

Mathematical Anxiety, Learning Motivation, and Mathematical Creative Thinking in Junior High School

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Abstract: This study contains the effect of mathematical anxiety on the motivation to learn mathematics and the mathematical creative thinking abilities of junior high school students. Mathematics learning also needs to understand the psychological aspects of students, including about mathematical anxiety and motivation to learn mathematics. Mathematical anxiety and motivation to learn mathematics that are not immediately addressed properly and correctly will affect students' creative thinking skills in mathematics. The purpose of this study was to determine the effect of mathematical anxiety on learning motivation and mathematical creative thinking abilities of junior high school students. This study uses the literature review method with publication limitations of the last 5 years. Exploration of publication results using an open-access website taken from Google Scholar with research results published in Reputable National Journals at least Sinta 4 and Reputable International Journals at least Q3. Publication results are limited to searches using the keywords "Math Anxiety", "Learning Motivation", "Creative Thinking Skills", "Junior High School Mathematics Learning", "Math Anxiety", "Learning Motivation", "Creative Thinking Skills", and "Mathematics Learning in Junior High School". Exploration results of publications were analyzed using PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) syntax. The results showed that mathematical anxiety had an effect on motivation to learn mathematics and students' mathematical thinking abilities. Students who have excessive mathematical anxiety tend to have low motivation to learn mathematics. Low motivation to learn mathematics will affect the way students think, especially with regard to the ability to think creatively mathematically. Therefore, teachers must be alert and communicative in order to overcome these problems and students become more comfortable when learning mathematics.

Keywords: Mathematical Anxiety; Mathematical Creative Thinking Skills; Motivation to Learn Mathematics; Junior High School Mathematics Learning

Abstrak: Penelitian ini berisi tentang pengaruh kecemasan matematis terhadap motivasi belajar matematika dan kemampuan berpikir kreatif matematis siswa sekolah menengah pertama. Pembelajaran matematika juga perlu untuk memahami aspek psikologis pada diri siswa antara lain tentang kecemasan matematis dan motivasi belajar matematika. Kecemasan matematis dan motivasi belajar matematika yang tidak segera diatasi dengan baik dan benar akan berpengaruh pada kemampuan berpikir kreatif matematika siswa. Tujuan dari penelitian ini yaitu untuk mengetahui pengaruh kecemasan matematis terhadap motivasi belajar dan kemampuan berpikir kreatif matematis siswa sekolah menengah pertama. Penelitian ini menggunakan metode *literature review* dengan batasan publikasi 5 tahun terakhir. Eksplorasi hasil publikasi menggunakan *open-access website* yang diambil dari *Google Scholar* dengan hasil penelitian yang dipublikasikan di Jurnal Nasional Bereputasi minimal Sinta 4 dan Jurnal Internasional Bereputasi minimal Q3. Hasil publikasi dibatasi dengan penelusuran

menggunakan kata kunci “Kecemasan Matematis”, “Motivasi Belajar”, “Kemampuan Berpikir Kreatif”, “Pembelajaran Matematika SMP”, “*Math Anxiety*”, “*Learning Motivation*”, “*Creative Thinking Skills*”, dan “*Mathematics Learning in Junior High School*”. Eksplorasi hasil publikasi dianalisis menggunakan sintaks PRISMA (*Preferred Reporting Items for Systematic Review and Meta-Analysis*). Hasil penelitian menunjukkan bahwa kecemasan matematis berpengaruh pada motivasi belajar matematika dan kemampuan berpikir matematis siswa. Siswa yang memiliki kecemasan matematis yang berlebih cenderung memiliki motivasi belajar matematika yang rendah. Motivasi belajar matematika yang rendah akan berpengaruh pada cara berpikir siswa khususnya yang berkaitan dengan kemampuan berpikir kreatif matematis. Oleh karena itu, guru harus sigap dan komunikatif agar dapat mengatasi permasalahan tersebut dan siswa menjadi lebih nyaman saat belajar matematika.

