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The Potential of Mind Mapping Learning Model on Students' Creative Thinking Skills

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Abstract
The ability to think creatively is an ability that needs to be developed in students in the modern education era. The mind-mapping learning model is one of the promising approaches to improve this ability. This study aims to analyze the potential of the mind-mapping learning model on students' creative thinking skills. The method used was a Systematic Literature Review (SLR) with the PRISMA protocol, using articles obtained from Elsevier publishers (Science Direct) with random indexes from Q1 to Q4. The results of the article analysis show that the mind-mapping learning model has a significant positive impact on students' creative thinking skills. The effectiveness of this model can be seen from several aspects: (1) Encouraging active and creative activities of students, (2) Facilitating visualization of relationships and links between concepts, (3) Improving understanding and retention of information through the use of colors, images, and codes. The article shows that mind mapping is equal to or even superior to several other learning models such as Think Talk Write (TTW) and problem-based learning in improving creative thinking skills. However, there are potential challenges in implementation, such as initial difficulties for students in learning mind-mapping techniques. The implications of these findings lead to recommendations to integrate the mind-mapping learning model into the educational curriculum to optimize the development of student's creative thinking skills.
Keywords: *Mind Mapping, Creative Thinking Ability, Systematic Literature Review*

Abstrak
Kemampuan berpikir kreatif merupakan kemampuan yang perlu dikembangkan pada diri peserta didik di era pendidikan modern. Model pembelajaran mind mapping hadir sebagai salah satu pendekatan yang menjanjikan untuk meningkatkan kemampuan tersebut. Penelitian ini bertujuan untuk menganalisis potensi model pembelajaran mind mapping terhadap keterampilan berpikir kreatif peserta didik. Metode yang digunakan adalah Systematic Literature Review (SLR) dengan protokol PRISMA, menggunakan artikel yang diperoleh dari penerbit Elsevier (Science Direct) dengan indeks acak dari Q1 sampai dengan Q4. Hasil analisis artikel menunjukkan bahwa model pembelajaran mind mapping memberikan pengaruh positif yang signifikan terhadap keterampilan berpikir kreatif peserta didik. Efektivitas model ini dapat dilihat dari beberapa aspek: (1) Mendorong aktivitas peserta didik yang aktif dan kreatif, (2) Memudahkan visualisasi hubungan dan kaitan antar konsep, (3) Meningkatkan pemahaman dan retensi informasi melalui penggunaan warna, gambar, dan kode. Artikel tersebut mendukung menunjukkan bahwa mind mapping setara atau bahkan lebih unggul dibandingkan beberapa model pembelajaran lain seperti Think Talk Write (TTW) dan problem-based learning dalam meningkatkan keterampilan berpikir kreatif. Namun, terdapat beberapa tantangan potensial dalam penerapannya, seperti kesulitan awal bagi siswa dalam mempelajari teknik pemetaan pikiran. Implikasi dari temuan ini mengarah pada rekomendasi untuk mengintegrasikan model pembelajaran pemetaan pikiran ke dalam kurikulum pendidikan untuk mengoptimalkan pengembangan keterampilan berpikir kreatif siswa.
Kata Kunci: Pemetaan Pikiran, Keterampilan Berpikir Kritis, Tinjauan Pustaka Sistematis

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INTRODUCTION

The ability to think creatively is one of the skills that must be possessed and developed in the 21st century, especially at the elementary school level at the same time. Several studies show that learning in elementary schools still tends to be teacher-centered and does not provide enough space for students to develop their creativity (Sekarini et al., 2020). The conventional learning methods that are predominantly used tend to limit students' opportunities to think outside the box and generate creative ideas. In addition, there is a need to develop creative thinking skills and existing learning practices. Many teachers still have difficulty in designing and implementing effective learning strategies to stimulate students' creativity. This is exacerbated by a lack of understanding of the importance of creative thinking skills in the context of 21st century learning (Awalia et al., 2022).

