The Effect of Math Anxiety on Students' Mathematics Performance with The Mediating Role of Math Self-Efficacy

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Abstract. The mathematics performance of Indonesian students is low, and there are still many students who have not reached the minimum level. Many factors affect students' mathematics performance, including math anxiety and self-efficacy. This study was conducted to determine whether there is a math self-efficacy medting role and effect between math anxiety and math performance. This research is quantitative research with a mediated path analysis model. The subjects were 236 students at MTs Nurul Huda Sedati who were taken using a proportionate stratified random sampling technique. To measure math anxiety, the Scale for Assessing Math Anxiety in Secondary School (SAMAS) and Alat Ukur Efikasi Matematika Indonesia (AUKEMI). And the original sc to measure math anxiety and self-efficacy, or the final semester exam to measure mathematics performance. The results showed (1) there is no direct effect between math anxiety and mathematics performance, with z-value = 0.873 and p = 0.382 (β = 0); (2) math self-efficacy fully mediates the effect between math anxiety and mathematics performance, with z-value = -2.006 and p = 0.045 on indirect effect, and z-value = -1965 and p = 0.049 on total effect; (3) math anxiety has a negative effect on math self-efficacy (β = -0.01). Thus, to improve mathematics performance, it will be more effective to focus on improving students' math self-efficacy.

Keywords: Math Anxiety; Math Self-Efficacy; Mathematics Performance.

1 Introduction

Based on the results of the PISA (Programme for International Students Assessment), Indonesian students obtained an average knowledge and proficiency score in mathematics of 386 from the average PISA mathematics score in 2015 of 490 (1), and decreased in PISA 2018 by obtaining a score of 379 from the average PISA math score of 489 (2). Additionally, the 2018 PISA results showed that only 28% of Indonesian students scored level 2 (minimum level) or above, and only 1% of students scored level 5 or above in math (3). These results can be concluded that the mathematics performance of Indonesian students is low, and there are still many students who have not reached the minimum level.

Similar conditions also occurred in one of the junior high schools, MTs Nurul Huda Sedati. From the results of the Computer-Based National Assessment in 2021, The school obtained a score of 1.82 in the field of numeracy, from the minimum competency with a range of 1.80 – 2.09. These results show that students' numeracy skills are still lacking even though they have reached the minimum competency, and only 40% of students have achieved basic competencies.

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At the same time, there are 2.52% of students who are under the basic competencies and require special handling.

The condition of students' low mathematics performance is cause for concern. Mathematics is one of the most important sciences which supports various aspects of life (e.g., being part of the skill development required in the current modern society) and has a connection with various other disciplines (4–6). Therefore, it is necessary to find out what factors play the most role in influencing students' mathematics performance so it can be used as a basis for reference in finding the right solution to improve students' low mathematics performance.

Several factors are often mentioned in influencing students' mathematics performance. Prior research states that Math anxiety is negatively correlated with students' mathematics performance. (7–9). Whereas in other studies, it was mentioned that math self-efficacy also influences students' mathematics performance (10,11).

Furthermore, previous research has found a reciprocal relationship between math anxiety and math self-efficacy (12–14). Additionally, Chandra & Royanto (2019) mentioned that math self-efficacy and math anxiety equally influence students' mathematics performance, although, in that study, math self-efficacy had a more significant effect on math performance (0.599; $p<0.01$) than math anxiety (-0.237; $p<0.01$). These results may indicate that there is a possibility that math self-efficacy mediates the relationship between math anxiety and mathematics performance, such as the research of D. Zhang & Wang (2020), which shows that math self-efficacy plays an important role in mediating the positive relationship between mathematics interest and mathematics achievement.

However, many studies have explained the relationship between math anxiety, math self-efficacy, and mathematics performance. However, a research model that examines the role of math self-efficacy as a mediator in the relationship between math anxiety and math performance is yet to be found. Hence, this study was conducted to examine whether math self-efficacy mediates the relationship between math anxiety and students' mathematics performance.

