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Research/Review

Improving Students' Creative Thinking Abilitiesthrough Problem Based Learning Model

Saniria Benu [1]*, Harun Y. Natonis [2]

[1] Master of PAK, Postgraduate, Institut Agama Kristen Negeri Kupang, Indonesia : saniria3@gmail.com
[2] Master of PAK, Postgraduate, Institut Agama Kristen Negeri Kupang, Indonesia : harunnatonis@gmail.com
Author Correspondence: Saniria Benu

Abstract. This study aims to analyze the application of problem-based learning models (PBL) in improving students' creative thinking skills. Creative thinking skills are one of the 21st century skills that are very much needed in facing future challenges. Problem-based learning models are seen as an effective approach to developing creative thinking skills because they provide students with the opportunity to explore innovative solutions to contextual problems. The research method used is a literature study by analyzing various relevant literature sources from 2019-2024. The results of the analysis show that the application of problem-based learning models can improve students' creative thinking skills through the stages of problem orientation, organizing students to learn, guiding individual and group investigations, developing and presenting work results, and analyzing and evaluating the problem-solving process. The conclusion of this study shows that problem-based learning models have proven effective in improving students' creative thinking skills with indicators of fluency, flexibility, originality, and elaboration.

Keywords: Problem-Based Learning, Creative Thinking, 21st Century Skills, Learning Innovation

1. Background

Education in today's global era requires the development of 21st century skills, which include critical, creative, collaborative and communicative thinking skills.(Rahayu et al., 2023). Creative thinking skillsbecome one of the main focuses in modern learning because it plays an important role in preparing a generation that can overcome the complex and ever-changing challenges of the future.(Thana & Hanipah, 2023).

Creativity in the context of education is not only seen as the ability to generate new ideas, but also the ability to integrate existing knowledge in innovative ways to solve complex problems.(Ulfaa et al., 2019). Developing students' creative thinking skills is a priority in the national education system, considering its strategic role in forming adaptive and innovative human resources in the future.(Sari et al., 2013).

However, the learning conditions in Indonesia still show various obstacles in improving students' creative thinking skills. The results of the Programme for International Student Assessment (PISA) survey show that Indonesian students' high-level thinking skills are still below the global average.(Gustia Angraini, 2019). This indicates the need for innovation in learning models that can maximize the development of creative thinking skills.

The fundamental problem in the Indonesian education system lies in the dominance of conventional learning approaches which tend to be teacher-centered and emphasize low-level cognitive aspects.(Masrinah, 2019). This kind of approach does not provide enough space for students to explore creative ideas and develop problem solving skills that are essential to face the challenges of the 21st century.(Melianingsih & Sugiman, 2015).

The problem-based learning model (PBL) is a student-focused approach, using authentic problems as a context for the learning process.(Astika, 2013). This model is considered appropriate for improving creative thinking skills, because it gives students the freedom to explore various alternative solutions to the problems they face.((Fuadi Rahman & Maslianti, 2015).

The advantage of the PBL model in developing student creativity lies in its characteristics which encourage active and constructive learning through authentic problem solving

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situations.(Masril et al., 2020). In this context, students do not only act as passive recipients of information, but as active constructors of knowledge who explore various perspectives and innovative solutions to the problems they face.(Siswanto, 2022).

The implementation of the PBL model is also in line with constructivism theory which emphasizes the importance of meaningful learning through direct experience and reflection.(Mones et al., 2023). This theory supports the premise that creative thinking skills can be developed through a scaffolding process that facilitates students in constructing their own understanding of complex concepts.(Ridwan Yusuf & Salsabila, 2023).

Another aspect that strengthens the relevance of the PBL model is its ability to integrate multiple intelligences and diverse learning styles in one cohesive learning framework. This allows each student to optimize their creative potential according to their individual characteristics.(Rohana & Wahyudin, 2017).

This study aims to analyze how problem-based learning models can improve students' creative thinking skills. Specifically, this study will examine: (1) the concept of creative thinking skills in the context of learning, (2) the characteristics of problem-based learning models, (3) the implementation of problem-based learning models in improving creative thinking skills, and (4) factors that support the successful implementation of learning models.problem based.

