OPEN ACCESS

ISAR Journal of Multidisciplinary Research and Studies
Abbriviate Tittle- ISAR J Mul Res Stud
ISSN *(Online)*- 2583-9705
https://isarpublisher.com/journal/isarjmrs

OPEN ACCESS

RELATIONSHIP OF MATHEMATICS ANXIETY AND SELF-EFFICACY TO STUDENTS' ACADEMIC PERFORMANCE IN GENERAL MATHEMATICS

Sidi Gaberson D. Empas
Department of Education, Division of Misamis Oriental.

***Corresponding Author**
Sidi Gaberson D. Empas
Department of Education, Division of Misamis Oriental.

Article History
Received: 15.10.2023
Accepted: 19.10.2023
Published: 02.11.2023

Abstract: Many of the students describe mathematics as hard and hard while others say challenging and thought-provoking subjects. Students' difficulty in learning mathematics makes them anxious and tend to develop mathematics anxiety and self-efficacy. A sense of anxiety that involves insecurity and fear towards mathematics is referred to as math anxiety while self-efficacy is the perseverance of the learner to continue working on the assigned task. Learning about students' anxiety in mathematics and self-efficacy in relation to their performance during class could be the most crucial factor in achieving proficiency in this area. This descriptive - correlational study examined the relationship between the self-efficacy, anxiety, and academic performance of students in mathematics. A sample of 89 students was randomly selected for this study. A questionnaire on students' level of mathematics anxiety and self-efficacy adopted from May (2009) was used where quantitative data were analyzed using correlation, t-test, and descriptive analyses. The results showed that a significant negative correlation value of r=-0.038 was found. This implies that students who exhibit high levels of math anxiety have lower academic achievement. Conversely, individuals who are less preoccupied with mathematics typically achieve better grades and academic success. In addition, self-efficacy is positively correlated to academic performance and that students who have high self-efficacy showed better performance in learning and thinking and should also have better performance in evaluative level of learning. Moreover, female is gender has no significant relationship to students mathematics anxiety.

Keywords: *Mathematics Anxiety, Self-Efficacy, Academic Performance.*

1. INTRODUCTION

Mathematics plays an important role because it is a basic science that is widely applied to many different aspects of life. The process of learning mathematics aims to promote the development of students' abilities such as critical thinking, logical reasoning, systematic analysis, accuracy, efficiency and effectiveness. One way to measure the effectiveness of mathematics instruction is to assess students' ability to solve mathematical problems (Diezmann et al.(2016) and Nasrin & Nasreen (2018), cited in Elastika et al. (2021)).

Students often deal with the challenge of perceiving Mathematics as a demanding discipline. Some individuals argue that its intricate and abstract nature leads to apprehension among students who fear they might struggle to arrive at correct solutions. According to processing efficiency theory (PET), math anxiety hinders working memory resources, which in turn negatively affects math ability. (Eysenck and Calvo, 2008). Consequently, the process of learning mathematics becomes difficult due to the disruptive impact of fear and anxiety on their academic performance.

Math anxiety is characterized by tension and fear that hinder the ability to perform mathematics, manipulate numbers, and solve mathematical problems in various academic and everyday situations. (Khasawneh et.al. 2021). Fear in taking advanced subjects in mathematics, unusual nervous when in participating in mathematics classes and unwillingness making an attempt solving mathematics problems indicates a character of mathematics anxiety which prevent their memory to work. (Smith, 2004).

Bandura (2012) states that self-efficacy is the belief in one's ability to succeed in a particular situation and a learner's willingness to perform, try, persevere, and succeed in an assigned and given task. If they fail, there are two probable reasons: they may lack the necessary skills to succeed, or they may have the necessary skills but lack the sense of efficacy to put them to use. These self-perceptions of their abilities influence how people think, act, and feel (Cherry, 2018).

It has been observed that in Mathematics class, the mean average of students' academic performance is 78% whose descriptive remark is "Fairly Satisfactory" and most of them falls under "Satisfactory" performance. In addition, there are students who do not complete their work and perhaps they feel that their ideas are not correct and not putting in more effort and not even completing their homework which in effect negatively affects their performance. In contrast, there are students who obtain good performance and showcase their knowledge. Consequently, students who are afraid of math think that if they don't understand the lesson the first time, they will never understand it.

