Condition Analysis of Mathematical Critical Thinking Ability in View of Self-Efficacy Condition of Grade V Students of SDN 2 Pakemitan

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Abstract.

Mathematical critical thinking ability is one of the important skills in facing the challenges of the 21st century, especially in the field of mathematics. This study aims to analyze students' mathematical critical thinking ability based on self-efficacy level. The method used is descriptive qualitative with instruments in the form of mathematical critical thinking ability test and self-efficacy questionnaire. The research subjects were fifth grade students of SDN 2 Pakemitan. The results showed that students with high self-efficacy tend to have better mathematical critical thinking skills than students with low self-efficacy. This study concluded that self-efficacy plays an important role in the development of mathematical critical thinking skills. The implication is that a learning approach is needed that can increase students' confidence in completing mathematical tasks to support the development of critical thinking skills.

Keywords: mathematical critical thinking ability, self-efficacy, grade V primary school students**.**

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INTRODUCTION

The world of education is currently undergoing a significant transformation triggered by the rapid development of technology and digitalization. This change has a major impact on the way learning is done, by demanding that students not only master academic knowledge, but also develop other skills that are relevant to the demands of the times. According to Anugerahwati (2019), 21st century learning requires students to have a wider range of competencies, such as critical thinking, creativity, communication, cultural understanding, collaboration and connectivity. These competencies are expected to equip students to face challenges in an increasingly complex and digitally connected world. In this context, the role of teachers becomes crucial, as they are not only responsible for delivering subject matter, but also for guiding students in developing these skills so that they can be applied positively in everyday life, both in academic and social contexts.

However, while technology provides many benefits in improving access and quality of education, its inappropriate use can bring negative impacts. Research by Widodo et al. (2022) shows that the intensity of technology use, especially mobile devices, has made students accustomed to looking for answers instantly from the internet when faced with school assignments. This habit leads to a high dependence on information that is available quickly and easily, without going through a deep thinking process. As a result, students tend to ignore the importance of analyzing, evaluating, and synthesizing information, which are core skills in critical thinking. This of course has the potential to hinder the development of students' critical

thinking skills, as they are no longer trained to formulate their own arguments or explore various perspectives in dealing with a problem.

In this case, the influence of technology on learning cannot be ignored, but it needs to be balanced with more structured efforts to encourage students not only to become consumers of information, but also to become producers who can think, assess and filter information critically. Therefore, it is important for educators to create a learning environment that not only utilizes technology, but also teaches students to think critically and creatively in processing the information they obtain.As a result, dependence on technology causes students' critical thinking skills to be underdeveloped. At school, when internet use is restricted, students find it difficult and lack confidence when working on problems. This shows that dependence on technology can hinder the development of critical thinking skills, which are essential in 21st century learning. Critical thinking skills are the ability to evaluate a statement in depth. According to Chukwuyenum (2013), this skill enables individuals to make decisions based on rational reasoning-filtering concepts based on logical evidence and empirical observations, so as to draw appropriate conclusions.

The understanding of critical thinking has been explained theoretically and practically by several experts, summarized by Rahardhian (2022). One figure, John Dewey in 1910 defines critical thinking as a process of continuous reflection that involves evaluating ideas and beliefs, along with the reasons that support them. Halpren added that critical thinking is directed and focused thinking, aimed at making decisions and solving problems effectively. Meanwhile, Ennis suggests that critical thinking is the ability to evaluate ideas appropriately in relation to what one believes and does. Facione, on the other hand, defines critical thinking as the ability to discuss and evaluate information objectively.

Through learning critical thinking, students can explore and understand the scientific thinking process, conduct in-depth analysis with an active and reflective approach, and follow systematic methods to find new solutions. They also learn to formulate evidence-based arguments and rational reasons, and make fair decisions by considering various related aspects (Yaumi & Ibrahim, 2016). Thus, students are invited not to simply receive information, but to evaluate, criticize, and consider various relevant factors in the problem-solving process. In addition, they are also equipped with the ability to follow systematic methods in finding new solutions, which require structured and evidence-based steps.

