Journal of Practice Learning and Educational Development
https://digitalpress.gaes-edu.com/index.php/jpled
E-ISSN: 2809-1205
Vol 6, No. 2 (2026) 1368-1375
DOI:10.58737/jpled.v6i2.1097

Submitted: 31-12-2025
Revised: 17-04-2026
Accepted: 19-05-2026

The Relationship Between Self-Concept and Students' Mathematical Adaptive Reasoning Abilities

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Abstract

This study aims to analyze the relationship between self-concept and adaptive mathematical reasoning ability of eighth-grade students at SMP Negeri 3 Tarogong Kidul, Garut. Adaptive reasoning ability is an important skill in facing the challenges of the 21st century, while self-concept is suspected as one of the internal factors that influence it. This study uses a quantitative approach with a non-experimental method. The research subjects were 30 students selected through a purposive sampling technique. The instruments used included a descriptive test to measure adaptive reasoning ability and a Likert scale questionnaire to assess self-concept. The normality test using Shapiro-Wilk showed that both variables were not normally distributed, so the relationship analysis was carried out using Spearman Rank correlation. The results showed a significant relationship between self-concept and students' adaptive mathematical reasoning ability, marked by a significance value of 0.000 <0.05 and a correlation coefficient of 0.624 which is included in the strong category. The coefficient of determination of 38.9% indicates that self-concept contributes to adaptive reasoning ability, while the remaining 61.1% is influenced by other factors, such as learning interest, conceptual understanding, and student creativity. Overall, this study concludes that mathematical self-concept plays an important role in improving students' adaptive reasoning ability, so strengthening the affective aspect needs to be part of the mathematics learning strategy.

Keywords: Self-Concept; Adaptive Reasoning; Mathematics; Correlation;Mathematics Education.

Introduction

Education in the 21st century requires students not only to master knowledge but also to possess higher-order thinking skills that are adaptive to various situations and constantly changing challenges. One important competency that students must possess is adaptive reasoning, namely the ability to flexibly and effectively adjust their thinking methods, problem-solving strategies, and understanding to new contexts. Reasoning skills are essential for the problem-solving process in mathematics learning (Permana et al., 2020). Adaptive reasoning is one of the essential skills students must possess in the modern education era. This reasoning is not only related to academic ability but also to the ability to face various situations and challenges in everyday life (Isnaini, 2024).

Students who possess adaptive reasoning skills can think critically, creatively, and flexibly in solving problems. This ability is essential in a dynamic world, where students are expected to think critically, creatively, and make rational decisions when facing various real-life problems. Mathematical adaptive reasoning is crucial for students to possess in the learning process. However, previous research by Permana et al. (2020) also showed that students' adaptive mathematical reasoning abilities were still low, as only five of 31 students were able to successfully solve adaptive reasoning problems. This is

supported by research by Kusniawati (2021), which showed that students' adaptive reasoning abilities were still low. Similar research by Putri & Warmi (2024) showed that the overall average adaptive reasoning indicator was only 24.64%, indicating that students' mastery of adaptive mathematical reasoning abilities was considered low.

Low adaptive reasoning abilities are not only caused by external factors such as learning methods and media, but also influenced by internal factors originating from within the students, such as motivation, interest, and self-concept. Furthermore, when working on adaptive mathematical reasoning problems, several dominant errors were presented, including errors in interpreting the problem, errors in solving operations, conceptual errors, and errors in drawing conclusions (Agustin et al., 2023). Research shows that one factor influencing adaptive reasoning ability is self-concept. In addition, other factors also influence adaptive reasoning ability, such as poor communication and representation skills (Rahmah & Lestari, 2023). Self-concept refers to an individual's view of themselves, including beliefs and evaluations of their abilities.

Several studies relevant to this research include those by Susilawati et al. (2020), which showed that some students' mathematical self-concepts were inversely related to their mathematical creative thinking ability test results. Some students had high self-concepts but lacked creativity, while others had low self-concepts but were categorized as creative. Research by Susilawati and Pujiastuti (2020) found that three students with high self-concepts scored in the good category on their mathematical communication ability test, with a score of 75%. Four students with moderate self-concept achieved adequate mathematical communication ability scores, with scores ranging from 41% to 60%. Two students with low self-concept achieved poor mathematical communication ability scores, with scores exceeding 40%. Students' mathematical communication ability aligns with their self-concept. The higher a student's self-concept, the better their mathematical communication ability. Similarly, research by Hadi et al. (2020) showed that students' self-concept, their activeness in independent learning, and their learning outcomes were all categorized as moderate. There was a significant positive influence of self-concept and activeness in independent learning on mathematics learning outcomes.

