
Journal of Creativity Student

<http://journal.unnes.ac.id/journals/jcs>
DOI: <https://doi.org/10.15294/jcs.v9i2.64277>

Systematic Literature Review: The Effect of Math Anxiety on Students' Academic Achievement

Hasna Idatul Fitri^{1*}, Isti Hidayah²

¹Universitas Negeri Semarang, Semarang, Indonesia

²PUI IPRA - Pusat Unggulan IPTEK Inovasi Pendidikan Ramah Anak, Semarang, Indonesia

*Corresponding Author: hasnaidatulfitri2023@students.unnes.ac.id

Abstract

Mathematics anxiety is one of the psychological factors that can affect students' mathematics achievement. Students who experience high levels of mathematics anxiety tend to have low confidence, difficulty concentrating, and weak problem-solving abilities during mathematics learning. This study aims to analyze the influence of mathematics anxiety on students' mathematics achievement through a Systematic Literature Review (SLR). The study employed the PRISMA approach consisting of identification, screening, eligibility, and inclusion stages. Articles were collected from several databases, including Google Scholar, Scopus, ERIC, SINTA, and DOAJ using keywords related to mathematics anxiety and mathematics achievement. The findings indicate that mathematics anxiety has a significant negative effect on students' learning achievement. Internal factors such as self-efficacy, motivation, and confidence, as well as external factors such as learning environment and teaching methods, contribute to mathematics anxiety. Furthermore, collaborative and student-centered learning strategies are considered effective in reducing mathematics anxiety and improving students' mathematics achievement. Therefore, teachers need to create supportive, interactive, and enjoyable learning environments to minimize mathematics anxiety in mathematics learning.

Keywords: *mathematics anxiety; mathematics achievement; mathematics education*

INTRODUCTION

Mathematics is one of the subjects that plays a crucial role in developing students' logical, critical, systematic, and creative thinking skills. Mathematical ability also serves as the foundation for mastering science and technology. However, in reality, many students still view mathematics as a difficult subject, which leads to feelings of fear, anxiety, and stress when participating in mathematics lessons. This condition is known as mathematics anxiety, which is an emotional state characterized by feelings of anxiety and discomfort when a person is faced with mathematical activities (Rozgonjuk et al., 2020). Mathematics anxiety is one of the affective factors that has received significant attention in the field of education because it impacts both the process and outcomes of student learning. Students who experience mathematics anxiety tend to have difficulty understanding concepts, lack self-confidence, struggle to concentrate, and face obstacles in solving mathematical problems. Akkaya and Polat (2022) explain that mathematics anxiety can be influenced by unpleasant learning experiences, academic pressure, low self-efficacy, and an unsupportive learning environment. Furthermore, Suren and Kandemir (2020) state that high levels of math anxiety have a negative correlation with student academic achievement.

The phenomenon of math anxiety is not limited to Indonesia but is also observed in various countries. Research by Rozgonjuk et al. (2020) indicates that math anxiety is experienced by both students and college students, including those in STEM fields and the social sciences. This situation indicates that math anxiety is a global issue in mathematics education. The results of the 2022

Programme for International Student Assessment (PISA), published by the OECD (2023), also show that Indonesian students' math proficiency remains below the international average. This low math proficiency is believed to be influenced not only by cognitive factors but also by psychological factors such as math anxiety. Various studies have demonstrated that math anxiety affects students' math learning outcomes. Artama et al. (2022) state that the higher a student's level of math anxiety, the lower their learning outcomes. Hadi et al. (2020) also found that math anxiety can hinder students' mathematical critical thinking skills. Furthermore, Ramlan et al. (2021) explain that students' low self-confidence in solving math problems can increase their levels of math anxiety.

Recent research developments indicate that math anxiety remains a significant issue in modern mathematics education. A study by Pei et al. (2025) found that math anxiety has a negative effect on students' math performance, while mathematical engagement is a factor that can help improve students' learning outcomes. Research by Wang et al. (2025) also indicates that access to digital learning resources and the use of technology in math instruction influence students' levels of math anxiety. On the other hand, Liu et al. (2025), through a meta-analysis, explained that learning interventions combining psychological approaches and the strengthening of mathematical skills are effective in reducing students' math anxiety.