In this process, students not only learn to formulate valid data-based arguments, but also to construct rational reasons that can be accounted for. They are trained to make fair and objective decisions by considering various perspectives and possible impacts. Critical thinking learning also provides space for students to develop a healthy skepticism, which is the ability

to question existing claims and not take for granted information provided without adequate evidence. This ability is essential in helping students deal with the complexity of the modern world full of often unverified information, as well as in developing their capacity to think independently and creatively in the face of life's challenges (Facione, 2015). Thus, learning critical thinking does not only focus on mastering the material, but also on building characters who are able to make good, fair and evidence-based decisions.

Students who have good critical thinking skills show high curiosity and access information systematically and logically (Facione, 2011). This ability is required in all subjects, including mathematics. According to Sari et al. (2018), critical thinking is one of the main objectives in learning mathematics and does not arise spontaneously, but is developed through the educational process, especially in the context of learning mathematics at school. Critical thinking in mathematics is known as mathematical critical thinking. This ability is very important to develop in students, but the reality in the field shows that its achievement still requires further improvement and improvement.

However, students' mathematical critical thinking skills need to be improved and need further attention because the condition is not optimal, this is indicated by the fact that the PISA 2022 results show that Indonesian students' mathematics scores have decreased, with an average score of 366, which places Indonesia in 70th place out of 81 participating countries. This is a decrease of 13 points compared to the previous PISA results in 2018, where Indonesia scored 379 (Factsheets, 2023). This fact shows that the condition of Indonesian students' critical thinking skills needs to be followed up. Setiana, et al. (2019) suggested that one of the factors causing the low ability to solve students' mathematical problems is the low critical thinking skills of students.

This phenomenon is influenced by various factors. Although research on the factors that influence students' critical thinking skills, especially in mathematics, is still limited, there are several studies that discuss related factors, including self-efficacy as one of the important components (Sukma & Priatna, 2021). This is also reinforced by research by Widodo et al. (2022), which shows that the development of critical thinking skills in primary level students requires stimulation to build their self-efficacy.

The purpose of stimulating self-confidence is to give students confidence in their abilities so that they feel confident in completing tasks, overcoming problems, and creating solutions. This is in accordance with the results of interviews with several students related to their experiences in dealing with math problems, they expressed the initial assumption that math is a complicated subject. Some students also stated that they often feel anxious and panic when

faced with math material. In addition, their lack of confidence in their ability to complete the task is also an influencing factor.

Self-efficacy is an individual's perception of his or her ability to achieve desired outcomes and performance (Bandura, 1997). It includes the belief that one is able to think, evaluate and correct mistakes without fear of failure. In the context of education, self-efficacy plays an important role: students with high self-efficacy tend to be more motivated to achieve learning goals and more resistant to challenges. High levels of self-efficacy are highly influential on academic performance (Bandura, 1997); individuals with high self-efficacy believe that they have control over the changes around them, while individuals with low self-efficacy feel less able to control the situation around them. Self-concept formation is influenced by reinforcement and judgment from others who have important relevance to the individual (Zagoto, 2019).

Self-efficacy plays an important role in the academic context. The higher the level of self-efficacy, the greater the influence on academic performance (Bandura, 1997). A person with high self-efficacy believes that the individual is capable of doing something to change the events around him/her, whereas a person with low self-efficacy believes that he/she is basically incapable of doing everything around him/her. In difficult situations, people with low self-efficacy tend to give up easily. In contrast, people with high self-efficacy will try harder to overcome the challenges they face.

Mathematical critical thinking ability is one of the important skills in facing the challenges of the 21st century, especially in the field of mathematics. This study aims to answer the questions: How is the relationship between self-efficacy and students' mathematical critical thinking ability? The method used is descriptive qualitative with instruments in the form of mathematical critical thinking ability test and self-efficacy questionnaire. The research subjects were fifth grade students of SDN 2 Pakemitan. The results showed that students with high self-efficacy tend to have better mathematical critical thinking skills than students with low self-efficacy. This study concluded that self-efficacy plays an important role in the development of mathematical critical thinking skills. The implication is that a learning approach is needed that can increase students' confidence in completing mathematical tasks to support the development of critical thinking skills.