Several previous studies have concluded that self-concept influences students' learning outcomes and mathematical abilities, such as communication and independent learning. However, for creative thinking skills, self-concept does not always align with student outcomes. The difference between this study and previous research is that this study focuses on mathematical adaptive reasoning ability, namely the ability to adapt strategies to solve new problems. Therefore, this study aims to test whether self-concept also influences adaptive reasoning.

A. Literature Review

1. Self-Concept

a. Understanding Self-Concept

Self-concept is a person's image or perception of themselves, encompassing evaluations, assessments, and beliefs about their abilities, weaknesses, feelings, and overall well-being. Burns (1993) explains that self-concept is a composite image of what an individual thinks about themselves and what is expected of them, as well as how they view themselves in relationships with others. Chaplin (2011) adds that self-concept is an individual's assessment or evaluation of themselves. Meanwhile, Hurlock (1990) emphasizes that self-concept is a combination of an individual's beliefs about themselves, encompassing physical, psychological, social, emotional, aspirations, and achievements. These definitions demonstrate that self-concept is a dynamic psychological construct formed through social interactions and individual experiences, ultimately influencing behavior and mental health.

Self-concept is an individual's perception and beliefs about themselves, including how they assess their abilities, personality, and social position. Self-concept is an individual's perception of themselves, including their beliefs about their abilities and competencies in a particular field, such as mathematics. Mathematical self-concept is a student's perception and belief in their ability to understand and solve mathematical problems (Algi & Indrakurniawan, 2024). This concept

encompasses self-assessment of competence, interest, and the value placed on mathematics. A positive self-concept can increase students' motivation and achievement in mathematics.

Research by (Susilawati et al., 2020) shows that a positive self-concept in mathematics contributes to improved students' creative mathematical thinking skills. Students with high self-concept tend to be more confident and motivated in facing mathematical challenges. Students with a positive self-concept in mathematics tend to be more confident, courageous in facing challenges, and have high persistence in solving complex problems.

b. Self-concept Dimensions

Self-concept is an individual's view of themselves. The dimensions of self-concept are:

1) Knowledge

The first dimension of self-concept is what we know about ourselves. In our minds, we have a list of self-descriptions, including age, gender, nationality, ethnicity, occupation, and so on. We can assign and add to this list of self-descriptions by identifying and comparing ourselves with other social groups. This reflects our perceived qualities compared to others. Our qualities are only temporary, so individual behavior can change over time in line with changes in the social groups within our environment.

2) Expectations

While individuals have a view of who they are, they also have another set of perspectives about their potential future. These expectations constitute their ideal self-image.

3) Self-Evaluation

In terms of self-evaluation, individuals assess themselves in terms of achieving expectations, internal conflicts, and appropriate standards of living. This ultimately determines their self-esteem, which essentially refers to how much they like themselves.

2. Mathematical Adaptive Reasoning Ability

Mathematical adaptive reasoning ability is a student's ability to solve mathematical problems using a flexible and effective approach, appropriate to the context of the problem at hand. Adaptive reasoning involves higher-order thinking skills such as analysis, evaluation, and non-routine problem solving.

Mathematical adaptive reasoning ability refers to a student's ability to adapt mathematical problem-solving strategies to the context and situation at hand. This ability includes flexibility in thinking, the ability to change approaches when faced with new challenges, and the ability to reflect on and evaluate the problem-solving process. Furthermore, a student's cognitive style also influences adaptive reasoning ability. (Andestia et al., 2024) found that students with a reflective cognitive style tend to have better adaptive reasoning ability than students with an impulsive cognitive style.

Research (Rahmah & Lestari, 2023) states that mathematical adaptive reasoning is a student's ability to adjust mathematical problem-solving strategies based on the situation at hand, which involves flexibility in thinking and evaluation of the problem-solving process. This ability is important in facing complex and non-routine mathematical challenges. Furthermore, students with adaptive reasoning are able to choose appropriate strategies, modify their approaches, and reflect on their thought processes.

