

GRIT, Expectancy-Value-Cost Motivation, Self-Regulated Learning and Mathematics Anxiety of Senior High School STUDENTS

Shawn C.J. A. Colman¹, Lolly Jean C. Simbulas²

¹Teacher, Pedro Mariscal National High School, Santa Maria, Davao Occidental
scolman_190000002663@uic.edu.ph

²Graduate School Department, University of the Immaculate Conception, Davao City, Philippines
lsimbulas@uic.edu.ph

ABSTRACT

This study sought to determine the significant influence of grit, expectancy-value-cost motivation, and self-regulated learning to mathematics anxiety of senior high school students. The study employed a quantitative approach in its research design specifically a descriptive-correlational method. The respondents were public Grade 11 students in the Municipality of Sta. Maria. Moreover, adapted and pilot-tested questionnaires for each of the variables of interest were utilized in data gathering. Mean, standard deviation, Pearson product-moment correlation and multiple regression analysis were employed in the analysis of the data. It was shown that high levels of grit, expectancy-value-cost motivation, and self-regulated learning and low levels of mathematics anxiety were exhibited by the respondents. In addition, the study revealed a significant negative relationship between grit, expectancy-value-cost motivation, and self-regulated learning and mathematics anxiety. Furthermore, the combined influence of grit, expectancy-value-cost motivation, and self-regulated learning significantly influences the mathematics anxiety of the senior high school students.

KEYWORDS: *Senior high school, grit, expectancy-value-cost motivation, self-regulated learning, mathematics anxiety, descriptive-correlation, public senior high school students, Philippines*

INTRODUCTION

The significance of mathematics has become evident through its relative benefit as a problem-solving tool in scientific contexts and its ability to address practical issues in everyday situations (Unlu et al., 2017). Nevertheless, despite

the significance of the aforementioned subject, a considerable number of students appear to experience feelings of anxiety in relation to it (Delgado & Kassim, 2019). In addition, 30 percent of students feel anxious or powerless when doing mathematical problems and performed poorly in mathematics (Živković et al., 2023).

Educators have been addressing the widespread problem of mathematics anxiety, as it significantly hinders students' ability to achieve their academic capabilities (Ramirez et al., 2018). It was reported that 67 percent of educators said that mathematics anxiety was a challenge for their students in their classrooms (Sparks, 2022). Also, it is worth noting that mathematics anxiety significantly impacts the lives of students across different countries and educational levels (Schillinger et al., 2018). With regards to that, researchers have estimated that between 6 to 17 percent of the population experience anxiety towards mathematics (Dowker et al., as cited in Victoria State Government, 2021).

In the United States of America, Ahmed (2018) reported that 21.90 percent of high school students had increasing mathematics anxiety. Another study by Deieso and Fraser (2018) in secondary schools in South Australia revealed that students exhibited higher levels of anxiety to mathematics. In addition to that, Dağdelen and Yildiz (2022) reported that secondary students in Istanbul exhibited mathematics anxiety levels that exceeded the median threshold, while their attitudes towards mathematics were below the average value.

Nationally, Estonanto and Dio (2019) reported that 49.28 percent of the grade twelve students in Southern Luzon experienced high levels of mathematics anxiety. Also, Ducay and Alava (2021) examined the mathematics anxiety of public grade 10 students in Negros Occidental. It indicated that a considerable number of students experienced high levels of mathematics anxiety. Another study by Mamolo (2022) revealed high levels of anxiety among high school students.

In Davao City, Bongcac (2021) revealed that grade seven students had exhibited mathematics anxiety. A study conducted in Davao Oriental by Salimaco (2020) reported an average level of mathematics anxiety among senior high school students. On the other hand, Delgado and Kassim (2019) revealed moderate levels of mathematics anxiety among junior high school students in

Zamboanga City.

