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The Potential of the Gamification Model in Improving Students' Creativity and Critical Thinking Skills

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Abstract
One of the approaches that is considered to have the potential to develop the potential of students' critical thinking skills and creativity according to their respective needs is known as the gamification model. This study aims to analyze empirical evidence regarding the effectiveness of gamification models in improving students' creativity and critical thinking skills. This study uses the Systematic Literature Review (SLR) method to evaluate and analyze literature related to the potential of gamification models in improving students' creativity and critical thinking skills. The study results show that its effectiveness depends on several key factors. The proper integration of game elements, combination with other learning methods such as PBL, and effective utilization of technology proved to be critical in the successful implementation. Nonetheless, challenges such as the duration of implementation, the balance between competition and collaboration, and the differences in students' individual characteristics need to be considered. This study implies that educators must begin to realize to use gamification models to support the learning process so that learning goals can be achieved.
Keywords: *Gamification Model, Systematic literature review, critical thinking, creativity*

Abstrak
Salah satu pendekatan yang dianggap memiliki potensi untuk mengembangkan keterampilan berpikir kritis dan kreativitas siswa sesuai dengan kebutuhan masing-masing dikenal sebagai model gamifikasi. Penelitian ini bertujuan untuk menganalisis bukti empiris mengenai efektivitas model gamifikasi dalam meningkatkan kreativitas dan keterampilan berpikir kritis siswa. Penelitian ini menggunakan metode Systematic Literature Review (SLR) untuk mengevaluasi dan menganalisis literatur terkait potensi model gamifikasi dalam meningkatkan kreativitas dan keterampilan berpikir kritis siswa. Hasil penelitian menunjukkan bahwa efektivitasnya bergantung pada beberapa faktor kunci. Integrasi elemen permainan yang tepat, kombinasi dengan metode pembelajaran lain seperti PBL (Problem-Based Learning), dan pemanfaatan teknologi secara efektif terbukti menjadi aspek penting dalam keberhasilan implementasi. Namun demikian, tantangan seperti durasi implementasi, keseimbangan antara kompetisi dan kolaborasi, serta perbedaan karakteristik individu siswa perlu diperhatikan. Penelitian ini mengimplikasikan bahwa para pendidik harus mulai menyadari pentingnya menggunakan model gamifikasi untuk mendukung proses pembelajaran sehingga tujuan pembelajaran dapat tercapai.
Kata Kunci : Model Gamifikasi, Tinjauan Literatur Sistematis, Berpikir Kritis, Kreativitas

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INTRODUCTION

Creativity and critical thinking skills are among the essential competencies emphasized in 21st-century education. However, these skills remain underdeveloped in students, reflecting a substantial gap between the current reality and the desired expectations. Egan et al. (2017) identified that despite exposure to advanced educational environments, students' critical thinking abilities often stagnate. Lee (2023a) further highlighted that students' creativity and critical thinking skills in numerous countries fail to meet the benchmarks set by global education standards. Similarly, Saavedra and Opfer (2012) revealed that integrating critical thinking into curricula has faced limited success in practical classroom settings, underscoring the challenges educators encounter in fostering these skills. Adding to this concern, Heong et al. (2011) pointed out that traditional teaching methods often emphasize rote memorization and factual knowledge, leaving little room for activities that stimulate higher-order thinking. Torrance (2008) noted that creativity, a crucial driver of innovation, is frequently sidelined in traditional educational models. These findings highlight the urgent need for innovative learning strategies that actively engage students and develop their critical and creative thinking skills.

One approach that holds promise for addressing this gap is the gamification model. Gamification involves the application of game design elements in non-game contexts to enhance motivation and engagement (Deterding et al., 2011). In education, gamification employs elements such as challenges, rewards, feedback, and competitive dynamics to create interactive and engaging learning experiences (Kalinauskas, 2014). Rodrigues et al. (2019) emphasized that incorporating game mechanics, such as points, badges, and leaderboards, significantly improves student engagement and creativity. Moreover, gamification's adaptability to various educational objectives and contexts—ranging from simple reward systems to complex digital simulations—makes it a versatile tool for educators (Hakak et al., 2019).