METHODOLOGY

In its implementation, this research uses a descriptive qualitative approach which aims to describe objective conditions based on the data collected without any manipulation or experimentation. This approach allows researchers to get a more in-depth picture of the phenomenon being studied. The instruments used in this study consisted of tests and non-

tests. The non-test instrument is a questionnaire specifically designed to measure the level of self-efficacy or self-efficacy of students in the context of mathematics learning. The questionnaire included 18 statements consisting of positive and negative statements designed to cover various aspects of students' self-efficacy.

The statements in the questionnaire were evaluated based on the three main dimensions underlying the concept of self-efficacy, namely: **magnitude** (perceived strength), which measures how much students feel capable of overcoming different levels of difficulty in learning; **strength** (intensity of belief), which measures the extent to which students believe in their ability to face academic challenges; and **generality** (scope of belief), which assesses the extent to which students' self-beliefs in one situation can be applied to various other situations or contexts in their academic lives.

In order to provide a more detailed and comprehensive assessment of students' self-efficacy levels, the researcher used a Likert scale that allows assessment in the form of a numerical scale, which facilitates data analysis related to students' self-efficacy in dealing with various learning situations. The use of Likert scales facilitates a deeper understanding of how students assess their own abilities, as well as providing an overview of the factors that influence students' overall self-efficacy levels.

Table 1. Self-efficacy questionnaire score scale

Answer	Value Weight	
	Positive	Negative
SS (Strongly Agree)	4	1
S (Agree)	3	2
TS (Disagree)	2	3
STS (Strongly Disagree)	1	4

To assess critical thinking skills, this research uses test instruments that are relevant to the cognitive domain in learning. Therefore, to measure students' mathematical critical thinking skills, an instrument in the form of an essay test is needed. This test was designed to provide an overview of students' critical thinking skills directly. In its implementation, researchers distributed test sheets to students containing five essay questions that focused on previously learned mathematics material. The preparation of this question is based on critical thinking indicators, namely: 1) provide diverse basic explanations, 2) apply certain tactics and

strategies, 3) develop explanations in more detail, and 4) conclude findings. Through the results of this test, researchers can identify the level of students' critical thinking skills. Student answer scores are given based on their achievements on each of these critical thinking ability indicators.

RESULTS AND DISCUSSION

The purpose of this study is to analyze mathematical critical thinking skills when viewed from self-efficacy during learning. In this study, the categories of mathematical critical thinking and self-efficacy are divided into three categories, namely high, medium and low. The results of the self-efficacy questionnaire and the students' critical thinking skills test can be seen in the following table:

Table 2 Mathematical Critical Thinking Ability Test Data and Self-Efficacy Questionnaire

Respondent number	Mathematical critical thinking ability	*Self-Efficacy*
1	35	59
2	52	72
3	44	53
4	48	40
5	41	61
6	22	61
7	60	63
8	53	62
9	53	62
10	46	68
11	58	66
12	60	55
13	66	59

14	31	62
15	47	58
16	43	50
17	47	61
18	66	69
19	30	66
20	68	65
21	42	54
22	58	59
23	52	64
24	61	66
25	62	59
26	58	67
27	52	57
28	10	53
29	62	69
30	67	73
31	38	63
32	30	59
33	64	59
34	10	53
35	43	54
36	66	50

Table 2 above is the result of filling out the questionnaire instrument and test instrument that has been answered by students. This shows that there is a significant variation in the level of mathematical critical thinking ability of elementary school students who are the subject of the study. These mathematical critical thinking ability scores reflect how students are able to analyze, evaluate, and solve problems mathematically. Students with high scores tend to have better critical thinking skills, which allow them to solve problems more analytically and logically.

Mathematics is a subject that requires critical thinking, problem-solving skills, and the ability to evaluate and analyze situations logically. In the context of education, particularly at the elementary school level, the development of students' mathematical critical thinking abilities is fundamental for their academic growth. A key factor that influences a student's mathematical critical thinking ability is their self-efficacy, or belief in their own ability to succeed in specific tasks. This article aims to analyze the condition of mathematical critical thinking abilities of fifth-grade students at SDN 2 Pakemitan, taking into account their self-efficacy levels. By examining the relationship between these two aspects, this study aims to provide insights into how students' self-efficacy influences their ability to think critically and solve mathematical problems.