Kata Kunci: Kecemasan Matematis; Keterampilan Berpikir Kreatif; Motivasi Belajar; Pembelajaran Matematika SMP

INTRODUCTION

Learning activities are closely related to academic and non-academic aspects. The academic aspect is related to the processing of cognitive aspects (Magdalena et al., 2021), while the non-academic aspects are related to the processing of psychological aspects (Magdalena et al., 2021; Qoriawati et al., 2021). These two aspects influence each other in the dynamics of learning activities, making both equally important in shaping students' overall learning experiences. The psychological aspects of learning include learning anxiety and learning motivation, where students' learning anxiety impacts their understanding of mathematics (Omar et al., 2022; Putra & Yulanda, 2021; Yurt, 2022) and further influences their cognitive and psychological responses (Velazco et al., 2021). In addition, learning mathematics for some students in junior high school is still considered a scary thing (Amran et al., 2021; Purnasari & Sadewo, 2020; Putri Hapsari et al., 2022), a condition often realized by mathematics teachers but not followed up more deeply, indicating a gap in mathematics learning management. Furthermore, learning mathematics at the junior high school level is a continuation of the elementary school level, where students have studied mathematics for approximately six years, and during that period they must have accumulated experiences—both pleasant and unpleasant—that strongly influence how they learn mathematics. These experiences can be grouped into psychological and cognitive experiences of learning mathematics, which in turn shape students' attitudes and performance in junior high school.

Based on the experience of researchers teaching mathematics at SD Sanjaya Tritis for approximately 4 years obtained that quite a lot of students who feel that mathematics is a difficult subject. The researchers also conducted personal conversations with students who experienced fear of the subject of mathematics. The results of the private conversations showed that most of these students felt anxious while studying mathematics and ended up lacking enthusiasm in learning mathematics. In addition to personal conversations, the researcher also sought to see the cognitive process of the work or tasks that the researcher had given to the group of students. The results of the researchers' observations show that students who feel anxious have not been optimal in their mathematical creative thinking skills. When the researcher gave a question of High Order Thinking Skill, it was seen that the group of students had difficulty in the process of answering it. It should be underlined that to be able to

answer questions of High Order Thinking Skill, students must have sufficient mathematical creative thinking skills.

In addition to the experience when teaching at the elementary school level, the researcher also has experience accompanying the learning of mathematics in one of the seventh grade students of junior high school level. The student whom the researcher accompanied admitted that he had a sense of anxiety and fear while studying mathematics. Based on *wawan hati* and observations of researchers during the accompanying students, it was found that these students had a bad experience learning mathematics when in elementary school. The student is still traumatized because he once got angry with his math teacher while in elementary school. That's what makes students anxious and afraid when studying mathematics.

Specifically, the researcher took the junior high school level in this scientific article because the junior high school level is in the middle between the elementary school level and the upper high school level. So, according to researchers, junior high school level has an important position in the processing of mathematical psychological aspects of students. The aspects that the author refers to are mathematical anxiety and students' motivation to learn mathematics. So that if the two mathematical psychological aspects which when in elementary school there are less pleasant experiences can be processed properly, the hope later when in high school students can enjoy and comfortable in learning mathematics.

Ulfah et al. (2021) explained that there is a negative relationship between mathematical anxiety and motivation to learn mathematics. The negative relationship appears especially in students who experience online math tutoring during the COVID – 19 pandemic (Ulfah et al., 2021). If the motivation to learn mathematics is low, it will affect the student's mathematics learning process (Gazali & Atsman, 2017; Ilmadi et al., 2023; Jemudin et al., 2019). The impact that can be seen is the achievement of mathematics students who have high mathematical anxiety tends to be low. In addition, students who have low mathematics learning achievement tend to increase mathematical anxiety in themselves (Kusmaryono & Ulia, 2020a; Lailiyah et al., 2021; Salinas et al., 2021).