2 Literature Review

2.1 Mathematics Performance

Many studies examine math performance (i.e., Chandra & Royanto, 2019; Finell et al., 2022; Ozkal, 2019; J. Zhang et al., 2019). Unfortunately, there are no studies that clearly explain what mathematics performance is. Therefore, in this study, mathematics performance is defined based on the definition of mathematics ability, which refers to the ability to use numbers (i.e., basic number representation, simple arithmetic, and operations skills) and solve mathematical problems (i.e., find the solutions or strategy from an abstract representation of mathematical relations in context-rich problem) (16). According to Livianandа & Ekawati (2019), mathematics performance can be defined as the capability that students have in the fields of knowledge, skills, and attitudes that are reflected in their habits of thinking and how they solve mathematical problems. Thus, mathematics performance can be defined as the student's ability to learn and solve problems in math.

2.2 Math anxiety and mathematics performance

Mathematics is often considered a difficult subject by most students. The results of the PISA study in 2012 reported that 59% of students often worried that math lessons would be difficult for them, 33% stated that they felt very tense when they had to complete math homework, and another 31% stated that they felt nervous when solving math problems (8,18). The circumstances when individuals feel anxious, tense, and fearful when dealing with math tasks are defined as math anxiety. (12,19). Math anxiety is also defined as an intense and negative fear and emotional response to math (20,21).

Math anxiety is often considered a problem among students (22). People who experience math anxiety will find it difficult to absorb information and learn concepts, affecting the quality of learning, and learning outcomes are not optimal, which will reduce student mathematics achievement (23). A meta-analysis of 49 research articles identified a strong negative relationship between math anxiety and math performance. (9). Moreover, math anxiety showed a negative relationship with students' numeracy skills (24), and has a long-lasting effect on learning, which makes them susceptible to a variety of harmful learning behaviors that can hinder student performance (8,25).

2.3 Math self-efficacy and mathematics performance

Academic achievement is often linked to self-confidence, and one of the most important aspects of self-confidence is self-efficacy (11,26). Self-efficacy refers to a consideration of how much a person believes about his ability or competence in carrying out several learning activities and his ability to complete learning tasks (27,28). At the same time, Math self-efficacy is defined as a student's belief or self-assessment of their ability to solve a particular mathematical problem and tasks related to mathematics. (29).

Schöber et al. (2018) found that there is a positive reciprocal effect between math self-efficacy and math and reading achievement. Students who have higher math self-efficacy tend to perform well on math achievement tests (30). Additionally, students who have high math self-efficacy can obtain better math performance (10), and can make students more motivated during the learning process (29). Thus, if students have high math self-efficacy, their math performance will also improve and ultimately make their math achievement better.

2.4 Math anxiety and math-self efficacy

Students' feelings of efficacy play an important role in generating anxiety in students (15,31). The more an individual feels unsure of their abilities, the more anxious they will feel (32,33). Previous research found that high math anxiety can cause low math self-efficacy and vice versa (13,14).

Thomaes et al. (2020) stated that when students who have negative beliefs about their competence experience difficulties in solving math problems, they tend to be anticipatory and worry about failure. So, it can trigger them to disengage from the task and ultimately reduce their mathematics performance.

3 Method

This research is a quantitative study with math anxiety as the independent variable, math self-efficacy as the mediator variable, and math performance as the dependent variable, with the research design shown in **Figure 1**. The population in this study were all students at MTs Nurul Huda Sedati, with a total of 358. The sample size of 236 participants was determined based on the Isaac and Michael table with an error rate of 1% (35). Of the 236 participants, 55.1% were male and 44.9% were female. The age range of participants is between 12 - 15 years old.

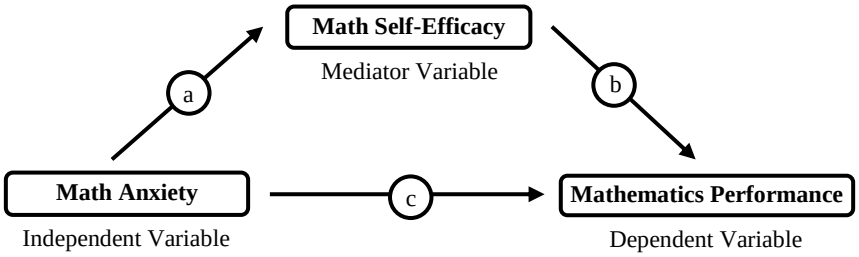

Figure 1. Study Design

This research uses a proportionate stratified random sampling technique by dividing the population into three strata based on grade level (i.e., grade 7, 8, and 9), with details in **Table 1**. Then, take a random sample in each stratum based on a predetermined percentage with a balanced proportion. Data collection was conducted by distributing the research information along with a link to the online questionnaire for the participants to fill out.