Nevertheless, studies have stated that there are several factors that can alleviate the mathematics anxiety of learners. One factor is the grit of the learners. Studies have reported that students who were gritty in their studies have shown less mathematics anxiety (Smith, 2021; Yu et al., 2021; Holtby, 2018). Moreover, another factor, which is motivation, has been regarded as having a negative correlation with mathematics anxiety (Li et al., 2021; Gunderson et al., 2018; Wang et al., 2015). In addition, it has been determined that there exists a negative correlation between self-regulated learning and mathematics anxiety (Cahyawati et al., 2023; Gabriel et al., 2020; Morsanyi et al., 2019).

Despite the existence of various studies reporting the influence of various factors to mathematics anxiety, there remains a gap in the literature examining the combined influence of grit, expectancy-value-cost motivation, and self-regulated learning to mathematics anxiety (Gabriel et al., 2020; Yu et al., 2021; Szucs & Toffalini, 2023). Hence, it fueled the drive of the researcher to conduct this study in order to fill in the gap. The findings of this study will be beneficial to teachers as it will serve as a basis of lesson planning and remediation. Moreover, carrying out this study will benefit learners, teachers, and institutions as it will launch intervention programs and trainings.

The goal of this study was to investigate the present condition of students' grit, expectancy-value-cost motivation, self-regulated learning, and mathematics anxiety. Findings of the study will be presented to learners, parents, and teachers. The completed study will be presented to school learning action cells, research conferences, and it is hoped to be submitted to research publications in order to reach readers around the globe.

METHODS

This study utilized a quantitative research approach specifically a descriptive-correlational design with the use of adapted questionnaires to gather data from the respondents in order to assess the levels of grit, motivation, self-regulated learning, and mathematics anxiety of senior high school students. It was also examined if the variables of interest were statistically significant in influencing the dependent variable.

The study was conducted at three public secondary educational institutions located in Santa Maria, Davao Occidental, referred to as School A,

School B, and School C. The aforementioned schools are affiliated with the Sta. Maria West District, which is a constituent unit of the School's Division of Davao Occidental. Moreover, the three educational institutions offer senior high school programs within the division. The selection of the three schools as the research's locale was based on their distinctive standing within the Division of Davao Occidental, few studies have been made regarding the senior high school students of the aforementioned schools.

The study identified 251 respondents using Raosoft taken from the three public secondary schools in Sta. Maria West District. Specifically, these respondents were students in the Academic Track of the Department of Education Senior High School program. Moreover, they were enrolled in the face-to-face classes in the school year 2023 – 2024. Furthermore, those in the alternative delivery mode and alternative learning system were not part of the study.

The researcher employed stratified random sampling as the method for selecting the respondents. In employing this method, the researcher divided the population into strata based on the school's location. Then, the researcher randomly selected respondents to answer the survey questionnaire from each stratum.

Before the data gathering, the study underwent ethics review with a protocol code of GS-0064-12-23 and after receiving the letter of recommendation from the Graduate School, the Schools Division Office of Davao Occidental responded by sending the researcher a letter of approval. After that, the researcher gave the school principals of the schools in the target research area a letter of request. The researcher individually corresponded with the school administrators of each school to establish a plan for the survey's implementation after getting confirmation.

The researcher obtained the signatures of the senior high school students and their parents on the Informed Consent Form (ICF). This also served as the official documentation of the agreement between the researcher and the respondents. In order to produce precise and trustworthy data, the researcher personally conducted and collected the survey. The respondents were given 15 minutes to complete the survey. Hence, the administration of the survey questionnaire was done face-to-face. Furthermore, data was tallied and analyzed through computer software and the statistical tools that were used in the data

analysis are the mean, standard deviation, Pearson product - moment correlation (r) and multiple regression analysis.

RESULTS

Table 1 reveals the level of grit of Grade 11 senior high school students. Four indicators of levels of grit of senior high school students are presented on the table with corresponding mean and standard deviation; these indicators include adaptability to situation, perseverance of effort, spirited initiative, and steadfastness in adverse situations. Results show that the overall mean 4.08, which is described as high, indicates that grit is oftentimes observed. The overall standard deviation measures at 0.38 implying that the responses are consistent.