A study conducted by Andani (2025) explained that there is a negative relationship between math anxiety and students' academic achievement. These findings are supported by Khalimah and Triyana (2025), who state that students with high levels of math anxiety tend to achieve lower math learning outcomes. Additionally, Nugraheni and Pramugita (2025) found that math anxiety also affects elementary school students' mathematical critical thinking skills. Mathematics anxiety not only impacts academic achievement but is also linked to students' problem-solving abilities and psychological well-being during learning. Irawadi (2025) explains that students with high levels of anxiety struggle to solve mathematical problems systematically. Meanwhile, Efendi et al. (2025) found that math anxiety is also experienced by students in 3T regions (frontier, outermost, and underdeveloped areas), indicating that this issue remains an educational challenge across various regions of Indonesia. In the context of modern learning, Mahesa and Dewi (2025) explain that the use of digital learning media is also related to students' levels of math anxiety.

Based on these various research findings, it can be concluded that math anxiety is one of the key factors influencing students' academic performance in mathematics. Furthermore, advancements in educational technology, changes in the post-pandemic learning system, and the increasing use of digital media in mathematics instruction present new challenges and phenomena related to students' math anxiety. Therefore, a Systematic Literature Review (SLR) is needed to analyze the development of research on math anxiety, the factors influencing it, and its impact on students' mathematics learning outcomes. This study is expected to provide a comprehensive overview of trends in mathematics anxiety research, thereby serving as a reference for teachers, researchers, and education practitioners in designing effective learning strategies to reduce mathematics anxiety and improve students' academic performance.

METHOD

This scientific article was prepared using the Systematic Literature Review (SLR) method. The Systematic Literature Review is a method of systematically reviewing the literature to identify, examine, evaluate, and interpret research findings relevant to a specific topic in a structured and comprehensive manner. This method was used to obtain an overview of the influence of math anxiety on students' math achievement based on previously published studies. Throughout the process, this study followed systematic steps to ensure that the findings were objective and reliable. This study adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which include the identification, screening, eligibility, and inclusion stages. These stages were conducted to ensure that the articles used were truly relevant to the research topic. To identify suitable articles, the researcher conducted searches across several databases, including Google Scholar, SINTA, DOAJ, ERIC, and Scopus. The keywords used in the article search included "mathematics anxiety," "mathematics learning outcomes," "mathematics learning achievement," and "mathematics achievement".

RESULTS AND DISCUSSION

Mathematics anxiety causes students to have difficulty understanding mathematical concepts, lack self-confidence, struggle to concentrate, and face obstacles in critical thinking and mathematical problem-solving. In addition, factors such as the learning environment, motivation, self-efficacy, and the use of educational technology also influence students' levels of mathematics anxiety. The research data included in this article consist of an analysis and summary of documented articles related to the effects of math anxiety on student academic achievement.

Table 1. Research Findings on the Effect of Math Anxiety on Student Academic Achievement

Author	Journal	Results
Suren & Kandemir (2020)	International Journal of Education in Mathematics, Science and Technology	Research shows that math anxiety has a significant negative impact on math achievement. Students with high levels of anxiety tend to experience a decline in focus and motivation to learn, whereas high motivation to learn can mitigate the negative impact of math anxiety on academic achievement.
Rozgonjuk et al. (2020)	International Journal of STEM Education	Mathematics anxiety is closely linked to students' low self-efficacy in mathematics learning. Students with low self-efficacy tend to avoid mathematics-related activities, which leads to poor academic performance and less effective learning strategies.
Hadi et al. (2020)	ALGORITMA Journal of Mathematics Education	Math anxiety causes students to experience difficulties in mathematical critical thinking. Students tend to have trouble analyzing problems and determining solution strategies because of the fear and pressure they feel when faced with math.
Ramlan et al. (2021)	AKSIOMA: Jurnal Program Studi Pendidikan Matematika	Low self-confidence among students has been shown to increase levels of math anxiety. Students who lack self-confidence are more likely to fear making mistakes when solving math problems, which affects their academic performance.
Akkaya & Polat (2022)	Educational Policy Analysis and Strategic Research	Family factors, the learning environment, and self-efficacy influence students' levels of math anxiety. Low levels of family support make students more prone to stress and anxiety when learning math.
Pei et al. (2025)	Mathematics Education Research Journal	Student engagement in learning (mathematical engagement) acts as a mediator in the relationship between math anxiety and academic performance. Students who are actively engaged in learning have lower levels of anxiety and better math performance.
Andani (2025)	Diskusi Panel Nasional Pendidikan Matematika	Research has found that students with high math anxiety tend to earn lower math grades than students with low levels of anxiety. Anxiety prevents students from fully understanding the material and performing well on assessments.