***Corresponding Author: Sidi Gaberson D. Empas**

Additionally, they prepare themselves for failure before even trying to succeed.

Thus, this research will explore the relationship of learners' mathematics anxiety and self-efficacy to their academic performance particularly in General Mathematics subject.

2. LITERATURE REVIEW

Self-Efficacy

Self-efficacy beliefs have an important influence on social cognitive theory. According to Bandura, self-efficacy is the foundation for human behavior. Although self-efficacy influences how people think, feel, motivate, and behave, individuals` behavioral outcomes depend largely on their beliefs about their ability to perform. Self-efficacy is an individual's assessment of his or her ability to complete assigned tasks. (Özcan and Kültür, 2021)

In reading and writing scientific articles, the majority of students admitted that they rarely read (50.98%) and write (56.86%) scientific articles.. In fact, a large number of students (29.41%) have never written a scientific article.. Interestingly, students' self-efficacy was high, leading to high confidence in their ability to complete tasks.. This confidence is gained through the student's experience in completing a series of courses and assignments.. Writing skills, especially scientific writing, are acquired through persistent reading and intensive writing practice.

Similarly, despite the challenges and obstacles faced by students in Grade 7 caused by COVID-19, they were resilient and have self-confidence in their academic endeavor. Different aspects of academic resilience predict different aspects of self-efficacy (Barrera, 2021).

Even amidst the COVID-19 pandemic, the level of self-efficacy of the graduating college students was still high which implies that there is a significant relationship between self-efficacy and academic motivation of graduating college students.. The effects of external events on intrinsic motivation altered a person's perception of competence and self-determination.. Intrinsic motivation was high, meaning this motivation can be the reason why students are still studying despite the pandemic.. The extrinsic motivation was also high however, the students' beliefs and confidence were above average since extrinsically motivated students tend to focus more on having a higher grade, acquiring rewards, and acceptance from their peers.. Student's self-efficacy to study resulted high which means that they want to finish college regardless of what happens. When students have higher self-efficacy, they are more likely to show perseverance in the face of challenges and overcome them more easily than students with low self-efficacy. (Baloglu & Kocak, 2006)

Academic resilience and self-efficacy has a significant relationship, but academic to students and all measures of academic resilience were predictive of students' self-regulation of learning and perceived control. Competence can be predicted by adaptive, attentive help seeking and negative emotional and affective responses, whereas persistence can be predicted by persistence alone. (Barrera, 2021).

Mathematics Anxiety

Math anxiety is the presence of feelings of panic, helplessness, inability to act, and absence of psychological control that occur when asking someone to solve a math problem. Math anxiety affects students' academic performance. (Baloglu & Kocak, 2006)

Anxiety and motivation are socio-emotional traits that are crucial for success in school and beyond (Hambree, 1990 cited in Pollack, et.al., 2021). A moderately unfavorable link of mathematics anxiety and students' motivation to learn the subject was found. Additionally, the value beliefs had a higher link between mathematics anxiety and competence beliefs.

Students had difficulties in learning the subject matter and adjusting to the "New Normal" significantly contributes to students' anxiety (Mamolo, 2022). In addressing these difficulties, designing educational technologies and engage students into a highly interactive activities by using strategies such the use of From Here to There (FH2T) and ASSISTments would help students in the learning process as well as determine the frequency of hint requests. With this problem-set condition, students who performed worse on the pretest would use more clues, and utilize more hints. Moreover, integrating the concept of a growth mindset into students' math anxiety and self-efficacy, as suggested by Chamberlain (2023), is expected to exert a more significant influence on students' anxiety and self-belief than directly instructing them on mindset distinctions and the process of cultivating a growth mindset.

Self-Efficacy in Mathematics and Mathematics Anxiety

Lower self-efficacy beliefs towards mathematics indicates higher level of mathematics anxiety (Hackett and Betz, 1989). Mathematics anxiety being predictors of self-efficacy has a negative linear correlation and considered as an important independent variable resulted in pre-service mathematics teachers' mathematics self-efficacy towards mathematics (Unlu, Ertekin, & Dilmac, 2017).

