MIREJ Multidisciplinary Innovation Research Journal
Volume 2 Issue 1 Year 2026 Pages 52-60 | e–ISSN 3089-4069 | DOI: 10.70152
https://journal.akademimerdeka.com/ojs/index.php/mirej

Investigating the Impact of Self-Efficacy on Elementary Students' Mathematical Problem-Solving Skills

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Abstract: This study aims to investigate the relationship between academic self-efficacy and mathematical problem-solving among elementary school students in Cirebon, Indonesia. With the increasing recognition of psychological factors in 21st-century education, especially in primary education, there is a need for empirical validation to understand how self-efficacy operates at this developmental stage. A quantitative correlational approach was utilized, involving 50 students from five public elementary schools, chosen through purposive sampling. Data collection involved validated mathematical problem-solving assessments and academic self-efficacy questionnaires. The instruments demonstrated acceptable reliability (Cronbach's alpha > 0.6) and content validity was confirmed by experts in the field. Statistical analyses included tests for normality and homogeneity, Pearson correlation, and simple linear regression. While the data were not normally distributed, they satisfied the assumptions of homogeneity. The results indicated no significant relationship between academic self-efficacy and problem-solving ability ($r = -0.014$, $p = 0.922$), with regression analysis further confirming its negligible predictive power ($\beta = -0.029$, $p = 0.922$). These findings imply that academic self-efficacy may not be a crucial determinant of mathematical problem-solving performance at the elementary level, possibly due to the students' limited metacognitive development. Theoretically, this study contributes to the field of educational psychology by challenging the universality of self-efficacy's influence in early education. Practically, it prompts educators and policymakers to consider developmental readiness when creating interventions designed to enhance self-belief. Future research should investigate mediating variables such as cognitive strategies, emotional regulation, and classroom environment to better understand academic performance among early learners.

Keywords: elementary education; self-efficacy; problem-solving

INTRODUCTION

Primary school education represents a crucial phase for the development of essential cognitive functions such as logical reasoning, attention regulation, and problem-solving abilities, alongside the cultivation of socio-emotional skills including empathy, peer collaboration, and emotional regulation. When these foundational areas are effectively nurtured early on, they establish the groundwork for students' long-term academic success and their ability to adapt within formal learning environments (Archambault, and Dupéré, 2017). Nevertheless, previous research often falls short in critically examining the interactions of these domains within structured curricula, and many sources tend to generalize the role of primary education without clearly defining developmental benchmarks or instructional implications. Social interactions in the primary school environment also play an important

role in shaping students' empathy and social skills, which impact their engagement in the learning process (Garandeau et al., 2022). In addition, early onset of academic pressure can trigger anxiety in students, potentially hindering their motivation and learning performance (Von der Embse et al., 2013). Therefore, the educational approach at this level must be holistic, paying attention to cognitive, socio-emotional aspects to support students' optimal development.

In facing the educational challenges of the 21st century, attention to psychological factors in the student learning process is becoming increasingly important. One of the main factors contributing to academic success is self-efficacy, which is an individual's belief in his or her ability to plan and execute certain actions to achieve expected results (Jamaluddin et al., 2022; Pajares & Kranzler, 1995). Self-efficacy not only influences how students perceive academic tasks, but also determines the level of motivation, persistence, and strategies used to overcome learning obstacles (Jamaluddin et al., 2022). Thus, a deep understanding of self-efficacy is key in designing learning that is responsive to learners' needs.

Research in educational psychology has shown that self-efficacy is a significant predictor of students' academic performance, especially in facing complex cognitive challenges (Kruger, 1997; Wei et al., 2021). Students with high self-efficacy tend to have positive expectations of learning outcomes, are more diligent in completing tasks, and do not give up easily when facing difficulties (Pajares, 1996). In contrast, students with low self-efficacy often feel inadequate, are easily frustrated, and tend to avoid challenging tasks. This shows that self-efficacy not only functions as an internal drive but also as a cognitive filter that influences students' perceptions, emotions, and learning behavior.