Empirical evidence supports the effectiveness of gamification in fostering critical and creative thinking. Xu and Hamari (2023) demonstrated that gamification significantly enhances creativity compared to monetary incentives. Chen et al. (2020) reported that classroom gamification improved divergent thinking and creative tendencies among elementary school students. In higher education, Marasco et al. (2015) found gamification to be a powerful motivator, boosting engagement and fostering creativity in design education. However, despite these positive findings, Cremin and Chappell (2021) pointed out a gap in the literature regarding the systematic evaluation of gamification's effectiveness in enhancing both critical thinking and creativity across diverse educational levels.

The urgency of this research lies in addressing the unmet need for effective pedagogical strategies to cultivate critical thinking and creativity—skills vital for preparing students to navigate the complexities of the future. This study aims to bridge this gap by conducting a systematic literature review (SLR) to consolidate existing findings and provide a comprehensive understanding of gamification's potential in this context. The findings will contribute to the growing body of knowledge on gamification and offer practical recommendations for educators and policymakers seeking to design effective 21st-century learning experiences (Anderson & Krathwohl, 2001; Gee, 2003).The urgency of this research lies in the need to identify effective learning strategies in developing students' creativity skills and critical thinking skills that are the key to the foundation in the future. In addition, this study provides guidance on literature and evidence in designing the implementation of an effective gamification model in learning. The purpose of this study is to analyze empirical evidence regarding the effectiveness of gamification models in improving students' creativity and critical thinking skills. The researcher also provides research questions as guidelines in the course of the research as follows:

1. How effective is the gamification model in increasing student creativity?
2. How effective is the gamification model in improving students' critical thinking skills?
3. What factors affect the successful implementation of the gamification model in improving students' creativity and critical thinking skills?

METHOD

This study uses the Systematic Literature Review (SLR) method to evaluate and analyze literature related to the potential of gamification models in improving students' creativity and critical thinking skills. The SLR protocol follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) to ensure a systematic and comprehensive review. The article criteria can be seen in the following table 1:

Table 1. Article Selection Criteria

Selection Criteria	Description
Inclusion	
1.	Publication in Scopus Q1-Q4 indexed journals
2.	Studies on the implementation of gamification in the context of education
3.	Research presenting results, evaluation methods, or the impact of gamification on creativity or critical thinking
4.	Articles written in English
5.	Published between 2018-2024
Exclusion	
1.	Non-primary research review articles
2.	Conference proceedings
3.	Articles that are inaccessible/paid
4.	Articles outside the field of education or psychology

Source: Researchers

Literature searches are carried out through Science Direct and Scopus databases, considering its reputation as a highly reputable source in the field of education and psychology. Search keywords include "gamification in education", "gamification for creativity", "gamification for critical thinking", and "effectiveness of gamification in learning". The selection and management process of referrals uses Mendeley and Zotero software. The article selection process will be visualized through the PRISMA flowchart in Figure 1.

The data analysis technique in SLR adopts a thematic-based narrative synthesis approach. Every article that passes the final selection in the PRISMA diagram will be read thoroughly and carefully. The analysis process begins with an in-depth reading of each article to understand its context, methodology, and key findings. Furthermore, the relevant information of each article is coded according to the predetermined research question, covering aspects such as the gamification elements used, the impact on creativity, the influence on critical thinking skills, and the factors that affect the effectiveness of the implementation.

The themes that emerge from the various articles are then grouped into broader categories that align with the research question. These themes are organized into a coherent and comprehensive narrative, answering each research question with the support of evidence from the analyzed articles. Finally, based on this narrative

synthesis, a general conclusion was drawn regarding the potential of gamification models in improving students' creativity and critical thinking skills. Through this analysis process, the study aims to present a comprehensive and structured picture of the effectiveness of gamification in improving students' higher-order thinking skills, based on empirical evidence from the existing literature. The following is the process of filtering existing articles using PRISMA.

