

The Effect of Self-Efficacy on Mathematical Critical Thinking of Special Needs Students

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ABSTRACT

Inclusive education provides equal learning opportunities for students with special needs; however, developing higher-order thinking skills, particularly critical thinking in mathematics, remains a challenge. Self-efficacy is considered an important psychological factor that can influence students' learning outcomes and critical thinking skills. However, previous studies have reported inconsistent findings regarding the relationship between self-efficacy and critical thinking in mathematics, especially among students with special needs in inclusive elementary schools. Therefore, this study aims to analyze the influence of self-efficacy on critical thinking skills in mathematics of fourth-grade students with special needs in inclusive elementary schools in the Pangeran Diponegoro Cluster, Purworejo Regency. This study used a quantitative survey research design. Participants were 22 fourth-grade students with special needs, selected through total sampling. Data were collected using a self-efficacy questionnaire and a critical thinking test in mathematics. The validity and reliability of the instruments were confirmed prior to data collection. Data were analyzed using descriptive statistics, the Shapiro–Wilk normality test, and the Spearman rank correlation test. The findings indicate that most students exhibit moderate levels of self-efficacy (77%), while their critical thinking skills in mathematics tend to be low (32%). Spearman Rank analysis showed a weak positive correlation between self-efficacy and critical thinking skills in mathematics ($r = 0.318$), but the relationship was not statistically significant ($p = 0.149$). This study concludes that self-efficacy does not significantly influence students with special needs' critical thinking skills in mathematics. Critical thinking skills in mathematics appear to be influenced by a range of cognitive, motivational, and environmental factors beyond self-efficacy alone. This study contributes to the literature on inclusive education by providing empirical evidence regarding the relationship between self-efficacy and critical thinking skills in mathematics among students with special needs. In practice, the findings suggest that teachers should collaborate to improve students' self-efficacy through instructional strategies that foster critical thinking, such as problem-based learning, differentiated instruction, and metacognitive approaches.

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1. INTRODUCTION

Education is the right of every citizen without exception, including students with special needs (PDBK). According to Ki Hajar Dewantara, education aims to guide children's growth and development toward the highest possible levels of safety and happiness. Furthermore, according to Law Number 20 of 2003 concerning the National Education System, education aims to develop students' potential to become faithful people, pious, with noble character, healthy, knowledgeable, capable, creative, independent, and democratic and responsible citizens. To provide equal educational opportunities for all children in regular schools, the government implements inclusive education [1]. Inclusive education enables children with special needs to learn alongside their peers without discrimination [2]. To ensure equitable access to education, inclusive education takes into account the diversity of all students, including those with special needs [3].

Students with special needs in inclusive schools learn alongside peers who develop typically in regular classes. In this context, teachers are required to design learning experiences that develop students' competencies, including in mathematics. Mathematics is an important subject because it helps students develop analytical, logical, systematic, and critical thinking skills. Mathematics is a crucial tool in developing students' thinking skills [4]. Furthermore, mathematics impacts various aspects of a person's life, both in education and daily life [5]. In the modern era, students are also required to possess 21st-century skills, such as critical, creative, collaborative, and communicative thinking [6].

Despite this, students' critical thinking skills in mathematics in Indonesia remain relatively low. Indonesia ranked 72nd out of 78 countries, with an average mathematics score of 350, in the 2018 Program for International Student Assessment (PISA) [7]. In 2022, Indonesia improved to a score of 366, ranking 69th out of 80 countries [8]. However, these results indicate that students' critical mathematical thinking skills still need improvement. Based on observations and interviews with fourth-grade teachers at inclusive elementary schools in the Pangeran Diponegoro Cluster in Purworejo Regency, students still experience difficulty solving math problems that require critical thinking. Students also often hesitate when answering questions, give up easily when faced with difficulties, and exhibit low levels of self-confidence.