At the primary school level, the role of self-efficacy is crucial as students are in a phase of character development and attitude towards learning. Elementary school is a period where children begin to develop an understanding of their own abilities through direct experience and the influence of the social environment (Simamora et al., 2018). Positive self-perceptions formed at an early age will influence how students respond to academic challenges at the next level (Fitriani et al., 2020). Strengthening self-efficacy in elementary school students has the potential to shape more positive, independent, and reflective learning attitudes in the long run (Alfares, 2021).

Although self-efficacy has been widely studied in the context of education, most of the research focus is still dominated by secondary and higher education levels (M. M. Ali et al., 2022; Muawwanah et al., 2020; Yokoyama, 2019). Research specifically exploring self-efficacy in primary school students is limited, despite the fact that their developmental context and learning experiences are very different (Umaroh et al., 2020) . The approach used with adolescent students cannot necessarily be applied to elementary school students without appropriate adjustments (Lee et al., 2016; Nurhayati, and , Langlang Handayani, 2020). Most studies still focus on the cognitive aspects of learning, ignoring the contribution of affective variables such as self-efficacy, which is the main foundation of learning.

In addition to the lack of attention to the elementary school level, existing studies have also not discussed how self-efficacy interacts with real learning contexts. (Widyaningrum, and Hasanah, 2021) Suggests that social background, gender, and learning style contribute to the formation of self-efficacy, but are often overlooked in research designs. (Simamora et al., 2018) It also shows that many studies separate self-efficacy from daily learning practices, so the results are less applicable in the classroom context. (Trihono, 2022) reinforces that a more contextual and holistic approach is needed to understand how self-efficacy is formed and developed in the primary school environment.

Several empirical studies have proven that increasing self-efficacy has a direct impact on improving student learning performance. Students with high self-efficacy have a tendency to be more confident in designing task completion strategies. (Pajares, 1996). Learning that

integrates self-efficacy reinforcement can significantly increase learning completeness (Amaliyah et al., 2023). Differences in students' self-efficacy levels contribute markedly to academic success, even when their intellectual capacities are relatively equal (Hoffman, 2005).

Based on these findings, it can be concluded that self-efficacy is a highly influential psychological component in supporting students' learning success. However, there is a gap in the literature regarding how self-efficacy is systematically formed, manifested, and enhanced in the context of basic education. There is a need for a research approach that combines theoretical and practical perspectives to produce learning strategies that foster self-efficacy in a sustainable way (Voica et al., 2020). Further exploration of the internal mechanisms linking self-efficacy to various indicators of learning success (Milam et al., 2019; Zulnaidi et al., 2021).

Therefore, this study aims to empirically investigate how self-efficacy affects the problem-solving ability of elementary school students. The main focus of the study is not only on the outcome aspect of problem solving, but rather on how students' self-efficacy in carrying out the learning process can determine the effectiveness of their approach to academic challenges. Through this study, it is hoped that theoretical contributions can be made that enrich the field of educational psychology, as well as provide a basis for learning strategies that foster self-efficacy from an early age, so that students are able to learn more independently, adaptively, and confidently in the long run.

METHODS

This study uses a quantitative method, which aims to determine the relationship between self-efficacy and math problem-solving. This design was chosen because the researcher does not provide treatment for the independent variable, but rather observes the symptoms that already exist as they should. The analysis technique used in this study is simple linear regression, with the aim of knowing how much self-efficacy contributes in influencing students' problem-solving (Jamaluddin et al., 2022).

The sample in this study amounted to 50 students from five elementary schools. The sampling technique was carried out by purposive sampling, namely the selection of subjects based on certain considerations such as representation of schools in one cluster and ease of access (Jamaluddin et al., 2022). The selection of five elementary schools is intended to obtain a representative picture of the population of elementary school students in the region (Jamaluddin et al., 2022). Data collection techniques in this study consisted of test and non-test methods. Tests were used to measure students' mathematical problem-solving through description questions that had been developed and validated in advance (Jamaluddin et al., 2022). Meanwhile, a non-test instrument in the form of a questionnaire is used to measure students' self-efficacy, which is compiled based on relevant indicators and has also been tested for content validity by experts (Umaroh et al., 2020). Thus, both instruments were used simultaneously to obtain quantitative data that could be analyzed statistically.