This ability is crucial in 21st-century learning because it emphasizes contextual problem-solving, critical thinking, and the ability to learn from experience. Adaptive reasoning differs from routine reasoning because it emphasizes flexibility of thought rather than memorizing fixed procedures.

According to Widjajanti (Nauvalika Permana et al., 2020), the indicators of mathematical adaptive reasoning ability that students must master are as follows:

a. Ability to formulate conjectures

The ability to formulate conjectures is a student's ability to formulate various possibilities based on their existing knowledge.

b. Ability to provide reasons or evidence for the truth of a statement.

This type of question emphasizes how students express reasons for the truth of a statement.

c. Ability to draw conclusions from a question

The ability to draw conclusions from a statement is a thought process that utilizes knowledge in such a way as to produce a thought.

d. Ability to verify the validity of an argument

The ability to verify an argument requires students to investigate the truth of a given statement.

e. Ability to identify patterns in mathematical phenomena

The ability to identify patterns in mathematical phenomena to make generalizations is a student's ability to identify patterns or methods within a given statement so that they can develop them into mathematical sentences.

Methods

This study aimed to determine the relationship between mathematical self-concept and adaptive reasoning ability at SMP Negeri 3 Tarogong Kidul, located on Jln. RSU No. 4, Sukakarya Village, Tarogong Kidul District, Garut Regency. The research approach was quantitative using a non-experimental method. According to Heryana (2020), a non-experimental method is research in which the subjects or respondents do not receive any intervention or treatment. The intervention in question is a trial given to the research subjects, such as the use of learning models, learning media, and so on. The research subjects involved eighth-grade students selected using a purposive sampling technique, based on certain considerations. In this case, the consideration was that the selected classes had relatively homogeneous characteristics in terms of adaptive reasoning ability and also based on the considerations of the responsible mathematics teacher. The total number of subjects was 30 students per class.

The instruments used included a post-lesson test and a questionnaire. The test instrument consisted of five essay-type questions to assess adaptive reasoning ability based on five indicators. The questionnaire instrument to observe students' self-concept consisted of 20 statements. Five possible answers were given for each statement, namely 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree). The data collection technique was carried out by giving each student who was the research subject the opportunity to work on both instruments. The data analysis technique used was inferential statistics with the Spearman Rank correlation method. Data calculations and analysis were processed using IBM SPSS Statistics 20.

Results and Discussions

1. Results

This study aims to analyze the relationship between self-concept and students' adaptive mathematical reasoning ability at SMP Negeri 3 Tarogong Kidul, located on Jl. RSU No. 4, Sukakarya Village, Tarogong Kidul District, Garut Regency. Data were collected from 30 eighth-grade students using two main instruments: a test of students' adaptive mathematical reasoning ability and a Likert-type self-concept questionnaire.

a. Normality Test

The data were first tested for normality to determine whether they were normally distributed. The statistical test used was the Shapiro-Wilk test using IBM SPSS Statistics version 20 software. In this study, normality testing was conducted based on the variables of adaptive mathematical reasoning ability and self-concept, using the following hypotheses:

H_0: Data is normally distributed

H_1: Data is not normally distributed

A summary of the results of the data normality test is presented in Table 1 below:

Table 1.
Normality Test Results

	Shapiro-Wilk		
	Statistic	***df***	***Sig.***
Self-concept	0,892	30	0,005
Mathematical Adaptive Reasoning Ability	0,876	30	0,002

The table above shows that the Sig. values for self-concept and mathematical adaptive reasoning ability are 0.005 and 0.002, respectively, meaning the Sig. value is <0.05. This indicates that H0 is rejected, and it can be concluded that the data collected from the mathematical adaptive reasoning ability test and the self-concept questionnaire came from a non-normally distributed population. Therefore, the analysis of the relationship between variables used the Spearman Rank Correlation Test.

b. Spearman Rank Correlation Test

The correlation test (r) aims to determine the relationship between self-concept and mathematical adaptive reasoning ability. In this study, a correlation test was conducted using Spearman Rank analysis with the help of IBM SPSS version 20.