In the process of learning mathematics required a high motivation to learn. Student math learning motivation has a positive relationship with student math learning achievement (Capinding, 2022; Ilmadi et al., 2023; Sreylak et al., 2022). Mathematical anxiety always has a negative impact on mathematics learning motivation and mathematics learning achievement (Kusmaryono & Ulia, 2020b; Prasetyawan, 2018). However, it is not universal because mathematical anxiety does not always have a negative impact on motivation and achievement of mathematics learning if it can be processed effectively (Kusmaryono et al., 2022).

Based on the explanation above, mathematics teachers in their learning need to pay attention to mathematical anxiety and motivation to learn mathematics further. Teachers are very important in classroom learning activities (Kusnadi et al., 2022; Purnasari & Sadewo, 2021; Putri Hapsari et al., 2022). In addition to being a facilitator for students, teachers must also be able to process various things related to the cognitive and psychological aspects of students in learning mathematics (Aji, 2020; Saputro & Mahmudi, 2020; Bagou & Sukung, 2020). The teacher's responsibility is not only in providing mathematics subject matter, but also in assisting non-academic matters in students (Budiana et al., 2021; Hakiki, 2020).



The teacher needs to recognize the characteristics of the students he teaches. In general, there are 2 types of characteristics of students, namely extroverts and introverts. The characteristic of extrovert students is to dare to ask questions and dare to express their opinions. While the characteristics of introverted students tend to be quiet and not much physical activity. Through understanding the characteristics of these students, teachers will be helped in understanding their students thinking processes, especially in their mathematical creative thinking processes (Pangestu & Yunianta, 2019).

The ability to think creatively is related to the ability of students to find solutions to mathematical problems that students face. The discovery of solutions to mathematical problems is synonymous with the ability to solve mathematical problems. In this case, teachers have responsibilities in addition to guiding and training students in working on problems, namely to construct problems properly and correctly (Sari & Prihatnani, 2021). Through the construction of good and correct problems, students can be helped in logical and structured thinking patterns.

Therefore, the mathematics teacher must fully observe and assess his students in the learning process that occurs. This is in accordance with the principles in educational pedagogy, especially for the junior high school level. Thus, teachers can better understand the process of self-development of their students in academic and non-academic fields. In particular, teachers can process and overcome students' mathematical anxiety. So that students can be more excited / motivated to learn in mathematics and develop their creative thinking skills. A further impact is the increased achievement of mathematics learning.

METHOD

The method used in this research is literature review. Literature review is a process of collecting, reviewing, and evaluating all literature related to the research to be carried out (Grant & Booth, 2009). This is an important part of the research process, because through literature review, researchers can find relevant and up-to-date information about the problem to be researched. Through literature review, researchers can identify the shortcomings and advantages of existing literature and provide a broader view of the research to be carried out. In implementing the literature review method, researchers use reference sources from selected articles in national and international journals.

There are 20 articles that are referenced by researchers in writing this article. Selection of articles according to the topic of article writing. The topic of this article is about the effect of mathematical anxiety on the motivation to learn mathematics and the mathematical creative thinking ability of junior high school students. Articles are sourced from national and international journals. National journals indexed by at least Sinta 4 and international journals indexed by Scopus at least Q3. The journal that the researcher refers to is a journal related to the discussion of the world of mathematics learning and education.

The exploration of published articles was carried out by providing the last 5 years of limitations using the keywords "Mathematical Anxiety", "Learning Motivation", "Creative Thinking Ability", "Junior High School Mathematics Learning", "Math Anxiety", "Learning Motivation", "Creative Thinking Skills", and "Mathematics Learning in Junior High School". Analysis of the exploration of publication results

was carried out using the framework of Preferred Reporting for Systematic and Meta-Analysis (PRISMA) (Moher et al., 2009). The results of the exploration of articles analyzed using the *PRISMA framework* are presented in Figure 1.