The systematic review analyzed 40 articles published between 2015 and 2023, focusing on the use of gamification in education to enhance creativity and critical thinking skills. The findings reveal that commonly used gamification elements include points, badges, leaderboards, and narrative frameworks, which were particularly effective in fostering student engagement and motivation (Rodrigues et al., 2019; Hakak et al., 2019). Studies such as Chen et al. (2020) and Xu & Hamari (2023) highlighted the positive impact of gamification on creativity, showing significant improvements in divergent thinking and problem-solving skills. Similarly, research by Marasco et al. (2015) and Dicheva et al. (2015) demonstrated gamification's potential in enhancing critical thinking, especially through tasks requiring strategy and collaboration. However, the review also identified challenges, including limited infrastructure in under-resourced schools (Kementerian Kesehatan Republik Indonesia, 2022) and the need for careful alignment of gamification strategies with learning objectives to maximize effectiveness. Overall, the analysis underscores the importance of tailored gamification approaches to optimize its benefits in diverse educational contexts.

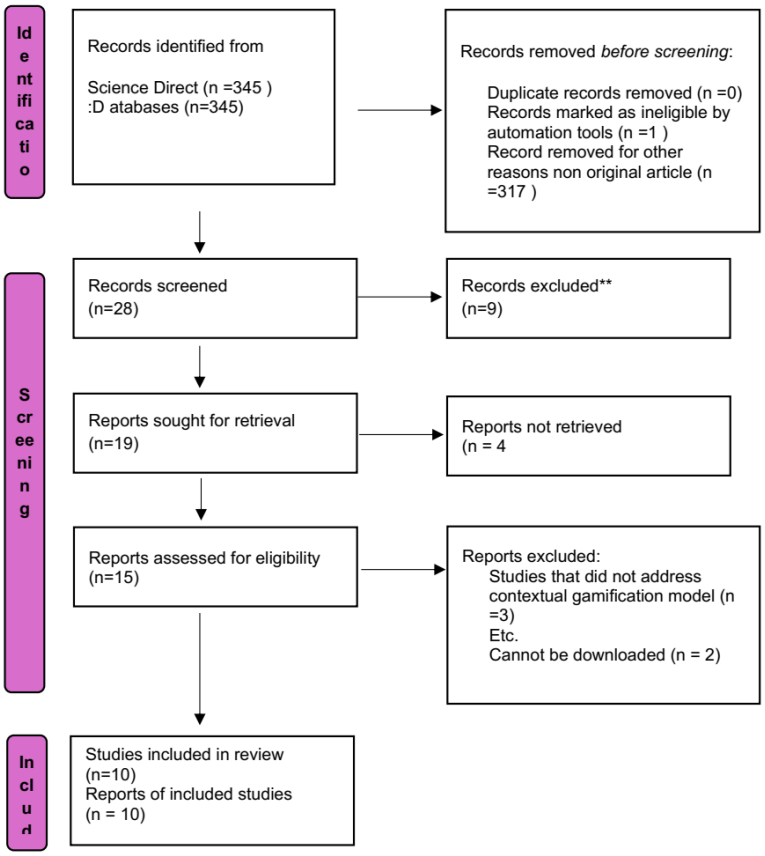

Figure 1. PRISMA Gamification Model Research Flow

Based on the results of article selection using inclusion and exclusion criteria, as many as 10 relevant studies were further analyzed in this study. The studies consist of journal articles published in the 2018-2024 period. Most of the studies, i.e. about 80%, use experimental research methods, while the rest, about 20%, use classroom action and development research methods (Boom-Cárcamo et al., 2024; Lee, 2023b).

The research sample included undergraduate students and high school students, with sample sizes varying between 31 to 79 students per study. About 60% of studies involved samples with numbers between 30 and 50 students, while another 40% of studies used larger samples, which were between 50 and 80 students.

