

**SYSTEMATIC LITERATURE REVIEW: STUDENTS' SELF EFFICACY
BASED ON MATHEMATICAL REFLECTIVE THINKING ABILITY**

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ABSTRACT

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This study is a literature review that aims to describe the differences in *self-efficacy* based on mathematical reflective thinking ability and identify factors that affect *self-efficacy* in improving mathematical reflective thinking ability. The research method used is *systematic literature review* by involving a detailed analysis of various selected articles using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines*. The literature search process through the *Publish or Perish application* uses academic databases such as SINTA, Google Scholar, Garuda. The results of the search for related articles out of 50 articles were selected 20 articles based on special criteria in the literature review in this study. The results of the literature review showed that *high self-efficacy* encouraged individuals to actively face and solve complex mathematical challenges. They were more confident in making analogies from two similarities, which increased their desire to develop reflective thinking strategies. In contrast, students with *low self-efficacy* tend to accept answers without considering other options and are more passive in the reflection process. Factors such as a supportive learning environment, the presence of inspiring role models, positive feedback, intrinsic motivation, and the ability to engage in continuous self-reflection all play a role in strengthening *self-efficacy* in the context of mathematical reflective thinking skills.

Penelitian ini merupakan kajian pustaka sistematis yang bertujuan untuk mendeskripsikan perbedaan efikasi diri berdasarkan kemampuan berpikir reflektif matematis dan mengidentifikasi faktor-faktor yang memengaruhi efikasi diri dalam meningkatkan kemampuan berpikir reflektif matematis. Metode penelitian yang digunakan adalah kajian pustaka sistematis, yang melibatkan analisis terperinci dari berbagai artikel yang dipilih menggunakan pedoman Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Proses penelusuran pustaka dilakukan dengan menggunakan aplikasi Publish or Perish dan basis data akademik seperti SINTA, Google Scholar, dan Garuda. Dari hasil penelusuran, 20 dari 50 artikel terkait dipilih berdasarkan kriteria tertentu dalam studi kajian pustaka ini. Hasil kajian pustaka menunjukkan bahwa efikasi diri yang tinggi mendorong individu untuk secara aktif menghadapi dan memecahkan tantangan matematika yang kompleks. Mereka lebih percaya diri dalam membuat analogi dari dua kesamaan, yang meningkatkan kemauan mereka untuk mengembangkan strategi berpikir reflektif. Sebaliknya, siswa dengan efikasi diri rendah cenderung menerima jawaban tanpa mempertimbangkan pilihan lain dan lebih pasif dalam proses refleksi.

Faktor-faktor seperti lingkungan belajar yang mendukung, adanya panutan yang inspiratif, umpan balik positif, motivasi intrinsik, dan kemampuan untuk terlibat dalam refleksi diri yang berkelanjutan semuanya berkontribusi untuk memperkuat efikasi diri dalam konteks keterampilan berpikir reflektif matematika.

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1. INTRODUCTION

Mathematics learning outcomes often reveal significant challenges for students, particularly in problem-solving skills, which are crucial for academic success and future opportunities. Various studies highlight the contributing factors to these difficulties and suggest effective strategies for improvement. One key factor is conceptual understanding, as many students struggle with basic mathematical concepts, leading to poor performance (Mangarin & Caballes, 2024). Additionally, math anxiety can hinder students' ability to engage with the material, negatively impacting their overall learning experience (Salsabila et al., 2024; Serin, 2023).

Ineffective teaching methods, such as traditional approaches that fail to address diverse learning needs, may also contribute to disengagement and confusion (Mangarin & Caballes, 2024). To address these issues, contextual teaching and learning have been shown to enhance student engagement and comprehension, leading to better learning outcomes (Misqa et al., 2024). Creating an interactive learning environment through study groups and personalized tutoring can help reduce anxiety and foster a deeper understanding of mathematical concepts (Salsabila et al., 2024; Khanal, 2022). Moreover, positive reinforcement through encouragement and recognition can boost student motivation and improve their learning experience (Khanal, 2022). While these strategies can significantly enhance mathematics learning outcomes, it is essential to acknowledge that some students may continue to face persistent challenges due to underlying cognitive issues or socio-cultural factors that require tailored interventions.