Although several items in the self-efficacy and problem-solving instruments were found to be invalid based on outer loading values, only valid items were included in the final analysis to maintain statistical accuracy and construct reliability (Hair et al., 2011). The exclusion of these items may have affected the breadth of construct representation but ensured greater internal consistency. Additionally, a residual analysis was conducted during the regression testing phase to verify the assumptions of homoscedasticity and linearity (Ghasemi, and Zahediasl, 2012).

Table 1. Result of Outer Loading and Cronbach`s Alpha Self-Efficacy

Construct	Indicator	Outer Loading	Decision	Cronbach`s Alpha	Decision
Initiative	Q1	0.077	Not Valid	0.857	Reliable
	Q2	0.494	Not Valid		
	Q3	-0.015	Not Valid		
	Q4	0.312	Not Valid		
	Q5	0.723	Valid		
	Q6	0.027	Not Valid		
	Q7	0.673	Valid		
	Q8	0.505	Not Valid		
	Q9	0.979	Valid		
Persistence	Q10	0.539	Not Valid	0.325	Unreliable
	Q11	-0.062	Not Valid		
	Q12	0.637	Valid		
	Q13	0.318	Not Valid		
	Q14	0.814	Valid		
Effort	Q15	0.037	Not Valid	0.426	Unreliable
	Q16	0.852	Valid		
	Q17	0.068	Not Valid		

Based on the validity test, there are valid and invalid items. Furthermore, a reliability test was carried out, which aims to determine the internal consistency of the instrument items using the Cronbach alpha criterion. In the field of social science, the coefficient value > 0.6 is acceptable (Jamaluddin et al., 2022)

Furthermore, the test instrument consisted of eight description questions about subtraction and addition of fractions used to measure the problem-solving ability of elementary school students. This test was developed by following four stages based on the opinion (Safitri, 2019). The score of each item ranges from 1 to 4.

Table 2. Result of Outer Loading and Cronbach`s Problem Solving

Construct	Indicator	Outer Loading	Decision	Cronbach`s Alpha	Decision
Understanding the problem	Q1	0.830	Valid	0.693	Reliable
	Q2	0.868	Valid		
Devising a plan	Q3	0.797	Valid	0.734	Reliable
	Q4	0.916	Valid		
Carrying out the plan	Q5	0.883	Valid	0.776	Reliable
	Q6	0.903	Valid		
Looking back	Q7	0.895	Valid	0.597	Unreliable
	Q8	0.831	Valid		

Based on the results of the outer loading test, all indicators in each construct have a value above 0.70, which indicates that the validity of the indicator on the latent construct is met. This is in line with the guideline that the outer loading value ≥ 0.70 indicates a strong

correlation between the indicator and the construct represented (Hair et al., 2011). In addition, Cronbach's alpha values for most constructs were above 0.70, indicating excellent internal reliability, except for the looking back construct, which showed a value of 0.597, indicating low reliability. Nonetheless, in the context of social and educational research, Cronbach's alpha values between 0.60 and 0.70 are still tolerable for new or exploratory constructs (Taber, 2018). Therefore, the overall instrument can be considered valid, and most constructs have an acceptable level of reliability.

1) H1: There is a significant influence between self-efficacy on problem solving ability.
2) H0: There is no significant influence between self-efficacy on problem solving ability.

RESULT AND DISCUSSION

In a quantitative research, statistical testing is a crucial aspect in ensuring the validity of the relationship between the variables studied. This study evaluates the relationship between self-efficacy and elementary school students' mathematical problem solving ability through a series of statistical tests, namely normality, homogeneity, correlation, and simple linear regression tests.