Low levels of student self-confidence are associated with low self-efficacy, or an individual's belief in their ability to complete math assignments. Self-efficacy is a person's belief in their ability to perform a task or achieve a specific goal. Bandura stated that self-efficacy is an individual's belief in their ability to take the necessary actions to achieve success [9]. Students with high self-efficacy tend to be more confident in solving math problems, are willing to try various problem-solving strategies, and persist when facing challenges. Conversely, students who doubt their own abilities tend to experience anxiety, lack self-confidence, and are less able to develop critical thinking skills. According to Pradinar et al. [10], self-efficacy plays a role in self-motivation, self-support, and self-control. Furthermore, Ningsih and Hayati [11] stated that students' beliefs in their own learning abilities are a crucial factor in determining academic success.

Previous research has shown a relationship between self-efficacy and mathematical critical thinking skills. Prajono et al. [12] found that students' mathematical critical thinking skills increased with increasing levels of self-efficacy. These findings suggest that self-efficacy is a psychological factor that can influence students' mathematical critical thinking skills. However, most previous research has been conducted with students in regular schools and has not specifically examined students with special needs in inclusive elementary schools. Students with special needs have different characteristics, learning needs, and psychological conditions than regular students, thus requiring special attention in the learning process, including aspects of self-confidence and belief in their abilities.

Based on these studies, a research gap exists: studies on the influence of self-efficacy on students with special needs' mathematical critical thinking skills in inclusive elementary schools remain limited. Most previous research has focused on regular students, thereby providing an inadequate picture of the relationship between these two variables in the context of inclusive education. Therefore, research is needed to specifically investigate the influence of self-efficacy on students with special needs' mathematical critical thinking skills.

The novelty of this research lies in its focus on fourth-grade students with special needs attending inclusive elementary schools within the Pangeran Diponegoro Cluster in Purworejo Regency. Unlike previous research, which focused primarily on regular students, this study seeks to provide empirical evidence regarding the influence of self-efficacy on mathematical critical thinking skills in the context of inclusive education. Therefore, this research is expected to broaden the study of the psychological factors that influence students with special needs' mathematical critical thinking skills.

Based on this description, the study, entitled "The Influence of Self-Efficacy on the Mathematical Critical Thinking Skills of Fourth-Grade Students with Special Needs at the Pangeran Diponegoro Cluster in Purworejo Regency," aims to determine the extent to which students' beliefs in their abilities (self-efficacy) influence their mathematical critical thinking skills in inclusive elementary schools. The results of this study are expected to provide theoretical contributions to the development of studies on self-efficacy and critical mathematical thinking skills in the context of inclusive education. Furthermore, teachers can use these findings to practically develop students with special needs' mathematical confidence and enhance their critical thinking skills through appropriate learning strategies. The findings are also expected to serve as a reference for schools and policymakers in improving the quality of inclusive education services.

2. METHOD

This study used a quantitative, survey-based approach to analyze the influence of self-efficacy on students with special needs' critical thinking skills in mathematics. The survey method was chosen because it enabled researchers to collect data directly from respondents via research instruments, such as questionnaires and tests. The study was conducted in the even semester of the 2025/2026 academic year at several elementary schools within the Diponegoro Elementary School Cluster in Grabag District, Purworejo Regency.

The study population consisted of 22 fourth-grade students with special needs from several elementary schools within the Diponegoro Elementary School Cluster in Grabag District, Purworejo Regency. Given the relatively small population, this study used a total sampling technique, or saturated sampling, which involves sampling all members of the population. This technique was chosen to ensure the data obtained are more representative and provide a more comprehensive picture of the population under study. Therefore, the sample size for this study was 22 students.

The research data were sourced from primary data obtained directly from respondents through questionnaires and tests. A questionnaire was used to assess students' self-efficacy, while a test was used to assess their mathematical critical thinking skills. Data collection was conducted after obtaining permission from the school and relevant teachers.

The research instruments consisted of a self-efficacy questionnaire and a test of mathematical critical thinking skills. The self-efficacy questionnaire was designed to measure students' confidence in their ability to complete mathematical tasks. Meanwhile, the mathematical critical thinking skills test was used to measure students' ability to analyze, evaluate, and solve mathematical problems logically and systematically.

In this study, self-efficacy was the independent variable (X), and mathematical critical thinking skills were the dependent variable (Y). Self-efficacy was measured using students' questionnaire scores, while mathematical critical thinking skills were measured using students' test scores.