2. Review Library

Creative Thinking Skills

Creative thinking is a person's skill in analyzing new information and combining unique ideas or concepts to solve a problem.(Gustia Angraini, 2019). Meanwhile, according to(Cahyani et al., 2023)Creative thinking is the ability to find many answers to a problem, where the emphasis is on quantity, appropriateness, and diversity of answers based on available data or information. Creative thinking is the ability to create a new idea or idea to produce new and unique answers or ways to solve problems. High creativity indicates that someone has been able to think creatively(Huliatunisa et al., 2020)

Creative thinking ability is defined as the ability to produce new ideas that are original, useful, and appropriate to the context of the problem at hand.(Lutfi, 2016). Guilford in his theory according to(Lutfi, 2016)identified four main indicators of creative thinking ability, namely:(1) fluency - the ability to produce many ideas, (2) flexibility - the ability to produce a variety of ideas, (3) originality - the ability to produce unique ideas, and (4) elaboration - the ability to develop ideas in detail.

In the context of learning, students' creative thinking abilities can be developed by providingstimulus in the form of challenging problems and encouraging students to think outside the box(Sintawati & Mardati, 2020).A conducive learning environment and appropriate methods are key factors in developing this ability.(Suwarni, 2022).

Problem Based Learning Model

Say"model" comes from the Latin term "mold" which means mold. This term can be associated with an imitation that resembles an object, condition, or system that can be studied.(Koebanu & Saingo, 2024). Sutiah in(Koebanu et al., 2023)states that learning is the realization of the interaction between the development of knowledge and life experience. The learning process is realized in two-way interaction between educators and students, with the aim of achieving learning outcomes, including progress in cognitive, affective, and psychomotor aspects. This learning includes the delivery of information, transformation, and evaluation of student development in the classroom. Thus, learning can be interpreted as an activity that brings changes to the cognitive, affective, psychomotor, and spiritual aspects for individuals who learn.

A learning model is a pattern used as a guideline to ensure the smooth running of learning activities.(Al Badriyah et al., 2023) explains that the learning model is applied in a structured manner in various stages of education, such as curriculum planning, preparation of teaching materials, and coaching according to the material in class. This model has four main characteristics, namely theoretical basis, thinking about the learning process, teaching behavior, and the learning environment needed.

Problem-based learning (PBL) model is a learning approach that uses real-world problems as a context for learning about critical thinking and problem-solving skills, as well as for acquiring essential knowledge and concepts from the subject matter.(Maryati, 2018).

According to Arends in(Inayati, 2022), modelProblem-based learning has five main steps: (1) orienting students to the problem, (2) organizing students to learn, (3) guiding individual and group investigations, (4) developing and presenting work results, and (5) analyzing and

evaluating the problem-solving process.

Main characteristicsThe PBL model includes: learning begins with problems, the problems presented are authentic and complex, students work in small groups, the teacher acts as a facilitator, and students are responsible for their own learning.(Nugraha et al., 2023).

The Relationship between PBL Model and Creative Thinking Ability

Creative thinking ability is defined as the ability to produce new ideas that are original, useful, and appropriate to the context of the problem at hand.(Saefudin, 2012). Thinking ability is a reasoning activity that is reflective, critical, and creative, focusing on intellectual processes that involve the formation of concepts, application, analysis, and assessment of information obtained (synthesis) through observation, experience, reflection, or communication. All of this is the basis for a person's beliefs and actions.(Mardhiyana & Sejati, 2016). Temporary(Aflah et al., 2023) Thinking ability is considered as an individual's ability to solve problems using logic. In the context of mathematics, thinking ability is more emphasized on the process, namely the basic thinking process, critical thinking, and creative thinking. Therefore, a more appropriate term for thinking ability in mathematics is basic thinking ability, critical thinking ability, and creative thinking ability. Positive correlation between the application of problem-based learning models and the increase in students' creative thinking abilities. (Fuadi Rahman & Maslianti, 2015) found that students who learned with the PBL model showed significant improvements in the aspects of fluency and flexibility compared to conventional learning.

According to (Dewi & Harjono, 2021) The PBL model is effective in developing students' originality and elaboration because it provides the freedom to explore unusual solutions and develop ideas in depth. This is in line with the findings of Sari and Wijaya (2022) which states that the challenging and collaborative learning environment in PBL encourages students to think creatively.

3. Methodstudy

This study uses a literature review method to analyze various sources of literature relevant to the topic being studied. This method was chosen because it allows researchers to collect, analyze, and synthesize information from various sources, thus gaining a comprehensive understanding of the topic.(Sugiyono, 2015). Data sources in this study include national and international scientific journals published between 2015 and 2024, reference books on problem-based learning and creative thinking skills, articles from national and international seminar proceedings, and relevant research reports.(Koebanu & Tari, 2024).