Studies have shown how mathematics anxiety affects self-efficacy. For example, during COVID-19 pandemic, learning mathematics with the use of technology was then an instant requirement to master the use of computers in mathematics class. According to Zay and Kurniasih (2023), they determined the level of mathematics anxiety towards the use of computer in learning mathematics and examine the relationship between mathematics anxiety and self-efficacy. As a result, students were not fully confident and satisfied in their ability to use computer devices and comply with online mathematics activities. With this, the was evident with the findings that there is a significant negative relationship between students' self-efficacy and mathematics anxiety.

Parents are the primary educators and role models for their children, and their values and parenting practices can affect how well their children do in school in math (Maloney, et.al, 2015 and Chang, et.al, 2016 cited by Wang, et.al., 2023). Macmull and Ashkenazi (2019) investigated direct and indirect influence of parenting styles, mathematics self-efficacy and sex on mathematics anxiety. The use of an authoritarian parenting style is a predictor of math anxiety. When a mother adopts an authoritarian parenting style, it leads to a higher level of math anxiety. Furthermore, there is a direct correlation between the authoritative parenting style and math anxiety, indicating that elevated levels of authoritative parenting are linked to increased levels of math anxiety.

Self-Efficacy in Mathematics and Academic Performance

Self-efficacy was also seen as strong affective factor that can affect math anxiety is learners. Self-efficacy plays a pivotal role in shaping academic success, acting as a vital bridge between factors such as cognitive abilities, past educational milestones, attitudes towards learning, and real academic performance. Research confirms the strong link between subject-specific self-efficacy and academic outcomes, highlighting math self-efficacy as a notable predictor of achievements in mathematics (Bandura, 1997; Pajares, 1996 cited in Dow, 2021).

Technology has been incorporated into educational settings, with a focus on computer-based or online learning, especially in the realm of mathematics. The academic performance of students in mathematics was found to be linked to their confidence in using computers. Although computer experience was found to have a statistically insignificant effect on math ability, it was significantly related to computer self-efficacy. This reflects a non-significant relationship between self-efficacy and math performance (Dow, 2021). This shows that students did not demonstrate much confidence in learning mathematics because they were unable to think well.

The influence of experience, mediated learning, and emotional state on self-efficacy is evident in academic achievement. Extrinsic goal orientation can lead to negative outcomes. Studies show that introducing autonomy and self-determination in the classroom improves students' conceptual understanding of mathematical tasks, leading to increased motivation. (Stevens, Olivarez Jr, Lan, & Tallen-Runnels, 2004)

Gender on Mathematics Anxiety and Self-Efficacy

Frenzel, Pekrun & Goetz (2007) as cited in Louis and Mistele (2011) found that girls experience lower enjoyment and pride in mathematics, while experiencing higher anxiety, hopelessness, and shame compared to boys. Beaton et al. (2007) found that higher mathematics anxiety among Canadian undergraduate women leads to a decline in mathematical performance, confirming earlier research findings.

Frenzel, Pekrun, and Goetz (2007) conducted a gender analysis. With German fifth graders, variations in mathematics were examined from a fresh perspective based on the kids' feelings, which went beyond worry to encompass feelings of pride, hopelessness, shame, and satisfaction. Without a difference in their accomplishment scores, their findings demonstrated that girls had lower self-efficacy in mathematics while also having higher feelings of fear, hopelessness, and humiliation. Additionally, the results showed no gender differences in the attitudes and self-efficacy of the pupils. It ran counter to other research (Wasike & Joseph, 2013; Vermeer et al., 2000 as cited by Alpacion, 2014) that claimed girls had a negative perception of mathematics and performed less well than boys in this subject. There are gender differences, although some research have found that women are more receptive to the topic than men are (Mahad et al., 2012; Tekerek et al., 2011 as cited by Alpacion, 2014).

Variations in gender-based skills in handling problems such students failing to record significant information they come across, failing to record the methods employed to solve problems, the inaccuracy of calculations, and not getting accustomed to double-checking the results. (Umaratu, Ngaba, & Nggaba, 2022).