Before being used in the research, the instruments were tested for validity and reliability to ensure accuracy and consistency. Validity testing was conducted to determine the extent to which the instrument measured the aspects it was intended to measure, while reliability testing assessed the instrument's consistency in producing stable, reliable data.

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Data analysis included descriptive and inferential statistics. A descriptive analysis was used to examine the levels of self-efficacy and mathematical critical thinking skills among students with special needs. Before hypothesis testing, the data were tested for normality to assess their distribution. The results of the normality test indicated that the data did not meet the assumption of a normal distribution, so the analysis continued using nonparametric statistics. Hypothesis testing was conducted using the Spearman Rank Correlation Coefficient to determine the effect between self-efficacy and students' mathematical critical thinking skills. Interpretation of the strength of the effect was based on the Spearman correlation coefficient (ρ), while decision-making was based on the significance value at a 5% error level ($\alpha = 0.05$).

This research was conducted in accordance with ethical research principles. All data obtained will be kept confidential and used only for academic purposes. Student participation is carried out with the school's approval and is voluntary, without any element of coercion.

3. RESULTS AND DISCUSSION

This section presents the findings obtained from the analysis of self-efficacy and mathematical critical thinking data among fourth-grade students with special needs. The

findings include instrument validity and reliability, descriptive statistics, normality testing, and hypothesis testing using Spearman's Rank correlation.

3.1. Result

3.1.1. Description of Respondents

The participants in this study were 22 fourth-grade students with special needs enrolled in inclusive elementary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, during the 2025–2026 academic year. Total sampling was employed, allowing all members of the population to participate in the study.

Table 1. Characteristics of Respondents

Characteristics of Respondents	Frequency	Percentage
Male	15	68,18%
Female	7	31,82%
Slow Learner	14	63,64%
ADHD	8	36,36%

3.1.2. Validity and Reliability

The results of the validity and reliability tests for the self-efficacy questionnaire and the critical thinking mathematics test instrument are listed below, along with the data that is attached:

Table 2. Results of the Validity Test of the Critical Thinking Mathematics Test

Critical Thinking	r count	r table	Sig (2-tailed)	Description
Y1	0,712	0,388	0,000	Valid
Y2	0,677	0,388	0,000	Valid
Y3	0,861	0,388	0,000	Valid
Y4	0,613	0,388	0,001	Valid
Y5	0,829	0,388	0,000	Valid

The formula $df = N - 2$, where N (sample) is 26 students, and the significance level is 0.05, is used to calculate the r table value based on the validity test findings above. The outcome is an r table of 0.388. The computed r and table r values are used to determine the validity of the data. The instrument is considered valid if the estimated $r > \text{table } r$ and the Sig. value < 0.05 . The aforementioned test results show that the data is reliable and applicable. In the meantime, the reliability test yielded the following findings:

Table 3. Results of the Reliability Test of the Mathematics Critical Thinking Test

<i>Reliability Statistics</i>	
<i>Cronbach's Alpha</i>	<i>N of Items</i>
.795	5

If the Cronbach's Alpha value is more than 0.06, the reliability test findings are considered reliable. Based on the collected data, the Cronbach's Alpha value is 0.795, which is > 0.06 . Consequently, the test device is trustworthy.

Table 4. Results of the Self-Efficacy Questionnaire Validity Test

Self Efficacy	r count	r table	Sig (2-tailed)	Description
X1	0,472	0,388	0,015	Valid
X2	0,558	0,388	0,003	Valid
X3	0,596	0,388	0,001	Valid
X4	0,408	0,388	0,039	Valid
X5	0,528	0,388	0,006	Valid
X6	0,466	0,388	0,016	Valid
X7	0,709	0,388	0,000	Valid
X8	0,659	0,388	0,000	Valid
X9	0,463	0,388	0,017	Valid
X10	0,515	0,388	0,007	Valid
X11	0,514	0,388	0,007	Valid
X12	0,776	0,388	0,000	Valid
X13	0,613	0,388	0,001	Valid
X14	0,598	0,388	0,001	Valid
X15	0,588	0,388	0,002	Valid
X16	0,612	0,388	0,001	Valid
X17	0,740	0,388	0,000	Valid
X18	0,701	0,388	0,000	Valid
X19	0,645	0,388	0,000	Valid
X20	0,542	0,388	0,004	Valid
X21	0,614	0,388	0,001	Valid
X22	0,617	0,388	0,001	Valid
X23	0,574	0,388	0,002	Valid
X24	0,672	0,388	0,000	Valid
X25	0,535	0,388	0,005	Valid