Reflective thinking is essential for enhancing students' problem-solving skills in mathematics, as it involves analyzing and evaluating their approaches to solving problems. This metacognitive process allows students to identify mistakes and refine their strategies, leading to a deeper understanding of mathematical concepts and applications (Kathayat, 2024; Ghofur et al., 2023). Additionally, self-efficacy plays a crucial role in students' confidence and persistence when tackling mathematical challenges, which can further influence their problem-solving abilities (Hanifa et al., 2023).

Reflective thinking fosters metacognitive awareness, enabling students to plan, monitor, and evaluate their problem-solving processes (Kathayat, 2024). It also encourages them to connect mathematical concepts to real-world applications, improving their comprehension and retention (Ghofur et al., 2023). Similarly, high self-efficacy is associated with increased motivation and resilience in solving mathematical problems (Hanifa et al., 2023). Students with strong confidence are more likely to engage in challenging tasks and

persist through difficulties, leading to better problem-solving outcomes (Hanifa et al., 2023). However, while reflective thinking and self-efficacy are crucial, some students may still struggle due to external factors such as ineffective teaching methods or classroom environments that do not promote active engagement or critical thinking, potentially hindering their overall mathematical development (Ghofur et al., 2023).

The relationship between students' self-efficacy and their ability to understand mathematical concepts is a critical area of research. This systematic literature review highlights how self-efficacy influences mathematical comprehension and reflective thinking skills. Findings indicate that higher self-efficacy correlates with improved mathematical understanding and problem-solving abilities while also emphasizing the role of contextual learning in enhancing these skills.

High self-efficacy is associated with better mathematical literacy and problem-solving skills (AlAli & Wardat, 2024; Faozan & Kusno, 2023). Students with strong self-efficacy demonstrate faster task completion and a deeper understanding of mathematical concepts (Faozan & Kusno, 2023). Interventions such as positive feedback and growth mindset training can enhance self-efficacy, leading to improved mathematical performance (AlAli & Wardat, 2024). Additionally, contextual learning strategies, such as Problem-Based Learning, significantly boost students' confidence and reflective thinking in mathematics (Zulfaizir, 2024). The integration of contextual learning fosters mathematical logical intelligence, enhancing students' abstract thinking abilities (Zulfaizir, 2024). While focusing on self-efficacy is essential, it is equally important to recognize that factors such as teaching methods and learning environments can significantly impact students' mathematical abilities and self-efficacy levels. Therefore, a holistic approach that combines self-efficacy development with effective teaching strategies is crucial for improving mathematical comprehension.

2. METHOD

The SLR (*Systematic Literature Review*) method is a structured and standardized method for collecting, evaluating, and interpreting all research that is relevant to a research question or a specific topic. SLRs also serve to identify gaps in the existing literature, offer guidance for future research, and assist practitioners and policymakers in making more informed decisions. The stages of the SLR method are presented in Figure 1 Arissona et al., (2023) , A. Princess & Juandi (2022).