For male students, there is evidence of strong causal connections between self-efficacy and achievement, with the effect most pronounced from earlier achievement to later self-efficacy. Weak evidence exists for these effects in girls. The results support greater impacts for male students, in contrast to past correlational research that did not discover gender differences despite theoretical predictions for their existence. (Sakellariou, 2022)

Mathematics Anxiety and Academic Performance

Individual differences in intellectual abilities are linked to competence in mathematics, as can students' emotional reactions to the subject, such as delight or worry. Individual variation in mathematical skills can be ascribed to differences in cognitive ability, but also to students' emotional experiences of mathematics, such as enjoyment and anxiety. The significant effects of working memory and anxiety on math performance were stronger for the math-problem-solving test, according to previous research. Students with high working memory ability experience anxiety more than students with poor working ability. On average, the speeded arithmetic test might be less nerve-wracking, but because of its speed, it might be more detrimental to pupils who have better working memory abilities. This discrepancy might be caused by the test's nature, which starts with simple single-digit problems and then increases in difficulty to double-digit problems, which demand more working memory resources from more advanced students, as well as the difficulty of retrieving math facts from long-term memory while under time pressure. (Van der Ven, Prast, & de Weijer-Bergsma, 2023)

A significant correlation was determined between high school math anxiety and academic performance. These finding indicates that students who exhibit high levels of math anxiety often experience reduced academic and math performance. (Rozgonjuk, et.al, 2020). Moreover, high levels of self-efficacy notwithstanding, anxiety levels remain high because of past negative experiences, which students use to build up their intellectual functioning through adaptive behavior. Self-efficacy was strongly linked to the correlation between anxiety and academic performance. (Ducay & Alave, 2021).

3. Methodology

3.1 Research Design

The researcher randomly selects the samples in collecting data. Samples are taken from 5 groups to represent 5 sections in Grade 11.

3.2 Data Collection

In the collection of data, an adopted survey questionnaire was used. The 15-item questionnaire was about their Mathematics Anxiety and Self-Efficacy and distributed to the respondents using Google Form. Survey questionnaire had a translated version to ensure that the respondents understands the statements. Further, the researcher uses a descriptive - correlational methods of research design in the conduct of this research.

4. Results

Table 1 reveals that about 20% of grade 11 learners *"did not meet the expected performance"* indicating that they have failed in the mathematics test. One third (33.33%) obtained a "*Fairly Satisfactory*" performance. The remaining number of learners exhibited "*Satisfactory*" - 16(35.56%), "*Very Satisfactory*" – 4(8.89%) and "*Outstanding"* (2.22%) performances.

Range	Description	Frequency	Percentage
90 – 100	Outstanding	1	2.22%
85 – 89	Very Satisfactory	4	8.89%
80 – 84	Satisfactory	16	35.56%
75 – 79	Fairly Satisfactory	15	33.33%
Below 75	Did not Meet Expectation	9	20.00%
		45	100%

Table 1. Grade 11 Academic Performance in General Mathematics

Table 2 shows that relationship between student's academic performance and mathematics anxiety. Since $p < 0.05$, then we reject the null hypothesis. It means that there is a significant relationship between students' academic performance and mathematics anxiety. Moreover, a significant negative correlation value of $r = -0.038$ was found. This implies that students with high Mathematics anxiety tend to do less in Mathematics over their academic performances. Moreover, high achieving students have lower levels of anxiety, while low achieving students have high levels of anxiety because high achieving students have a strong understanding of mathematics and have greater confidence than low achieving students. (Ducay &Alave, 2021).

Table 2. Correlations between Mathematics Anxiety (MA), Self-Efficacy (SE), Academic Performance and Sex

	1	2	3	4
1. Sex	-			
2. Mathematics Anxiety (MA)	0.066	-		
3. Academic Performance	-0.228	-0.380**	-	
4. Self-Efficacy	-0.013	-0.788**	0.023	-

***Significant at* $p < 0.05$

Table 2 shows that there is self-efficacy has a weak positive correlation to the students' academic performance ($r = 0.023$) which indicates that those with high self-efficacy performs better in the evaluation (Tamur, 2021). Moreover, there is a very highly positive correlation between self-efficacy and Mathematics Anxiety ($r = -0.788$) and thus, both mathematics anxiety and self-efficacy showed significant relationship with mathematics performance (Hiller, et.al., 2021). Hence, it is expected that students who perform well in school will have a greater level of confidence in their learning abilities. Additionally, students who achieve academic success are more likely to feel secure in their ability to manage their own learning, avoid peer pressure, and think they can better meet the expectations of others.