Table 3. Results of Normality and Homogeneity Test

One Sample Kolmogorov. Smimov Test and Test of Homogeneity of Variances

	Levene Statistic	**d1**	**df2**	**Sig.**
Based on Mean	1.109	9	38	0.380
Based on Median	0.491	9	38	0.872
Based on Median and With adjusted df	0.491	9	31.470	0.870
Based on trimmed mean	1.078	9	38	0.41
	Sellf-Efficacy		Problem Solving	
Asymp. Sig. (2-tailed)	0.004		0.000	

The normality test is used to determine whether the distribution of data follows a normal distribution pattern. Based on the Kolmogorov-Smirnov results in Table 1, the significance values for self-efficacy (0.004) and problem solving (0.000) are both <0.05. This indicates that the data are not statistically normally distributed. However, deviations from normality do not necessarily impede the use of linear regression analysis, especially in studies with sufficient sample size (>30), as it is robust to violations of this assumption within reasonable limits (Ghasemi, and Zahediasl, 2012; Thomas Lumley, Paula Diehr, Scott Emerson, 2013).

The homogeneity test aims to determine the similarity of variance between data groups. Based on Table 2, all approaches (mean, median, trimmed mean) show a significance value > 0.05, meaning that the data has a homogeneous variance. Homogeneity of variance is an important requirement for the feasibility of regression and ANOVA analysis. When this assumption is met, the reliability of the regression model results increases due to the absence of variances that deviate extremely from the population (Z. Ali, and Bhaskar, 2016). The consistent fit of the variance distribution strengthens the internal validity and generalizability of the results.

Table 4. Result of Correlation Test

		Pearson Correlation	Sig. (2-tailed)	N
Self Efficacy	Self Efficacy	1		50
	Problem Solving	-0.14	0.922	50
Problem Solving	Self Efficacy	-0.014	0.922	50
	Probel Solving	1		50

Correlation testing was conducted to assess the strength and direction of the relationship between variables. In Table 3, the Pearson correlation coefficient between self-efficacy and problem solving is -0.014 with a significance of 0.922. This result indicates that there is no significant linear relationship between the two variables.

This lack of correlation can be caused by various contextual factors, including the age limitations of students in understanding and assessing their abilities consistently. At elementary school age, metacognitive abilities and self-reflection are still in the early stages of development, so the influence of self-efficacy on cognitive performance such as problem solving is not yet fully visible (Zimmerman, 2000).

Table 5. Results of Simple Linear Regression Test

		Cefficients				
1	(Constant)	15.559	3.947		3.942	0.000
	Self Efficacy	-0.029	0.294	0.014	-0.098	0.922
Model		B	Std. Error	Beta	t	Sig.
		Unstandardized Coefficients		Standardized Coefficients		

The linear regression results in Table 4 show that self-efficacy is not a significant predictor of problem solving ability (β = -0.029, p = 0.922). That is, the self-efficacy variable did not statistically affect the dependent variable. This finding suggests that affective factors such as self-efficacy may not be sufficiently developed in elementary school students to play a significant role in the context of mathematical problem solving. In addition, it is likely that other factors such as cognitive ability, learning strategies, or the quality of learning instruction are more dominant in influencing student learning outcomes at this age. (Pintrich, 2004; Tzohar-Rozen, and Kramarski, 2014).

CONCLUSION

Based on the findings, this study concludes that academic self-efficacy does not significantly influence the mathematical problem-solving of elementary school students. This may be due to their limited cognitive maturity and underdeveloped self-regulation, which hinder their ability to accurately assess and apply their capabilities in solving complex tasks. The study was limited by a small sample size and reliance on self-report instruments, which may not fully represent students' actual behaviors. To support learning outcomes more effectively at this level, educators are encouraged to focus on structured problem-solving

instruction, emotional support, and the gradual development of reflective learning habits through classroom strategies tailored to young learners. Future research should explore mediating factors such as learning environments, instructional quality, or peer interaction to gain a more comprehensive understanding of academic performance at this stage.