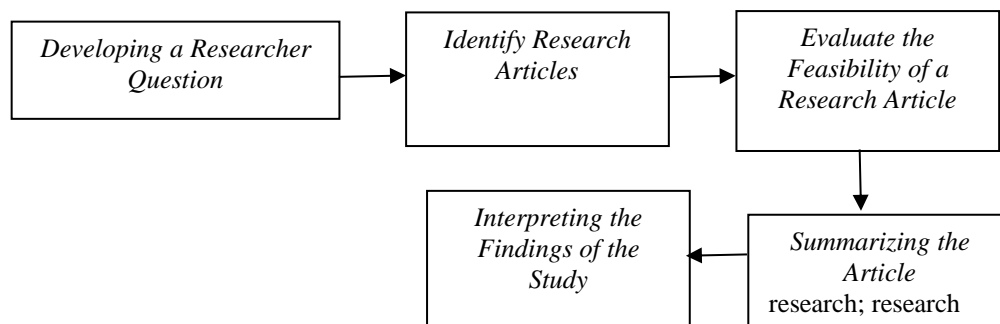


Figure 1. Stages of SLR

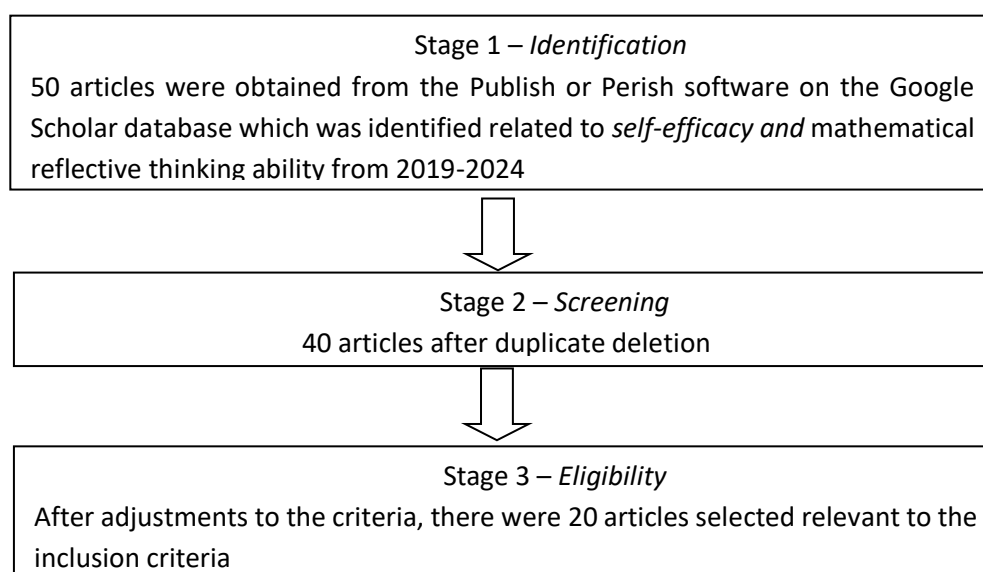
The researcher determines the main focus of the research by identifying specific topics or issues that want to be explored, namely *students' self-efficacy* based on students' mathematical reflective thinking skills. The research questions are formulated clearly and in detail to ensure that the research objectives can be achieved by a systematic literature review. The formulation of *the Research Question* includes: 1) Describe how the students' self-efficacy differs based on their mathematical reflective thinking skills. 2) Identify what factors of *self-efficacy* have an impact on increasing their mathematical reflective thinking skills. The researcher designed a systematic and comprehensive search strategy, including the use of keywords, namely *self-efficacy* and mathematical reflective thinking skills. The literature search process through *the Publish or Perish* application uses academic databases such as SINTA, Google Scholar, Garuda.

According to using inclusion criteria helps researchers filter and select the most relevant and useful studies to include in their review, ensuring that the analysis conducted is based on solid and consistent evidence. The criteria in this study are presented in Table 1 Nasution et al., (2024)

Table 1 Inclusion and Exclusion Criteria

It	Inclusion Criteria	Exclusion Criteria
1.	The article contains variables that are in accordance with the research, namely mathematical reflective thinking or <i>student self-efficacy</i>	It does not contain variables of mathematical reflective thinking or <i>student self-efficacy</i>
2.	Indexed journals: Scopus, Sinta, and DOAJ	The journal is not indexed; blogs, journal reviews, book reviews, and more
3.	Article publication in 2019 - 2024	Article Publication before 2019
4.	The results of the study showed the relationship between mathematical reflective thinking and <i>students' self-efficacy</i>	The results of the study did not show the relationship <i>between students' self-efficacy</i> and mathematical reflective thinking

This study will follow the guidelines of *the Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) to ensure transparency and rigor in the SLR process. The explanation of the prism guidelines in this study is modified from the following: Ridho & Dasari, (2023)





Stage 4 – Included
 There are 20 articles that are in accordance with the topic of discussing *students' self-efficacy* based on students' mathematical reflective thinking skills

Figure 2. PRISMA Guidelines

3. RESULTS AND DISCUSSION

3.1. Result

Based on the results of the evaluation of the feasibility of the research articles, there are 20 articles that analyze mathematical reflective thinking skills with a focus on *self-efficacy*. This study presents the results of several articles that meet the inclusion criteria. The articles were organized by year of publication, and through a rigorous selection process, 20 articles were selected for further analysis. From the relevant data, the number of articles published between 2019 and 2024 can be seen in Figure 3.