Research in educational psychology has extensively explored various strategies for developing creative thinking skills in students. The foundational work of Torrance (1972) established the fundamental aspects of creative thinking education, emphasizing fluency, flexibility, originality, and elaboration as key components. Several learning models have demonstrated significant success in this area, including Problem-Based Learning (PBL), which showed a 35% improvement in creative problem-solving abilities compared to traditional methods (Johnson et al., 2023). Project-Based Learning has similarly proven effective, with studies by (Yang et al., 2022) indicating that long-term projects significantly enhance students' creative capacity and ability to connect different concepts, particularly when combined with collaborative learning approaches.

The implementation of creative thinking strategies in educational settings requires specific environmental and pedagogical factors to be successful. Studies have consistently shown that an open and supportive classroom atmosphere, where diverse ideas are welcomed and students feel safe to take risks, is crucial for developing creative thinking skills (Martinez & Rodriguez, 2022). However, institutions often face challenges such as rigid curriculum requirements and limited resources, while teachers require specialized training to effectively implement these strategies. Recent developments in educational technology have opened new avenues for supporting creative thinking development, with digital tools and blended learning approaches showing promise in enhancing student engagement and creative exploration. These approaches, when properly integrated with traditional teaching methods, provide a comprehensive framework for developing students' creative thinking abilities.

To overcome this problem, the researcher offers to integrate an innovative visualization technique that can stimulate and develop students' creative thinking skills. Mind mapping is an information visualization technique that uses keywords, images, and relationships between concepts to represent ideas (Sekarini, 2022). This technique allows students to organize information in a non-linear manner, explore relationships between concepts, and develop a more creative way of thinking. When implemented as a teaching strategy, mind mapping enables educators to guide students in developing their creative thinking abilities through visual organization and connection of ideas.

Several studies have shown the effectiveness of the Mind Mapping learning model in improving students' creative thinking skills. A study by (Acesta, 2020)) found that the application of the Mind Mapping method had a positive effect on students' creative thinking skills. Other research by (Ananda, 2019)It also shows that the use of Mind Mapping can improve the creative thinking ability and learning outcomes of elementary school students. However, these studies have limitations in terms of subject coverage and relatively short implementation duration. Although there have been several studies related to the effectiveness of Mind Mapping, more evidence-based studies are still needed to analyze the potential of this learning model in improving the creative thinking skills of elementary school students. Thus, the researcher decided to use the Systematic Literature Review (SLR) method chosen as the research method because it can provide

a broader and in-depth overview of various aspects of the application of Mind Mapping in the context of elementary school education.

The urgency of this research lies in the development of creative thinking skills as one of the crucial 21st century competencies for students. While previous studies have explored various aspects of creative thinking development, several important research gaps remain unaddressed. First, although mind mapping has been studied as a visualization technique, existing research has primarily focused on its general cognitive benefits rather than its specific impact on creative thinking abilities. Studies by (Thompson, 2013) explored mind mapping's effectiveness for memory retention and concept understanding, but did not thoroughly examine its potential for enhancing creative thinking processes.

Second, most existing research on creative thinking development in elementary schools has centered on traditional teaching methods or problem-based learning approaches (Amir et al., 2020). While these studies provide valuable insights, they do not fully address how visualization techniques like mind mapping can be systematically integrated into elementary school curricula to foster creative thinking. Additionally, there is limited empirical evidence specifically analyzing the relationship between mind mapping practices and the development of different aspects of creative thinking, such as fluency, flexibility, and originality.

Furthermore, while several studies have documented the benefits of mind mapping in secondary and higher education settings (Wilson, 2016), there is a notable lack of comprehensive research examining its effectiveness and implementation challenges specifically in elementary school contexts. This gap is particularly significant given the unique developmental needs and learning characteristics of elementary school students. This study aims to analyze and identify the potential of the Mind Mapping Learning Model on students' creative thinking abilities based on relevant evidence. The purpose is specifically for the researcher to provide research questions to guide the course of this article.

This research seeks to investigate three key aspects of mind mapping implementation in elementary education. First, the study examines the effectiveness of mind mapping as a visualization technique in enhancing elementary school students' creative thinking abilities, focusing on measuring and evaluating specific improvements in their creative cognitive processes. Second, the investigation delves into identifying and analyzing various factors that contribute to or hinder the successful implementation of mind mapping in developing creative thinking skills, including both internal factors such as student readiness and external factors such as teaching environment and resources. Finally, the research aims to determine the most effective strategies for implementing mind mapping within the elementary school context, considering aspects such as grade level appropriateness, integration with existing curriculum, and specific pedagogical approaches that maximize its potential for developing students' creative thinking capabilities.