Sex has insignificant influence to students' mathematics anxiety, self-efficacy and academic performance. In other words, the degree of anxiety associated with mathematics is unaffected by gender. Students can experience either a low or high level of anxiety toward mathematics, regardless of whether they are male or female. Thus, there were no sex differences in student's mathematics anxiety, self-efficacy and academic performance.

The results showed that there is a modest and inverse relationship between anxiety level and mathematical performance, indicating that when students in grade 11 exhibit high levels of anxiety, their mathematical performance is correspondingly low. Every unit increase in worry will result in a 0.380 unit loss in arithmetic performance among grade 11 students, according to a scale of magnitude.

Range of Anxiety	Level of Anxiety
4.51 – 5.00	Very high
3.51 – 4.50	High
2.51 – 3.50	Moderate
1.51 – 2.50	Low
1.00 – 1.51	Very Low

Table 3. Levels of Mathematics Anxiety (adopted from Abocejo, et.al, 2019)

Table 4 shows the comparison of students' level of Mathematics Anxiety in terms of sex. Both sexes have a moderate level of anxiety but female manifests a moderately higher level of Mathematics Anxiety than male. However, the level of mathematics anxiety has no significant relationship with the Gender of students (Izzah, et., 2022).

	LEVEL OF MATH ANXIETY		LEVEL OF SELF-EFFICACY	
MALE	3.09	MODERATE	3.05	LOW
FEMALE	3.22	MODERATE	3.03	LOW

Table 4. Students' Level of Math Anxiety and Self-Efficacy (Ducay & Alave, 2021)

This study found that learners' mathematics anxiety negatively impacts their performance in mathematics. Higher anxiety levels result in lower performance, while lower anxiety levels lead to higher performance. The study also found that gender does not significantly impact anxiety levels and mathematics performance. However, female learners had a slightly moderate association with anxiety levels than female learners while male had a slightly low association with self-efficacy. Moreover, if students experience anxiety, it has an impact on the decreasing of mathematical achievement and increased anxiety.

The study suggests that reducing anxiety levels and its contributing attributes is crucial for improving mathematics performance among senior high school learners. Future research should consider other variables and explore the relationship between anxiety levels and mathematics performance at different levels among high school learners, identify factors that affect students' mathematics anxiety and self-efficacy, and social environment factors related to dealing with math anxiety problems.

References:

1. alpacion, n. j., camanan, c. T., gregorio, a. j., & Panlaan, J. M. (2014). Attitude, Self-Eicacy and Students' Academic Performance in Mathematics. *IAMURE Multidisciplinary Research*, 22-34. doi:doi: http://dx.doi.org/10.7718/ijss.v12i1.920

2. Baloglu, M., & Kocak, R. (2006). A multivariate investigation of the differences in mathematics anxiety, Personality and Individual Differences. *ScienceDirect*, 1325-1335. doi:10.1016/j.paid.2005.10.009.

3. Barrera, K. (2022). Academic resilience and self-efficacy of Grade 7 students in Social Studies in a science high school in the Philippines. *International Research Journal of Social Sciences*, 1-12. doi:10.13140/RG.2.2.18633.62566

4. Beaton, A. T. (2007). Strength in numbers? Women and mathematics. *European Journal of Psychology of Education*, 291–306.

5. Chamberlain, A. G. (2023). "Investigating Correlations Among a Growth-Mindset Intervention, Students' Math Anxiety, and Students' Math Self-Efficacy. *ScholarWorks@BGSU*. From https://scholarworks.bgsu.edu/honorsprojects/899/

6. Chang, H. a. (2016). The math anxiety-math performance link and its relation to individual and environmental factors: a review of current behavioral and psychophysiological research. *Curr. Opin. Behav. Sci.*, 33–38. doi:doi: 10.1016/j.cobeha.2016.04.011

7. Dow, H. M. (2021). COMPUTER SELF-EFFICACY AND MATH PERFORMANCE IN ADULT BASIC EDUCATION STUDENTS. *Theses and Dissertations--Science, Technology, Engineering, and*, 1-69. From https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1019&context=stem_etds

8. Ducay, J., & Alave, A. (2021). Self-Efficacy, Anxiety and Academic Performance in Mathematics of Junior High School students. *Globus Journal of Progressive Education: A Refereed ResearchJournal*, 41-46. doi:10.46360/globus.edu.220211009

9. Frenzel, A. C. (2007). Girls and mathematics—a hopeless issue? A control-value approach to gender differences in emotions towards mathematics. *European Journal of Psychology of Education*, 497–514.