The formula $df = N - 2$, where N (sample) is 26 students, and the significance level is 0.05, is used to calculate the r table value based on the validity test findings above. The outcome is an r table of 0.388. The computed r and table r values are used to determine the validity of the data. The instrument is considered valid if the estimated $r > \text{table } r$ and the Sig. value < 0.05 . The aforementioned test results show that the data is reliable and applicable. In the meantime, the reliability test yielded the following findings:

Table 5. Results of the Reliability Test of the Self-Efficacy Questionnaire Instrument

<i>Reliability Statistics</i>	
<i>Cronbach's Alpha</i>	<i>N of Items</i>
.921	25

If the Cronbach's Alpha value is more than 0.06, the reliability test findings are considered reliable. Based on the collected data, the Cronbach's Alpha value is 0.921, which is > 0.06 . As a result, the survey tool is trustworthy.

3.1.3. Descriptive Analysis

a. Self-Efficacy Variable

A person's confidence in their capacity to handle different circumstances and finish tasks is known as self-efficacy. During the 2025–2026 school year, fourth-grade special needs pupils in primary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, were given a questionnaire to complete in order to quantify this variable. A Likert scale with four response options always, frequently, seldom, and never was used to evaluate the questionnaire. Respondents choose one of the numerous answer options to indicate how much they agree with a question in a Likert scale exam. The following information was gathered on the self-efficacy of kids with special needs:

Table 6. Self-Efficacy Data for Students with Special Needs

Data	<i>Self Efficacy</i>
N	22
Median	68
Mean	63
Std. Dev	20
Variance	404
Maximum	84
Minimum	0
Range	84

From the data, the median was 68, the mean was 63, the minimum was 0, the maximum was 84, and the standard deviation was 20. The data was then grouped into interval classes in the following table:

Table 7. Self-Efficacy Interval Class for Students with Special Needs

No Interval	Frequency	Percentage
1 0 – 14	2	9%
2 15 – 29	0	0%
3 30 – 44	0	0%
4 45 – 59	1	5%
5 60 – 74	16	73%
6 75 – 89	3	14%
Total	22	100%

Then, it is categorized into predetermined self-efficacy levels: high, medium, and low. To determine the classification of self-efficacy data for grade IV students with special needs in the Pangeran Diponegoro Cluster, Purworejo Regency, it is then calculated using the Sturges formula as follows:

$$\begin{aligned}
 \text{Maximum Score} &= \text{number of questions} \times \text{maximum weighting} \\
 &= 25 \times 4 \\
 &= 100
 \end{aligned}$$

$$\begin{aligned}
 \text{Minimum Score} &= \text{number of questions} \times \text{minimum weighting} \\
 &= 25 \times 1 \\
 &= 25
 \end{aligned}$$

If

I : Interval

R : Range ($100 - 25 = 75$)

K : Number of categories

Then,

$$I = \frac{R}{K}$$

$$I = \frac{75}{3} = 25$$

Table 8. Classification of Self-Efficacy Data for Students with Special Needs

No	Interval	Frequency	Percentage	Criteria
1	$X \leq 49$	2	9%	Low
2	$50 \geq X \leq 74$	17	77%	Medium
3	$X \geq 75$	3	14%	High

