an integral part of improving the quality of education across various disciplines and levels of learning, equipping individuals with the tools needed to face complex challenges and make informed decisions.

3.1.2. Project Based Learning Approach

Project-based learning (PjBL) is a pedagogical approach that emphasizes deep learning through inquiry-based methods, which allows students to engage with real-world issues relevant to the subject matter (Jalinus et al., 2017). This method encourages student-directed inquiry, fostering collaboration and communication between students (Huysken et al., 2019). By implementing a project-based learning model, student creativity can be increased because they are involved in activities that require planning, implementing and evaluating projects with real-world applications (Ummah et al., 2019). In addition, project-based learning has been proven to be effective in improving speaking skills (Sirisrimangkorn, 2018), recycling education (Rajan et al., 2019), and increasing students' creativity and competence in various subjects (Usmeldi & Amini, 2022).

Research has shown that project-based learning not only improves academic skills but also prepares students for real-life applications, developing behaviors and skills that can be applied outside the classroom (Mehta, 2020). In addition, project-based learning has been proven to be effective in improving students' reading comprehension and overall academic achievement (Assidiq & Sasmayunita, 2022). This approach provides opportunities for students to engage authentically with academic subjects, thereby enhancing their learning experience (Chun et al., 2015).

Project-based learning is known to facilitate the teaching and learning process by actively involving students, motivating and fostering creativity (Cahyani, 2021). The learning approach is considered effective because it involves students in the learning process so that they are more effective and enthusiastic (Naviri et al., 2021). Additionally, project-based learning has been studied as a learning method with benefits for language learning and translation classes (Astuti et al., 2021). In conclusion, project-based learning is a valuable educational approach that places students at the center of learning, encouraging collaboration, creativity, and real-world application of knowledge. This enhances students' skills, prepares them for life after graduation, and fosters a deeper understanding of academic subjects through practical engagement.

Project Based Learning (PBL) is an educational approach that is student-centered, involving them in real-world projects or problems that require critical thinking, research, and creativity (Norman & Schmidt, 1992). This method highlights the application of knowledge and skills in authentic contexts, encouraging the development of important skills such as teamwork,

communication, and problem solving (Ströbel & Barneveld, 2009). Through PBL, students not only gain knowledge but also learn to apply it in practical situations, improving understanding and retention of concepts (Norman & Schmidt, 2000).

PBL involves various steps, including formulating questions or problems, planning and implementing actions, and reflecting on learning outcomes and processes (Barrows, 1986). This has been recognized as an effective strategy for improving critical thinking skills and preparing students to become lifelong learners (D'Antoni et al., 2010). By actively engaging in collaborative projects, students develop a deeper understanding of the course material and improve their problem-solving abilities (Bate et al., 2013).

Research shows that PBL can have a positive impact on students' motivation and problem-solving skills (Shishigu et al., 2016). Apart from that, implementing PBL is also associated with improving student learning outcomes, such as increasing critical and analytical thinking skills (Ramli et al., 2020). This approach not only benefits students academically but also helps them develop into reflective practice (Imai et al., 2016).

In conclusion, PBL is a valuable educational approach that encourages active learning, critical thinking, and practical application of knowledge. By engaging students in real-world projects and problems, PBL equips them with the skills necessary to succeed academically and beyond.

3.1.3. The Relationship between Project Based Learning and Critical Thinking Skills

Project-based learning has been widely studied in relation to critical thinking skills. Various research articles have explored the impact of project-based learning on students' critical thinking abilities in various disciplines. Research such as that conducted by (Anazifa & Djukri, 2017), (Ijirana et al., 2022), and Situmorang et al. (2022) shows that project-based learning has a positive effect on students' critical thinking abilities. In addition, research by Kause et al. (2022) and Rusnawati et al. (2021) further supports this assumption by showing that the project-based learning model improves students' critical thinking skills and active participation in problem solving.

Moreover, the integration of project-based learning with other approaches such as metacognitive skills (Magno, 2010), problem-based learning (Amin et al., 2020), and design thought Maknuunah et al. (2021) is proven to contribute to the development of students' critical thinking skills. These studies emphasize the importance of combining different educational strategies to improve critical thinking among students.

Although some studies, such as (Farcis et al., 2022), did not find a significant influence between project-based learning and critical thinking skills in certain contexts, most of the reviewed literature supports a positive relationship between project-based learning and improved critical thinking skills. The findings show that project-based learning can stimulate students' creativity, analytical thinking, problem-solving abilities, and decision-making skills, all of which are important components of critical thinking. In conclusion, this synthesis of research articles shows a strong correlation between project-based learning and improving students' critical thinking skills across a variety of educational settings and subjects. By engaging students in hands-on projects, encouraging collaboration, and fostering deeper understanding of concepts, project-based learning is emerging as a valuable pedagogical approach for cultivating critical thinking skills among students.