The collected data was analyzed using content analysis techniques with several stages. First, the main themes were identified from each literature source. Next, the information was categorized based on the established research focus. After that, a comparative analysis was conducted between sources to compare the existing findings. Finally, the results of the analysis were synthesized to obtain comprehensive conclusions.(Hermawan & Amirullah, 2021).

4. Resultsand Discussion

The results of the literature analysis show that the implementation of problem-based learning models in improving students' creative thinking skills can be done through five main stages.which can be described as follows.

Implementation of Problem Based Learning Model

Based on the resultsThe findings on improving students' creative thinking skills through problem-based learning models show that the implementation of problem-based learning models in improving students' creative thinking skills can be done through five main stages.(Nasution & Surya, 2017):

Stage 1: Student Orientation to the Problem At this stage, the teacher presents authentic problems that are complex and attract students' attention. The problems presented must be open-ended and have various possible solutions to encourage students' creativity.(Isrok'atun & Rosmala, 2021). Example of problemthat can be used are environmental issues, social problems, or technological challenges that are relevant to students' lives.

Student-oriented problems are essential because they present authentic issues that are relevant to their daily lives, encouraging students to think critically and creatively. With open-ended problems, students are not only encouraged to find solutions, but also practice exploring various possibilities, which can increase their engagement and motivation in learning. This approach is effective in building social awareness and problem-solving skills needed in the real world.

Stage 2: Organizing Students for Learning Teachers help students organize learning tasks related to the problem. Formation of heterogeneous groups and clear division of roles.facilitate collaboration and exchange of creative ideas between students(Satar et al., 2025).

Organizing students to learn is crucial because it creates a collaborative environment that supports the exchange of ideas. By forming heterogeneous groups and clearly assigning roles, students can learn from each other's different perspectives, enhancing their creativity and understanding of the problem at hand. This approach not only strengthens collaborative skills but also facilitates deeper and more meaningful learning.

Stage 3: Guiding Individual and Group Inquiry This stage provides students with the opportunity to explore various sources of information and develop creative hypotheses. The teacher acts as a facilitator who provides scaffolding according to the students' needs.(Malatuny & Rahmat, 2018).

Guiding individual and group investigations is essential because it gives students the opportunity to explore sources of information independently and develop creative hypotheses. The teacher's role as a facilitator who provides scaffolding allows students to get the support they need to overcome challenges in the learning process. This approach increases students' self-confidence and encourages them to think critically and innovate in finding solutions.

Stage4: Developing and Presenting Work Results Students develop creative solutions and present them in a variety of innovative formats. This stage allows students to develop aspects of elaboration and originality in creative thinking.(Sam et al., 2018).

Developing and presenting student work is valuable because it provides a space for them to express creative solutions in innovative formats. With a focus on elaboration and originality, students are encouraged to think outside conventional boundaries, enhancing their creative thinking skills. This approach not only enriches the learning experience, but also prepares students to face challenges in more creative and effective ways.

Step 5: Analyze and Evaluate the Problem Solving Process Reflection and evaluation oflearning processes and outcomes help students develop metacognitive abilities and improve the quality of their creative thinking.(Darwati & Purana, 2021).

Analyzing and evaluating the problem-solving process is essential because it allows students to reflect on their learning experiences. By evaluating the process and outcomes, students can develop metacognitive skills that help them understand their own thinking. This approach not only improves the quality of creative thinking, but also equips students with the skills to continue learning and adapting in the future.

Based on the opinion above, it can be concluded thatThe five stages of learning outlined in problem orientation, student organization, guided inquiry, product development, and process evaluation create a comprehensive framework for enhancing student engagement, creativity, and critical thinking. By presenting authentic issues and creating a collaborative environment, students are encouraged to explore solutions independently and creatively. This approach not only enriches the learning experience, but also equips students with important metacognitive and problem-solving skills to face future challenges.

ImprovementCreative Thinking Ability Indicators

Based onAnalysis of various studies, the application of the PBL model shows a significant increase in the four indicators of creative thinking ability:

***Fluency*(Smoothness)**according to (Pratiwi, 2021) showed that students who learned with the PBL model were able to produce an average of 15-20 solution ideas for each problem, compared to 8-10 ideas in conventional learning. This increase occurred because students were accustomed to facing complex problems that encouraged them to think quickly and produce a lot ofalternative solutions.

