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MATHEMATICS TEACHERS' ANXIETY IN TEACHING AND LEARNING PROCESS

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Abstrak

Selama beberapa decade terakhir, telah banyak penelitian yang memberikan atensi terhadap kecemasan matematika pada siswa, padahal guru matematika juga dapat mengalami kecemasan yang memerlukan perhatian. Guru matematika dapat mengalami kecemasan berupa kecemasan matematika dan kecemasan mengajar matematika, yang dapat berdampak terhadap proses pembelajaran matematika. Tujuan penelitian ini yaitu untuk mengidentifikasi faktor penyebab dialaminya kecemasan matematika dan kecemasan mengajar matematika pada guru. Metode yang digunakan pada penelitian ini yaitu Systematic Literature Review (SLR) dengan pendekatan deskriptif berbasis survei melalui analisis terhadap artikel yang memenuhi kriteria inklusi berupa (1) terindeks Sinta atau Scopus, (2) terdapat pada database ERIC, Garuda, dan Google Scholar serta dirilis pada rentang waktu 2013-2022, dengan menggunakan instrumen penelitian berupa lembar observasi terkait kriteria inklusi. Hasil penelitian menunjukkan bahwa guru matematika yang mengalami kecemasan matematika berupa perasaan khawatir dan tidak nyaman ketika sedang memikirkan atau melakukan sesuatu yang berkaitan dengan matematika, hal ini disebabkan oleh tingkat pengetahuan matematika dan kepercayaan diri yang rendah, sedangkan kecemasan mengajar matematika menimbulkan rasa cemas dan gelisah ketika akan atau sedang mengajar matematika, yang mana disebabkan oleh beberapa faktor seperti mengalami kecemasan matematika, rendahnya penguasaan teknologi pembelajaran, rendahnya tingkat kepercayaan diri, dan insfrastruktur pembelajaran yang kurang mendukung

***Kata kunci**: Kecemasan matematika guru, kecemasan mengajar, systematic literature review.*

Abstract

Over the last few decades, many studies have placed attention on math anxiety in students, but math teachers can also experience anxiety that requires the attention. Math teachers can experience the anxiety in the form of math anxiety and math teaching anxiety, which can affect the learning process of mathematics. The purpose of this study is to identify the factors that cause math anxiety and math teaching anxiety in teachers. The method used in this research is Systematic Literature Review (SLR) with a survey-based descriptive approach through analysis the articles that fulfilled the inclution criteria, namely (1) published during the last ten years (2013-2022), (2) written in Indonesian or English, (3) indexed by Scopus or Sinta, which are browsed on the Google Scholar, ERIC, and Garuda database using the keywords "teachers' math anxiety" and "teacher's math teaching anxiety". The results showed that mathematics teachers who experience mathematics anxiety in the form of feelings of worry and discomfort when thinking or doing something related to mathematics, this is caused by a low level of mathematics knowledge and self-confidence, while mathematics teaching anxiety causes worry and feeling uncomfortable when going to or teaching mathematics, this is caused by several factors such as experiencing mathematics anxiety, low mastery of learning technology, low levels of self-confidence, and unsupportive learning infrastructure.

Keywords: Teachers' math anxiety, teaching anxiety, systematic literature review

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INTRODUCTION

Over the last few decades math anxiety has become an interesting topic of research. There are many studies that discuss math anxiety in students such as Ng, Chen, Wu, & Chang (2022); Pantoja, Schaeffer, Rozek, Beilock, & Levine, (2020); Ramda, Gunur, Mulu, & Makur, (2021). But math anxiety can occur to anyone including teachers that requires attention too. As found by (Hunt & Sari, 2019) teaching anxiety can occur to teachers regardless of whether they are male, female, pre-service, or even in-service teachers. Anxiety occurs when there are certain situations or objects that are considered to be frightening or threatening (Anindyarini & Supahar, 2019). Math anxiety is defined as the fear or worry that is experienced by someone when doing or even thinking about activities related to mathematics (Lyons & Beilock, 2012). Mathematics anxiety is also defined as discomfort or nervousness that arises when thinking or doing math (Ganley, Schoen, Lavenia, & Tazaz, 2019). One of the defining characteristics of math anxiety is the fear, extension, and avoidance of the mathematics (Brittain, 2022). Based on this description, teaching anxiety is a condition where teachers feel worried and uncomfortable when going to or teaching mathematics. This conditions certainly cannot be left alone, these anxieties are negative emotions that are feared to have a certain influence or impact.