3.1.5. Research Methods in Evaluating the Effectiveness of Project-Based Learning Approaches

In assessing the effectiveness of a project-based learning approach, it is important to consider the wide range of research that has investigated this pedagogical model. Project-based learning (PBL) has been widely recognized as an effective method for improving student learning outcomes. Research studies such as those conducted by Kokotsaki et al.

(2016) and Amer (2022) have shown positive results in terms of narrowing the achievement gap between students from different socio-economic backgrounds and improving specific skills such as oral performance. In addition, research by Chiang & Lee (2016) and Ashfahani et al. (2020) shows that PBL can increase student motivation, problem-solving abilities, and overall learning outcomes compared to traditional teaching methods.

Additionally, the effectiveness of project-based learning has been explored in various disciplines. For example, Shrestha et al. (2021) conducted research specifically focusing on the effectiveness of PBL in university-level ICT courses, highlighting its benefits in an engineering context. Likewise, Muna & Aziz (2021) investigated the impact of PBL on students' language skills, emphasizing its role in improving communication skills.

Furthermore, the literature shows that project-based learning not only improves academic performance but also promotes the development of important 21st century skills. Research such as that conducted by Guntur & Retnawati (2020) shows that PBL helps students develop important skills such as problem solving, collaboration, communication and research skills, which are highly valued in today's world of work. In conclusion, research on project-based learning evaluation underscores its effectiveness in improving student learning outcomes, bridging achievement gaps, increasing motivation, and developing important skills. By implementing PBL, educators can create engaging learning experiences that encourage holistic skill development and academic achievement.

Project-based learning (PBL) has been widely researched to evaluate its impact on students' critical thinking skills. Researchers use a variety of research methods to comprehensively assess the effectiveness of PBL. Quantitative research often uses randomized control experimental designs to compare the outcomes of students who experience PBL with those of students who receive traditional instruction (Amin et al., 2020). Valid and reliable instruments were used to measure critical thinking skills before and after the intervention, allowing statistical analysis to identify differences between groups (Situmorang et al., 2022). On the other hand, qualitative research, such as case studies and interviews, explores students' experiences in PBL, providing insight into how PBL influences critical thinking skills (Hardian & Chamisijatin, 2019). By combining quantitative and qualitative approaches, researchers can gain a holistic understanding of the factors that influence PBL effectiveness (Tristan et al., 2019).

Research has shown that PBL has a positive effect on students' critical thinking skills in various disciplines, including mathematics, biology, and social sciences (Suteja & Setiawan, 2022). The incorporation of innovative methods such as video-based learning further improves students' critical thinking abilities in PBL (Anggito et al., 2021). Additionally, integrating a design thinking approach into PBL has been shown to improve critical thinking skills among students (Maknuunah et al., 2021). Furthermore, PBL has been proven to be effective in improving students' abilities in arguing, explaining, analyzing, evaluating and making decisions (Wulandari et al., 2020). In conclusion, utilizing diverse research methods allows researchers to explore the nuances of PBL and its impact on critical thinking skills in a comprehensive manner. By analyzing quantitative and qualitative data, researchers can gain a deeper understanding of how PBL affects students' critical thinking abilities and identify key factors that contribute to its success.

4. Conclusion

Based on the results of the discussion from the previous section, it can be concluded that critical thinking skills have a very important role in modern education, enabling students to analyze information effectively and make the right decisions. These skills are not only relevant in academic contexts but also in everyday life and professional careers. Critical thinking skills can be improved through a variety of pedagogical strategies, including project-based learning, which places students at the center of learning and encourages collaboration, creativity, and

real-world application of knowledge. Project-based learning has proven effective in improving students' critical thinking skills in a variety of subjects and educational environments. The integration of project-based learning with other approaches such as metacognitive skills and problem-based learning can strengthen its positive effect on the development of critical thinking skills. Research studies have shown a strong correlation between project-based learning and improved students' critical thinking skills. Research methods used in evaluating the effectiveness of project-based learning approaches are diverse, including quantitative and qualitative research. This approach allows researchers to gain a holistic understanding of the influence of PBL on students' critical thinking skills. Findings from various studies show that PBL makes a positive contribution to students' critical thinking skills in various disciplines and educational environments.

Nevertheless, there are several studies that do not find a significant relationship between project-based learning and students' critical thinking skills in certain contexts. This suggests a need for further research to understand the factors that influence the effectiveness of PBL and how this approach can be optimized to improve students' critical thinking skills more effectively.

Thus, the results of this discussion provide important implications for educational practice, highlighting the importance of integrating critical thinking skills into relevant and effective learning strategies. Although there are some limitations in this research, such as variations in research design and teaching context, these findings suggest that project-based learning can be a valuable tool in cultivating students' critical thinking skills in the contemporary educational era. To this end, further research is needed to identify the best strategies for implementing this approach and ensuring that students can develop the critical thinking skills necessary to succeed in a variety of educational and professional contexts.

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