Author	Journal	Results
Nugraheni & Pramugita (2025)	Jurnal Pendidikan MIPA	Mathematics anxiety affects elementary school students' ability to think critically about mathematics. Students experiencing high anxiety demonstrate lower mathematical analysis and reasoning skills compared to students with low anxiety.
Khalimah & Triyana (2025)	Pedagogy: Jurnal Pendidikan Matematika	High levels of mathematics anxiety cause students to lack confidence and panic easily when solving math problems. This has a direct impact on students' low achievement in mathematics.
Kusmartiningrum et al. (2025)	Teorema: Teori dan Riset Matematika	Mathematics anxiety hinders the process of solving math problems because students struggle to determine systematic solution strategies. Students with high anxiety tend to rush and lack attention to detail when working on problems.
Nurdin & Hasma (2025)	Pedagogy: Jurnal Pendidikan Matematika	Gender influences students' levels of mathematics anxiety. Research shows that students with high anxiety levels have lower cognitive abilities and poorer academic performance in mathematics.
Ningtyas & Sari (2025)	Pedagogi: Jurnal Ilmu Pendidikan	Collaborative learning has been shown to reduce students' math anxiety by enhancing social interaction, self-confidence, and student engagement in the math learning process.
Al Kheni et al. (2025)	Jurnal Ilmu dan Pendidikan Matematika	Active and contextual learning models are effective in reducing students' math anxiety. Learning approaches that directly involve students make them feel more comfortable and less stressed when learning math.
Ritonga et al. (2026)	PIJAR: Jurnal Pendidikan dan Pengajaran	Factors contributing to math anxiety include monotonous teaching methods, an unsupportive learning environment, and low student self-confidence. These conditions cause students to feel afraid and avoid learning math.
Meileni et al. (2026)	Pendas: Jurnal Ilmiah Pendidikan Dasar	Math anxiety results in lower mathematical problem-solving skills among junior high school students. Anxiety makes it difficult for students to concentrate and hinders their ability to logically structure problem-solving steps.

Based on the analyzed research findings, it can be concluded that math anxiety has a significant effect on students' math achievement. Most studies indicate that math anxiety is negatively correlated with math achievement. This means that the higher a student's level of math anxiety, the lower their math achievement. Conversely, students with low levels of anxiety tend to be better able to understand mathematical concepts and achieve better learning outcomes. Mathematics anxiety causes students to experience psychological pressure when faced with mathematics learning. This condition leads to a decline in students' focus, concentration, and motivation to learn. Research by Suren and Kandemir (2020) shows that students with high levels of math anxiety tend to experience a decline in motivation and academic performance in math. This occurs because students fear making mistakes and lack confidence when solving math problems.

Furthermore, math anxiety is closely linked to low self-efficacy among students. Rozgonjuk et al. (2020) explain that students with low self-confidence tend to avoid math activities, which leads to poor learning outcomes and the use of less effective learning strategies. These findings are supported by Ramlan et al. (2021), who state that low self-confidence causes students to feel more fearful and stressed during math learning. These conditions indicate that psychological factors play a significant

role in determining students' success in learning mathematics. Research findings also indicate that math anxiety not only affects learning outcomes but also students' critical thinking skills and mathematical problem-solving abilities. Hadi et al. (2020) found that students experiencing math anxiety struggle to analyze problems and determine appropriate problem-solving strategies. Research by Nugraheni and Pramugita (2025) also shows that students with high levels of anxiety have lower mathematical analysis and reasoning abilities compared to students with low anxiety. These findings are supported by Kusmartiningrum et al. (2025) and Meileni et al. (2026), who state that math anxiety causes students to be less systematic, rushed, and less thorough when solving math problems.

The factors causing math anxiety stem from both internal and external sources. Internal factors include low learning motivation, self-efficacy, and self-confidence. Meanwhile, external factors include the family environment, teaching methods, and the students' learning environment. Akkaya and Polat (2022) explain that family support and the learning environment influence students' levels of math anxiety. A lack of family support makes students more prone to experiencing stress when learning mathematics. Additionally, Ritonga et al. (2026) found that monotonous teaching methods and an unsupportive learning environment can increase students' math anxiety, leading them to avoid learning mathematics.

