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Self-Efficacy and High-Order Thinking Skills (HOTS) In Mathematics: A Systematic Literature Review

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ABSTRACT

The study aims to examine the influence of self-efficacy on high-order thinking skills in mathematics learning while identifying the factors underlying the observed differences in outcomes. The method used is a Systematic Literature Review. Fifteen articles published between 2020 and 2025 were selected as the research subjects. Data were collected from four databases, Scopus, ERIC, ScienceDirect, and Google Scholar, using the primary keywords "self-efficacy" and "HOTS". The journals were systematically reviewed and analyzed following the PRISMA 2020 guidelines. The results of the study indicate that self-efficacy positively affects high-order thinking skills in mathematics among secondary school students. Students with high self-efficacy generally demonstrate stronger abilities in analysis, evaluation, problem-solving, and creative thinking than students with low self-efficacy. However, for the problem-solving indicator, 7% of the results showed no significant relationship. The variation in results is attributed to learning strategies that do not support the development of students' understanding of mathematical concepts. Therefore, teachers are advised to implement learning strategies that can enhance students' self-efficacy to support the development of HOTS.

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INTRODUCTION

Mathematics is a discipline that plays a role in developing logical thinking, analytical skills, reasoning, and the ability to argue a point. In addition, it helps solve various problems in everyday problems and serves as an important foundation for the advancement of science and technology (La'ia & Harefa, 2021). According to Dari (2022), mathematics education serves to prepare students to become experts in various fields of study, such as science, technology, and planning. In the learning process, students are not merely expected to understand the material; they must also master various mathematical skills relevant to

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addressing the challenges of the modern world. Thus, the success of mathematics education is determined not solely by mastery of the material but also by students' skills in thinking, reasoning, and problem-solving (Suryawan *et al.*, 2023). One of the competencies that must be developed in modern education is high-order thinking skills (HOTS). These skills are necessary for students to analyze information, evaluate various solutions, and generate new ideas when facing complex problems. In line with these requirements, the Indonesian government is promoting the implementation of HOTS-oriented learning through various curriculum and assessment policies (Al Ghifari *et al.*, 2022). However, various pieces of empirical evidence indicate that Indonesian students' HOTS skills have not yet developed to their full potential.

This situation is reflected in the low mathematics scores on the 2022 PISA assessment, which reached only 366 (OECD, 2023). Furthermore, TIMSS results show that Indonesia's mathematics score was only 397, placing it in the low category below the average score (IEA, 2016). Both results indicate that most students struggle with problems requiring reasoning, analysis, evaluation, and problem-solving skills. These findings are supported by previous research indicating that, on average, students' high-order thinking skills are lacking, with the analysis indicator (C4) at 42.05%, the evaluation indicator (C5) at 39.76%, and the creation indicator (C6) at 24.76% (Fasha & Triyastuti, 2022). This lack of skills poses a serious challenge, as HOTS are competencies needed to cope with advances in science and technology and the increasingly complex dynamics of life.

In Bloom's Taxonomy, developed by Anderson and Krathwohl, high-order thinking skills encompass the three highest levels: analyzing (C4), evaluating (C5), and creating (C6), which reflect critical thinking, creativity, and problem-solving as their core components (Manik & Ngurah, 2020). High-order thinking skills are cognitive abilities that go beyond mere recall; they also require complex cognitive skills, such as analytical and innovative thinking, in order to examine problems and find solutions (Syahri & Ahyana, 2021). Therefore, HOTS can be defined as the ability that requires an individual to use critical and creative thinking to identify and solve problems. For this reason, high-order cognitive skills play a crucial role in the mathematics learning process, as they help students identify relationships between concepts, develop problem-solving strategies, and devise innovative solutions to various mathematical problems (Sya'banningrum *et al.*, 2025). Given the importance of HOTS in mathematics learning, it is necessary to identify the factors that can support its development in students. One internal factor believed to support the

development of HOTS is self-efficacy.