10. Gallagher, A. D.-D. (2000). Gender differences in advanced mathematical problem solving. *Journal of Experimental Child Psychology*, 165–190.

11. Hackett, G., & Betz, N. E. (1989). An Exploration of the Mathematics Self-Efficacy/Mathematics Performance Correspondence. *National Council of Teachers in Mathemaics*, 261-273. From https://sci-hub.hkvisa.net/10.2307/749515

12. Hanifah, N., Afidah, L. N., Soraya, A. I., & Ardiansyah, A. S. (2023). Study Literature of ICT toward

Mathematics Anxiety for Students. *PRISMA, Prosiding Seminar Nasional Matematika*, 120-125. From https://journal.unnes.ac.id/sju/index.php/prisma/article/view/66500/23769

13. Hiller, S., Kitsantas, A., Cheema, J., & Poulou, M. (2021). Mathematics anxiety and self-efficacy as predictors of mathematics literacy. *International Journal of Mathematical Education in Science and Technology.*, 1-19. doi:10.1080/0020739X.2020.1868589.

14. Izzah, L., Faslurrohman, M., & Permatasari, D. (2022). STUDENTS' MATHEMATICS PROBLEM-SOLVING VIEWED FROM MATHEMATICS ANXIETY AND GENDER. *Jurnal Pendidikan dan Pembelajaran Matematika*, 166-175. doi:https://doi.org/10.35316/alifmatika.2022.v4i2.166-175

15. Khasawneh, E., Gosling, C., & Williams, B. (2021). The effect of self-efficacy on maths anxiety among paramedic students. *Australasian Journal of Paramedicine*. doi:18. 10.33151/ajp.18.814.

16. Kurniasih, M. D., & Zay, D. A. (2023). Exploring Math Anxiety Towards the Students' Computer Self-Efficacy in Learning Mathematics. *Mosharafa: JunalPendidikanMatematika*, 113-124. doi:10.31980/mosharafa.v12i1.1621

17. Li, Q., Cho, H., Cosso, J., & Maeda, Y. (2021). Relations Between Students' Mathematics Anxiety and Motivation to Learn Mathematics: a Meta-Analysis. *Educational Psychology Review*, 33. doi:10.1007/s10648-020-09589-z

18. Lopez, M. A., Francisco, C. D., Capinig, C., Alayan, J., & Manalo, S. (2021). *International Journal of Advance Research and Innovative Ideas in Education*, 2395-4396. From https://ijariie.com/AdminUploadPdf/Amidst_COVID_19_Pandemic__The_Self_Efficacy_and_Academic_Motivation_of_the_College_Students_from_the_Private_Higher_Education_Institutions_in_the_Philippines_ijariie14568.pdf#:~:text=Based%20on%20the%20data%20gathered%2C

19. Ma, X. &. (1997). Assessing the relationship between attitude towards mathematics and achievement in mathematics: A meta-analysis. *Journal for Research in Mathematics*.

20. Maloney, E. A. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychol. Sci.*, 1480–1488. doi:doi: 10.1177/0956797615592630

21. Mamolo, L. A. (2022). Online Learning and Students' Mathematics Motivation, Self-Efficacy, and Anxiety. *Education Research International*, 2090-4002. doi:10.1155/2022/9439634

22. Maulidiyah, E. C., & Rohman, K. (2022). Students' Self-Efficacy in Confronting Changes of the Form on the Final Project During COVID-19 Pandemic. *Jurnal: Dinamika Penelitian*, 130-145. doi:https://doi.org/10.21274/dinamika.2022.22.01.130-1455

23. Negara, H. R., Nurlaelah, E., Wahyudin, Herman, T., & Tamur, M. (2020). Mathematics self efficacy and mathematics performance in online learning. *Journal of Physics: Conference Series*, 1-6. doi:10.1088/1742-6596/1882/1/012050