Recent research developments also indicate that learning strategies play a crucial role in reducing students' math anxiety. Ningtyas and Sari (2025) found that collaborative learning can reduce math anxiety by enhancing social interaction, student engagement, and self-confidence in math learning. Research by Al Kheni et al. (2025) also indicates that active and contextual learning models are more effective in reducing math anxiety than conventional instruction. Learning approaches that directly engage students make them feel more comfortable and less stressed when learning math. In addition to learning strategies, student engagement in the learning process is also a key factor in reducing math anxiety. Pei et al. (2025) explain that mathematical engagement acts as a mediator in the relationship between math anxiety and student academic performance. Students who are active in the learning process tend to have lower levels of anxiety and are able to achieve better learning outcomes.

Recent research also indicates that gender influences students' levels of math anxiety. Nurdin and Hasma (2025) found that there are differences in math anxiety levels based on gender, with students exhibiting high levels of anxiety demonstrating lower cognitive abilities and poorer math learning outcomes. These findings suggest that students' individual characteristics must also be taken into account in the mathematics learning process. Overall, the results of this study indicate that math anxiety remains a common problem in mathematics education. Mathematics anxiety not only leads to low student achievement but also affects students' critical thinking skills, problem-solving abilities, motivation to learn, and self-confidence. Therefore, innovative teaching strategies, a comfortable learning environment, and positive support from the learning community are needed to minimize students' mathematics anxiety and improve their academic performance in mathematics.

CONCLUSION

Based on the results of the Systematic Literature Review (SLR) that was conducted, it can be concluded that math anxiety has a negative impact on students' math achievement. Students with high levels of math anxiety tend to have difficulty understanding mathematical concepts, lack self-confidence, struggle to concentrate, and face obstacles in critical thinking and mathematical problem-solving. These conditions result in lower mathematics achievement for these students compared to those with low levels of math anxiety. The study's findings also indicate that math anxiety is influenced by various internal and external factors. Internal factors include low learning motivation, self-efficacy, self-regulation, and students' self-confidence. Meanwhile, external factors include the family environment, teaching methods, the learning environment, and the use of technology in mathematics instruction. Furthermore, several studies indicate that gender also influences students' levels of math anxiety. Teaching methods that actively engage students can enhance their learning engagement, self-confidence, and comfort during the math learning process. Thus, teachers need to create a learning environment that is enjoyable, interactive, and free from pressure to minimize students' math anxiety. Overall, math anxiety remains a significant issue in mathematics education across various educational levels. Therefore, teachers, schools, and parents must work together to help students overcome math anxiety through psychological support, appropriate learning strategies, and a positive learning environment so that students' academic performance in mathematics can improve.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The author declares that there is no conflict of interest in the publication of this article.

FUNDING INFORMATION STATEMENT

This research did not receive any specific grants from any funding bodies, whether in the public, commercial or non-profit sectors.