Self-efficacy is a person's belief in their own competence when facing challenges and solving problems. In the context of mathematics learning, students with high self-efficacy tend to be more motivated, more willing to take on challenges, and more able to persevere in the learning process despite various difficulties (Aras *et al.*, 2022). These characteristics make self-efficacy one of the psychological aspects believed to contribute to the development of high-order thinking skills. Students who are confident in their abilities generally engage more actively in thinking strategies, conduct in-depth analysis, evaluate alternative solutions, and generate creative solutions when faced with complex mathematical problems. Although the relationship between self-efficacy and HOTS has been extensively studied in mathematics education, research findings remain mixed. Several previous studies have shown that self-efficacy plays a positive role in enhancing critical thinking skills (Hari *et al.*, 2018; Misbahudin, 2019; Sukma & Priatna, 2021) and the existence of a correlation between self-efficacy (a sense of competence) and mathematical reasoning ability in the context of HOTS (Sya'banningrum *et al.*, 2025). Meanwhile, other studies show that self-efficacy does not significantly influence creative thinking (Septiani *et al.*, 2018), problem-solving skills (Haqqul & Saraswati, 2023), or high-order thinking skills if the learning strategies used do not support the development of those skills (Sari, 2024).

These differing findings indicate that the relationship between the two variables cannot yet be consistently explained and is likely influenced by various contextual factors, including educational level, student characteristics, learning materials, research instruments, and teaching methods. This suggests that the relationship between self-efficacy and HOTS cannot be understood solely from individual study results but must be analyzed more comprehensively, taking into account the varying characteristics of the research. Therefore, a synthesis of previous research findings is crucial to obtaining a complete picture of the relationship between the two variables. Such a synthesis is necessary to identify consistent patterns in the findings, explain the factors causing differences in research results, and draw stronger conclusions to serve as a basis for decision-making in mathematics education (Chong *et al.*, 2022). The lack of a comprehensive synthesis study means that teachers often still face difficulties in determining the extent to which self-efficacy contributes to the development of students' HOTS. Therefore, a study is needed that can integrate and evaluate existing findings to provide a more comprehensive analysis of the impact of self-efficacy on mathematics HOTS.

Based on these varied findings, the researchers conducted a Systematic Literature Review (SLR) focusing on the influence of self-efficacy and HOTS in mathematics at the secondary school level, aiming to identify, examine, and analyze relevant studies. Through the SLR, researchers can gain insight into previous research, thereby obtaining a clear picture of the concepts, theories, and findings related to the topic under study (Linnenluecke *et al.*, 2020). Not only that, but this approach also helps draw more accurate conclusions by synthesizing findings from multiple studies, resulting in more valid outcomes than relying on a single source alone. A systematic literature review (SLR) is a research method aimed at identifying and synthesizing existing research in depth to address specific research questions, using systematic and transparent steps throughout the process (Ariati & Juandi, 2022). In this case, researchers do not collect data directly in the field but instead use reliable sources from existing research to gain a deep understanding of the topic.

Based on the above discussion, the research questions for this study are: (1) Does self-efficacy influence high-order thinking skills (HOTS) in mathematics among high school students? (2) What factors influence the differences in the effects of self-efficacy on HOTS in mathematics learning among high school students? Thus, the objective of this systematic literature review is to identify, analyze, and synthesize the results of previous studies on the influence of students' self-efficacy on high-order thinking skills in mathematics and the contextual factors that account for differences in outcomes between the two. The findings of this study are expected to contribute to mathematics learning strategies that strengthen students' HOTS and self-efficacy, thereby improving the quality of learning.

METHODS

This study employed a Systematic Literature Review (SLR) approach, which encompasses the stages of identification, screening, evaluation, and interpretation of various research findings on a given topic to answer the previously formulated research question (Anditiasari *et al.*, 2021). Through this approach, the researchers systematically reviewed and identified journals at each stage in accordance with the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The aim was to minimize various forms of bias and facilitate the effective synthesis of research (Muthmainnah *et al.*, 2024). The selection process consists of four main steps: identification, screening, inclusion, and evaluation (Page *et al.*, 2021).

Identification

Identification is the first step in searching for articles using relevant keywords. Keywords are necessary during the search process to find accurate articles. The two main keywords used were "self-efficacy" and "high-order thinking skills." To diversify the keywords, synonyms, and indicators of HOTS (critical thinking, creative thinking, and problem-solving) were also used as alternative keywords in the search. Keywords must appear in the title or abstract of the journals being searched. Articles were retrieved from Scopus, ERIC, ScienceDirect, and Google Scholar databases, with a restriction to articles published between 2020 and 2025. These four databases were selected for several reasons. Scopus, ERIC, and ScienceDirect offer comprehensive, stable, and high-quality search capabilities. Meanwhile, Google Scholar has very broad coverage of articles, making it a supplementary database for expanding the scope of article searches.