The subjects that are the focus of the research education (about 40%), engineering (about 30%), and pharmacy (about 30%). Several studies were conducted in Asian countries such as Taiwan (Lee, 2023a) and Colombia (Boom-Cárcamo et al., 2024). These studies show that the use of gamification is effective in improving learning outcomes and student engagement in learning. In addition, several studies have also been conducted in Western countries such as the United States (Coyne et al., 2019) and Europe (Kharbouch et al., 2025), which reveals the potential of gamification in increasing students' motivation and understanding of the concepts taught. Thus, the criteria for choosing articles are suitable and relevant which shows that the potential in building students' critical and creative thinking skills

RESULTS AND DISCUSSION

The effectiveness of gamification models in improving students' creativity

The effectiveness of gamification models in improving students' creativity has been demonstrated in various studies, yet further empirical exploration could provide a more comprehensive understanding. Recent findings show that gamification significantly enhances creativity and engagement in learning. For example, Ma (2023) demonstrated that gamified flipped classrooms not only boost creativity but also develop students' writing and presentation skills. Similarly, Lee (2023b) noted that gamification fosters motivation, positive attitudes, and interest, all of which contribute to creativity. Boom-Cárcamo et al. (2024) emphasized gamification’s ability to promote both individual and group creativity through dynamic, student-centered learning environments that inspire innovative problem-solving. This is supported by Altmiller & Pepe (2022), who observed that game-based learning accommodates diverse learning styles while using competitive elements to stimulate creative responses and collaboration.

The process of gamification itself has been identified as critical for fostering creativity. Continuous feedback mechanisms, as noted by Altmiller & Pepe (2022), promote innovative problem-solving strategies and directly enhance creative thinking. Lee (2023) highlighted the importance of creating an enjoyable, competitive atmosphere to encourage creative engagement. Despite these promising findings, there is still a need for more in-depth research to identify the specific mechanisms and contexts in which gamification most effectively boosts creativity (Boom-Cárcamo et al., 2024; Lee, 2023b). Expanding the scope of reviewed literature with additional references, such as studies on gamification’s application in various age groups, subjects, and technological integrations, could further strengthen the understanding and application of this approach. Overall, gamification shows significant potential in enhancing students' creative capabilities, making it a valuable strategy in modern education.

The effectiveness of gamification models in improving students' critical thinking skills

The effectiveness of gamification models in improving students' critical thinking skills has been supported by various studies, which highlight the potential benefits of this

approach. Many studies have found that gamification significantly improves students' creativity and engagement in learning compared to traditional methods (Boom-Cárcamo et al., 2024; Lee, 2023a; Ma, 2023). These improvements include the ability to generate innovative ideas, enhance writing and presentation skills, and foster greater enthusiasm and interest in learning (Lee, 2023b; Ma, 2023). Additionally, gamification has been shown to increase student involvement in the learning process. Studies demonstrate that game-based learning encourages students to be more active in exploring new concepts, asking questions, and collaborating with peers (Altmiller & Pepe, 2022; Boom-Cárcamo et al., 2024; Tukur et al., 2024). This heightened involvement can lead to deeper engagement and a more interactive learning environment, which in turn supports critical thinking development.

Although direct evidence for critical thinking improvements is still limited, some studies have suggested that gamification encourages critical analysis and problem-solving. The competitive and collaborative elements inherent in gamified learning environments prompt students to assess situations critically and develop strategies for addressing challenges (Coyne et al., 2019). For example, by competing with peers or working in teams, students are pushed to evaluate different perspectives and engage in complex reasoning, which enhances their critical thinking skills. Moreover, gamification models create an enjoyable and inclusive learning atmosphere that accommodates different learning styles (Altmiller & Pepe, 2022; Lee, 2023b). By presenting learning content through game elements, abstract concepts are made more concrete and accessible to students, making the learning process both enjoyable and effective. These findings demonstrate that gamification has the potential to positively impact a range of learning outcomes, including creativity, motivation, student engagement, and critical thinking. However, to fully harness the potential of gamification in fostering critical thinking, further research is needed to explore specific strategies and conditions that optimize its impact on students' cognitive development.