The results of the Spearman Rank correlation test are presented in Table 2 as follows:

Table 2.
Spearman Rank Correlation Test Results

Correlation Coefficient	**Sig. (2-tailed)**	**Description**
0,624**	0,000.	Significant Correlation

To improve students' adaptive reasoning abilities, both student readiness and classroom conditions during the learning process are required. Therefore, a positive self-concept is related to a person's level of adaptive reasoning. The results in Table 2 show a significance value of 0.000, which is less than 0.05, thus rejecting the null hypothesis (H0). This indicates a significant relationship between the two variables. The strong relationship between the variables can be seen from the correlation coefficient value in the table, which is 0.624. This value is considered strong, indicating a strong relationship between mathematical self-concept and the adaptive reasoning abilities of eighth-grade students at SMP Negeri 3 Tarogong Kidul. The correlation coefficient value is greater than zero, indicating a positive relationship between the variables. Next, the magnitude of the relationship, or coefficient of determination, between self-concept and adaptive mathematical reasoning ability was determined using the following formula:

$$KP = (r_s)^2 \times 100\%$$

$$KP = (0{,}624)^2 \times 100\%$$

$$KP = 38{,}9\%$$

Based on the calculation, KP = 38.9%. This means that approximately 38.9% of the variation in students' adaptive mathematical reasoning ability can be explained by self-concept, while the remainder is influenced by other factors.

2. Discussion

Based on data analysis, the Spearman Rank correlation coefficient (ϱ) of 0.624 indicates a significant relationship between reasoning ability and self-concept. The correlation coefficient is

interpreted as strong, and a significance value of less than 0.05 indicates that the relationship between the two variables is statistically significant.

To determine the contribution or role of mathematical self-concept to adaptive reasoning ability, the coefficient of determination can be calculated. The calculation results show that mathematical self-concept contributes 38.9%, while the remaining 61.1% is influenced by other factors such as learning interest, conceptual understanding, and student creativity. Although many other factors are influential, self-concept still plays a strong role in students' adaptive reasoning ability. Thus, this study demonstrates a significant and positive relationship between mathematical self-concept and the adaptive reasoning abilities of eighth-grade students at SMP Negeri 3 Tarogong Kidul. The interpretation is that the better a student's self-concept, the better their adaptive reasoning abilities, and vice versa.

This strong relationship can be seen from the results of the mathematical self-concept tests and questionnaires completed by the study subjects. These findings align with psychological and educational development theories, which state that mathematical self-concept is an affective aspect that significantly influences students' cognitive abilities, particularly in the context of mathematical reasoning. A positive self-concept enables students to be more confident in facing mathematical problems, leading them to be more active, critical, and persistent when faced with challenges. This ultimately facilitates students' development of more adaptive strategies in solving mathematical problems, which is the core of adaptive reasoning abilities.

The correlation coefficient of 0.624 indicates a strong relationship between the two variables. This confirms that students with a positive mathematical self-concept tend to demonstrate better adaptive reasoning. However, it's important to understand that while this relationship is strong and significant, 61.1% of the variation in adaptive reasoning ability is influenced by other factors. These factors include learning interest, understanding of mathematical concepts, creativity, study habits, teacher support, and the learning environment. This means that improving adaptive reasoning ability cannot be achieved solely through strengthening self-concept but also requires support from other relevant factors.

Furthermore, these results offer practical implications for teachers and educators in designing mathematics lessons. Teachers need to create a learning environment that supports the formation of a positive mathematical self-concept, for example by providing constructive feedback, providing opportunities for students to experience success, and encouraging students to value the learning process, not just the end result. Learning strategies that emphasize problem-solving, group discussions, and reflection on the thinking process can also help students develop adaptive reasoning while strengthening their mathematical self-concept.

This research also opens the door for other researchers to further examine other factors influencing adaptive reasoning abilities, such as self-efficacy, learning motivation, and social environmental factors. This way, more comprehensive and integrated learning interventions can be designed to improve students' adaptive reasoning abilities comprehensively. In other words, although mathematical self-concept plays a strong role, improving adaptive reasoning abilities requires a holistic approach, focusing not only on affective aspects but also on cognitive, social, and learning environmental aspects.

Conclusion

The results of this study concluded that based on the results of research conducted on 30 eighth grade students of SMP Negeri 3 Tarogong Kidul, the data obtained on mathematical adaptive reasoning ability and self-concept were not normally distributed, so the relationship analysis was carried out using the Spearman Rank correlation test. The test results showed a significant relationship between mathematical self-concept and adaptive reasoning ability, with a significance value of 0.000 which is smaller than 0.05 and a correlation coefficient of 0.624 which is included in the strong category. This means that the better the student's self-concept, the better their adaptive reasoning ability. The

calculation of the coefficient of determination shows that self-concept contributes 38.9% to mathematical adaptive reasoning ability, while the remaining 61.1% is influenced by other factors such as learning interest, conceptual understanding, creativity, and learning environment support. Thus, mathematical self-concept has an important role in the development of students' adaptive reasoning abilities, so that strengthening this affective aspect needs to be a concern in the learning process so that students are more confident, critical, and able to face various mathematical problems adaptively.