The article search technique in these databases (Scopus, ERIC, ScienceDirect, and Google Scholar) involves advanced searches using Boolean operators (AND, OR). Based on keywords, databases, and search techniques, 57 articles were retrieved from the Scopus database, 37 from the ERIC database, 198 from the ScienceDirect database, and 1,030 from Google Scholar. In total, 1,322 articles were collected; 148 of these were automatically excluded using Mendeley, a tool for organizing articles, storing metadata, and identifying duplicate documents across various database sources. A total of 232 duplicate articles were excluded, and 327 were excluded because they were not empirical studies but rather review articles. The remaining 615 articles proceeded to the screening stage.

Screening

Screening is the process of applying inclusion or exclusion criteria to select articles suitable for a systematic literature review. The following are the criteria used in this study.

Tabel 1. Inclusion and Exclusion Criteria

Inclusion	Exclusion
An empirical research article is not a research review	Articles that are neither empirical research nor research reviews
Focusing on secondary-level students	The research subjects were not high school students
Examining self-efficacy in relation to high-order thinking skills (HOTS) or their component indicators (critical thinking, creativity, and problem-solving)	The focus of the research does not directly examine the relationship/influence of self-efficacy with HOTS or its components (critical, creative, and problem-solving thinking).
Articles published between 2020 and 2025	Articles published before 2020 that are duplicates

Establishing inclusion criteria is crucial to ensure that all selected articles provide findings relevant to the systematic literature review. The articles selected for this study

present findings on the influence of self-efficacy on high-order thinking skills. Therefore, articles that do not explicitly discuss this primary focus will be excluded. After the screening process, 460 articles were excluded, leaving 155 articles for the next stage.

Included

The next step is to screen the articles for eligibility to ensure that all selected articles are relevant and suitable for review in the SLR. This process involves reading the titles and abstracts. If no decision can be made after reading the titles and abstracts, the analysis continues by reviewing the methodology, results, and discussion sections until a relevant decision is reached. During this process, 68 articles were excluded because the studies addressed only one of the variables—self-efficacy or high-order thinking skills (HOTS)—26 articles were excluded because they discussed self-efficacy and HOTS outside the context of mathematics, and 46 articles were excluded because the research subjects were not high school students. Consequently, at this stage, only 15 articles remained and were deemed suitable for analysis in the SLR.

Evaluation

In this step, the remaining articles were reviewed through the following stages: (1) grouping the articles based on their focus on high-order thinking skills or their indicators; (2) analyzing each article to assess the completeness of the data presented, such as research design, sample size, instruments used, and reported statistical results; (3) the researcher conducts an analysis by comparing the findings in the discussion section of each article to identify similarities and differences in the research results; (4) the researcher synthesizes the findings by summarizing the main results of each article, then tabulating them in a table that lists the author, year of publication, title, and research results; (5) organizing the data into a descriptive synthesis to ensure accurate results for this study.