Table 1
Level of Grit of Senior High School Students

Indicators	Mean	SD	Description
Adaptability to Situations	3.73	0.56	High
Perseverance of Effort	4.01	0.61	High
Spirited Initiative	4.15	0.44	High
Steadfastness in Adverse Situations	4.45	0.40	Very High
OVERALL MEAN	4.08	0.38	HIGH

The results of the study are similar to the findings of the study conducted by Mata (2020) where it was revealed that the senior high school students had high levels of grit. However, it contradicts the findings of the studies Britto et al. (2023), Advincula (2023), and Quing and Baudin (2021) which reported moderate levels of grit.

Looking closely at the results, it can be observed that adaptability to situations has the lowest mean of 3.73 with a standard deviation of 0.56 among the indicators, but it is still described as high. It shares the same findings with the results of the studies of Li and Lin (2024) and Datu and Fincham (2021) where it showed high levels of adaptability to situations among the respondents of their study of grit. However, it differs from the study of Ting and Datu (2020)

where they reported moderate levels of adaptability to situations among secondary school students.

Perseverance of effort got a mean of 4.01 with a standard deviation of 0.56, which is described as high. The results confirmed the studies of Britto et al. (2023) and Datu and Fincham (2021), which revealed high levels of perseverance of effort. On the other hand, spirited initiative got a mean of 4.15 with a standard deviation of 0.40, which is described as high. The findings confirm the studies of Agrawal et al. (2022), Winandari and Naqiyah (2022), and Morell et al. (2021) where the results showed high levels of spirited initiative.

The indicator steadfastness in adverse situations got the highest mean of 4.45 with a standard deviation of 0.40, described as very high. Results confirm the study of Agrawal et al. (2022) that showed high levels steadfastness to adverse situations. In addition, it yielded similar findings to the research conducted by Winandari and Naqiyah (2022), which reported high levels of steadfastness to adverse situations.

Level of Expectancy-Value-Cost Motivation of Senior High School Students

Table 2 reveals the level of expectancy-value-cost of Grade 11 senior high school students. Three indicators of levels of expectancy-value-cost motivation of senior high school students are presented on the table with corresponding mean and standard deviation; these indicators include expectancy, value, and cost. Results show that the overall mean 3.80 which is described as high indicating that expectancy-value-cost motivation is oftentimes manifested. The overall standard deviation measures at 0.42 implying that the responses are consistent.

Table 2

Level of Expectancy-Value-Cost Motivation of Senior High School Students

Indicators	Mean	SD	Description
Expectancy	3.68	0.61	High
Value	3.98	0.66	High

Cost	3.75	0.53	High
OVERALL MEAN	3.80	0.42	High

Similarly, the results align with the findings of the studies of Kryshko et al. (2022), Schnettler et al. (2020), and Putwain et al. (2019) where high levels of expectancy-value-cost motivation were reported. The indicator expectancy got the lowest mean of 3.68 with a standard deviation of 0.61, which can be described as high. This confirms the study of Perez et al. (2019), Putwain et al. (2019), and Guo et al. (2015) where it reported high levels of expectancy.

On the other hand, the indicator cost got a mean of 3.75 with a standard deviation of 0.53, which can be described as high. High levels of the indicator cost were also reported in the findings of Gaspard et al. (2017) of motivation among students in grades 5 to 12. However, it contradicts the findings of Hess et al. (2018) and Perez et al. (2014) where low levels of cost were observed on the respondents of their study.

The indicator value got the highest mean of 3.98 with a standard deviation of 0.66, which is described as high. The findings confirm the result of the study of Perez et al. (2019) and Guo et al. (2015) where high levels of value were revealed among the respondents. However, it differs from the findings of the study of Gaspard et al. (2017) where respondents reported low levels of value.