Table 1. Distribution of Participants in Each Class

Number	Class	Number of Participants	Percentages
1	7	61	26%
2	8	79	33%
3	9	96	41%
	Total	**236**	**100%**

The measurements in this study were a series of questionnaires consisting of two types of scales. The measurement tool for math anxiety is adapted from the Scale for Assessing Math Anxiety in Secondary Education (SAMAS) (36). then translated into Indonesian through a process of review and translation by three experts. SAMAS consists of 20 items in three dimensions, namely everyday life's math anxiety (e.g., "I get nervous when calculating the total price of what I bought"), math learning anxiety (e.g., "I get nervous at the thought of having to study again math next year"), and math test anxiety (e.g., "I got nervous the previous day of a math test"). With a continuous response scale ranging from 0 (Strongly disagree) to 10 (Strongly Agree). The internal consistency in everyday life's math anxiety factors of $\alpha = 0.83$, math learning anxiety of $\alpha = 0.86$, and math test anxiety of $\alpha = 0.84$ (36). The reliability test on the SAMAS scale, after being administered to the subject, showed a reliability result of $\alpha = 0.897$. The results

of confirmatory factor analyses (CFA) using the DWLS estimator are presented in **Table 2**, showing that the three dimensions have met the suitability index standards.

The measurement tool for math self-efficacy uses Alat Ukur Efikasi Matematika Indonesia (AUKEMI) (37). AUKEMI consists of 23 items which consist of four dimensions, namely positive views (e.g., "I am confident about my answers when calculating math problems"), negative affect (e.g., "I feel math is a terrifying subject"), math application (e.g., "I am able to calculate and manage the money that I use daily"), and out-of-class learning (e.g., "I have an extra time to study outside of class to learn math"). With a range of answer options ranging from 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree). Whereas all items in the negative affect dimension are unfavorable items, so the calculation of the score is reversed. The reliability of AUKEMI on positive view was 0.92, the negative effect was 0.83, the math application was 0.79, and learning out of class was 0.72, and the overall reliability was 0.918 (37). The reliability test of the AUKEMI scale, after being administered to the subject, showed a Cronbach's alpha reliability result of $\alpha = 0.850$. The CFA results with the ML estimator are presented in **Table 3**, showing that the four dimensions have met the suitability index standard.

Table 2. CFA Model Fit Index Test on SAMAS

Fit Indices	Indices Value	Standard Value	Description
χ^2	157.541 (*df* = 167; p = 0.688)	p > 0.05	Model Fit
SRMR	0.062	< 0.08	Model Fit
TLI	1.003	> 0.90	Model Fit
CFI	1.000	> 0.90	Model Fit
RMSEA	0.000	< 0.07	-

Table 3. CFA Model Fit Index Test on AUKEMI

Fit Indices	Indices Value	Standard Value	Description
χ^2	p < .001	p < .001	-
SRMR	0.047	< 0.08	Model Fit
TLI	0.907	> 0.90	Model Fit
CFI	0.918	> 0.90	Model Fit
RMSEA	0.064	< 0.07	Model Fit

Source. Mubarrak et al. (2022)

Meanwhile, mathematics performance is measured based on the original mathematics score on the Odd Semester Final Examination, which is compiled based on the applicable curriculum at school and has been given to each student according to grade level. The score data is obtained

from the original document of the odd semester final exam results in mathematics, which have been obtained by researchers from the school administration.

The data analysis in this study used a mediated path analysis model by using JASP 0.14.1.0 software to see the direct effect (i.e., the relationship between math anxiety and math performance). And the indirect effect (i.e., the mediating role of math self-efficacy on the relationship between math anxiety and math performance).

4 Result

4.1 Descriptive Statistics Analysis

The results of descriptive statistical analysis in **Table 4** showed an average math anxiety score of 66,153 (SD=11,087), math self-efficacy of 102,644 (SD=33,530), and mathematical performance of 34,936 (SD=13,404), so the data showed heterogeneous traits.