References

Agustin, S. Y., Cahya MA, E., & Herman, T. (2023). Analisis Kesalahan Kemampuan Penalaran Adaptif dan Pemecahan Masalah pada Siswa SMP. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(2), 1295–1308. https://doi.org/10.31004/cendekia.v7i2.2208

Algi, A. U. P., & Indrakurniawan, M. (2024). Kemampuan Koneksi Matematis Siswa Sekolah Dasar Ditinjau Dari Self Concept. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *09*(01), 1070–1081. https://journal.unpas.ac.id/index.php/pendas/article/view/12553/5417

Andestia, N. P., Ratnaningsih, N., & Natalliasari, I. (2024). *Jurnal Kongruen*. *3*(1), 14–23.

Burns, R. B. 1979. The Self Concept in Theory Measurement, Development and Behavior. London. Longman Group UK Ltd.

Chaplin.,J.P, (2011) Kamus Psikologi, terjemahan Kartini Kartono, Jakarta: Rajawali Press.

Hadi, A., Karim, & Danaryanti, A. (2020). *Analisis self concept, keaktifan, dan hasil belajar matematika siswa smp*.

Heryana, A., Unggul, U. E., & Emergency, H. (2020). Desain Penelitian Non-Eksperimental. *June). doi*, *10*.

Hurlock, E. B. 1978. Developmental Psychology. Edisi 4. New Delhi: Tata McGraw Hill.

Isnaini, Z. (2024). Hubungan Self Confidence dan Motivasi Belajar Terhadap Kemampuan Berpikir Kritis serta Dampaknya pada Penalaran Adaptif Peserta Didik. *Αγαη*, *15*(1), 37–48.

Kusniawati, S. R. I. (2021). Pengaruh Metode Penemuan Terbimbing (Guided Discovery Method) dalam Pembelajaran Matematika Terhadap Kemampuan Penalaran Adaptif Siswa Kelas XI MIPA 8 di SMA Negri 2 Bangkalan. *Jurnal Inovasi Pendidikan Menengah*, *1*(3), 243–247.

Permana, N. N., Setiani, A., & Nurcahyono, N. A. (2020). Analisis Kemampuan Penalaran Adaptif Siswa dalam Menyelesaikan Soal Higher Order Thinking Skill (HOTS). *urnal Pengembangan Pembelajaran Matematika*, *II*(2), 51–60.

Putri, D. A., & Warmi, A. (2024). An Analysis Of Adaptive Reasoning Ability Middle School Students Mathematics Learning. *Jurnal Pendidikan Matematika (JPM)*, *10*(2), 117–125.

Rahmah, A., & Lestari, K. E. (2023). Hubungan *Self-concept* Matematis dengan Kemampuan Penalaran Adaptif Matematis Siswa. *Gammath : Jurnal Ilmiah Program Studi Pendidikan Matematika*, *8*(2), 143–151. https://doi.org/10.32528/gammath.v8i2.770

Susilawati, S., Pujiastuti, H., & Sukirwan, S. (2020). Analisis Kemampuan Berpikir Kreatif Matematis Ditinjau Dari *Self-concept* Matematis Siswa. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(2), 512–525. https://doi.org/10.31004/cendekia.v4i2.244

Acknowledgment

The authors would like to express their sincere gratitude to SMPN 3 Tarogong Kidul for granting permission and providing support for the implementation of this research. Special appreciation is extended to the mathematics teacher and the eighth-grade students for their cooperation, enthusiasm, and active participation throughout the learning and data collection processes.

The authors also acknowledge the valuable contributions of colleagues who provided constructive suggestions and academic insights during the preparation of this study. In addition, the authors would like to thank the reviewers for their thoughtful comments and recommendations, which significantly contributed to the improvement of the quality and clarity of this article.

Finally, the authors appreciate all parties who, directly or indirectly, supported the successful completion of this research.