Level of Self-Regulated Learning of Senior High School Students

Table 3 reveals the level of self-regulated learning of Grade 11 senior high school students. Six indicators of levels of self-regulated learning of senior high school students are presented on the table with corresponding mean and standard deviation; these indicators include planning, self-monitoring, evaluation, reflection, effort, and self-efficacy. Results show that the overall mean 4.06 which is described as high, indicates that self-regulated learning is oftentimes demonstrated. The overall standard deviation measures at 0.45 implying that the responses are consistent.

Table 3*Level of Self-Regulated Learning of Senior High School Students*

Indicators	Mean	SD	Description
Planning	4.00	0.56	High
Self - Monitoring	4.10	0.55	High
Evaluation	4.18	0.57	High
Reflection	4.16	0.57	High
Effort	3.95	0.56	High
Self - Efficacy	3.96	0.55	High
OVERALL MEAN	4.06	0.45	High

Similarly, the results of this study align with the findings of Goffena and Horn (2021), Çakıroğlu and Öztürk (2017), and Lucieer et al. (2016), where high levels of self-regulated learning were observed on the respondents. The indicator planning got the lowest mean of 4.00 with a standard deviation of 0.56, which can be described as high. It yielded similar findings to the studies of Guven and Babayigit (2020), Losenno et al. (2020), and Leana-Tascilar (2016) where it reported high levels of planning.

In addition, self-monitoring got a mean of 4.10 with a standard deviation of 0.55, which can be described as high. The results confirm the findings of Guo (2022), Bartulovic et al. (2017), and Fabriz et al. (2014) where they have shown high levels of self-monitoring among athletic groups. Also, reflection got a mean of 4.16 with a standard deviation of 0.57, which can be described as high. The findings of this study are similar with results of Zheng et al. (2020) and Naeimi et al. (2019) where it indicated a high level of reflection among students. However, it contradicts with the findings of Gaupp et al. (2018), which showed moderate levels of reflection.

Apart from that, evaluation got a mean of 4.18 with a standard deviation of 0.57, interpreted as high. The findings are consistent with the studies of Raković et al. (2022) and Guven and Babayigit (2020) that revealed high levels of evaluation among students. On the contrary, Losenno et al. (2020) indicated low levels of evaluation. In addition, effort got a mean of 3.95 with a standard deviation of 0.56. It can be described as high. It confirms the findings of

Broadbent et al. (2021) where respondents demonstrated high levels of effort. However, it contradicts the results of the study of Biwer et al. (2023) and Turan et al. (2022) where it revealed moderate levels of effort. The indicator self-efficacy got the highest mean of 3.96 with a standard deviation of 0.55, described as high. The results corroborate with the findings of Fokkens-Bruinsma et al. (2021) where it showed high levels of self-efficacy among the respondents. However, it is different from the study of El-Adl and Alkharusi (2020) and Grijalva-Quiñonez et al. (2020), which reported moderate levels of self-efficacy among their respondents.

Level of Mathematics Anxiety of Senior High School Students

Table 4 reveals the level of mathematics anxiety of Grade 11 senior high school students. Three indicators of levels of mathematics anxiety of senior high school students are presented on the table with corresponding mean and standard deviation; these indicators include everyday life’s math anxiety, math learning anxiety, and math test anxiety. Results show that the overall mean 1.88, mathematical concepts and activities. The overall standard deviation measures at 0.22 implying that the responses are consistent.

Table 4

Level of Mathematics Anxiety of Senior High School Students

Indicators	Mean	SD	Description
Everyday Life’s Math Anxiety	1.28	0.06	Very Low
Math Learning Anxiety	2.06	0.32	Low
Math Test Anxiety	2.31	0.40	Low
OVERALL MEAN	1.88	0.22	Low

The study's results align with the findings of Xin et al. (2023) and Szczygieł and Pieronkiewicz (2022), where it revealed low levels of mathematics anxiety. However, it differs from the results of the study of Ryan et al. (2023) where it reported high levels of mathematics anxiety.