The increase in the number of solution ideas generated by students through the PBL model shows the effectiveness of this approach in encouraging creativity and critical thinking. By being accustomed to facing complex problems, students not only learn to think quickly, but also develop the ability to generate various alternative solutions. This reflects that PBL is able to create a dynamic learning environment, where students feel more confident in exploring new ideas, which is certainly very valuable for their problem-solving skills in the future.

***Flexibility*(Flexibility)**The flexibility aspect shows consistent improvement in various studies.(Belay, 2022) found that students were able to categorize their solutions into 5-7 different categories, compared to 2-3 categories in traditional learning. Thisdemonstrates students' ability to see problems from multiple perspectives.

The students' increased ability to categorize solutions into 5-7 different categories shows that they are able to see problems from multiple perspectives. This is better compared to traditional learning which only produces 2-3 categories. This ability shows that students are thinking critically and analytically, which helps them understand problems better. By having diverse perspectives, students will be better prepared to face complex challenges in the future.

***Originality*(Authenticity)**(Utomo et al., 2014)reported that students in PBL learning producedsolutions that are categorized as original or unusual, compared to those that are not. Learning environments that encourage exploration and do not punish errors contribute to the improvement of this aspect.

Students in PBL learning tend to produce more original and unusual solutions thanks to a learning environment that encourages exploration and does not punish mistakes. When students feel safe to try new ideas without fear of being judged, they are more likely to think creatively and find innovative solutions. This shows that the PBL approach not only encourages creativity, but also creates a positive atmosphere, where students can learn from their mistakes and continue to develop unique ideas.

***Elaboration*(Elaboration)**Students' elaboration abilities increased significantly, marked by higher detail and complexity of solutions. Research(Trisna Rukhmana, 2022) shows that students are able to develop solutions in detail, compared toin conventional learning.

Students in PBL learning are able to develop solutions in more detail compared to conventional learning. This happens because they are invited to explore the problem in depth and consider various related aspects. With group discussions and guidance from teachers, students can explore their ideas more thoroughly, so that the resulting solutions are more comprehensive and structured. This approach not only improves the quality of solutions, but also helps students understand the importance of details in the problem-solving process.

Based on the explanation above, it can be concluded that the Project-Based Learning (PBL) model has proven effective in improving four important aspects of students' thinking skills: fluency, flexibility, originality, and elaboration. Students are able to generate more solution ideas, categorize them from various perspectives, and create more original solutions thanks to a learning environment that supports exploration. In addition, they can also develop solutions with higher detail, demonstrating a deep understanding of the problem. Overall, PBL creates a dynamic and positive learning atmosphere, which prepares students to face complex challenges in the real world with confidence and creativity.

Supporting Factors for Success

Literature analysis identified several key factors that support the success of the PBL model inimprove creative thinking skills:

Quality Issues The problems used must be authentic, complex, and have multiple possible solutions.(Whatoni et al., 2024)emphasizes that a good problem is one that can trigger students' curiosity and is relevant to the context of their lives.

The quality of problems used in learning must be authentic, complex, and have multiple possible solutions. Problems that are relevant to students' daily lives can trigger their curiosity, thus encouraging higher engagement in the learning process. When students are faced with challenging and real problems, they are more motivated to find creative solutions, which in turn improves their critical thinking skills and ability to solve real-world problems.

The Role of Teachers as Facilitators The teacher's ability to facilitate learning is a crucial factor.(Sunaryo & Fatimah, 2019)found that teachers trained in questioning and scaffolding techniques produced more significant improvements in creative thinking skills.

The role of the teacher as a facilitator is very important in the learning process. The finding that teachers who are trained in questioning and scaffolding techniques can improve students' creative thinking skills shows how much influence effective teaching methods can have. When teachers are able to ask the right questions and provide the necessary support, students feel more encouraged to think critically and innovate. This creates a more interactive learning environment and helps students develop skills that will benefit them in the future.

Conducive Learning EnvironmentA classroom atmosphere that supports creativity, tolerates mistakes, and encourages collaboration is a prerequisite for success.(Suryana & Iskandar, 2022)states that a psychologically safe environment allows students to express themselves withoutfear of being judged.

A conducive learning environment is critical to student success. When the classroom atmosphere is supportive of creativity and tolerant of mistakes, students feel safer expressing their ideas without fear of judgment. An emphasis on psychological safety allows them to collaborate with peers and try new things. This type of environment not only increases student

engagement, but also helps them learn from their experiences and grow personally and academically.

Duration and Intensity of Learning Research shows that implementing the PBL model requires sufficient time to produce significant impact. Implementation of at least 8-10 meetingsneeded to see meaningful improvements in creative thinking skills.(Widodo & Sari, 2022).