Through this comprehensive examination, the study strives to provide practical insights and evidence-based recommendations for educators and policymakers regarding the implementation of mind mapping in elementary education. The research particularly emphasizes the importance of understanding not just whether mind mapping works, but how it can be optimally adapted and applied to meet the specific needs and challenges of elementary school settings while effectively fostering students' creative thinking development.

METHOD

This study uses the Systematic Literature Review (SLR) method to review and analyze literature related to the potential of the Mind Mapping learning model on students' creative thinking skills. The SLR protocol refers to the Preferred Reporting

Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a systematic and comprehensive review (Page et al., 2021)

Article selection criteria include inclusion criteria: (1) Publication in Scopus Q1-Q4 indexed journals; (2) Study on the implementation of the Mind Mapping learning model in the development of creative thinking skills; (3) Research that presents the results, evaluation methods, or impacts of using the Mind Mapping learning model; (4) Articles in English; (5) Published in 2020-2024 (considering the topic so that the latest is still valid). Exclusion criteria include: (1) Non-primary research review articles; (2) Conference proceedings; (3) Articles are not accessible/paid; (4) Articles outside the field of education and educational psychology.

Literature searches are carried out through the Scopus database by considering its reputation as a highly reputable source in the field of education. The search keywords used are: ("Mind Mapping" OR "concept mapping") AND ("creative thinking" OR creativity OR innovation) AND (education OR learning OR teaching) AND (student OR learner). The reference selection process uses Mendeley software.

The data analysis technique in SLR adopts a thematic-based narrative synthesis approach. Every article that passes the final selection will be read thoroughly. The analysis process begins with an in-depth reading of each article to understand its context, methodology, and key findings. Furthermore, the relevant information from each article is coded according to the predetermined research questions, covering aspects such as the implementation of the Mind Mapping learning model, the impact on creative thinking skills, factors affecting effectiveness, and implementation challenges.

The coding that emerges from the various articles is then grouped into broader themes 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 about the potential of the Mind Mapping learning model on students' creative thinking skills.

Through this analysis process, the study aims to analyze the effectiveness and potential of the Mind Mapping learning model in improving students' creative thinking skills, based on relevant research in the Scopus database. The process of filtering articles will be presented using the PRISMA flowchart in Figure 1 below:

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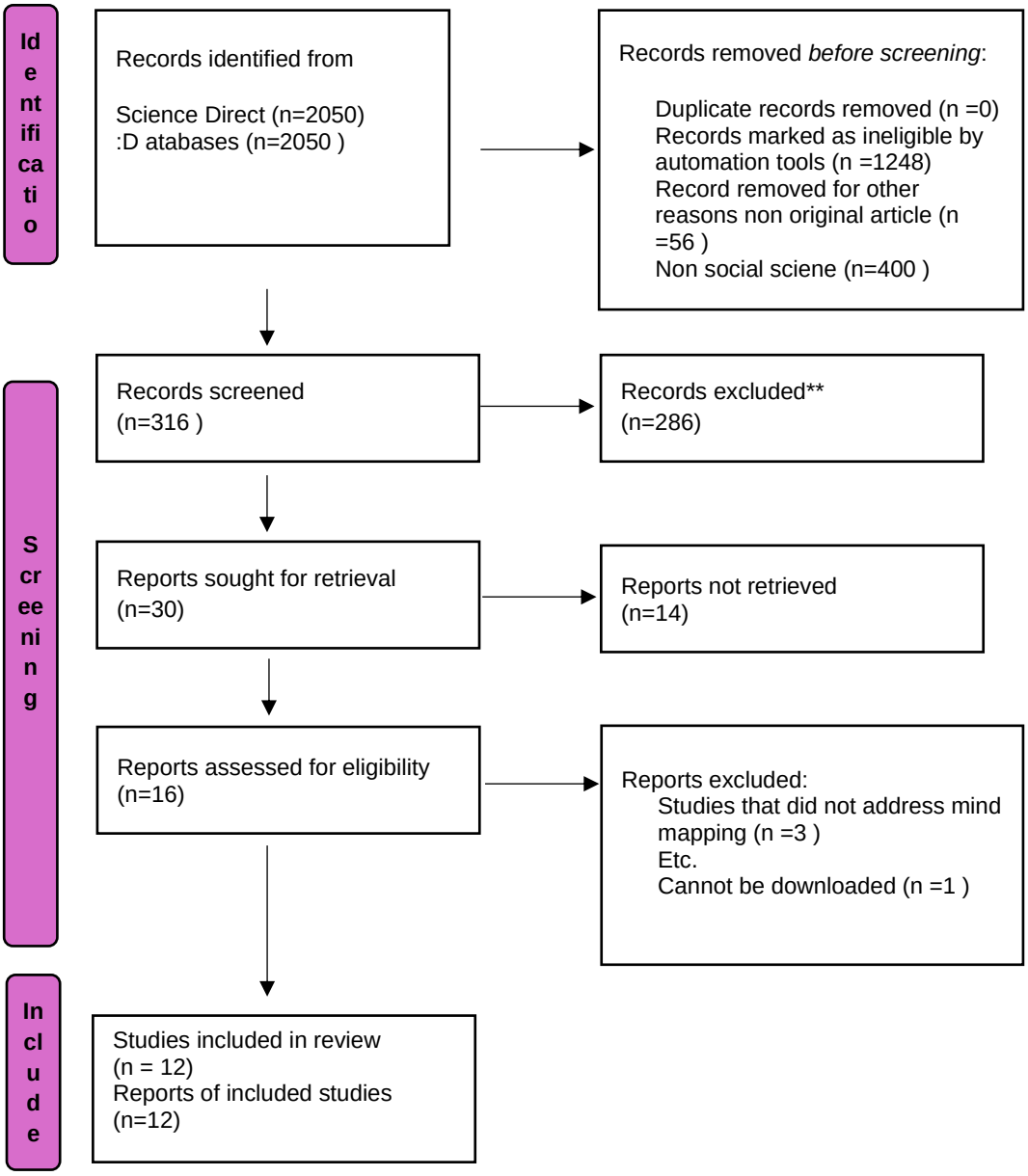

Figure 1. PRISMA Flow Chart Mind Mapping research

Before entering the analysis based on the research question, the researcher wants to see the relativity and distribution of data from the final paper which is identified as follows;

The articles that have been filtered cover a wide range of topics in education, including the use of Mind Mapping in social science learning, the development of computational thinking skills in K-12 students, the application of thinking design in education, and the enhancement of creativity through peer assessment (Mou, 2024). The research methodology used is diverse, including a descriptive qualitative approach with literature review, experiments with control groups and interventions, and a combination of quantitative and qualitative methods (Yang et al., 2022; Zhao et al., 2022). Some studies used pre-test and post-test designs to analyse the effectiveness of the intervention (Wang et al., 2024; Zhao et al., 2022).

The research sample covers various levels of education, ranging from elementary school students to college students (Sun et al., 2022; Zhao et al., 2022) The number of participants varied between studies, with 21 talented students aged 12-14 to 80 nursing students (Yang et al., 2022). (Mou, 2024)reported a study involving 48 college design students, with 24 participants in the test group and 24 in the control group. The average age of the test group was 19.5 years, while the control group was 18.7 years. Other studies reported by (Ho et al., 2023a) It involved 49 students from various academic backgrounds, including liberal arts, engineering, and medical sciences. Charlotte noted a study that focused on 23 prospective first-year teachers who worked in small groups.

Although the country where the study was conducted is not always explicitly mentioned, some of the characteristics of the sample provide clues about the geographical context. For example (Yang et al., 2022) reported that the majority of participants (97.5%) were of Han ethnicity, indicating the study may have been conducted in China. The same study also noted that participants came from urban (63.7%) and rural (36.3%) areas.

Data analysis methods include paired sample t-test, ANCOVA, and other statistical analyses for quantitative data (Li Zhao; Xiao-Ming Wang et al.). For qualitative data, some studies used focus group interviews and thematic analysis (Xiong et al., 2022). (Zhao et al., 2022)reported on the use of the Dr. Scratch platform to assess the quality and score of programming assignments. (Mou, 2024)noted that surveys are used to measure creative self-efficacy and motivation.