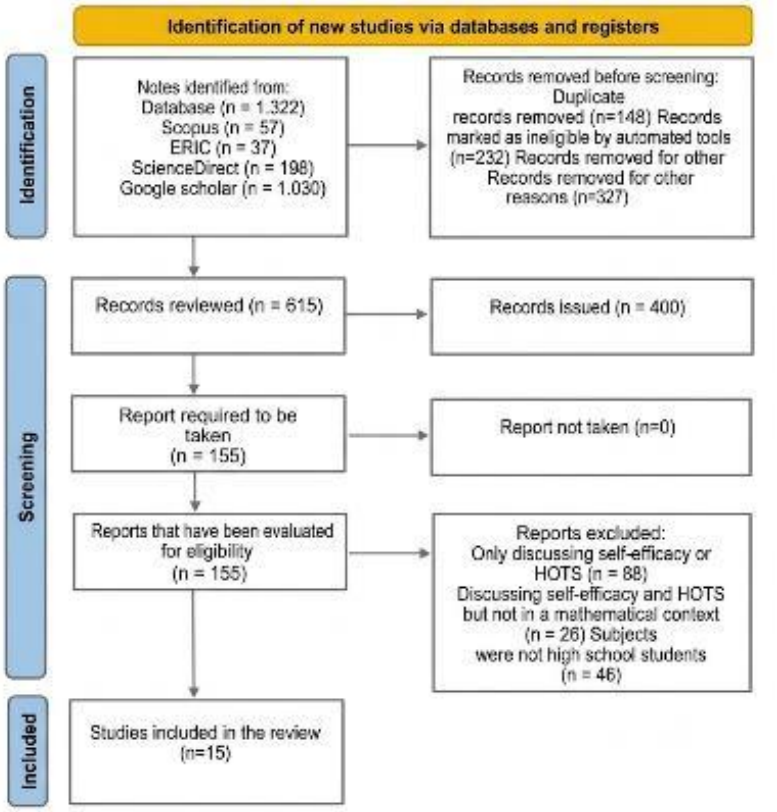

Figure 1. SLR Diagram

The figure illustrates the article selection process in accordance with the PRISMA 2020 guidelines. During the identification stage, a total of 1,322 articles were retrieved from the Scopus, ERIC, ScienceDirect, and Google Scholar databases. All retrieved articles were then managed in Mendeley to facilitate data organization and identify duplicate articles. Next, duplicate articles and those not relevant to the research topic were removed, bringing the total to 615. During the screening stage, the titles and abstracts of the articles were reviewed to determine their relevance to the research focus. The screening phase yielded 155 articles suitable for further review. Through evaluation based on inclusion and exclusion criteria, 15 articles were deemed eligible and were subsequently used as data sources in the Systematic Literature Review (SLR) analysis.

RESULT AND DISCUSSION

The data analyzed in this literature review comprised articles published between 2020 and 2025 examining the relationship between self-efficacy and HOTS. The researcher classified a total of 15 articles covering several mathematical abilities that serve as indicators of HOTS, namely critical thinking, creative thinking, and problem-solving. The results of

the study are as follows:

Table 2. Self-Efficacy Regarding High-Order Thinking Skills (HOTS)

No	Author's Name and Year of Publication	Title	Result
1.	Sarah *et al*., (2023)	Analisis Kesalahan Siswa Dalam Menyelesaikan Soal *High Order Thinking Skills* ditinjau Dari *Self efficacy*	Students with high self-efficacy generally make transformation errors and errors during the problem-solving stage. Students with moderate or even low self-efficacy generally make mistakes in identifying problems, choose the wrong problem-solving steps, and make errors in writing down the final answers.
2.	Sya'banningrum *et al*., (2025)	*Mathematical Reasoning of Junior High School Students in Solving HOTS Problems in Terms of Self-Efficacy*	Self-efficacy shows a significant correlation with mathematical reasoning ability in the context of solving HOTS problems.
3.	Purwasih *et al*., (2020)	*Self-efficacy* Terhadap Kemampuan *High Order Thinking Mathematics* Siswa Melalui Pembelajaran Berbantuan *Softwere* Geogebra	Students with high self-confidence tend to be persistent and motivated when solving problems, which encourages them to think more deeply. Through the use of Geogebra-based worksheets, students' reasoning skills are effectively stimulated as they work on assignments, enabling them to arrive at the correct answers.
4.	Sari, (2024)	Pengaruh Model *Problem Based Learning* (PBL) dan *Self-efficacy* Terhadap *High Order Thinking Skill* (HOTS) Matematika Siswa	There was no significant difference in average HOTS scores based on students' self-efficacy levels regarding the use of the Problem-Based Learning (PBL) approach. However, assessment results showed that students with high self-efficacy levels were able to achieve high HOTS test scores, and vice versa.

Based on the four studies in Table 2, self-efficacy plays an important role in supporting students' high-order thinking skills (HOTS) in mathematics. Most studies (Purwasih et al., 2020; Sari, 2024; Sya'banningrum et al., 2025) indicate that students with high self-efficacy demonstrate better reasoning skills, are more motivated when solving problems, and achieve superior performance on HOTS compared to students with low self-efficacy. Belief in their own competence makes them more persistent in tackling complex problems and less likely to give up when encountering difficulties. However, high self-efficacy does not always guarantee that students will avoid mistakes. Some students with high self-efficacy still make errors during the stages of problem conversion and the determination of problem-solving steps (Sarah et al., 2023).

Regarding the implementation of the Problem-Based Learning (PBL) teaching strategy, the results indicate that it does not affect students' self-confidence in their HOTS abilities. Nevertheless, students with high self-efficacy still achieve higher HOTS results than those with low self-efficacy. This suggests that students' performance in solving HOTS

problems is more strongly influenced by their belief in their own competence than by the use of a specific learning model. Overall, the reviewed research findings indicate that higher self-efficacy correlates with better mathematics HOTS abilities. Meanwhile, learning models such as PBL can help develop high-order thinking skills, but their effectiveness is maximized when students possess strong self-efficacy.