One of the feared impacts is that it will affect learning. According to Ramirez, Hooper, Kersting, Ferguson, & Yeager (2018), the anxieties possessed by these teachers will affect the learning process. Learning that should be fun has turned into a scary thing and has caused anxiety for teachers about teaching mathematics (Wulantina, Ikashaum, Mustika, Rahmawati, & Kurniawan, 2021). Teachers' previous experiences influence their mathematics teaching. Teachers' previous experiences can be both positive and negative. (Boyd, Foster, Smith, & Boyd, 2014). Teachers can experience a variety of positive and negative emotions related to their teaching, these feelings are about how to fulfill students' needs, about the subject being taught, and about their ability to teach the subject (Ganley *et al*., 2019). Teachers who had positive experiences in the past can be passionate about teaching math, provide hands-on activities, and be able to make learning fun, which will contribute to creating positive math learning. However, if a teacher has had negative experiences in the past, this can lead to poorly explained material, too fast, or a lack of teaching experience, so that the learning process does not support student understanding (Boyd *et al*., 2014). In addition, the causes of math anxiety experienced by students are often influenced by the teacher (Finlayson, 2014) and by several other reasons such as personality, parents, peers, and teachers with their teaching strategies and styles (Alkan, Cosguner, & Fidan, 2019). Mathematics anxiety that experienced by teachers will affect their teaching styles, methods, and strategies which will contribute to students' mathematical abilities and understanding. The teachers' anxiety does not appear suddenly, but there must be certain factors that cause the emergence of these anxieties.

Many factors can trigger anxiety in teachers, whether it is math anxiety or math teaching anxiety. Siroj stated that teachers who have mathematics anxiety are the result of inappropriate

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learning practices, such as teacher inaccuracies in managing learning, learning methods that are less relevant, the structure of teaching materials that do not support the achievement of a competency, and learning structures that are not well organized (Heru, Yuliani, & Nery, 2020). Then the factors that contribute to the emergence of math teaching anxiety in teachers are differences in students' ability, worrying that learning is uninteresting, unable to apply active, creative, and problem-solving-based learning, and worrying that the material presented is not well received by students (Wulantina *et al*., 2021). In addition, anxiety about teaching mathematics can also arise if learning cannot be carried out according to the designed scenario and there is anxiety if the expectations of the goals of the learning process are not achieved (Heru *et al*., 2020). Factors that cause anxiety in mathematics teachers need further identification of the causes and their impact on the learning process.

Based on this explanation, considering the enormous influence that anxiety has on teachers that requires attention, so this study will identifying the factors that causes mathematics anxiety and mathematics teaching anxiety in teachers, and their impact on the learning process. By knowing the factors that can cause anxiety, math teachers can be able to find the right solution to overcome the anxities.

METHOD

The method used in this research is Systematic Literature Review (SLR). Literature review means providing a framework related to new findings and previous findings to identify indications of whether or not there is progress from the results of a study through comprehensive research and inter-pretation of the literature related to a particular topic in which it identifies research questions by searching and analyzing relevant literature using a systematic approach (Randolph, 2009). The literature review aims to provide opportunities to create new knowledge to support or even refute the research (Faryadi, 2018).

A compilation of this literature review was carried out by using articles that fullfilled the inclusion criteria, namely (1) published during the last ten years (2013-2022), (2) written in Indonesian or English, (3) indexed by Scopus or Sinta. Which are browsed on the Google Scholar, ERIC, and Garuda search engines using the keywords “teachers’ math anxiety" and “teacher’s math teaching anxiety”. Identification related to the factors that cause teachers’ math anxiety and teachers’ math teaching anxiety, as well as their influence on the learning process, was carried out by grouping the sources based on year, index, and method. Furthermore, the factors that cause math anxiety and math teaching anxiety in teachers, and how they impact the learning process, will be presented.

RESULTS AND DISCUSSION

From the results of the initial search using the keywords, several related journals were obtained which were then re-selected based on the criteria, index, relevance, and relevance to the topic of discussion, until in the end, twenty journals were obtained for the analysis.