The duration and intensity of learning are very important in the implementation of the PBL model. Research that shows the need for a minimum of 8-10 meetings to see a significant increase in creative thinking skills confirms that the learning process cannot be forced in a short time. By giving enough time, students can delve deeper into the problem, collaborate with friends, and develop better solutions. This shows that consistency and deep involvement in PBL learning greatly contribute to the development of students' creative thinking skills.

Based on the opinion above, it can be concluded thatThe success of problem-based learning (PBL) is influenced by the quality of authentic problems, the role of the teacher as a facilitator, and a conducive learning environment. Problems that are relevant to students' lives increase curiosity and engagement. Teachers who are skilled in questioning and scaffolding techniques encourage critical and creative thinking. A classroom atmosphere that supports creativity and tolerance for mistakes provides a sense of security for students to collaborate. Adequate learning duration, with a minimum of 8-10 meetings, is also important to improve creative thinking skills. All of these factors contribute to an effective learning experience.

Challenges in Implementation

Althoughshows positive results, implementation of the PBL model in improving thinking skillscreative also faces some challenges:

Time Limitation LearningProblem-based learning takes longer than conventional learning. This is often an obstacle in achieving curriculum targets.(Afifah et al., 2025).

Problem-based learning (PBL) does take longer than conventional methods. This time constraint can be a challenge in achieving the set curriculum targets. However, it is important to remember that despite the time-consuming nature of PBL, it provides a more in-depth and meaningful learning experience for students. With this approach, students not only gain knowledge but also invaluable critical and creative thinking skills. Therefore, it is important for educators to find ways for PBL to be effectively integrated into the curriculum without sacrificing the quality of learning.

Student Readiness Not all students are ready for learning that demands high levels of independence and responsibility. Gradual adaptation is needed to accustom students to this approach.(Baroya, 2018).

The authors agree that student readiness is an important factor in the success of problem-based learning. Not all students are immediately ready to face an approach that demands high independence and responsibility. Therefore, it is important to make gradual adaptations so that they can get used to this method. By providing appropriate support and guidance, students will be more adaptable and begin to feel comfortable in taking initiative and actively participating in the learning process. This will help them develop the skills needed to succeed in PBL learning.

Teacher Competence Effective implementation requires teachers who have a deep understanding of the PBL model and good facilitation skills. Teacher training and professional developmentbecome an important need(Marisana & Herawati, 2023).

The authors agree that teacher competence is crucial for the successful implementation of the problem-based learning (PBL) model. Teachers who have a deep understanding of PBL and good facilitation skills can create a more effective learning environment. Therefore, training and professional development for teachers is a very important need. By providing them with the necessary tools and knowledge, we can ensure that they are ready to support students in a more creative and collaborative learning process. This will have a positive impact on the overall quality of education.

Based on the opinion above, it can be concluded thatThe success of problem-based learning (PBL) is influenced by several key factors, namely time constraints, student readiness, and teacher competence. Although PBL takes longer than conventional methods, it offers a more in-depth learning experience and improves students' critical thinking skills. Students' readiness to face an approach that demands independence is very important, so gradual adaptation is needed. In addition, teacher competence in implementing PBL and facilitation skills are also crucial, making professional training for teachers a priority. All of these factors contribute to improving the quality of education and preparing students to face future

challenges.

5. Conclusionand Suggestions

Based on the analysis of the literature study that has been conducted, it can be concluded that the problem-based learning (PBL) model has proven effective in improving students' creative thinking skills in four main indicators: fluency, flexibility, originality, and elaboration. The implementation of this model through five stages of problem orientation, learning organization, investigation, presentation of results, and evaluation provides a systematic structure that supports the development of creative thinking skills. The success of PBL implementation is greatly influenced by the quality of the problems presented, the role of the teacher as a competent facilitator, a conducive learning environment, and adequate implementation duration. However, the main challenges faced include time constraints, student readiness, and teacher competence, which need to be anticipated through careful planning and preparation. Therefore, it is recommended that teachers develop competence in designing authentic problems and learning facilitation skills, and attend training on the implementation of the PBL model. Schools should provide infrastructure and policy support that supports innovative learning, including flexible time allocation. Further researchers are advised to conduct experimental research with a more rigorous design to test the effectiveness of the PBL model in specific contexts and subjects, and conduct longitudinal research to observe the long-term impact on students' creative thinking skills. For policy makers, it is important to integrate problem-based learning approaches into the curriculum and provide ongoing teacher training support.

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