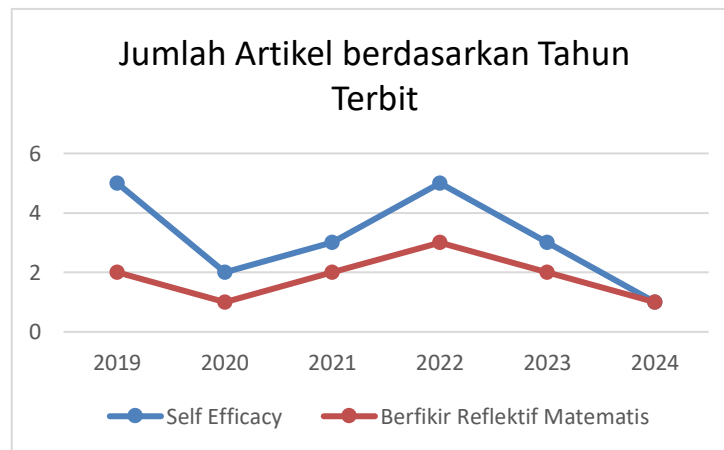


Figure 3. Article Criteria Graph by Variable and Year of Publication

Based on Figure 3, the distribution of the number of articles published between 2019 and 2024 shows a fluctuating trend. In the *self-efficacy* category, there was a decrease of 60% from 5 articles in 2019 to 2 articles in 2020, then increased by 50% to 3 articles in 2021, reached a peak with 5 articles in 2022, then decreased by 40% in 2023 to 3 articles, and dropped sharply by 67% in 2024 to only 1 article. The category of mathematical reflective thinking showed a 50% decrease from 2 articles in 2019 to 1 article in 2020, up 100% to 2 articles in 2021, up 50% to 3 articles in 2022, then down 33% in 2023 to 2 articles, and down 50% in 2024 to 1 article.

This graph reflects significant fluctuations in the number of publications, with increases in 2021 and 2022 indicating increased interest in research in *self-efficacy* and mathematical reflective thinking ability. However, the number of articles discussing these two topics simultaneously is still relatively small, indicating an opportunity for further research in integrating *self-efficacy* and mathematical reflective thinking.

Studies based on the level of education of the research subjects, including elementary, junior high, and high school. The number of articles about *students' self-efficacy* based on mathematical reflective thinking skills is presented in Figure 4.

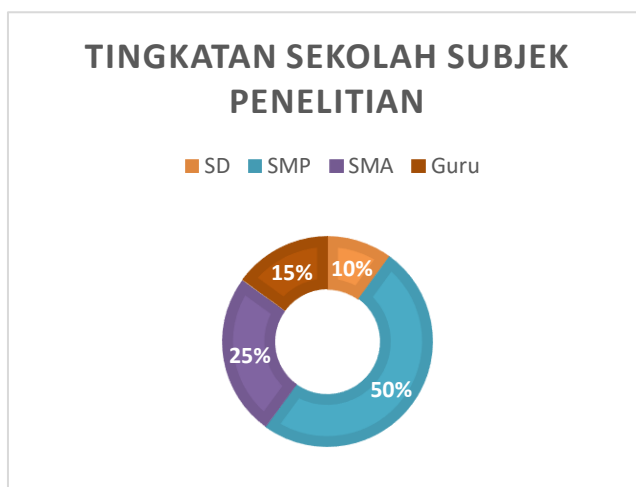


Figure 4. Graph of Article Criteria by Research Subject

Based on Figure 4, from the 20 articles analyzed, the distribution of research subjects is as follows: elementary school students as many as 10%, junior high school students as many as 50%, high school students as many as 25%, and training for teachers as much as 15%. Meanwhile, 25% of articles focused on high school students reflected the importance of strengthening reflective thinking and *self-efficacy* skills before students entered higher education or the workforce.