Table 3. Self-Efficacy and Mathematical Critical Thinking Skills

No	Author's Name and Year of Publication	Title	Result
1.	Sukmawati *et al.*, (2025)	Kemampuan Berpikir Kritis Matematis Siswa Berdasarkan Efikasi Diri Pada Materi Bangun Ruang Sisi Datar	The role of self-efficacy in students' mathematical critical thinking skills is classified into three categories: high, moderate, and low. Students with high self-efficacy demonstrate optimal mathematical critical thinking skills, as they meet all the specified criteria. Meanwhile, students with moderate self-efficacy also demonstrate relatively high ability. On the other hand, students with low self-efficacy tend to have very low critical thinking skills.
2.	Prajono *et al.*, (2022)	Analisis Kemampuan Berpikir Kritis Matematis Peserta Didik SMP Ditinjau dari *Self Efficacy*	There is a correlation between mathematical thinking skills and self-efficacy. Students with high self-efficacy demonstrate superior mathematical critical reasoning, including the ability to analyze, identify problems, connect concepts, solve problems, and evaluate. Meanwhile, students at the moderate level possess relatively similar abilities but are still less precise in the problem-solving process. As for those at the low level, their mathematical critical thinking abilities are also among the lowest because they are generally only capable of analyzing; although they perform all the indicators, their results are not yet accurate.
3.	Yuliana & Miatun, (2023)	Analisis Kemampuan Berpikir Kritis Matematis Siswa Berdasarkan *Self efficacy* dan Gender	Self-efficacy plays an important role in mathematical critical thinking. Male students with high levels of self-efficacy are able to interpret, analyze, evaluate, and draw conclusions. Meanwhile, at the moderate level, only one criterion is met. As for female students, whether at the high or moderate level, they have not yet been able to meet all the TKBK indicators.
4.	Hidayat & Noer (2021)	Analisis Kemampuan Berpikir Kritis Matematis ditinjau Dari *Self efficacy* Siswa Dalam Pembelajaran Daring	Low self-confidence among students leads to poor mathematical critical thinking skills. Conversely, high self-confidence encourages students to demonstrate their critical thinking abilities more effectively by solving problems carefully.

Based on the research findings, self-efficacy is positively related to students' mathematical critical thinking skills. All studies listed in Table 3 (Hidayat & Noer, 2021; Prajono et al., 2022; Sukmawati et al., 2025) indicate that students with high self-efficacy

demonstrate superior critical thinking skills compared to those in the moderate and low categories. With high self-efficacy, students are able to meet more critical-thinking indicators, such as analyzing problems, connecting concepts, evaluating solutions, and drawing accurate conclusions. In contrast, students in the low category generally struggle to solve problems accurately, evaluate answers, and draw conclusions based on available information. Meanwhile, students in the moderate category demonstrate fairly good skills, although inaccuracies remain in their problem-solving steps.

In addition to identifying a positive correlation between self-efficacy and mathematical critical thinking, the study Yuliana & Miatun (2023) indicates that other factors, such as gender and learning conditions, also influence student achievement. Nevertheless, findings from all studies generally indicate that self-efficacy is an important internal factor in supporting mathematical critical thinking. An increase in students' self-efficacy is associated with improved ability to solve mathematical problems critically.