Self-Efficacy of Students with Special Needs in the Pangeran Diponegoro Cluster

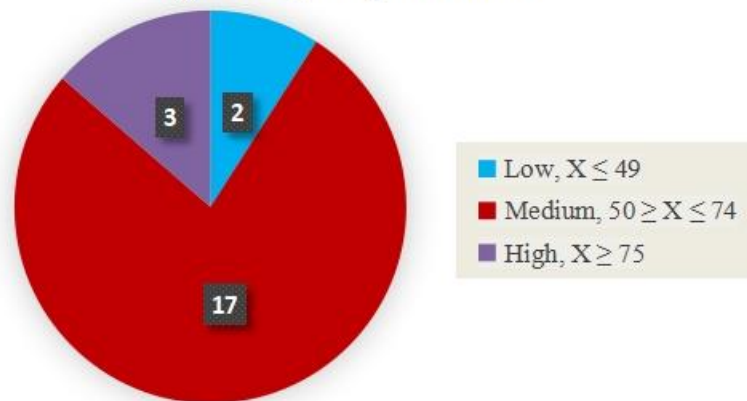


Figure 1. Self-efficacy Pie Chart Diagram

According to the classification table of data on the self-efficacy abilities of students with special needs, there were 22 students in class IV with special needs; "3 students (14%) fell into the high category, 17 students (77%) into the medium category, and 2 students (9%) into the low category. The findings showed that children with special needs in class IV primary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, tended to have a medium degree of self-efficacy."

b. Critical Thinking Variable

A higher-order thinking ability, critical thinking includes cognitive functions including issue analysis, appraisal, and decision-making. The exam results of fourth-grade special needs children from primary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, during the 2025–2026 school year provided the critical thinking data used in this study. Whole numbers up to 10,000 were covered in this exam. The following information was found in the critical thinking exam results for kids with exceptional needs:

Table 9. Critical Thinking Data of Students with Special Needs

Data	Critical Thinking
N	22
Median	25
Mean	29
Std. Dev	17
Variance	293
Maximum	64
Minimum	0
Range	64

The results showed that the mean was 29, the median was 25, the minimum was 0, the maximum was 64, and the standard deviation was 17. The following table shows the data after it was divided into interval classes:

Table 10. Critical Thinking Interval Class for Students with Special Needs

No Interval	Frequency	Percentage
1 0 – 11	2	9%
2 12 – 23	7	32%
3 24 – 35	7	32%
4 36 – 47	1	5%
5 48 – 59	4	18%
6 60 – 71	1	5%
Total	22	100%

The ideal Mean/Mi and ideal Standard Deviation/SDi values are then determined using the data. "The ideal Mean/Mi and ideal Standard Deviation/SDi values are then computed using the following formula in order to classify data on the critical thinking abilities of fourth-grade special needs children in the Pangeran Diponegoro Cluster, Purworejo" Regency:

$$Mi = \frac{1}{2} (\text{highest score} + \text{lowest score})$$

$$SDi = \frac{1}{6} (\text{highest score} - \text{lowest Score})$$

From this formula, the result is $Mi = \frac{1}{2} (64 + 0) = 32$, and the result is $SDi = \frac{1}{6} (64 - 0) = 11$. The following is a table of classification of critical thinking ability data for students with special needs:

Table 11. Classification of Critical Thinking Skills Data for Students with Special Needs

No	Interval	Frequency	Percentage	Criteria
1	$\bar{X} \geq 44$	5	23%	Very High
2	$33 \leq \bar{X} \leq 43$	2	9%	High
3	$22 \leq \bar{X} \leq 32$	6	27%	Medium
4	$11 \leq \bar{X} \leq 21$	7	32%	Low
5	$\bar{X} \leq 10$	2	9%	Very Low

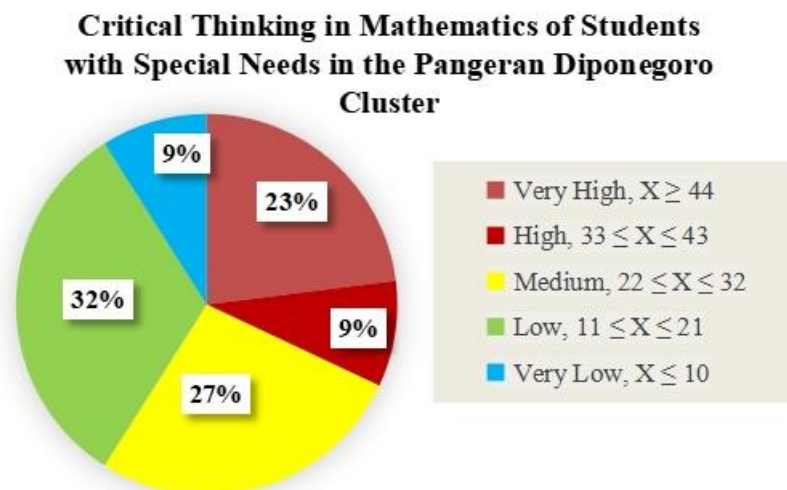


Figure 2. Critical Thinking Pie Chart Diagram

The sample of class IV students with special needs was 22, according to the classification table of critical thinking ability data of students with special needs. Five students (23%) were in the very high category, two students (9%), six students (27%) were in the medium category, seven students (32%) were in the low category, and two students (9%) were in the very low category. These findings showed that children with special needs in class IV of primary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, tended to have low levels of mathematical critical thinking."