In addition, 15% of articles discussing training for teachers highlight the importance of teachers' role in developing *self-efficacy* and reflective thinking skills in students, with teacher training aiming to equip them with effective strategies to support students in developing both skills. The study based on the journal index is presented in Figure 5.

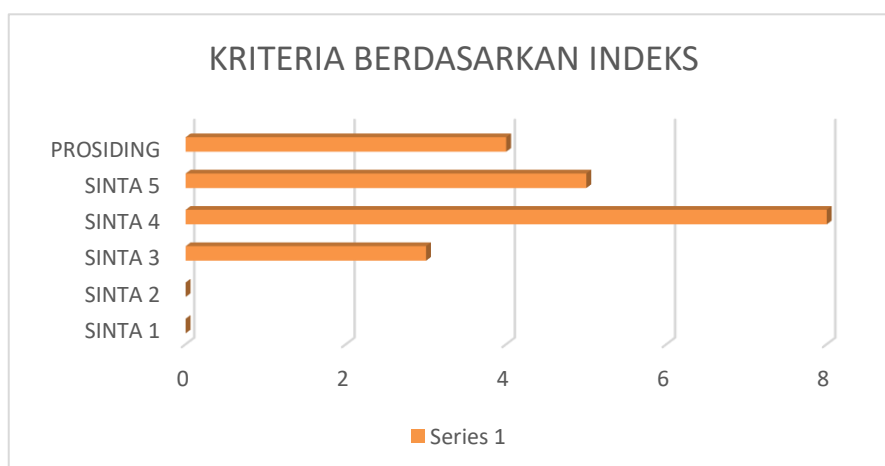


Figure 5. Article Criteria Graph by Index

Based on the distribution graph of articles based on the SINTA index, research related to *students' self-efficacy* based on mathematical reflective thinking ability shows that most of the articles are in the journals SINTA 4 and SINTA 3, while only a few are in SINTA 1 and 2. This shows that this topic is gaining attention in the academic community even though

it has not been widely published in the highest quality journals. The significant number of articles in SINTA 5 and the proceedings also show that this research is still in the early stages of development or dissemination.

3.2. Discussion

In general, research on *self-efficacy* based on mathematical reflective thinking ability shows that there are variations in the focus of research at various levels of education. Research that focuses on junior high school students dominates, reflecting the importance of adolescence in the development of reflective thinking skills and *self-efficacy*. According to this level, students begin to face more complex mathematical materials, so understanding how Islamiyah et al (2022) *self-efficacy* affects problem-solving abilities is very important. Research on high school students also highlights the importance of strengthening these two skills before students enter higher education or the world of work. According to the SMK period, it is a crucial phase for academic and career preparation, so the development Widyastuti & Nuriadin (2021) of *self-efficacy* and reflective thinking skills is expected to help students achieve success in the future.

Research on elementary school students is still limited. However, he said that developing Akuba et al., (2020) *self-efficacy* and understanding of mathematical concepts so that reflective thinking from an early age can provide a solid foundation for further development at the next level of education. This early development is essential to build a solid foundation that will support students in facing greater academic challenges in the future. In addition, a number of studies highlight the importance of training for teachers in supporting the development of *self-efficacy* and reflective thinking skills in students. Teachers play a key role in the learning process that with the right training, they can use effective strategies to improve both skills in students (Lesta Ariany et al., 2023).

Differences in students' self-efficacy based on the level of mathematical reflective thinking ability

Students' self-efficacy has a positive influence on their mathematical reflective thinking ability. In research, students with high mathematical reflective thinking can make an analogy of two similarities. This is based on strong Widyastuti & Nuriadin (2021) *self-efficacy* that is more persistent so that students see challenges as opportunities to learn and improve themselves, not as a sign of incompetence. In research, students who have high self-efficacy will be actively involved in class discussions, group projects, and other activities. They can interpret a case based on the mathematical concepts involved Akbari & Meilani (2023)