REFERENCES

- Akkaya, S., & Polat, K. (2022). An investigation of the relationship between the parents' math literacy self-efficacy and their math anxieties. *Educational Policy Analysis and Strategic Research*, 17(2), 246–265. <https://doi.org/10.29329/epasr.2022.442.11>
- Al Kheni, A. Y., Khusnainy, A. F., Rizaldi, H. R., & Rofiki, I. (2025). Model pembelajaran untuk mereduksi kecemasan matematika siswa: Systematic literature review artikel SINTA tahun 2021–2025. *Jurnal Ilmu dan Pendidikan Matematika*.
- Andani, C. (2025). Analisis hubungan kecemasan matematika dengan prestasi belajar siswa. *Diskusi Panel Nasional Pendidikan Matematika*. <https://perpus.unindra.ac.id/index.php/DPNPMunindra/article/view/8237>
- Artama, E. N. N., Amin, S. M., & Siswono, T. Y. E. (2022). Pengaruh kecemasan matematika terhadap hasil belajar siswa. *Nucleus*, 3(2), 155–161. <https://doi.org/10.37010/nuc.v3i2.992>
- Efendi, R., Diana, Y., & Panjaitan, A. T. (2025). Analisis disposisi matematis, kecemasan matematika, dan numerasi siswa di daerah 3T: Perbatasan RI–PNG. *Jurnal Cendekia: Jurnal Pendidikan Matematika*.
- Hadi, F. Z., Fathurrohman, M., & Santosa, C. A. H. F. (2020). Kecemasan matematika dan kemampuan berpikir kritis matematis siswa di sekolah menengah pertama. *ALGORITMA Journal of Mathematics Education*, 2(1), 59–72.
- Khalimah, H., & Triyana, I. W. (2025). Pengaruh kecemasan matematika terhadap hasil belajar matematika siswa MTs Miftahul Ulum Peganden. *Pedagogy: Jurnal Pendidikan Matematika*. <https://e-journal.my.id/pedagogy/article/view/5838>
- Kusmartiningrum, S. A., Prayitno, A., & Hidayat, W. (2025). Dampak kecemasan matematis terhadap proses dan hasil pemecahan masalah matematika siswa SMA. *Teorema: Teori dan Riset Matematika*. <https://jurnal.unigal.ac.id/teorema/article/view/20150>
- Irawadi, A. A. (2025). Kemampuan pemecahan masalah matematis siswa ditinjau dari kepercayaan diri dan kecemasan matematika. *Journal of Classroom Action Research*.
- Khalimah, H., & Triyana, I. W. (2025). Pengaruh kecemasan matematika terhadap hasil belajar matematika siswa MTs Miftahul Ulum Peganden. *Pedagogy: Jurnal Pendidikan Matematika*. <https://e-journal.my.id/pedagogy/article/view/5838>
- Liu, Y., Peng, P., & Li, S. (2025). How to reduce mathematics anxiety: A systematic review and meta-analysis on intervention studies. *Journal of Educational Psychology*.
- Mahesa, A. Y., & Dewi, N. R. (2025). Kajian teori: Kemampuan penalaran matematis peserta didik ditinjau dari kecemasan matematika pada pembelajaran preprospec berbantuan liveworksheet. *PRISMA: Prosiding Seminar Nasional Matematika*. <https://proceedings.unnes.ac.id/prisma/article/view/4293>
- Meileni, D., Pujiastuti, H., & Anriani, N. (2026). Kecemasan matematis sebagai faktor yang memengaruhi kemampuan pemecahan masalah siswa SMP: Kajian literatur sistematis. *Pendas: Jurnal Ilmiah Pendidikan Dasar*. <https://journal.unpas.ac.id/index.php/pendas/article/view/47952>
- Ningtyas, S. C., & Sari, Y. M. (2025). Optimizing collaborative learning as a solution to overcome math anxiety in mathematics learning: A systematic literature review. *Pedagogi: Jurnal Ilmu Pendidikan*. <http://pedagogi.ppj.unp.ac.id/index.php/pedagogi/article/view/2558>
- Nugraheni, N., & Pramugita, C. (2025). Pengaruh efikasi diri, minat belajar, dan kecemasan matematika terhadap kemampuan berpikir kritis matematis siswa sekolah dasar. *Jurnal Pendidikan MIPA*. <http://ejournal.tsb.ac.id/index.php/jpm/article/view/2793>

- Nurdin, N., & Hasma, E. A. (2025). Eksplorasi kecemasan matematika pada peserta didik di berbagai jenjang pendidikan: Perspektif gender dalam pembelajaran matematika. *Pedagogy: Jurnal Pendidikan Matematika*. <https://e-journal.my.id/pedagogy/article/view/7033>
- OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. <https://www.oecd.org/pisa/>
- Pei, Y., Poon, K. K., & Suen, A. (2025). Influence of mathematics anxiety on mathematics performance: Mediating effects of mathematical engagement. *Mathematics Education Research Journal*. <https://doi.org/10.1007/s13394-025-00536-1>
- Ramlan, A. M., Hermayani, H., & Jahring, J. (2021). Analisis kemampuan pemecahan masalah matematis ditinjau dari kepercayaan diri. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 10(4), 2188–2199. <https://doi.org/10.24127/ajpm.v10i4.3996>
- Ritonga, N., Nasution, N., & Handayani, R. (2026). Math anxiety pada murid sekolah dasar: Studi systematic literature review terhadap faktor penyebab dan strategi intervensi. *PIJAR: Jurnal Pendidikan dan Pengajaran*. <http://putrapublisher.org/index.php/pijar/article/view/1571>
- Rozgonjuk, D., Kraav, T., Mikkor, K., Orav-Puurand, K., & Täht, K. (2020). Mathematics anxiety among STEM and social sciences students: The roles of mathematics self-efficacy and approaches to learning. *International Journal of STEM Education*, 7(1), 1–11. <https://doi.org/10.1186/s40594-020-00246-z>
- Suren, N., & Kandemir, M. A. (2020). The effects of mathematics anxiety and motivation on students' mathematics achievement. *International Journal of Education in Mathematics, Science and Technology*, 8(3), 190–218. <https://doi.org/10.46328/IJEMST.V8I3.926>
- Wang, C., Yang, G., Cui, H., Ming, Y., & Sun, Z. (2025). How does digital learning resource accessibility affect math learning anxiety in high school? An empirical analysis based on PISA 2022. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2025.1646854>