Table 4. Self-Efficacy and Creative Thinking Skills

No	Author's Name and Year of Publication	Title	Result
1.	Levinta *et al*., (2024)	Pengaruh *Self-efficacy* Terhadap Kemampuan Berpikir Kreatif Matematis Siswa Dalam Pembelajaran Saintifik	Self-efficacy influences students' creative thinking skills. Students in the moderate-to-high category generally have fairly optimal self-efficacy scores. Students' level of self-confidence serves as the foundation for sparking their curiosity, encouraging independence, and fostering dedication to independent learning activities.
2.	Putri & Awalludin, (2024)	Analisis Kemampuan Berpikir Kreatif Matematis ditinjau dari *Self efficacy* dalam Menyelesaikan Soal Berbasis Literasi dan Numerasi	Students with high or moderate self-efficacy can meet the established criteria, including fluency, elaboration, and originality. They find it easier to complete test questions because they are confident that when faced with difficulties, they will be able to handle them well. On the other hand, students in the low self-efficacy category are only able to meet the fluency criterion and find it difficult to complete the questions because they consider them too difficult.
3.	Antika & Rahaju, (2024)	Tingkat Kemampuan Berpikir Kreatif Siswa SMP dalam Menyelesaikan *Mathematical Modelling Problem* Ditinjau dari *Self Efficacy*	The findings of this study show that students with high self-efficacy achieved an innovative level of 4 (satisfactory), while those with moderate self-efficacy were at level 3 (good) and those with low self-efficacy were at level 2 (adequate).
4.	Astuti *et al*., (2022)	Profil Kemampuan Berpikir Kreatif Matematis Siswa SMP Dalam Menyelesaikan Permasalahan Matematika Ditinjau dari *Self-Efficacy*	Self-efficacy influences creative mathematical thinking. A high perception of one's own abilities boosts students' confidence when solving problems, enabling them to arrive at accurate

No	Author's Name and Year of Publication	Title	Result
			answers. Conversely, a low perception of one's own abilities causes students to lack confidence when faced with difficult problems and makes them more likely to give up during the problem-solving process.

Based on the analysis of the research findings above, self-efficacy supports the improvement of students' mathematical creative thinking skills. In general, all studies show a consistent pattern: students with high self-efficacy tend to have superior creative thinking skills compared to those with moderate or low self-efficacy. This is reflected in students' ability to generate a wider variety of mathematical ideas and to solve problems more independently with accurate solutions (Astuti et al., 2022; Levinta et al., 2024).

Students with high self-efficacy generally meet the criteria for creative thinking. They are also more confident when facing difficulties, making them more persistent in finding various problem-solving strategies. Conversely, low self-confidence hinders the development of ideas and leads to giving up easily when faced with difficult problems (Putri & Awalludin, 2024). Additionally, research (Antika & Rahaju, 2024) indicates differences in levels of creative thinking ability across categories. Students with high self-efficacy demonstrate a higher level of creativity than those in the moderate and low categories. These findings indicate that belief in one's own abilities not only influences success in solving problems but also plays a role in fostering the emergence of creative ideas in mathematics learning. Thus, it can be concluded that self-efficacy is an internal factor that positively contributes to mathematical creative thinking skills; the higher a student's self-efficacy, the more optimal their demonstrated creative thinking competencies will be.

Table 5. Self-Efficacy and Mathematical Problem-Solving Ability

No	Author's Name and Year of Publication	Title	Result
1.	Imaroh *et al.*, (2021)	Analisis Kemampuan Pemecahan Masalah Matematika Ditinjau Dari *Self-Efficacy* Siswa Pada Materi Sistem Persamaan Linear Tiga Variabel	There are differences in problem-solving skills, evident from the stage of understanding the problem through to reviewing the answer. Students with high self-efficacy are able to successfully navigate each stage identifying the problem, planning, solving it, and checking the results with ease. In contrast, students with low self-efficacy struggle to understand the problem, select the appropriate formula, and fail to review their answers.

No	Author's Name and Year of Publication	Title	Result
2.	Firmanti *et al*., (2021)	Hubungan Kemampuan Pemecahan Masalah dengan Efikasi Diri Siswa SMAN 1 Banuhampu	There is a correlation between students' problem-solving ability and their level of self-efficacy; however, this correlation is so weak that it can be disregarded and is considered to indicate no meaningful relationship between the two. Although the research results show that students' self-efficacy is at a moderate level.
3.	Rahmawati *et al*., (2021)	Analisis Kemampuan Pemecahan Masalah Matematis Ditinjau dari Tingkat *Self-Efficacy*	Self-efficacy influences problem-solving skills. A high level of self-efficacy among students contributes to strong performance because all criteria can be met—from understanding the problem, formulating a solution strategy, and resolving the problem, to reviewing the answers. Conversely, students with moderate or even low self-efficacy fall into the adequate-to-low problem-solving proficiency category, where they are only able to meet some of the indicators, particularly in carrying out solutions according to plan.