The critical thinking ability in mathematics involves the ability to approach and solve mathematical problems using systematic and logical methods. Students with high critical thinking abilities can analyze and evaluate problems more effectively, leading to better problem-solving outcomes. In the study conducted at SDN 2 Pakemitan, it was found that there is a significant variation in the critical thinking abilities of the fifth-grade students, as reflected in their test scores. The results from the instruments used show that students exhibit different levels of ability, ranging from high to low. Students with high scores demonstrate the ability to solve problems in an analytical and logical manner, while those with lower scores struggle with analyzing and evaluating mathematical problems.

Self-efficacy, as defined by Bandura (1997), refers to an individual's belief in their ability to perform tasks and overcome challenges. In the context of mathematics, self-efficacy influences how students approach and solve mathematical problems. The study found a correlation between high self-efficacy and better mathematical critical thinking abilities. Students with higher self-efficacy are more confident in their ability to tackle challenging problems and are more likely to engage in critical thinking processes, such as evaluating different strategies and analyzing various approaches to solving a problem. Conversely, students with lower self-efficacy often view challenges as obstacles and may become discouraged, leading to a decrease in their willingness to engage with mathematical tasks.

Students who exhibit high mathematical critical thinking abilities are able to demonstrate a clear understanding of mathematical concepts and approaches to solving problems. According to Delina (2021), these students have a solid grasp of the fundamental steps required to solve mathematical problems but are also capable of selecting the most effective strategy based on the specific nature of the problem at hand. High-achieving students can analyze complex problems, evaluate different approaches, and select the most efficient methods to reach a solution. They are often more persistent and resilient when faced with difficult problems, using their critical thinking skills to find solutions.

Students with high self-efficacy tend to exhibit behaviors that reflect their confidence in their abilities. They are more likely to seek out challenges, view mistakes as learning opportunities, and use problem-solving strategies that help them overcome obstacles. Research by Taha et al. (2022) supports the idea that students with high critical thinking abilities in mathematics are often able to think analytically, solve problems logically, and engage with new mathematical concepts more effectively. These students are also more likely to succeed academically, as their confidence allows them to approach learning tasks with a positive and proactive attitude.

On the other hand, students with low mathematical critical thinking abilities face several challenges in the learning process. According to the findings of Delina (2021), while some students may answer questions correctly, they often struggle to solve problems comprehensively and effectively. This may indicate that while they understand the basic steps of solving a problem, they lack the ability to choose the right approach or organize their problem-solving strategies in a systematic way. Students with low critical thinking abilities may also struggle to analyze and evaluate mathematical problems in a deeper way, which affects their overall performance.

Students with low self-efficacy, in particular, may find it difficult to engage with mathematical problems. According to Fergina (2022), students with low self-efficacy tend to perceive challenges as insurmountable obstacles, leading them to withdraw from the learning process. They may lack the motivation to persist through difficult tasks, and this often results in poor performance. These students may also have lower levels of confidence, which reinforces the negative cycle of low self-efficacy. When students lack the belief in their own abilities, they are less likely to engage in critical thinking or employ effective problem-solving strategies. As a result, their mathematical performance suffers.

Research has shown that self-efficacy plays a critical role in enhancing students' ability to think critically in mathematics. Students with high self-efficacy are more likely to approach mathematical problems with confidence, systematically evaluate different solutions, and select the most effective strategies to solve them. According to Lidiawati and Aurelia (2023), students

with high self-efficacy are better able to adapt to the rapid advancements in knowledge and technology, as they possess the ability to think critically and solve problems in a logical and structured manner. These students are more likely to achieve academic success, as their self-confidence allows them to face challenges head-on and persist through difficulties.

Self-efficacy influences students' approach to problem-solving, which in turn affects their critical thinking abilities. When students believe in their own capacity to succeed, they are more likely to engage in the learning process actively, using their critical thinking skills to analyze problems and find solutions. The study at SDN 2 Pakemitan found that students with high self-efficacy also demonstrated higher levels of critical thinking in mathematics, as they were more willing to explore complex problems and find solutions that required deep analysis and evaluation.