This is reinforced in the research showing that high mathematical reflective thinking skills are also able to analyze in depth complex mathematical problems, the ability to solve problems systematically, the ability to develop and test hypotheses, and the ability to reflect on the mathematical learning process, these abilities are influenced by Cahya Kusuma et al., (2022) *Self efficacy* which is high in students in the context of mathematics. In line with the results of research, individuals with Kurniawati et al., (2019) *strong self-efficacy* tend to feel confident and able to face mathematical tasks that require an understanding of mathematical concepts, so they are more likely to actively explore and

understand the underlying elements of the problem, as well as use various problem-solving strategies. They are also more open to proposing new hypotheses and considering evidence critically, because they believe that they are capable of understanding and explaining complex mathematical phenomena. In addition, high *self efficacy* encourages individuals to reflect on their own learning strategies, allowing them to critically evaluate weaknesses and strengths in mathematical problem-solving. Students with strong *self-efficacy* are better able to face challenges, think critically, and develop a deeper conceptual understanding, so they are better prepared and able to solve mathematical problems.

Students with low mathematical reflective thinking skills in research often feel doubtful about their own abilities, so they quickly feel pressured and tend to avoid problems that they find difficult. In line with research This attitude inhibits their ability to think reflectively effectively, as they are more passive in the process of reflection and less critical in examining their own answers. In the study, it was found that students with low Rahmawati et al., (2021), Nuraeni et al., (2019), Septhiani (2022) *self-efficacy* were more likely to receive answers without conducting an in-depth examination or considering alternative solutions.

In research, low Annisa Indrawati (2019) *self-efficacy* can lead to high levels of anxiety and stress associated with math lessons. This can negatively impact students' emotional well-being and mental health. Students may begin to feel pressured to check the correctness of an argument based on the concepts/traits used because they have a negative self-view, consider themselves incapable of being compared to others.

Self-efficacy factors that have an impact on increasing the ability to think mathematically reflective

In the context of systematic research on *self-efficacy* based on mathematical reflective thinking skills, on research Lu (2018) on a positive, inclusive, and supportive learning environment, where students feel safe to take risks and make mistakes. So that it has an impact on students who feel supported and are not afraid to fail are more likely to engage in reflective problem-solving, because they know that mistakes are part of the learning process. In addition, in research students who have individuals who are used as role E. Suryani, (2021) *models* can increase students' *self-efficacy* because when students see models that successfully apply reflective thinking strategies in solving mathematical problems, they are more likely to try the same approach and believe that they can also succeed.

Positive emotional and physical states, such as calmness, happiness, and minimal stress, can increase *self-efficacy*. In line with research, students who feel calm and positive are more likely to engage in problem-solving reflectively, because they are not distracted by anxiety or stress. stated that positive feedback from the surrounding environment, including teachers and peers, also plays an important role in improving Junaedi et al., (2022) Thahir et al., (2019) *self-efficacy* in this context. Finally, the intrinsic motivation to master mathematics more deeply is also a strong encouragement for individuals to develop their mathematical reflective thinking skills. By considering these factors holistically, this study explores the complex dynamics surrounding the development of *self-efficacy* in mathematical reflective thinking skills. Through continuous self-reflection,

students can identify areas for improvement, develop new strategies, and strengthen their confidence in mathematical reflective thinking abilities (Shidqiya & Sukestiyarno, 2023).

4. CONCLUSION

Based on the results and discussions in the literature review, it can be concluded that there is a difference *in high and low self-efficacy* in mathematical reflective thinking ability. High *self-efficacy* motivates individuals to actively face and overcome complex mathematical challenges, as well as to be more confident in trying to make analogies from two similarities, increasing their willingness to develop reflective thinking strategies. Meanwhile, *self-efficacy* is low. Students who are not confident tend to accept answers without considering other options and are more passive in the process of reflection. Factors such as a positive learning environment, the existence of *role models* that encourage self-confidence, get positive feedback, have intrinsic motivation, and being able to reflect on themselves continuously together contribute to strengthening self-efficacy in the context of mathematical reflective thinking skills. By understanding these complex dynamics, mathematics education approaches can be more focused on building students' self-confidence and improving their mathematical reflective thinking skills, bringing positive impacts on academic achievement and deeper mastery of mathematical concepts.

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