RESULT

Table 1. Summary of Findings on Mind Mapping Effectiveness, Factors, and Strategies

Aspect	Key Findings	Sources
Effectiveness	- Stimulates creative thinking through colors, symbols, and structured lines.	Ho et al. (2023b), Zhao et al. (2022), Wang et al. (2024)
	- Converts abstract ideas into visuals, fostering deeper understanding and creativity.	Zhao et al. (2022), Mou (2024)
	- Enhances problem-solving, motivation, and collaborative skills.	Beal & Hontvedt (2023), Mou (2024)
Factors for Success	- Adequate guidance and exploration opportunities enhance mapping effectiveness.	Ho et al. (2023b), Yang et al. (2022)
	- Time constraints and tool mastery challenges can be addressed through gradual support and training.	Yang et al. (2022), Öz & Işık (2024)
	- Interactive and reflective practices improve cognitive engagement.	Wang et al. (2024), Beal & Hontvedt (2023)
Optimal Strategies	- Use of scaffolded mind mapping (e.g., COS-MM) is effective for skill development.	Zhao et al. (2022)
	- Collaborative activities and philosophical inquiry promote critical thinking and teamwork.	Öz & Işık (2024), Beal & Hontvedt (2023)

Aspect	Key Findings	Sources
	- Integration of visual aids, real-world problem-solving, and group activities enhances engagement and learning outcomes.	Zhao et al. (2022), Öz & Işık (2024), Beal & Hontvedt (2023)

How effective is the Mind Mapping learning model in improving creative thinking skills

Based on 12 articles that have been reviewed about the effectiveness of the Mind Mapping learning model in improving creative thinking skills has been proven through various studies. (Ho et al., 2023b). states that this model utilizes the symbols of drawing |lines and colors to stimulate creative thinking in a fun way, encourage students to think creatively, and increase motivation in completing tasks and understanding the material. Mind Mapping also serves as a medium in problem-based learning, helping students generate diverse ideas and optimize their potential (Ho et al., 2023b). Research from (Zhao et al., 2022)explained that Mind Mapping improves creative thinking skills by turning abstract concepts into visual representations, making it easier for students to understand and organize their thoughts. This model encourages students to connect different ideas and concepts, fostering creativity through visualization of relationships between different levels of thought (Li Zhao et al.).

Researcher from (Wang et al., 2024; Xiong et al., 2022) emphasized that the use of mind maps in the curriculum has a positive impact on students' cognitive learning outcomes, especially in the fields of science, engineering, and technology. The process of mind mapping deepens students' understanding of the technical implementation and structural design of the project, providing a solid knowledge base for future project design (Xiao-Ming Wang et al.). Yueh-Ren Ho et al. highlighted that the Mind Mapping learning model facilitates the organization of information, ideas, and concepts, which can improve creative thinking skills. By visually representing information, mind maps help students identify relationships between different concepts, fostering deeper understanding and fostering creative connections (Ho et al., 2023b)

Researcher from (Polat & Aydın, 2020a) revealed that Mind Mapping promotes skills such as collecting, grouping, questioning, and evaluating information, which are essential for creative thinking. This model encourages children to discuss different opinions, generate questions, share their views, and seek and analyze knowledge (Öz & Işık, 2024) and (Beal & Hontvedt, 2023). (Mou, 2024) emphasized that Mind Mapping is effective in improving creative thinking skills by visually representing ideas or items related to central concepts, which increases understanding and retention. Research shows that mind mapping has a positive impact on students' motivation, creativity, and problem-solving abilities (Tsai-Yun Mou).

Researchers from Charlotte Beal and Magnus Hontvedt highlight the use of Mind Mapping as a tool for collaborative learning, which encourages brainstorming and exploration of associations between concepts, thus fostering creative thinking. Their study shows that video-based mind map co-construction by students leads to deep conversations and critical engagement with the subject matter, which is an essential component of creative thinking (Beal & Hontvedt, 2023). Thus it can be synthesized that Mind Mapping not only stimulates individual creativity, but also supports collaborative learning, allowing students to develop critical and innovative thinking in a variety of educational contexts.