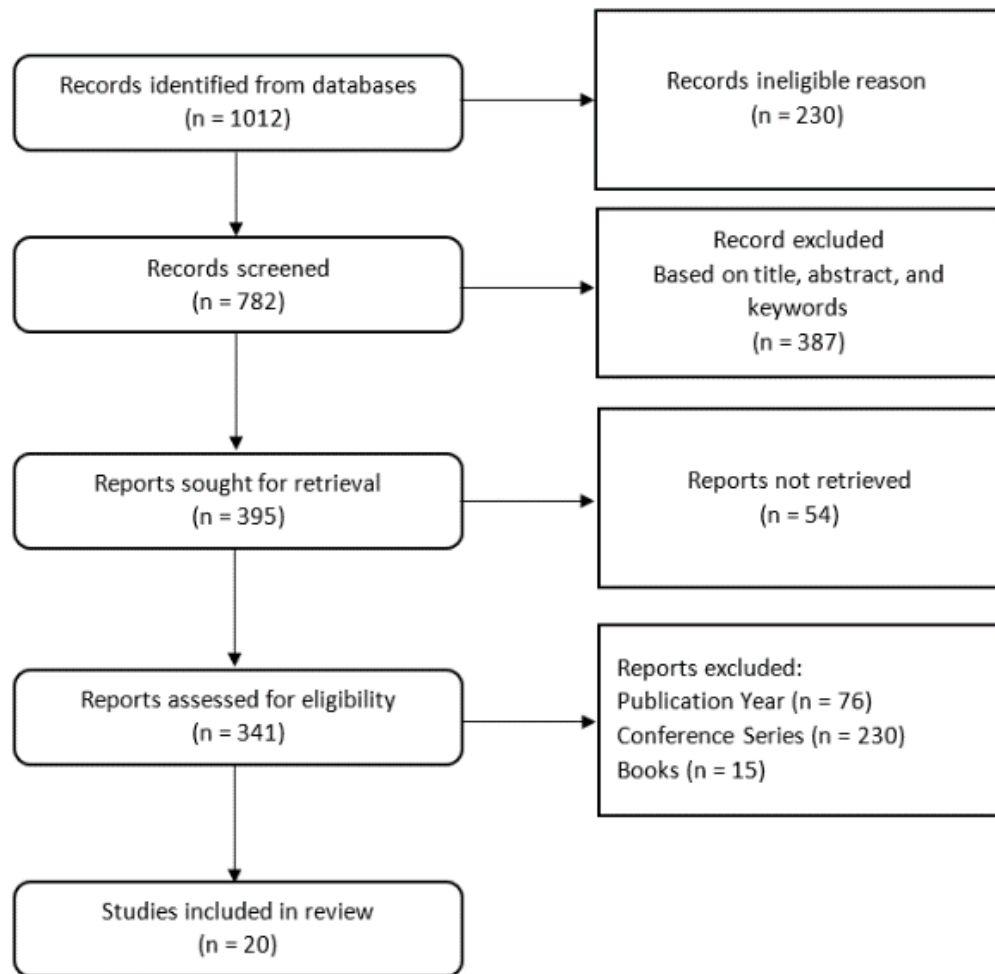


Figure 1. PRISMA Diagram

RESULT AND DISCUSSION

After the researcher made observations and analysis of 20 journal articles related to this research topic, the following results and discussions were obtained:

Table 1. Analyzed Article

Author	Results
Cahyani et al. (2025)	The first journal explains that a metacognitive approach, when considered alongside differences in <i>self-regulated learning</i> skills, influences elementary students' mathematical reflective thinking. It further highlights that self-regulated learning plays a crucial role in fostering deeper mathematical understanding
Kusmaryono & Ulia (2020)	The second journal explains the use of teacher teaching styles using <i>the Problem Based Learning</i> model which can reduce mathematical anxiety
Gunawan & Fitra (2021)	The third journal explains the conceptual understanding of influential students in the cognitive process of learning mathematics, especially exponent and logarithmic material at the <i>transformation</i> and <i>process skill</i> stages