The indicator, everyday life’s math anxiety, got the lowest mean of 1.28 with a standard deviation of 0.06. This can be described as very low. The

findings confirm the studies of Szczygieł (2022), Yurt (2022), and Rolison et al. (2020) which showed low levels of everyday life's mathematics anxiety.

Moreover, the indicator, math learning anxiety, got a mean of 2.06 with a standard deviation of 0.32. It can be described as low. It confirms the findings of Shimizu (2022) and Szczygieł (2022), which showed low levels of mathematics learning anxiety in high school students. However, it contradicts the findings of Pirrone et al. (2022), which revealed high levels of mathematics learning anxiety. On the other hand, math test anxiety got the highest mean of 2.31 with a standard deviation of 0.40, still described as low. The findings of this study share the same results of the study of Szczygieł (2022), which showed low levels of mathematics test anxiety among the respondents. However, it contradicts the findings of Pirrone et al. (2022) and Shimizu (2022), which reported high levels of mathematics test anxiety.

Significance of the Relationship of Grit, Expectancy-value-cost motivation, and Self-regulated learning to Mathematics anxiety

Table 5 shows the relationships of grit, expectancy-value-cost motivation, and self-regulated learning to mathematics anxiety of grade 11 learners. It shows that grit has a significant moderate, negative relationship with mathematics anxiety with the correlation value at $r = -.676$ and with a p-value of .000 that is less than the alpha set at .05. It means that as grit of the grade 11 students increases, their mathematics anxiety significantly decreases. The results share the same findings with the studies of Yu et al. (2021) and Holtby (2018) that grit has a significant negative relationship with mathematics anxiety.

On the other hand, expectancy-value-cost motivation has a significant moderate, negative relationship with mathematics anxiety with the correlation value at $r = -.683$ and with a p-value of .000 that is less than the alpha set at .05. It means that as expectancy-value-cost motivation of the grade 11 students increases, their mathematics anxiety significantly decreases. The findings align with the results of the study of Szucs and Toffalini (2023), Putwain and Wood (2023), and Li et al. (2021) that expectancy-value-cost motivation has a negative relationship with mathematics anxiety.

Table 5

Significance of the Relationship of Grit, Expectancy-value-cost motivation, and Self-regulated learning to Mathematics anxiety

Mathematics Anxiety			
	r	p-value	remarks
Grit	-.676	.000	Significant
Expectancy-Value-Cost Motivation	-.683	.000	Significant
Self-Regulated Learning	-.685	.000	Significant

Furthermore, it also shows that self-regulated learning has a significant moderate, negative relationship with mathematics anxiety with the correlation value at $r = -.685$ and with a p-value of .000 that is less than the alpha set at .05. It means that as self-regulated learning of the grade 11 students increases, their mathematics anxiety significantly decreases. It confirms the studies of Gabriel et al. (2020), Tashtoush et al. (2020), and Tham and Lua (2022) where they reported that self-regulated learning has a negative relationship to mathematics anxiety.

Significance of the Influence of Grit, Expectancy-value-cost motivation, and Self-regulated learning to Mathematics anxiety

Presented in Table 6 is the result of the multiple regression analysis that determined the significance of the influence of grit, expectancy-value-cost motivation, and self-regulated learning on the mathematics anxiety of senior high school students. The results reveal that self-regulated learning significantly influences the mathematics anxiety of senior high school students having a p-value that is less than the 0.05 level of significance and a negative standardized beta value of -1.024.

This indicates that for every unit increase in the value of self-regulated learning, there is a corresponding decrease of -1.024 in the mathematics anxiety of senior high school students. In addition, test of multicollinearity revealed that grit, expectancy-value-cost motivation, and self-regulated are multicollinear, meaning, they are correlated to one another. This explains why the results show

that grit and expectancy-value-cost motivation are not significant predictors of mathematics anxiety. The results share the same findings with Balali et al. (2023), Fajri and Amir (2022), and Kaphesi (2017) where it was reported that self-regulated learning influences the mathematics anxiety of high school students.