Factors affecting the successful implementation of the Mind Mapping learning model

Based on 12 articles that have been analyzed, it is shown that the factors that affect the successful implementation of the Mind Mapping learning model include various interrelated aspects. (Ho et al., 2023b). emphasized the importance of providing opportunities for students to explore answers from various sources, as well as the importance of giving rewards and guidance in creating mind maps to improve students' understanding (Ho et al., 2023b). A fun learning process and actively involving students is also a key factor in improving creative thinking skills.

Research from (Yang et al., 2022). identified several challenges in the implementation of Mind Mapping, including students' difficulty in creating mind maps effectively, lack of familiarity with the tools used, and time constraints. This shows the importance of adequate training and guidance to ensure students can master the necessary skills. Further strengthened by (Wang et al., 2024). highlighting the importance of students' interaction with the physical and social environment during peer assessment, as well as the use of online forums to enhance social constructivist learning. Active reflective practice is also considered important to improve high-level cognitive processes and creativity.

Researcher from (Öz & Işık, 2024) underlines the time challenges in determining keywords and preparing the visuals required for Mind Mapping, as well as the difficulties that young people may face in determining the main branches and keywords. They emphasized the importance of gradual support to help children engage in mind mapping without fear of failure. Researcher from (Mou, 2024) emphasizing the importance of specialized training in creativity and the design of appropriate learning experiences to improve students' learning performance and self-efficacy. The integration of Mind Mapping in project-based learning is also considered to provide an authentic mastery experience. (Beal & Hontvedt, 2023)highlighting the importance of selecting appropriate video formats, digital platforms that facilitate subject-oriented meaning creation, and the design of mind mapping activities that encourage engagement and feedback between students. They also emphasized the importance of an explicit focus on subject-specific concepts and the provision of adequate time and incentives to read and work with the course literature.

Thus, it can be synthesized that the implementation of the Mind Mapping learning model depends on various interrelated factors, including effective learning design, adequate support and guidance, appropriate use of technology, and the development of students' skills in creating and using mind maps. It is important to consider all of these factors holistically to maximize the potential of Mind Mapping as an effective learning tool.

Optimal strategy for the application of the Mind Mapping learning model in the context of elementary school education

The optimal strategy for the implementation of the Mind Mapping learning model in the context of elementary school education involves several important aspects that are interrelated. Mayrisa Undari et al. emphasized the importance of designing learning that is fun and actively engages students, as well as providing opportunities for them to explore answers from various sources. The use of colors, images, and symbols in mind maps is also encouraged to increase students' creativity and understanding. (Zhao et al., 2022)suggested the use of construct-by-self mind mapping (CBS-MM) and construct-on-scaffold mind mapping (COS-MM) approaches to improve computational thinking (CT) skills in elementary school students. They found that the COS-MM method was more effective in improving students' CT skills, suggesting that scaffolding can be a beneficial strategy in mind mapping applications.

(Öz & Işık, 2024)highlighting the effectiveness of mind mapping in improving critical thinking skills among preschool children, which can be applied to primary school education. They recommend the implementation of mind-mapping activities that promote philosophical inquiry, allowing children to explore themes such as emotions, honesty, and sharing. Other recommended strategies include creating a supportive learning environment where students can visually share and explain their ideas, encouraging collaboration and shared cognitive construction.

It is also important to design instruction that incorporates mind mapping as a tool for conceptual organization, record-keeping, and knowledge visualization, tailored to the specific needs of elementary school students. Prioritizing a collaborative learning environment is highly advised, as large group mind mapping studies have been found to be more effective than individual studies. Training teachers to facilitate mind mapping sessions, incorporating different teaching approaches and ensuring that activities encourage questioning, flexible thinking and creativity are also important components of this strategy.

The use of visual aids and interactive materials during mind mapping sessions can increase engagement and understanding among elementary school students. Conducting regular assessments of students' mind mapping outputs is also essential to provide insight into their understanding and development of critical thinking, allowing for tailored instructional strategies. Finally, integrating mind mapping into problem-based learning scenarios allows students to visualize problems and brainstorm solutions collaboratively.

Thus, it can be synthesized that the optimal application of the Mind Mapping learning model in elementary schools requires a comprehensive and integrated approach. This strategy should consider the cognitive and affective needs of students, utilize appropriate technology and visual aids, and encourage creative collaboration and exploration. By incorporating these strategies, educators can create a learning environment that supports the development of critical thinking, creativity, and problem-solving skills through the effective use of mind mapping.