The findings of this study have important implications for teaching and learning in the classroom. It is clear that self-efficacy plays a crucial role in enhancing students' critical thinking abilities in mathematics. Therefore, educators should prioritize fostering self-efficacy among their students to help them improve their mathematical critical thinking skills. This can be achieved by providing positive reinforcement, recognizing students' efforts and achievements, and offering support when they encounter challenges. Encouraging a growth mindset, where students view learning as a continuous process and believe in their ability to improve, can also help increase self-efficacy.

Furthermore, teachers can incorporate active learning strategies that engage students in problem-solving tasks, allowing them to apply critical thinking in real-world contexts. Providing opportunities for collaborative learning and peer discussions can also help students build confidence in their abilities and improve their problem-solving skills. By creating a supportive and encouraging learning environment, educators can help students develop the self-efficacy needed to succeed in mathematics and enhance their critical thinking abilities

Based on the results of the research discussed, it can be concluded that there is a positive relationship between self-efficacy and students' mathematical critical thinking skills. The contribution of self-efficacy to mathematical critical thinking ability is quite significant, as found in the research of Nuraeni et al. (2019), which shows that high-order-thinking aspects have the greatest influence on critical thinking ability, while laboratory usage has the least influence. In addition, Misbahudin's research (2019) revealed that self-efficacy has a strong correlation with mathematical critical thinking skills, although the contribution is partial, which is 19.89%, while the remaining 80.11% is influenced by other factors.

Bandura's social-cognitive theory reinforces these findings by stating that self-efficacy influences the way individuals think, feel and act, so students with high self-efficacy are more likely to engage in critical thinking because they have confidence in solving complex mathematical problems. This result is also supported by Yanuari's research (2021) which analyzes the relationship between self-efficacy and critical thinking through three main aspects, namely level, strength, and generalization. Students with high self-efficacy are more confident in facing challenging problems, more creative in finding solutions, and able to apply their knowledge in various situations.

Furthermore, Sukmawati research (2021) shows that there is a significant relationship between self-efficacy and mathematical critical thinking ability on circle material. In addition, Salea & Soetjiningsih's research (2022) found that the higher the students' self-efficacy, the higher the average score of their mathematical critical thinking ability. Students with high self-efficacy had an average score of 74.70, while students with moderate and low self-efficacy had an average score of 46.26 and 19.55 respectively.

In conclusion, this study highlights the significant relationship between self-efficacy and mathematical critical thinking ability in fifth-grade students at SDN 2 Pakemitan. Students with high self-efficacy tend to exhibit better critical thinking skills in mathematics, which enables them to analyze, evaluate, and solve problems more effectively. Conversely, students with low self-efficacy face challenges in engaging with mathematical problems and often lack the motivation to persist through difficulties. Therefore, it is essential for educators to focus on building students' self-efficacy to help them develop their critical thinking abilities in mathematics.

To improve students' mathematical critical thinking abilities, teachers should incorporate strategies that build students' confidence and provide opportunities for active engagement with mathematical tasks. By doing so, educators can help students not only enhance their problem-solving skills but also prepare them to face the challenges of an increasingly complex and rapidly changing world.

CONCLUSION

Based on the results of this study, it can be concluded that there is a significant relationship between mathematical critical thinking ability and students' self-efficacy level. Students with high self-efficacy tend to have better critical thinking skills, which enable them to analyze and solve mathematical problems more effectively. Strong self-efficacy gives students the confidence to face academic challenges, which in turn encourages them to be more active and motivated in learning and not easily give up when facing difficulties.

On the other hand, students with low self-efficacy often show limitations in critical thinking, view difficulties as obstacles, and tend to avoid challenges. This reinforces the importance of support from the learning environment, such as support from teachers and the use of educational resources, to help them develop self-efficacy and critical thinking skills.

This research also shows that increasing students' self-efficacy has great potential in supporting academic success, as well as their readiness to face future challenges. By emphasizing the importance of self-efficacy in mathematics learning, teachers can help students improve their critical thinking skills.

REFERENCES

Anugerahwati, M. (2019). Integrating the 6Cs of the 21st Century Education into the English Lesson and the School Literacy Movement in Secondary Schools. KnE Social Sciences, 165-171.