Table 4. Descriptive Statistics Analysis

	Math Anxiety	Math Self-Efficacy	Mathematics Performance
Valid	236	236	236
Missing	0	0	0
Mean	102.644	66.153	34.936
Std. Deviation	33.530	11.087	13.404
Variance	1124.239	122.913	179.677
Minimum	13.000	38.000	5.000
Maximum	184.000	101.000	85.000

The normality test is determined based on the distribution plot diagram displayed on each variable. Based on the output display in **Figure 2**, it shows that the data distribution on the math anxiety and math self-efficacy variables shows a bell-shaped data distribution pattern, so the data distribution is considered normally distributed. In the math performance variable, the data distribution pattern in **Figure *2*** shows a distribution pattern that deviates to the left, although the data distribution pattern is still shaped like a bell, so the data on the math performance variable is interpreted as normally distributed data.

Figure 2. Distribution Plot Diagram of Math Anxiety, Math Self-Efficacy, and Mathematics Performance Variables

4.2 Correlation Test

The correlation test results in **Table 5** show that no relationship existed between math anxiety and math performance (p=0.052). At the same time, the relationship between math anxiety and math self-efficacy shows a significant relationship (p<.001), with a negative degree of relationship. This study also shows a positive and significant relationship between math self-efficacy and math performance (p=0.007).

Table 5. Correlations Test

Pearson's Correlations				
Variable		**Math Self-Efficacy**	**Math Anxiety**	**Mathematics Performance**
1. Math Self-Efficacy	Pearson's r	—		
	p-value	—		
2. Math Anxiety	Pearson's r	-0.437	—	
	p-value	< .001	—	
3. Mathematics Performance	Pearson's r	0.175	-0.127	—
	p-value	0.007	0.052	—

4.3 Mediation Path Analysis

In this study, mediation path analysis was conducted to see the direct effect between math anxiety and math performance and the indirect effect between math anxiety and math performance with math self-efficacy as the mediator variable. Then, the total effect estimates the direct effect and indirect effect. The results of the analysis that examined the direct effect between math anxiety and math performance in **Table 6** showed a z-value = 0.873 and p = 0.382 (p>0.05), indicating that there is no direct effect between math anxiety and math performance.

Table 6. Direct Effects

							95% Confidence Interval	
			Estimate	**Std. Error**	**z-value**	**p**	**Lower**	**Upper**
Math Anxiety	→	Mathematics Performance	-0.002	0.002	-0.873	0.382	-0.006	0.002

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Meanwhile, the results that examined the indirect influence between the math anxiety variable and the math performance variable with the math self-efficacy variable as a mediator in **Table 7** showed z-value = -2.006 and p = 0.045 (p < 0.05). These results indicate that there is a significant indirect influence between math anxiety and math performance when the math self-efficacy variable is included as a mediator variable.

Table 7. Indirect Effects

								95% Confidence Interval	
				Estimate	Std. Error	z-value	p	Lower	Upper
Math Anxiety	→	Math Self-Efficacy	→	Mathematics Performance	-0.002	9.625e -4	-2.006	0.045	-0.004	-4.443e -5

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

In the results of the total influence that can be seen in **Table 8**, the value of z-value = -1965 and p = 0.049 (p < 0.05). These results indicate that there is a mediating role for math self-efficacy variables in the relationship between math anxiety and math performance.

Table 8. Total Effects

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
Math Anxiety	→	Mathematics Performance	-0.004	0.002	-1.965	0.049	-0.008	-9.610e -6

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Similarly, the results revealed that there was a negative influence between math anxiety and math self-efficacy (β = -0.01), and math self-efficacy also had a positive effect on mathematics performance (β = 0.15). However, there was no effect between math anxiety and mathematics performance (β = 0), which can be seen in Figure 3. These results indicate that math self-efficacy fully mediates the effect between math anxiety and math performance.