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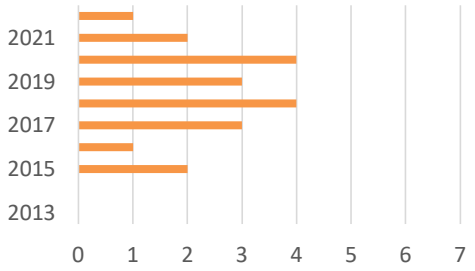

Figure 1. Classification by year

After obtaining the relevant articles, the researcher grouped the articles based on the year of publication. Figure 1 shows that over the past few years, the most published articles on Sinta or Scopus were in 2018 and 2020 with four publications each, and then followed by 2017 and 2019 with three publications, 2015 and 2021 with two publications, 2016 and 2022 with one publication, and finally, there were no articles that published on either Sinta or Scopus in 2013 and 2014. As can be seen, there has been no significant change in the number of publications each year. The graphic movements are not consistent, there was an increase in the number of publications in 2015 from none at all to existing ones, but decreased again in 2016 and then increased again in 2017, and so on, and this pattern always repeated until 2022.

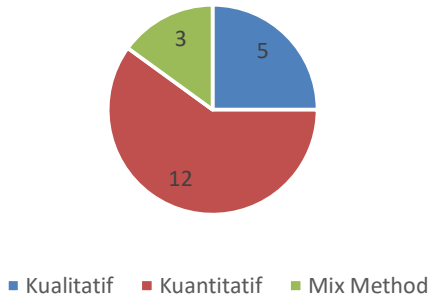

Figure 2. Classification by method

After classifying by year, the researcher grouped the articles based on the method used. As shown in Figure 2, there are three methods or approaches used by researchers to examine and identify the causes of teachers' math anxiety and teachers' math teaching anxiety. As can be seen in Figure 2, where the method is dominated by a quantitative approach to as many as twelve articles, then a qualitative approach to as many as five articles, and finally using a combined method of qualitative and quantitative as many as three articles. This is understandable because quantitative research makes it easier for researchers to find out the correlation between research variables, which in this case is the correlation between teachers' math anxiety and teachers' math teaching anxiety in the learning process. The articles discuss the elaboration of the factors that cause these anxieties and their influence on the learning process, in which the acquisition of data is obtained through observation and interviews so that the most appropriate approach is qualitative. This is because the data obtained through these sources will require a description in its elaboration.

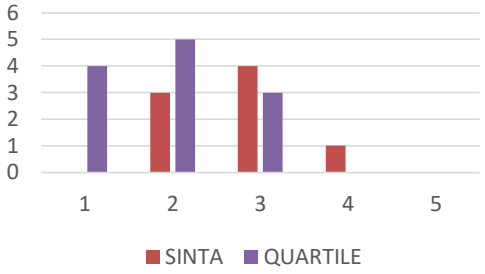

Figure 3. Classification by index

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The third classification, after the year and method, researcher classifies the found articles based on their index. As seen in Figure 3, we can see a graph showing the number of articles based on their index by both Sinta and Scopus. In Figure 3 it can be seen that there are no articles indexed by Sinta 5 and Sinta 1, but there is one article indexed by Sinta 4, four articles indexed by Sinta 3, and three articles indexed by Sinta 2. For the index by Scopus, there are four articles in Quartile 1, five articles in Quartile 2, and three articles in Quartile 3, but no articles are indexed in Quartile 4.

Furthermore, of the twenty articles that were sampled in this study, the articles were divided into two focuses of discussion, namely articles that focused on discussing about teachers' mathematics anxiety and articles that discussing about teacher's mathematics teaching anxiety. As shown in Table 1, ten articles focus on discussing mathematics anxiety in teachers, and eleven articles focus on discussing mathematics teaching anxiety, which there is one article that discusses both of teachers' math anxiety and teachers' math teaching anxiety.