3.1.4. Assumption Test

Normality Test

To ascertain if the study data is regularly distributed, a normality test is carried out. The validity and reliability of the findings are assessed using the normality test. The Shapiro-Wilk test statistic indicates the normality of the data distribution. The data can be considered normally distributed if the p-value is greater than 0.05. The following are the normality test results:

Table 12. Shapiro-Wilk Normality Test

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Self Efficacy	.349	22	.000	.599	22	.000
Critical Thinking	.156	22	.173	.932	22	.136

a. Lilliefors Significance Correction

According to the above table, the Shapiro-Wilk normality test yielded a Sig. result since there were 22 samples (<50). The self-efficacy variable's Sig. The value in the normality test is $0.000 < 0.05$, indicating that the data are not normally distributed. The data are regularly distributed, as indicated by the critical thinking variable's Sig. value. value of $0.136 > 0.05$. This suggests that a nonparametric test should be used, as the normality assumption is not met.

3.1.5. Hypothesis Testing

Spearman Rank Test

Based on non-normally distributed data, hypothesis analysis using the Spearman rank correlation test aimed to determine the level of influence between students' critical mathematical thinking skills and self-efficacy.

Two hypotheses were used:

- H_0 : There is no influence between self-efficacy and critical mathematical thinking skills in students with special needs
- H_1 : There is an influence between self-efficacy and critical mathematical thinking skills in students with special needs

Table 13. Spearman Rank Nonparametric Test

Correlations				
Spearman's rho	Self Efficacy			
		Self Efficacy		Critical Thinking
		Correlation Coefficient	1.000	.318
		Sig. (2-tailed)	.	.149
		N	22	22
	Critical Thinking	Correlation Coefficient	.318	1.000
		Sig. (2-tailed)	.149	.
		N	22	22

Based on the Spearman Rank correlation test results in the table above, a correlation coefficient (r) of 0.318 was obtained, with a significance value (Sig. 2-tailed) of 0.149, and a sample size of 22 students. Because the significance value of 0.149 is > 0.05 , H_0 is accepted and H_1 is rejected. This indicates that there is no significant relationship or influence between self-efficacy and critical mathematical thinking skills in fourth-grade

students with special needs at the Pangeran Diponegoro Elementary School Cluster in Purworejo Regency.

However, the correlation coefficient of 0.318 indicates a positive relationship, categorized as low (weak). This means that as students' self-efficacy increases, their mathematical critical thinking skills tend to increase, but the relationship is not strong enough and is not statistically significant.

3.2. Discussions

The results showed that most students with special needs had a moderate level of self-efficacy (77%), while their mathematical critical thinking skills tended to be low (32%). Furthermore, the Spearman Rank test indicated a weak positive relationship between self-efficacy and mathematical critical thinking skills ($r = 0.318$), but the relationship was not statistically significant ($p = 0.149 > 0.05$). These findings suggest that self-efficacy is not the only factor influencing students with special needs' mathematical critical thinking skills.

a. Level of Self-Efficacy

Twenty-two children with special needs (ABK) in grade IV of primary schools in Pangeran Diponegoro Cluster, Purworejo Regency, had a mean self-efficacy value of 63, a median of 68, a standard deviation of 20, a minimum of 0, and a maximum of 84, according to the findings of a descriptive analysis. The majority of pupils fell into the middle group, which included 17 students (77%), the high category, which included 3 students (14%), and the low category, which included 2 students (9%), after being divided into three categories using the Sturges algorithm. According to these findings, children with special needs often exhibit a moderate level of self-efficacy, indicating they have a basic level of confidence in their skills despite their limitations. This result is consistent with Bandura's social cognitive theory, which defines self-efficacy as a person's confidence in their ability to act to accomplish specific objectives. Research by Binammar et al. [13] demonstrates that self-efficacy is positively correlated with inclusive learning practices and a supportive learning environment for students with special needs, corroborating this study's findings.