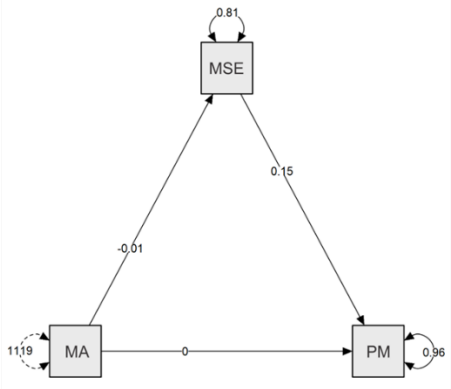

Figure 3. Model Plot

Description. MA = Math Anxiety; MSE = Math Self-Efficacy; PM = Mathematics Performance

5 Discussion

5.1 The effect between math anxiety and mathematics performance

The present study contributes to the previous literature by validating a theoretical model of the effect between math anxiety and students' mathematics performance. This study found that there was no direct relationship or influence between math anxiety and students' mathematical performance. The result is contrary to the prior studies, which stated that there is a relationship between math anxiety and math performance (7,9,23,24). In other words, high or low math anxiety in students does not affect their math performance. This result also refutes the results of previous meta-analysis on the relationship between math anxiety and math performance, which states that the negative effect between math anxiety and math performance increases in the middle school period. (9).

The lack of relationship between math anxiety and math performance may be due to the fact that students who have entered adolescence are more focused on social issues, such as exploring various roles to build an identity or finding their identity to fit the perspective of their peers. Thus, anxiety at this time is more focused on social relationship issues than on issues related to academic performance (12).

5.2 The effect between math anxiety and math self-efficacy

This study has relevance to previous research, which states that there is a significant relationship between math anxiety and math self-efficacy (13,14). This means that the more anxious students are when dealing with math, the less confidence they have in their ability to solve math problems.

Thomaes et al. (2020) state that when students with negative competence beliefs work on mathematics problems, they are prone to anticipate and worry about failure. Thus, it can trigger them to disengage from the task and ultimately reduce their math performance.

Additionally, Fitriyani & Miatun (2022) stated that when students who have high self-confidence in mathematics cannot do math problems, which makes them feel anxious about mathematics, they will try to find ways to make the anxiety disappear.

5.3 The effect between math self-efficacy and mathematics performance

Meanwhile, this finding also shows that there is a significant effect between math self-efficacy and students' mathematics performance. Therefore, every increase in math self-efficacy is accompanied by an increase in math performance. The results support the previous research, which also states that there is a relationship between math self-efficacy and students' mathematics performance (10–12). Additionally, students who have higher math self-efficacy tend to perform well on math achievement tests (30). When students' math performance increases, it can make students able to do learning activities or academic tasks smoothly, thus making students more motivated in the learning process and eventually achieve better mathematics achievement (10,28,29).

5.4 Math self-efficacy as a mediator

The mediation analysis in this study shows that math self-efficacy fully mediates the effect between math anxiety and math performance, which means that the effect between math anxiety and math performance is always mediated by math self-efficacy. In other words, it shows that any increase in math anxiety in students cannot explain the effect on students' math performance. However, when mediated by math self-efficacy, any increase in math anxiety can explain the effect on math performance. These results support the results of previous studies on the relationship between math interest and math achievement, which show the important role of math self-efficacy in mediating the positive relationship between math interest and math achievement (15). Additionally, the research of Finell et al. (2022) found that there is a significant indirect effect of math anxiety on mathematics performance when adding working memory as a mediator variable.

Therefore, from the results of the study, effective intervention in improving students' low math performance is by providing interventions that focus more on increasing math self-efficacy rather than doing interventions that focus on math anxiety. One of the approaches that can be done to improve students' math self-efficacy is problem-based learning or brain-based learning approach. (26,29,38).

5.5 Limitation

The study had some limitations. First, data collection is carried out quantitatively through self-report scales, which tend to be influenced by social desirability bias, so the data obtained is not deep and complex enough, especially to measure math anxiety, which can be obtained through observation. Second, the participants were limited to one school population, so these results may differ if conducted in a population with different characteristics or with a more varied sample (9).

Third, the studied independent and moderator variables in this research (i.e., math anxiety and math self-efficacy) are both included in the internal factors that can affect math performance. So this research is limited to the internal factors that affect math performance. Therefore, perhaps future research can explore the dynamics of the relationship between variables that become external factors in influencing students' mathematics performance, such as parental and teachers' social support (39–41).