Table 1. The focus of the Articles

Focus	References
Teachers' mathematics anxiety	(Dzulfikar, 2016; Ganley *et al*., 2019; Hartatik & Fitriyah, 2017; Makur & Prahmana, 2015; Olson & Stoehr, 2019; Patkin & Greenstein, 2020; Ramirez *et al*., 2018; Rawa & Yasa, 2018; Richland, Naslund-Hadley, Alonzo, Lyons, & Vollman, 2020; Szczygieł, 2020)
Teachers' mathematics teaching anxiety	(Aksu & Kul, 2019; Hapsari & Argaswari, 2022; Hasanuddin, Nurdin, Nufus, & Sari, 2019; Heru *et al*., 2020; Olson & Stoehr, 2019; Patkin & Greenstein, 2020; Peker & Ulu, 2018; Tatar, Zengin, & Kagizmanli, 2015; Unlu, Ertekin, & Dilmac, 2017; Uygun-Eryurt, 2021; Wulantina *et al*., 2021; Yorulmaz, Altintas, & Sidekli, 2017)

Factors that cause teachers' mathematics anxiety

It was found that the main causes of mathematics anxiety experienced by the teacher were not having a good knowledge of mathematics and low self-confidence. One of the factors that cause math anxiety in teachers is due to their low ability and knowledge related to mathematics (Dzulfikar, 2016; Ganley *et al*., 2019; Makur & Prahmana, 2015; Rawa & Yasa, 2018; Richland *et al*., 2020). The low understanding and knowledge of teachers related to mathematics will certainly make them experience difficulties when teaching. How can they teach well when they just don't understand the materials they are going to teach, besides that understanding, the material also consist of prerequisite materials. In mathematics, a person cannot continue to the next lesson when he does not understand the material currently being studied. He must first understand the previous material, this is known as the prerequisite material. For example, we cannot learn the concept of multiplication well, if we do not understand the concept of addition first. Therefore, if a teacher does not master the prerequisite materials, this will affect his knowledge of mathematics forever.

The next factor that can cause mathematics anxiety in teachers is the teachers' low self-confidence. A low level of self-confidence or belief is one

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of the factors that cause teachers to experience math anxiety (Dzulfikar, 2016; Richland *et al*., 2020; Unlu *et al*., 2017). This level of confidence is also influenced by teaching experience, where the experience of teaching mathematics will increase self-confidence and reduce teaching anxiety (Patkin & Greenstein, 2020). In addition, the competencies possessed are also closely related to this, when a teacher is not sure that he has good abilities in mathematics, his self-confidence will also decrease, he is not sure that he can understand mathematics well, and he is also worried that he will encounter problems difficulties when there is a mathematical problem and he cannot solve it.

These two factors greatly contribute to mathematics anxiety that occurs in teachers and is interrelated. High self-confidence and ability, and good mathematical knowledge are basic requirements for teachers in teaching mathematics (Wilson, 2009). Teachers with inadequate mathematical competence can lead to low self-confidence, so a teachers must have good knowledge of mathematics as initial capital in increasing his confidence.

Factors that cause teachers' mathematics teaching anxiety

Several factors were found to be able to cause teachers' mathematics teaching anxiety, namely mathematics anxiety (Olson & Stoehr, 2019), low mastery of the learning technology (Hapsari & Argaswari, 2022; Tatar *et al*., 2015; Wulantina *et al*., 2021), low levels of self-confidence (Aksu & Kul, 2019; Hasanuddin *et al*., 2019; Peker & Ulu, 2018), and learning facilities and infrastructure that unsupportive (Hapsari & Argaswari, 2022; Wulantina *et al*., 2021).

That has been explained earlier in the section on teachers' mathematics anxiety, this arises due to mastery of the material and a lack of self-confidence of teachers, this is what causes teachers' anxiety in teaching mathematics. In addition, someone who has experienced math anxiety can bring the experience of anxiety into their teaching (Olson & Stoehr, 2019). When a person experiences math anxiety, he will be afraid to do or even be afraid to just think about activities related to mathematics (Lyons & Beilock, 2012). So, every teaching mathematics time arrives, a teacher who experiences mathematics anxiety will always feel worried and uneasy, and will tend to avoid teaching mathematics.

The next factor that causes anxiety in teaching mathematics is the mastery of learning technology. Not all teachers mastering the learning technology, this is especially experienced by older teachers who are used to teaching using whiteboards, paper, and so on. Although this does not rule out the existence of young teachers who still do not master learning technology. Along with the times, there is a demand for teachers to incorporate elements of the use of technology into learning mathematics. Then, when they are required to change their learning media to be technology-based, they will feel uncomfortable with this condition. As another example, when COVID-19 hit, all learning was shifted to online, so like it or not, teachers must be able to teach mathematics online based on the technology. The level of anxiety in teaching mathematics can decrease or increase along with knowledge about the use of technology and the level of computer literacy in teaching

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mathematics (Tatar *et al*., 2015). Teachers whose level of the mastery technology is low, will feel worried and uncomfortable when teaching mathematics, they feel that it will be more difficult to do and will be more difficult for students to accept.