According to Bandura's theory of self-efficacy development, which includes mastery experiences, vicarious experiences, verbal and social persuasion, and emotional and physiological factors, students with special needs primarily fall into the middle group in terms of self-efficacy. Students with special needs may face challenges in their quest for academic success, leading to varying degrees of self-efficacy. However, the low number of students in the low category indicates that the inclusive school environment provides sufficient support for the development of student self-confidence. This finding is supported by research by Basileo et al. [14], which indicates that a supportive learning environment, positive classroom relationships, and a mastery-focused learning orientation can enhance students' self-efficacy. Furthermore, Bandura's theory (1986; 1997) also explains that self-efficacy is related to learning motivation, self-regulation, and academic performance. Therefore, students with high self-efficacy tend to be more confident, persistent, and better able to face learning challenges. Therefore, ongoing intervention and support are needed in

inclusive education to help students with special needs improve their self-efficacy from the moderate to the high category.

b. Level of Critical Thinking

Descriptive research found that among 22 students with special needs (ABK) enrolled in fourth-grade primary schools in the Pangeran Diponegoro Cluster, Purworejo Regency, the average Score for critical thinking ability was 29, the median was 25, the standard deviation was 17, and the range was 0–64. With an Ideal Mean (Mi) of 32 and an Ideal Standard Deviation (SDi) of 11, the majority of students were classified into four groups: low (32%), medium (27%), very high (23%), high (9%), and very low (9%). Consequently, this study found that special needs students had poor critical thinking skills in mathematics.

Findings like these align with a comprehensive study by Guamanga et al. [15], which asserts the importance of critical thinking skills such as analysis, evaluation, and synthesis for understanding and applying educational ideas. The low critical thinking skills of students with special needs are also supported by research showing that students with mild intellectual disabilities experience difficulties in understanding mathematical concepts, mathematical language, and mathematical procedures, and have limitations in visuospatial and numerical memory, which impact their mathematical thinking processes.

The low critical-thinking skills of students with special needs in this study may also be influenced by limitations in cognitive function, working memory, and information-processing speed, which are the foundations for higher-order thinking. Research by Kivirähk et al. [16] shows that children with intellectual disabilities acquire critical thinking skills more slowly than their peers because they need more time and intensive repetition to grasp mathematical ideas. Nonetheless, the fact that five students (23%) fell into the very high category suggests that, with the right learning interventions, children with special needs may still improve their critical thinking abilities. According to Wang and Abdullah [17], adaptive and evidence-based learning systems can enhance critical thinking abilities. Therefore, the findings highlight the importance of implementing inclusive and differentiated mathematics instruction that accommodates the diverse needs of students with special needs.

c. The Influence of Self-Efficacy on Critical Thinking Skills in Mathematics

The Spearman rank correlation test showed a significance level of 0.149 and a correlation coefficient of 0.318. There is no statistically significant relationship between students' confidence in their own mathematical abilities and their critical thinking skills, as the significance value is greater than 0.05 ($0.149 > 0.05$). The association between mathematical critical thinking skills and self-efficacy is not statistically significant, despite a minor positive correlation. This study's findings align with those of Granello et al. [18], who found that self-efficacy had either no influence on mathematical ability or only a very small one in many previous studies. Zakariya [19] also reported that several psychological factors, including motivation, anxiety, and mathematical self-concept, influence the relationship between self-efficacy and mathematical achievement.

However, these findings differ from those of Prajono et al. [12], who found a significant positive relationship between self-efficacy and mathematical critical thinking skills. Variations in sample characteristics, educational levels, sample sizes, and research instruments may cause these differences. Unlike previous studies that generally involved regular students, this study specifically focused on students with special needs in inclusive elementary schools. From a theoretical perspective, Bandura's Social Cognitive Theory explains that self-efficacy affects motivation, effort, persistence, and behavior. Nevertheless, the theory also emphasizes that learning outcomes are influenced by reciprocal interactions among personal, behavioral, and environmental factors. Therefore, self-efficacy alone may not be sufficient to improve mathematical critical thinking skills. Critical thinking requires complex cognitive processes, including analysis, evaluation, reflection, and reasoning, which are also influenced by instructional experiences, metacognitive strategies, and cognitive functioning.