Widodo, E. R., Budiarti, M., & Lestari, S. (2022). The Relationship between Academic Self-Efficacy and Critical Thinking Ability in Mathematics Learning of Grade V {SDN} 02 {Manisrejo} Students. Proceedings of Basic Scientific Conference, 3(0), 392-398. http://prosiding.unipma.ac.id/index.php/KID/article/view/2991

Chukwuyenum, A. N. (2013). impact of critical thinking on performance in mathematics among senior secondary school students in Lagos State. OSR Journal of Research & Method in education, 3 (5), 18-25.

Yaumi, M., & Ibrahim, N. (2016). Multiple Intelligences-Based Learning: Identifying and Developing Children's Second Multitalent. PRENADA MEDIA GROUP. https://core.ac.uk/download/pdf/227425684.pdf

Sari, T. A., Hidayat, S., & Harfian, B. A. A. (2018). Analysis of Critical Thinking Skills of Senior High School Students in Kalidoni and Ilir Timur Ii Districts. Biome: Scientific Journal of Biology, 7(2), 183-195. https://doi.org/10.26877/bioma.v7i2.2859

Facione, P. A. (2011). Critical Thinking: What It Is and Why It Counts. Insight Assessment, 1(1), 1-23.

Setiana, D. S., Santosa, R. H., Izzaty, R. E., & Herawan, T. (2019). Pengembangan Perangkat Pembelajaran Matematika untuk Menstimulasi Berpikir Kritis. Jurnal Internasional Sains dan Teknologi Maju, 129, 81-88. https://doi.org/10.33832/ijast.2019.129.08

Sukma, Y., & Priatna, N. (2021). The Effect of Self-Efficacy on Students' Critical Thinking Ability in Mathematics Subjects. Soulmath Scientific Journal: Journal of Mathematics

Education Education, 9(1), 75-88. https://doi.org/10.25139/smj.v9i1.3461

Bandura, A. (1997). Self-efficacy: {The} exercise of control. W H Freeman/Times Books/ Henry Holt & Co.

Zagoto, L. (2019). Self-efficacy in process. 2, 386-391.

Bandura, A. (1994). Self-efficacy. I: V. S. Ramachandran (red.), Encyclopedia of human behavior. Academic Press, 4, 71–81

Delina. (2021). Mathematical Critical Thinking Ability of Junior High School Students Through Realistic Mathematic Education Approach. Educatif Journal of Education Research, 2(3), 47-52. https://doi.org/10.36654/educatif.v2i3.178

Taha, I., Bakar, M. T., Nani, K. L., & Purwati. (2022). ANALYZING STUDENTS' MATHEMATICAL CRITICAL THINKING SKILLS IN SOLVING MATHEMATICAL PROBLEMS. Journal of Mathematics Education, 1(1), 25-35.

Lidiawati, K. R., & Aurelia, T. (2023). Critical thinking skills of students in Indonesia: Low or high. KPIN Bulletin, 9(02).

Hidayat, R., Wicaksono, L., & Fergina, A. (2022). Analysis of low academic self-efficacy in class IX students of Smp Negeri 21 Pontianak. Journal of Equatorial Education and Learning (JPPK), 11(12), 3227-3237.

Cahyono, H. P., Setiadi, P. B., & Rahayu, S. (2022). Analyzing of Self Esteem, Self Efficacy, and Learning Organization on Employee Performance at PT Bank Republik Indonesia Branch Jemursari Surabaya. Dynasty International Journal of Economics, Finance & Accounting, 3(3), 272-280.

Nuraeni, S. (2019). Self-efficacy relationship with critical thinking skills on chemical equilibrium material. In Repository.UINJKT (Vol. 8, Issue 5). Jakarta State Islamic University.

Yanuari, N. F. (2021). The Effect of Self-Efficacy on Mathematical Critical Thinking Ability of Junior High School Students [Universitas Pendidikan Indonesia]. http://repository.upi.edu/60684/

Sukmawati, R. (2018). The Relationship between Mathematical Literacy Ability and Critical Thinking of Students. Proceedings of SEMPOA (National Seminar, Props Exhibition, and Mathematics Olympiad), 4.

Salea, N., & Soetjiningsih, C. (2022). The Relationship between Self-efficacy and Critical Thinking in College Students. Undiksha Scientific Journal of Counseling Guidance, 13(2), 1-7