DISCUSSION

This study aims to analyze and identify the potential of the Mind Mapping Learning Model on students' creative thinking abilities based on relevant evidence. Based on the results of the analysis of 12 articles that have been reviewed, the Mind Mapping learning model shows significant potential in improving students' creative thinking skills at the elementary school level. The main findings of this study show the effectiveness of Mind Mapping in stimulating creative thinking through the use of line symbols, images, and colors, as affirmed by (Ho et al., 2023b). This is reinforced by (Zhao et al., 2022). which explains that Mind Mapping helps students turn abstract concepts into visual representations, making it easier for them to understand and organize their thoughts creatively. Further (Wang et al., 2024)emphasizing the positive impact of the use of mind maps on students' cognitive learning outcomes, especially in the fields of science, engineering, and technology, shows that Mind Mapping not only increases creativity, but also supports a deeper understanding of concepts in various subjects.

The successful implementation of the Mind Mapping learning model is influenced by several key factors. (Yang et al., 2022). Identifying challenges such as students' difficulty in creating mind maps effectively and lack of familiarity with the tools used, highlights the importance of adequate training and guidance for students and teachers. (Öz & Işık, 2024; Polat & Aydın, 2020b) emphasized the importance of gradual support to help children engage in mind mapping without fear of failure, pointing out that a patient and structured approach is necessary in implementing Mind Mapping, especially for students who are new to this technique.

The optimal strategy for the implementation of Mind Mapping in primary schools, as recommended by various researchers, includes several important aspects(Zhao et al., 2022) suggested the use of construct-by-self mind mapping (CBS-MM) and construct-on-scaffold mind mapping (COS-MM) approaches, with the finding that the COS-MM method was more effective in improving students' computational thinking skills. Özgül Polat and Ebru Aydın recommend the implementation of mind mapping activities that promote philosophical inquiry, allowing children to explore themes such as emotions, honesty, and sharing. The importance of creating a learning environment that supports collaboration and shared cognitive construction is also emphasized by some researchers.

While these findings are promising, the study has some limitations. First, variations in methodology and sample size between studies may affect the generalization of results. Second, most of the research focuses on short-term effects, so longitudinal studies are needed to assess the long-term impact of Mind Mapping on creative thinking skills. Third, the diverse cultural and geographical contexts of the analyzed studies may affect the application and effectiveness of Mind Mapping in various educational settings.

Based on these findings and limitations, some recommendations for further research can be proposed. Future research should develop on the development and validation of special assessment tools to measure the impact of Mind Mapping on creativity will be invaluable. Finally, research on the integration of digital technology in the implementation of Mind Mapping can open up new opportunities to increase its effectiveness in the era of digital education**.**

CONCLUSION

Overall this study has been identified that the results show that for 12 research articles, it can be concluded that the Mind Mapping learning model has significant potential in improving the creative thinking ability of elementary school students. The effectiveness of Mind Mapping can be seen from its ability to facilitate concept visualization, encourage non-linear thinking, and increase students' active involvement in the learning process. Key findings show that Mind Mapping not only stimulates creativity, but also improves concept understanding, information retention, and problem-solving skills.

Factors that affect the successful implementation of Mind Mapping include the quality of training and guidance provided to students and teachers, the appropriate design of learning activities, and effective technology integration. The optimal strategy for implementing Mind Mapping includes the use of scaffolding approaches, the promotion of collaborative learning, and adaptation to the cognitive needs of elementary school students.

Some of the challenges in the implementation of Mind Mapping, include the initial difficulty of students mastering this technique and the need for adequate time and resources. Therefore, the application of Mind Mapping needs to be accompanied by structured and sustainable support to maximize its potential in improving students' creative thinking skills. The implications of the research lie in the need for teacher training programs to be developed to equip educators with the skills and knowledge needed to implement Mind Mapping effectively. These include facilitation techniques, scaffolding strategies, and technology integration in the creation of mind mapping as well as the implications of these findings lead to recommendations to integrate the mind mapping learning model into the educational curriculum to optimize the development of students' creative thinking skills.

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