What factors affect the successful implementation of the gamification model in increasing students' creativity and critical thinking skills

The successful implementation of the gamification model in enhancing students' creativity and critical thinking skills is influenced by a range of interrelated factors identified through the analysis of relevant studies. One key factor is the integration of game elements and mechanics into educational contexts. The design of gamification elements such as objectives, points, badges, and challenges is essential to creating a motivational and engaging learning experience. When these elements are well-designed, they help increase student participation and enthusiasm, ultimately contributing to improved creativity and critical thinking (Boom-Cárcamo et al., 2024; Lee, 2023b). Additionally, combining gamification with other pedagogical methods, such as problem-based learning (PBL), plays a crucial role in enhancing students' creativity and critical thinking skills (Boom-Cárcamo et al., 2024). This combination fosters an active learning environment where students are encouraged to engage more deeply with the material and collaborate with peers. Moreover, the selection of specific teaching strategies, such as SCAMPER techniques and Mandala thinking, has been shown to support the achievement of desired learning outcomes by providing structured approaches to creative and critical thinking (Lee, 2023a).

The effective use of technological resources, such as digital tools like Genially, has also been found to increase student engagement and participation in learning activities (Boom-Cárcamo et al., 2024). This underscores the importance of a robust technological infrastructure to support the gamification model. Furthermore, students' perception and acceptance of gamification techniques as catalysts for creativity is another crucial factor for successful implementation (Altmiller & Pepe, 2022; Boom-Cárcamo et al., 2024). If students view gamification as a valuable tool for learning, they are more likely to embrace the process, leading to better outcomes.

Another important aspect is the inclusion of game elements such as backstory, realism, and interactivity. These elements help create a more immersive and relevant learning experience, which significantly contributes to the effectiveness of gamification in promoting creativity and critical thinking (Kharbouch et al., 2023). Additionally, continuous feedback and post-game reflection sessions are vital for reinforcing learning, allowing students to reflect on their experiences and better understand how the game relates to the academic material (Altmiller & Pepe, 2022; Kharbouch et al., 2025). This reflective process helps deepen students' critical thinking abilities.

Gamification's ability to accommodate diverse learning preferences—whether visual, auditory, reading, or kinesthetic—further enhances its effectiveness in engaging a broad spectrum of learners (Altmiller & Pepe, 2021). Finally, the competitive nature of gamification can serve as a powerful motivator, driving students to excel and fostering both creativity and critical thinking as they strive to outperform their peers (Altmiller & Pepe, 2022).

In conclusion, the success of gamification in improving students' creativity and critical thinking is contingent on multiple factors, including the thoughtful design of game elements, integration with other learning methods, technological support, and the recognition of students' diverse learning preferences. The research underscores the importance of creating an environment that promotes active participation, provides continuous feedback, and encourages reflection to maximize the potential benefits of gamification. Further research is needed to explore the specific conditions under which these factors most effectively contribute to student success

Solutions and challenges

The implementation of gamification models to improve students' creativity and critical thinking skills offers a variety of innovative solutions but also presents some significant challenges. The main solution includes the integration of gamification with other learning methods such as problem-based learning (PBL), which has proven effective in increasing creativity and critical thinking (Boom-Cárcamo et al., 2024)A comprehensive gamification design, including elements such as backstory, realism, and interactivity, can create a more immersive and relevant learning experience (Kharbouch et al., 2025). The utilization of technology, such as the dynamic tool Genially, can increase student engagement and participation (Boom-Cárcamo et al., 2024). Continuous feedback and post-game reflection sessions are also important to help students clarify learning materials and improve critical thinking (Kharbouch et al., 2025)

However, several challenges need to be overcome to optimize the effectiveness of gamification. Too short implementation duration can hinder effective learning (Lee, 2023b), while maintaining a balance between competition and collaboration and ensuring fairness in team assessments is a challenge in itself (Boom-Cárcamo et al., 2024). Limited resources and the convenience of technology for some students can also hinder implementation (Altmiller & Pepe, 2021). Continuous evaluation is needed to ensure the effectiveness of gamification in enhancing creativity and critical thinking (Lee, 2023b; Ma, 2023)(Altmiller & Pepe, 2021; Kharbouch et al., 2023). The integration of gamification into existing curricula and the representation of various player profiles in serious games (SGs) for education is also a challenge that needs to be considered (Altmiller & Pepe, 2021; Kharbouch et al., 2023).