Table 6

Significance of the Influence of Grit, Expectancy-value-cost motivation, and Self-regulated learning to Mathematics anxiety

Variables	β	Mathematics Anxiety		
		t	p-value	Remarks
Grit	.896	1.769	.078	Not Significant
Expectancy-value-cost motivation	-.559	-1.653	.100	Not Significant
Self-regulated learning	-1.024	-2.280	.023	Significant
Holistic Model				
r ²	.477			
F-value	75.061			
p-value	.000			
Remarks	Significant			

Finally, the computed r² value of 0.477 indicates that grit, expectancy-value-cost motivation, and self-regulated learning contributed significantly to the variability of the mathematics anxiety of the senior high school students by 47.7 percent from the total variability. Therefore, the difference of 52.3 percent can be attributed to other variables or factors that are not included in this study. The p-value of .000 which is less than 0.05 level of significance further shows a significant impact of self-regulated learning to mathematics anxiety. The results align with the findings of Balali et al. (2023), Fajri and Amir (2022), and Kaphesi (2017), where self-regulated learning was accounted for the variability in mathematics anxiety.

REFERENCES

- Advincula, J. (2023). Grit competency, growth mindset, and mental ability among filipino high school students. *Espergesia*, 10(1), 20-27.
- Agrawal, D., Chukkali, S., & Singh, S. (2022). Antecedents and consequences of grit among working adults: A transpersonal psychology perspective. *Frontiers in psychology*, 13, 896231.
- Ahmed, W. (2018). Developmental trajectories of math anxiety during adolescence: Associations with STEM career choice. *Journal of Adolescence*, 67, 158–166. <http://doi:10.1016/j.adolescence.2018.06.010>
- Balali, M., Sadeghi, J., & Homayouni, A. (2023). The Intermediating Role of Self-Regulation in the Relationship between Math Educational Beliefs and Students' Math Anxiety. *Iranian Journal of Learning and Memory*, 6(21), 61-67.
- Bartulovic, D., Young, B. W., & Baker, J. (2017). Self-regulated learning predicts skill group differences in developing athletes. *Psychology of sport and Exercise*, 31, 61-69.
- Biwer, F., Wiradhany, W., Egbrink, M., & De Bruin, A. (2023). Understanding effort regulation: Comparing 'Pomodoro' breaks and self-regulated breaks. *British Journal of Educational Psychology*, 93, 353-367.
- Bongcac, B. (2021). Self-efficacy and anxiety as determinants of mathematical achievement of grade 7 students: A quan + qual approach. *Global Scientific Journal*. 9(10)
- Britto, D., Rizvana, A., George, N., Subramaniyan, D., Narayanan, D., Mani, D., & Prakas, E. (2023). Guts, resilience, integrity, and tenacity (grit) among mid adolescent school students in a district of south india: A cross-sectional study. *Indian Journal of Psychological Medicine*, 45(3), 243-249.
- Broadbent, J., Sharman, S., Panadero, E., & Fuller-Tyszkiewicz, M. (2021). How does self-regulated learning influence formative assessment and summative grade? Comparing online and blended learners. *The Internet and Higher Education*, 50, 100805.
- Cahyawati, D., Delima, N., & Gunarto, M. (2023). The impact of undergraduate students' mathematics anxiety and self-concept on their self-regulated learning and academic achievement. *Jurnal Elemen*, 9(1), 183-196. <https://doi.org/10.29408/jel.v9i1.6898>
- Çakıroğlu, Ü., & Öztürk, M. (2017). Flipped classroom with problem based activities: Exploring self-regulated learning in a programming language course. *International Forum of Educational Technology and Society*.