Sulaiman et al. (2021)	The fourth journal explains the influence of self-esteem on student success in participating in mathematics learning
Sari & Prihatnani (2021)	The fifth journal explains the significant influence of the problem posing learning model on the ability to solve mathematical problems compared to <i>the problem solving</i> learning model.
Faturohman et al. (2022)	The sixth journal explains about <i>self-confidence</i> influential in online mathematics learning.
Machmud et al. (2022)	The seventh journal explains the mathematical disposition (confidence, persistence and perseverance, flexibility, interest and curiosity, reflection, and appreciation) affect the mathematics lecture process.
Mihăescu et al. (2025)	The eighth journal explains that breaking the cycle of mathematics anxiety can be achieved by equipping pre-service teachers with evidence-based strategies. It emphasizes that providing such strategies not only helps future teachers manage their own anxiety but also empowers them to support students more effectively in overcoming math-related challenges.
Velazco et al. (2021)	The ninth journal describes significant differences in the understanding of mathematics content presented by teachers virtually for cognitive and physiological response systems and general anxiety levels, as well as in the situational area of anxiety and anxiety evaluation in everyday situations between students who attended classes virtually and students who attended classes in person during the COVID-19 quarantine season.
Nisa & Astriani (2022)	The tenth journal explains that the application of the guided inquiry learning model can significantly enhance students' learning motivation. It shows that involving students actively in the inquiry process fosters engagement, curiosity, and a stronger drive to learn.
Polman et al. (2021)	The eleventh journal explains that meaningful learning in mathematics at the upper-primary level involves connecting new mathematical concepts with students' prior knowledge and real-life experiences. It highlights that such connections foster deeper understanding, retention, and the ability to apply mathematical ideas more effectively
Yunitasari et al. (2023)	The twelfth journal explains that the application of contextual teaching and learning can improve students' learning outcomes while at the same time reducing mathematics anxiety. It highlights that situating mathematics within real-life contexts makes the subject more engaging, understandable, and less intimidating for learners
Lailiyah et al. (2021)	The thirteenth journal explains about mathematics anxiety in students and its impact on mathematics learning achievement in online mathematics learning.
Hasnida et al. (2022)	The fourteenth journal explains the role of good teachers in learning mathematics and always improving their knowledge to motivate students to have a passion for learning as well.
Kelly et al. (2022)	The fifteenth journal describes a portfolio of validity for a measure of general mathematical anxiety that can be used across a variety of teaching modalities, throughout life, and is simple enough to be used cross-culturally.
Moliner et al. (2022)	The sixteenth journal describes changes in the learning environment, lack of motivation outside of school, boredom, and lack of student responsibility as part of the factors causing the decline in student mathematics learning achievement.
Ersozlu et al. (2022)	The seventeenth journal describes the causes of math and test anxiety and some intervention strategies that teacher educators can use to prepare for future teaching
Khaled (2022)	The eighteenth journal describes the positive relationship between systemic thinking skills, epistemological beliefs, and mathematical beliefs.



Salinas et al. (2021)	The nineteenth journal describes an inverse comparison between students' mathematical anxiety and student achievement
Garba et al. (2020)	The twentieth journal describes the interaction of peers in daily life can have an effect on students' mathematical anxiety

Based on the important points of the twenty journal articles above, it can be observed that mathematical anxiety, motivation to learn mathematics, and students' mathematical creative thinking ability correlate with each other. These three things will affect students' mathematics learning outcomes. Therefore, follow-up is needed to regulate and process these three things appropriately.