6 Conclusion

The results of this study show that math anxiety has no relationship with students' mathematics performance. Furthermore, there is a significant negative relationship between math anxiety and math self-efficacy. And there is a significant positive relationship between math self-efficacy and mathematics performance. The results also show whether there is a fully mediating role of math self-efficacy on the influence between math anxiety and mathematics performance, where any increase in math self-efficacy can reduce students' math anxiety and make students' mathematics performance increase.

Therefore, improving students' mathematics performance can be effectively done by conducting interventions that focus on increasing students' mathematics self-efficacy, such as conducting

problem-based learning or conducting mathematics learning with a brain-based learning approach.

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References

1. OECD. PISA 2015 Results in Focus. 2016.
2. Schleicher A. PISA 2018: Insights and Interpretations. OECD Publishing. Paris; 2019.
3. Avvisati F, Echazarra A, Givord P, Schwabe M. Indonesia - Country Note - PISA 2018 Results. Vol. 1, OECD Publishing. 2019.
4. Julie H, Sanjaya F, Anggoro AY. The students' ability in the mathematical literacy for uncertainty problems on the pisa adaptation test. In: The 4th International Conference on Research, Implementation, and Education of Mathematics and Science (4th ICRIEMS). Sleman: AIP Publishing; 2017. p. 1–10.
5. Rizki LM, Priatna N. Mathematical literacy as the 21st century skill. In: Journal of Physics: Conference Series. Bandung: IOP Publishing Ltd; 2019. p. 1–5.
6. Sumiati A, Agustini Y. Analisis kesulitan menyelesaikan soal segi empat dan segitiga siswa smp kelas viii di cianjur. J Cendekia J Pendidik Mat. 2020;4(1):321–30.
7. Finell J, Sammallahti E, Korhonen J, Eklöf H, Jonsson B. Working memory and its mediating role on the relationship of math anxiety and math performance: a meta-analysis. Front Psychol. 2022;12(798090):1–14.
8. Luttenberger S, Wimmer S, Paechter M. Spotlight on math anxiety. Psychol Res Behav Manag. 2018;11:311–22.
9. Zhang J, Zhao N, Kong QP. The relationship between math anxiety and math performance: A meta-analytic investigation. Front Psychol. 2019;10(1613):1–17.
10. Ozkal N. Relationships between self-efficacy beliefs, enggagement and academic performance in math lessons. Cypriot J Educ Sci. 2019;14(2):190–200.
11. Schöber C, Schütte K, Köller O, McElvany N, Gebauer MM. Reciprocal effects between self-efficacy and achievement in mathematics and reading. Learn Individ Differ. 2018;63:1–11.
12. Chandra T, Royanto LRM. Pengaruh math self-efficacy dan math anxiety terhadap performansi matematika pada siswa kelas v sd. J Magister Psikol UMA. 2019;11(2):126–36.
13. Du C, Qin K, Wang Y, Xin T. Mathematics interest, anxiety, self-efficacy and achievement: Examining reciprocal relations. Learn Individ Differ. 2021;91(102060):1–8.
14. Macmull MS, Ashkenazi S. Math anxiety: The relationship between parenting style and math self-efficacy. Front Psychol. 2019;10(1721):1–12.
15. Zhang D, Wang C. The relationship between mathematics interest and mathematics achievement: Mediating roles of self-efficacy and mathematics anxiety. Int J Educ Res. 2020;104(101648):1–9.
16. Muncer G, Higham PA, Gosling CJ, Cortese S, Wood-Downie H, Hadwin JA. A meta-analysis investigating the association between metacognition and math performance in adolescence. Educ Psychol Rev. 2022;34(1):301–34.
17. Liviananda F, Ekawati R. Hubungan keyakinan siswa tentang matematika dan pembelajarannya dengan kemampuan matematika. J Ilm Pendidik Mat. 2019;8(2):357–64.