24. Özcan, B., & Kültür, Y. Z. (2021). The Relationship Between Sources of Mathematics Self-Efficacy and Mathematics Test and Course Achievement in High School Seniors. *SAGE Open*, 0. doi:doi.org/10.1177/21582440211040124

25. Rozgonjuk, D., Kraav, T., Mikkor, K., & Orav-Puurand, K. (2020). Mathematics anxiety among STEM and social sciences students: the roles of mathematics self-efficacy, and deep and surface approach to learning. *International Journal of Mathematical Education in Science and Technology*, 2196-7822. doi:10.1186/s40594-020-00246-z

26. Sakellariou, C. (2022). The reciprocal relationship between mathematics self-efficacy and mathematics performance in US high school students: Instrumental variables estimates and gender differences. *Frontiers in psychology*, 13. From https://doi.org/10.3389/fpsyg.2022.941253

27. Smith, M. (2004). Math Anxiety: Causes, Effects, and Preventative Measures. *Math Anxiety: Causes, Effects,*

and Preventative Measures, 1-37. From https://core.ac.uk/download/pdf/58825205.pdf

28. Stevens, T., Olivarez Jr, A., Lan, W. Y., & Tallen-Runnels, M. K. (2004). Role of Mathematics Self-Efficacy and Motivation in Mathematics Performance Across Ethnicity. *The Journal of Educational Research*, 208-222. doi:10.3200/JOER.97.4.208-222

29. Tapia, M. &. (2004). The Relationship of Mathematics Anxiety and Gender. *Academic exchange quarterly*, 130-134.

30. Tapia, M., & Marsh, G. (2004). The relationship of Math Anxiety and Gender. *Academic Exchange Quarterly*, 130-134.

31. Tipon, F. K., Villanueva, A., Baluyot, M. K., Lloyd, K., Juan, K. L., Cruz, N., & Tus, J. (2021). The Self-Efficacy and Its Relationship on the Academic Motivation to the Senior High School Students from Public Schools Amidst the New Normal Education in the Philippines. *International Journal Of Advance Research And Innovative Ideas In Education*, 7. doi:10.6084/m9.figshare.14813397.v2.

32. Umaratu, S. J., Ngaba, A. L., & Nggaba, M. E. (2022). Analysis of Mathematical Problem Solving Ability Viewed from Gender Differences in Public High Schools. *Jurnal Penelitian Didaktik Matematika*, 1-13. From https://pdfs.semanticscholar.org/1e64/1a1e17a9fcc18d6a1af6d02df65dafcb33e9.pdf?_gl=1*uoekzg*_ga*NTY2OTQxMTkuMTY5MzkyMDUxNg..*_ga_H7P4ZT52H5*MTY5NTg3OTIwMC4xOC4xLjE2OTU4Nzk0MDYuMzEuMC4w

33. Unlu, M., Ertekin, E., & Dilmac, B. (2017). Predicting Relationships between Mathematics Anxiety, MathematicsTeaching Anxiety, Self-efficacy Beliefs towards Mathematics and Mathematics Teaching. *International Journal of Research in Education and Sciences*, 636-646. doi:10.21890/ijres.328096

34. Van der Ven, S. H., Prast, E. J., & de Weijer-Bergsma, E. V. (2023). Towards an Integrative Model of Math Cognition: Interactions between Working Memory and Emotions in Explaining Children's Math Performance. *Journal of Intelligence*. doi:10.3390/jintelligence11070136

35. Venkatesh Kumar, G., & Karimi, A. (2010). Mathematics Anxiety, Mathematics Performance and OverallAcademic Performance in High School Students. *Journal of the Indian Academy of Applied Psychology*, 147-150. From https://www.academia.edu/37315599/Mathematics_Anxiety_Mathematics_Performance_and_Overall_Academic_Performance_in_High_School_Students

36. Wang C, L. X.-j. (2023). The mediating effect of math self-efficacy on the relationship between parenting style and math anxiety. *Front. Psychology*. doi: doi: 10.3389/fpsyg.2023.1197170

37. Yapo, F. C., Tabiliran, J. P., Dagami, A. T., & Navales, K. J. (2021). The Self-Efficacy and Academic Motivation of the Graduating College Students during the COVID-19 Pandemic in the Philippines. *International Journal Of Advance Research And Innovative Ideas In Education*, 7. doi:10.6084/m9.figshare.14784885.v1

.