Mathematical anxiety can come from the trauma of learning mathematics as well as students' fear of math learning outcomes. Students are usually afraid of their learning outcomes after seeing that the material being studied is difficult for them. In addition, it could be due to the influence of friends related to a negative view of the mathematics material being studied or related to the figure of the mathematics teacher. These anxieties if not controlled properly will make students feel depressed when learning mathematics.

The pressure of learning mathematics caused by excessive mathematical anxiety will make the motivation to learn mathematics in students decrease. Students become discouraged in participating in mathematics learning activities. Students tend to be passive in mathematics learning activities. If this condition continues to occur and is left alone, it will affect students' mathematical thinking skills.

Students' mathematical thinking skills include mathematical creative thinking skills. This type of thinking ability is needed by students in finding solutions to mathematical problems that require *high order thinking skills*. Students who are too anxious about mathematics will usually find it difficult to think mathematically, especially thinking creatively mathematically. There are already shadows of mathematical fear that appear in his mind and hinder students from progressing in learning mathematics. If this condition is left alone, it will affect the mathematical thinking process of students. If the mathematical thinking process is disrupted, then the formation of concepts in students will not be optimal and of course students' mathematics learning achievements will not be optimal.

Follow-up to regulate and process mathematical anxiety, motivation to learn mathematics, and students' creative thinking ability can be started from setting strategies in learning activities. Teachers must draft mathematical learning designs according to the real situation and conditions of students. In addition, teachers must also apply the principle of meaningfulness of learning mathematics in their teaching.

Teachers can develop mathematics learning plans that suit the characteristics and needs of students. Teachers need to compile a map of students in order to find out the characteristics and needs of students. Teachers can obtain this information through heart, observation, and pre-test. Through this way of acting teachers will be able to organize mathematics learning that is more pro-student, meaningful, and fun.

In addition, the ongoing student mentoring process can be carried out in collaboration with parents/guardians of each student. Through good communication and openness between teachers and parents/guardians of students, it is hoped that optimization of student assistance can occur. So that the mathematical anxiety that arises in students can be controlled properly. As a result, students can be more easily invited to learn mathematics and the growth of motivation from within students to learn mathematics. The ability to think creatively in students can be more optimally



developed. In order for such treatment to continue until students graduate from high school, it is better for every mathematics teacher in junior high school to have a special book recording the progress of student mathematics learning that contains cognitive aspects and psychological aspects of mathematics students.

CONCLUSION

Based on the analysis and results of research on 20 selected journal articles, it can be concluded that: Excessive mathematical anxiety has a negative influence on students' mathematics learning development. These influences include students' motivation to learn mathematics to decrease because of the shadow of fear of stepping forward in learning mathematics. Because the motivation to learn mathematics decreases and there is inner pressure that arises, the clarity of mathematical thinking of students will be disrupted. So that students' mathematical creative thinking skills are less developed optimally. A further impact is that students' mathematics learning achievement will be less than optimal. Therefore, in order for students to learn mathematics more optimally, the teacher's way of acting can be carried out as follows:

- 1) Teachers develop mathematics lesson plans based on student characteristics and needs. Teachers should carry out an initial diagnosis of the condition of their students. Overall, teachers must know the potentials and weaknesses that exist in each student. One aspect that needs to be considered is also the selection of learning styles and models that will be implemented in mathematics learning later. Models that teachers can use in mathematics learning to overcome mathematical anxiety and to increase student motivation and mathematical thinking skills include contextual learning models. Through this learning model students will feel closer to mathematics and faster in grasping the concepts that the teacher provides. In addition, students also practice in the application of mathematical concepts in everyday life.
- 2) Mathematics teachers in junior high school should have a special notebook containing the development of cognitive and psychological aspects of students in learning mathematics. This book will be very useful to observe and assess the development that occurs in the students it teaches. In addition, this book will help mathematics teachers at the next level in observing the characteristics of the students they will teach.
- 3) Teachers also need to establish communication with parents/guardians of students so that there is continuous assistance. The hope is that assistance at school and home can still be controlled.

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