One unexpected finding of this study was the absence of a significant relationship between self-efficacy and mathematical critical thinking skills. Several possible explanations can be proposed. First, all respondents were students with special needs who have unique cognitive characteristics and learning needs. Second, the relatively small sample size ($N = 22$) may have reduced the statistical power to detect significant relationships. Third, mathematical critical thinking skills may be more strongly influenced by cognitive abilities, metacognitive awareness, learning motivation, teacher support, and classroom learning environments than by self-efficacy alone. Further evidence for this conclusion comes from Fu et al. [20], who reported that metacognitive learning strategies mediate the relationship between self-efficacy and critical thinking skills. Similarly, Tian et al. [21] found that motivation and metacognition play important roles in determining mathematical competence. Therefore, the findings of this study indicate that mathematical critical thinking skills are influenced not only by self-efficacy but also by a range of cognitive, motivational, and environmental factors.

d. Implications of the Study

This study has several limitations. First, the sample was relatively small, comprising only 22 students with special needs from one school cluster, limiting the generalizability of the findings. Second, the study examined only one independent variable, namely self-efficacy, while other factors potentially affecting mathematical critical thinking skills were not investigated. Third, the study used a cross-sectional design that could not capture changes in students' self-efficacy and critical thinking skills over time.

e. Suggestions for Future Research

Future studies are recommended to involve larger samples and wider research areas to obtain more representative findings. Researchers are also encouraged to examine additional variables such as learning motivation, metacognitive strategies, cognitive functioning, family support, classroom climate, and instructional models. Furthermore, experimental and longitudinal studies are needed to deepen understanding of the factors that

influence the development of mathematical critical thinking skills among students with special needs in inclusive educational settings.

4. CONCLUSION

This study aimed to analyze the influence of self-efficacy on the mathematical critical thinking skills of fourth-grade students with special needs at inclusive elementary schools in the Pangeran Diponegoro Cluster, Purworejo Regency. The study was conducted to understand whether students' beliefs in their abilities play a role in the development of mathematical critical thinking skills.

The results showed that most students with special needs had moderate self-efficacy, while their critical thinking skills in mathematics tended to be low. Furthermore, the Spearman Rank correlation analysis revealed a weak positive relationship between self-efficacy and mathematical critical thinking skills, but this relationship was not statistically significant. Therefore, self-efficacy was not found to have a significant influence on students with special needs' mathematical critical thinking skills in this study.

These findings address the research objective: that their level of self-efficacy does not solely determine students with special needs' mathematical critical thinking skills but is also influenced by various other, more complex factors, such as cognitive abilities, metacognitive strategies, learning motivation, teacher support, and a supportive learning environment.

Theoretically, this research contributes to the development of studies on self-efficacy and mathematical critical thinking skills in the context of inclusive education. The results reinforce the view that the relationship between affective factors and higher-order thinking skills in students with special needs is complex and cannot be explained by a single variable. Therefore, this research contributes to the empirical literature on the factors influencing students with special needs' mathematical critical thinking skills.

In practice, the results of this study have implications for inclusive teachers and schools to focus not only on improving students' self-efficacy but also on developing learning strategies that train mathematical critical thinking skills. Problem-based learning, the use of metacognitive strategies, differentiated learning, and the provision of learning support tailored to the characteristics of students with special needs can be alternatives for improving their higher-order thinking skills.

This study has several limitations, including a relatively small sample size and the inclusion of only students with special needs in one school cluster. Furthermore, this study only examined self-efficacy as an independent variable, thus not fully describing the factors influencing mathematical critical thinking skills.

Given these limitations, further research is recommended to involve a larger sample and a broader research area. Future research could also examine other variables that could potentially influence mathematical critical thinking skills, such as learning motivation, metacognitive strategies, cognitive function, family support, and the learning models implemented in inclusive education.

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