Next, a low level of self-confidence is also one of the factors that cause anxiety in teaching mathematics. This self-confidence consist of two things, namely mathematical ability and teaching ability. The teacher who does not believe that he has good abilities in mastering mathematics material will feel uncomfortable and worried when he is going to teach, he is worried that the material he is going to convey is not right or even he is worried that there will be problems that will be asked by students but he does not can answer it. Furthermore, teachers who do not believe in their competence in teaching also tend to feel worried when they are going to teach mathematics. able to overcome it because he felt that his teaching competence related to learning methods, models, and strategies was very minimal. Pedagogic ability is a predictor of anxiety in teaching mathematics based on the efficacy of teaching mathematics (Aksu & Kul, 2019). It is also found that anxiety about self-confidence directly affects anxiety about the knowledge content (Peker & Ulu, 2018). Every teachers must have good self-confidence, he must believe in the mastery of the material and teaching competence that he has.

Less supportive learning facilities and infrastructure are the next one that causes anxiety in teaching mathematics. Inadequate learning facilities such as uncomfortable classrooms, incomplete classroom learning equipment, and a noisy learning environment. This learning facility must also support, especially when learning is carried out online, when learning must be carried out virtually students who do not have mobile phones or laptops will have difficulty participating in learning, besides that obstructed internet network access also complicates the mathematics learning process. These conditions make teachers' anxious when they are going to teach mathematics, they are worried that learning will not be interesting, they are worried that they cannot apply active and creative learning, and are based on problem-solving, they are worried that students' interest and motivation in learning will decrease, and they are worried that the material presented is not accepted well by students (Wulantina *et al*., 2021), and worry that students don't pay attention when the teacher is teaching (Hapsari & Argaswari, 2022). It is these feelings, that ultimately make teachers feel anxious when they are going to teach mathematics.

Mathematics teachers' anxiety in learning and teaching process

The higher teachers' math anxiety was inversely proportional to how well the students performed in the math class. In addition, the math anxiety experienced by teachers can also be transmitted to students in class. Mathematics teachers with anxious conditions will indirectly give an idea to students that not everyone can be good at math, this will shape the mindset of students that mathematics is difficult, and when their subconscious has described mathematics as something difficult, even for the teachers themselves, they will begin to doubt their mathematical abilities.

Then related to the anxiety of teaching mathematics experienced by teachers. The occurrence of teaching

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anxiety in mathematics teachers has an impact on the learning model they apply. In a state of anxiety, teachers become unable to apply appropriate learning strategies and methods, this is in line according to (Hadley, 2005) that teachers who experience math anxiety will teach poorly and students will not be proficient in mathematics. Also, because of this anxiety, teachers cannot apply appropriate learning strategies and methods so that it can cause the learning process become not optimal.

Based on the research conducted, first it was found that some of the factors that can cause math anxiety in math teachers are not having a good mathematics knowledge and low self-confidence. Second, the factors that can cause math teaching anxiety in math teachers are experiencing math anxiety, low mastery of the learning technology, low levels of self-confidence, and learning facilities that are unsupportive. Then was found, that there is a relationship between teacher anxiety and the learning process, this is because teachers who experience the anxiety will not be able to carry out learning optimally. This research is in line with studies conducted by Beilock, Gunderson, Ramirez, & Levine (2010) that teachers with math anxiety will also give negative responses.

By knowing the factors that can cause anxiety, math teachers can be able to find the right solution to overcome the anxieties, and make the math learning more effective and efficient.

CONCLUSION

Teachers' mathematics anxiety in the form of feelings worry and discomfort when thinking or doing something related to mathematics, this is caused by a low level of teachers' mathematics knowledge and self-confidence.

Teacher's mathematics teaching anxiety causes worry and feeling uncomfortable when they are going to or while teaching mathematics, this is caused by several factors such as experiencing mathematics anxiety, low mastery of learning technology, low levels of self-confidence, and unsupportive learning infrastructure.

Teachers who experience the anxiety can transfer that anxiety to students. Because of this anxiety, teachers cannot apply an appropriate learning strategies and methods that can cause the learning process become not optimal.

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