Based on these three studies, self-efficacy is an aspect that is associated with mathematical problem-solving skills. Studies by Imaroh et al. (2021) and Rahmawati et al. (2021) indicate that students with high self-efficacy can identify problems, plan solution steps, implement the solution, and evaluate their answers. Conversely, students with moderate and low self-efficacy face difficulties in understanding the problems and determining solutions to them. However, Firmanti et al. (2021) noted that the correlation between self-efficacy and mathematical problem-solving skills is very weak, indicating no significant relationship. Overall, the study's results indicate that individuals with high self-efficacy tend to demonstrate greater competence in solving problems optimally than those with low self-efficacy. In other words, students' confidence in their abilities can support their success in solving mathematical problems.

The results of the study show that self-efficacy influences the High Order Thinking Skills of high school students enrolled in mathematics classes. This statement is supported by prior empirical findings indicating that self-efficacy positively affects all HOTS indicators, including critical thinking, creative thinking, and problem-solving (Wulandari et al., 2023). Higher levels of students' self-efficacy are associated with improved cognitive abilities. This is because individuals with strong self-confidence are better prepared to face challenges, understand the goals and benefits of devising solutions, and effectively address problems

that arise (Prismana et al., 2018). In contrast, students with low self-confidence tend to lack self-assurance and give up easily. They constantly struggle to understand problems, determine problem-solving strategies, experience anxiety while studying, and even view problems as a burden in life. All of these factors affect students' cognitive thinking abilities.

In addition to showing a positive correlation between self-efficacy and high-level mathematical competence, the findings indicate that other factors, such as gender and the instructional model used, also influence student achievement. This is evident in a study Ulya & Yullah (2026), which found that students' critical thinking skills differ by gender even when they have the same level of self-efficacy. Similar findings were also reported by Sugiarti et al. (2023), who identified differences in mathematical critical thinking skills between male and female students. This suggests that individual characteristics can influence how self-efficacy contributes to the development of high-order thinking skills. On the other hand, learning factors also play a role in optimizing self-efficacy regarding students' mathematical abilities. For example, the use of Geogebra-assisted learning helps students understand concepts and stimulates their cognitive abilities (Purwasih et al., 2020). Consequently, this encourages students to explore mathematical concepts more actively, thereby developing their high-order thinking skills (HOTS).

Meanwhile, Islami et al. (2023) found that although the relationship between the learning model and self-efficacy was not significant, students with high self-efficacy still achieved optimal HOTS performance compared to those with low self-efficacy. These findings indicate that the right learning model can facilitate the development of high-order cognitive skills while strengthening students' confidence in their own abilities. This reaffirms that students' self-efficacy can be developed through effective teaching approaches that bolster personal self-confidence, thereby stimulating improvements in thinking skills, particularly at higher levels. However, while numerous studies have shown a significant influence of self-efficacy on HOTS, research by Firmanti et al. (2021) actually found no effect on problem-solving indicators within the HOTS context, even though students' self-efficacy levels were relatively high.

These differing results stem from both external and internal factors at play during the learning process. Curriculum content, instructional strategies, and students' individual characteristics all influence these variations in outcomes. If the teaching methods employed do not support students' self-efficacy, they will negatively affect students' cognitive abilities. Therefore, efforts to enhance students' HOTS must be comprehensive, taking into account

both psychological factors and a supportive learning environment. Active, collaborative, and student-centered learning approaches can serve as alternatives for enhancing self-efficacy while simultaneously developing higher-order mathematical cognitive abilities. Linking the findings of this study with previous research reinforces the conclusion that self-efficacy is an internal factor influencing students' high-order thinking skills. This research approach expands the potential for strengthening students' self-confidence in mathematics learning by implementing several teaching strategies that support its reinforcement and development to aid in the improvement of thinking skills.

CONCLUSION AND RECOMMENDATION

A review of the literature on the relationship between self-efficacy and high-order mathematical thinking skills has concluded that self-efficacy significantly influences students' high-order thinking skills in mathematics learning. This positive influence is evident in every aspect of HOTS, including critical and creative thinking, as well as problem-solving. Students with high levels of self-efficacy demonstrate superior thinking performance, whereas those with low levels tend to struggle with these cognitive abilities. However, one study found no significant correlation between self-efficacy and problem-solving proficiency. These differing results stem from teaching strategies that do not support students' ability to understand mathematical material or foster their self-confidence, as well as from individual differences among students. The recommendation for teachers is to support the strengthening of students' self-efficacy by using effective learning strategies or models that promote self-efficacy, thereby enhancing students' high-order cognitive abilities, particularly in mathematics education.

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