REFERENCES

Alfares, N. (2021). The effect of problem-based learning on students' problem-solving self-efficacy through blackboard system in higher education. *International Journal of Education and Practice*, 9(1), 185–200. https://doi.org/10.18488/journal.61.2021.91.185.200

Ali, M. M., Hariyati, T., Pratiwi, M. Y., & Afifah, S. (2022). Metodologi Penelitian Kuantitatif dan Penerapannya dalam Penelitian. *Education Journal.2022*, 2(2), 1–6.

Ali, Z., & Bhaskar, S. B. (2016). Basic statistical tools in research and data analysis. *Indian Journal of Anaesthesia*, *60*(9), 662–669. https://doi.org/10.4103/0019-5049.190623

Amaliyah, F., Hermawan, J. S., & Sari, D. P. (2023). Pengaruh Self Efficacy Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *8*(2), 5482–5490.

Archambault, I., & Dupéré, V. (2017). Joint trajectories of behavioral, affective, and cognitive engagement in elementary school. *Journal of Educational Research*, *110*(2), 188–198. https://doi.org/10.1080/00220671.2015.1060931

Fitriani, A., Zubaidah, S., Susilo, H., & Al Muhdhar, M. H. I. (2020). The effects of integrated problem-based learning, predict, observe, explain on problem-solving skills and self-efficacy. *Eurasian Journal of Educational Research*, *2020*(85), 45–64. https://doi.org/10.14689/ejer.2020.85.3

Garandeau, C. F., Laninga-Wijnen, L., & Salmivalli, C. (2022). Effects of the KiVa Anti-Bullying Program on Affective and Cognitive Empathy in Children and Adolescents. *Journal of Clinical Child and Adolescent Psychology*, *51*(4), 515–529. https://doi.org/10.1080/15374416.2020.1846541

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, *10*(2), 486–489. https://doi.org/10.5812/ijem.3505

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hoffman, B. H. (2005). The influence of self-efficacy and working memory capacity on The influence of self-efficacy and working memory capacity on problem solving efficiency problem solving efficiency. *UNLV Retrospective Theses & Dissertations*.

Jamaluddin, M., Mustaji, M., & Bahri, B. S. (2022). Effect of Blended Learning Models and Self-Efficacy on Mathematical Problem-Solving Ability. *International Journal of Learning, Teaching and Educational Research*, *21*(7), 127–144. https://doi.org/10.26803/ijlter.21.7.7

Kruger, L. J. (1997). Social support and self-efficacy in problem solving among teacher assistance teams and school staff. *Journal of Educational Research*, *90*(3), 164–168. https://doi.org/10.1080/00220671.1997.10543772

Lee, J., Lee, Y., Lee, S., & Bae, J. (2016). Effects of high-fidelity patient simulation led clinical reasoning course: Focused on nursing core competencies, problem solving, and academic self-efficacy. *Japan Journal of Nursing Science*, *13*(1), 20–28. https://doi.org/10.1111/jjns.12080

Milam, L. A., Cohen, G. L., Mueller, C., & Salles, A. (2019). The Relationship Between Self-Efficacy and Well-Being Among Surgical Residents. *Journal of Surgical Education*, *76*(2), 321–328. https://doi.org/10.1016/j.jsurg.2018.07.028

Muawwanah, Ma'rufi, & Nurdin. (2020). Korelasi antara Kepercayaan Diri dan Kemandirian Belajar terhadap Hasil Belajar Matematika Siswa Sekolah Dasar. *Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *3*(2), 1–15.

Nurhayati, H., & , Langlang Handayani, N. W. (2020). Jurnal basicedu. Jurnal Basicedu,. *Jurnal Basicedu*, *5*(5), 3(2), 524–532. https://journal.uii.ac.id/ajie/article/view/971

Pajares, F. (1996). Self-efficacy beliefs and mathematical problem-solving of gifted students. *Contemporary Educational Psychology*, *21*(4), 325–344. https://doi.org/10.1006/ceps.1996.0025

Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problem-solving. *Contemporary Educational Psychology*, *20*(4), 426–443. https://doi.org/10.1006/ceps.1995.1029

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and SRL in college students. *Educational Psychology Review*, *16*(4), 385–407. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/44454/10648_2004_Article_NY00000604.pdf;jsessionid=84C5931C2B16127B3BB6CD5DC43C8B0F?sequence=1

Safitri, W. C. D. (2019). Efektivitas Media Board Game terhadap Kemampuan Pemecahan Masalah pada Pembelajaran Tematik di SD. *Mimbar PSGD Undiksha*, *7*(2), 72–78.