18. OECD. PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know. Paris; 2013.
19. Ashcraft MH. Math anxiety: Personal, educational, and cognitive consequences. Curr Dir Psychol Sci. 2002;11(5):181–5.
20. Mutlu Y. Math anxiety in students with and without math learning difficulties. Int Electron J Elem Educ. 2019;11(5):471–5.
21. Sherard WH. Math Anxiety in the Classroom. Clear House A J Educ Strateg Issues Ideas. 1981;55(3):106–10.
22. Hadi FZ, Fathurrohman M, Hadi CA. Kecemasan matematika dan kemampuan berpikir kritis matematis siswa di sekolah menengah pertama. Algoritm J Math Educ. 2020;2(1):59–72.
23. Berliana C, Adirakasiwi AG. Pengaruh mathematics anxiety terhadap hasil belajar matematika siswa smp di masa pandemi covid-19. J Cendekia J Pendidik Mat. 2021;5(3):2628–35.
24. Commodari E, La Rosa VL. General academic anxiety and math anxiety in primary school. The impact of math anxiety on calculation skills. Acta Psychol (Amst). 2021;220(103413):1–7.
25. Mazana MY, Montero CS, Casmir RO. Investigating students' attitude towards learning mathematics. Int Electron J Math Educ. 2019;14(1):207–31.
26. Rusyda NA, Suherman S, Suhendra S, Rusdinal R. Meningkatkan self-efficacy matematis peserta didik pada pembelajaran matematika melalui pendekatan brain based learning. Media Pendidik Mat. 2020;8(2):74–9.
27. Ardiansyah A. Penguasaan Konsep Matematika Ditinjau Dari Efikasi Diri dan Kemandirian Belajar. Alfarisi J Pendidik MIPA. 2018;1(1).
28. Somawati S. Peran efikasi diri (self efficacy) terhadap kemampuan pemecahan masalah matematika. J Konseling dan Pendidik. 2018;6(1):39–45.
29. Masitoh LF, Fitriyani H. Improving students' mathematics self-efficacy through problem based learning. Malikussaleh J Math Learn. 2018;1(1):26–30.
30. Xu Z, Jang EE. The role of math self-efficacy in the structural model of extracurricular technology-related activities and junior elementary school students' mathematics ability. Comput Human Behav. 2017;68:547–55.
31. Bandura A, Freeman WH, Lightsey R. Self-efficacy: The exercise of control. Springer; 1999.
32. Fitriyani L, Miatun A. Efikasi diri dan kecemasan matematika hubungannya dengan kemampuan berpikir kritis siswa kelas xi mipa. Prox J Penelitihan Mat dan Pendidik Mat. 2022;5(2):168–80.
33. Sujarwo S. Hubungan antara efikasi diri dengan kecemasan belajar matematika pada siswa ips kelas i sma karya ibu palembang. J Ilm PSYCHE. 2014;8(1):63.
34. Thomaes S, Tjaarda IC, Brummelman E, Sedikides C. Effort self-talk benefits the mathematics performance of children with negative competence beliefs. Child Dev. 2020;91(6):2211–20.
35. Sugiyono. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. 2nd ed. Sutopo, editor. Bandung: Alfabeta CV; 2022. 1–444 p.
36. Yáñez-Marquina L, Villardón-Gallego L. Math anxiety, a hierarchical construct: Development and validation of the scale for assessing math anxiety in secondary education. Ansiedad y Estres. 2017;23(2–3):59–65.
37. Mubarrak KR, Ihsan H, Wyandini DZ. Development of math efficacy scale for junior high school student in indonesia. J Elem. 2022;8(1):276–89.
38. Negara FP, Abidin Z, Faradiba SS. Meningkatkan self-efficacy matematika siswa melalui pembelajaran berbasis masalah. J Cendekia J Pendidik Mat. 2022;7(1):455–66.
39. Fane A, Sugito S. Pengaruh keterlibatan orang tua, perilaku guru, dan motivasi belajar terhadap prestasi belajar matematika siswa. J Ris Pendidik Mat. 2019;6(1):53–61.
40. Putrie CAR, Fauzia M. Pengaruh dukungan sosial orang tua terhadap prestasi belajar siswa smp angkasa halim perdana kusuma jakarta timur. J Inov Pendidik Ekon. 2019;9(2):177–82.
41. Uran AL, Leton SI, Uskono IV. Pengaruh efikasi diri dan dukungan sosial guru terhadap prestasi belajar matematika siswa. Asimtot J Kependidikan Mat. 2019;1(1):69–76.