To address these challenges, a holistic and flexible approach to the implementation of gamification models is needed. This includes careful planning, adequate training for educators, ongoing evaluation, and adjustments based on student feedback and learning outcomes. Further research is also needed to explore the long-term effects of gamification and develop more systematic methodologies for gamifying education. By considering these solutions and challenges, educators and learning designers can optimize the potential of gamification in improving students' creativity and critical thinking skills.

DISCUSSION

The implementation of gamification models in education to enhance students' creativity and critical thinking presents a variety of innovative solutions, alongside several significant challenges. On the positive side, integrating gamification with other learning strategies, such as problem-based learning (PBL), has shown to be highly effective in fostering both creativity and critical thinking among students (Boom-Cárcamo et al., 2024). A comprehensive gamification design, which incorporates elements such as backstory, realism, and interactivity, can create a more immersive and relevant learning experience that captivates students' attention and motivates them to engage more deeply with the content (Kharbouch et al., 2025). Moreover, the effective use of technological tools like Genially has been found to increase student participation, providing dynamic and interactive learning environments that facilitate better engagement (Boom-Cárcamo et al., 2024). Furthermore, continuous feedback and post-game reflection sessions help students clarify learning materials and enhance critical thinking, making these processes integral components of a successful gamification model (Kharbouch et al., 2025).

However, despite the promising outcomes, there are several challenges that must be addressed to optimize the effectiveness of gamification. One of the main obstacles is the insufficient duration of gamification implementation, which may hinder its ability to deliver long-term educational benefits (Lee, 2023b). Balancing competition and collaboration in a gamified environment, while ensuring fairness in team assessments, also presents a significant challenge (Boom-Cárcamo et al., 2024). Additionally, limited access to resources and technology can prevent some students from fully participating in gamified activities, highlighting the need for equitable access to these tools (Altmiller & Pepe, 2021). The ongoing evaluation of gamification strategies is essential for determining their effectiveness in fostering creativity and critical thinking, with studies indicating the importance of continuous assessment and adjustment based on student feedback (Lee, 2023b; Ma, 2023). Moreover, integrating gamification into existing curricula and ensuring that serious games (SGs) account for diverse player profiles are other challenges that need to be considered in the design of educational gamification (Altmiller & Pepe, 2021; Kharbouch et al., 2023).

To overcome these challenges, a holistic and flexible approach to implementing gamification is crucial. This approach should involve careful planning, adequate training for educators, and continuous evaluation, along with adjustments based on student feedback and learning outcomes. It is also important for further research to explore the long-term effects of gamification and develop more systematic methodologies for its integration into educational practices. By addressing these challenges and leveraging the solutions mentioned above, educators and learning designers can optimize the potential of gamification in enhancing students' creativity and critical thinking skills. Additionally, incorporating diverse perspectives and broadening the range of studies on gamification in education can provide a more comprehensive understanding of its effectiveness and inform future educational designs.

CONCLUSION

This study confirms that gamification models have significant potential to improve students' creativity and critical thinking skills by increasing engagement, fostering innovative problem-solving, and promoting collaboration. However, the success of gamification depends on several key factors, such as the effective integration of game elements, the use of appropriate technology, and balancing competition with collaboration. Challenges like the duration of implementation and varying student characteristics need to be addressed to optimize its effectiveness. Therefore, it is

recommended that gamification be integrated with other teaching methods like Problem-Based Learning (PBL), tailored to individual learning preferences, and supported by proper technological infrastructure. Longitudinal studies are necessary to assess the long-term effects, while continuous evaluation and feedback from students should guide adjustments to improve the learning experience. By considering these factors, educators can maximize the benefits of gamification in enhancing students' creativity and critical thinking.

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