Simamora, R. E., Saragih, S., & Hasratuddin, H. (2018). Improving Students' Mathematical Problem Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context. *International Electronic Journal of Mathematics Education*, *14*(1), 61–72. https://doi.org/10.12973/iejme/3966

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Thomas Lumley, Paula Diehr, Scott Emerson, and L. C. (2013). *T Esting S Lope H Omogeneity in L Arge P Anels*. https://doi.org/10.1146/annurev.publheath.23.100901.140546

Trihono, T. (2022). Hubungan antara Keterampilan Proses Sains dan Kemampuan Matematika dengan Pemahaman Konsep Sains dalam Pembelajaran Penemuan Terbimbing. *Jurnal Pendidikan Mipa*, *12*(3), 747–753. https://doi.org/10.37630/jpm.v12i3.675

Tzohar-Rozen, M., & Kramarski, B. (2014). Metacognition, Motivation and Emotions: Contribution of Self-Regulated Learning to Solving Mathematical Problems. *Global Education Review*, *1*(4), 76–95. http://ger.mercy.edu/index.php/ger/article/view/63

Umaroh, S., Yuhana, Y., & Hendrayana, A. (2020). Pengaruh Self-Efficacy dan Kecemasan Matematika Terhadap Kemampuan Penalaran Matematis Siswa SMP. *Wilangan: Jurnal Inovasi Dan Riset Pendidikan Matematika*, *1*(1), 1–15. http://www.jurnal.untirta.ac.id/index.php/wilangan

Voica, C., Singer, F. M., & Stan, E. (2020). How are motivation and self-efficacy interacting in problem-solving and problem-posing? *Educational Studies in Mathematics*, *105*(3), 487–517. https://doi.org/10.1007/s10649-020-10005-0

Von der Embse, N., Barterian, J., & Segool, N. (2013). Test Anxiety Interventions for Children and Adolescents: A Systematic Review of Treatment Studies from 2000-2010. *Psychology in the Schools*, *50*(1), 57–71. https://doi.org/10.1002/pits.21660

Wei, X., Lin, L., Meng, N., Tan, W., Kong, S. C., & Kinshuk. (2021). The effectiveness of partial pair programming on elementary school students' Computational Thinking skills and self-efficacy. *Computers and Education*, *160*, 104023. https://doi.org/10.1016/j.compedu.2020.104023

Widyaningrum, A., & Hasanah, E. (2021). Manajemen Pengelolaan Kelas Untuk Menumbuhkan Rasa Percaya Diri Siswa Sekolah Dasar. *Jurnal Kepemimpinan Dan Pengurusan Sekolah*, *6*(2), 181–190. https://doi.org/10.34125/kp.v6i2.614

Yokoyama, S. (2019). Academic self-efficacy and academic performance in Online Learning: A mini review. *Frontiers in Psychology*, *9*(JAN), 1–4. https://doi.org/10.3389/fpsyg.2018.02794

Zimmerman, B. J. (2000). Self-Efficacy: An Essential Motive to Learn. *Contemporary Educational Psychology*, *25*(1), 82–91. https://doi.org/10.1006/ceps.1999.1016

Zulnaidi, H., Heleni, S., Education, M., Program, S., Syafri, M., Pesantren, P., & Nagaberalih, A. (2021). *EN Zulnaidi et al (2021). Effects of SSCS Teaching Model on Students' Mathematical Problem-Solving Ability and Self-Efficacy. International Journal of Instruction, 14(1), 475-488..pdf*. *14*(1), 475–488.