- Dağdelen, M., & Yildiz, A. (2022). The relationship between the secondary school students' mathematics anxiety and mathematical literacy self-efficacy. *Journal of Computer and Education Research*, 10(20), 636-655.
- Datu, J. A. D. & Fincham, F. D. (2021). The relational and mental health payoffs of staying gritty during the covid-19 pandemic: a cross-cultural study in the philippines and the united states. *Journal of Social and Personal Relationships*, 39(3), 459-480. <https://doi.org/10.1177/02654075211029380>
- Deieso, D., & Fraser, B. J. (2019). Learning environment, attitudes and anxiety across the transition from primary to secondary school mathematics. *Learning Environments Research*, 22, 133-152.
- Delgado, K. D. D., & Kassim, S. R. (2019). Mathematics Anxiety among Young Filipino Learners: Investigating the Influence of Gender and Socio-Economic Status. *Online Submission*, 31(3), 575-579.
- Ducay, J., & Alava, A. (2021). Self-efficacy, anxiety, and academic performance in mathematics of junior high school students. *Globus Journal of Progressive Education*, 11(1), 41-46.
- El-Adl, A. & Alkharusi, H. (2020). Relationships between self-regulated learning strategies, learning motivation and mathematics achievement. *Cypriot Journal of Educational Science*. 15(1), 104–111. <https://doi.org/10.18844/cjes.v15i1.4461>
- Estonanto, A. J. J., & Dio, R. V. (2019). Factors causing mathematics anxiety of senior high school students in calculus. *Asian Journal of Education and e-Learning* (ISSN: 2321–2454), 7(01).
- Fabriz, S., Dignath-van Ewijk, C., Poarch, G., & Büttner, G. (2014). Fostering self-monitoring of university students by means of a standardized learning journal—a longitudinal study with process analyses. *European Journal of Psychology of Education*, 29, 239-255.
- Fajri, F. R., & Amir, M. F. (2022). Math self-regulated learning assisted by metacognitive support by reviewing sex differences in mathematics anxiety. *REID (Research and Evaluation in Education)*, 8(2), 100-113.
- Fokkens-Bruinsma, M., Vermue, C., Deinum, J. F., & Van Rooij, E. (2021). First-year academic achievement: the role of academic self-efficacy, self-regulated learning and beyond classroom engagement. *Assessment & Evaluation in Higher in Higher Education* 46(5):1-12. <http://doi:10.1080/02602938.2020.1845606>
- Gabriel, F., Buckley, S., & Barthakur, A. (2020). The impact of mathematics

- anxiety on self-regulated learning and mathematical literacy. *Australian Journal of Education*, 64(3), 227-242. <https://doi.org/10.1177/0004944120947881>
- Gaspard, H., Häfner, I., Parrisius, C., Trautwein, U., & Nagengast, Benjamin (2016). Assessing task values in five subjects during secondary school: Measurement structure and mean level differences across grade level, gender, and academic subject. *Contemporary Educational Psychology*, (), S0361476X16300418-. <http://doi:10.1016/j.cedpsych.2016.09.003>
- Gaupp, R., Fabry, G., & Körner, M. (2018). Self-regulated learning and critical reflection in an e-learning on patient safety for third-year medical students. *International journal of medical education*, 9, 189.
- Goffena, J. D., & Horn, T. S. (2021). The relationship between coach behavior and athlete self-regulated learning. *International Journal of Sports Science & Coaching*, 16(1), 3-15.
- Grijalva-Quiñonez, C. S., Valdés-Cuervo, A. A., Parra-Pérez, L. G., & Vázquez, F. I. G. (2020). Parental involvement in Mexican elementary students' homework: Its relation with academic self-efficacy, self-regulated learning, and academic achievement. *Psicología Educativa. Revista de los Psicólogos de la Educación*, 26(2), 129-136.
- Gunderson, E. A., Park, D., Maloney, E. A., Beilock, S. L., & Levine, S. C. (2018). Reciprocal relations among motivational frameworks, math anxiety, and math achievement in early elementary school. *Journal of Cognition and Development*, 19(1), 21-46.
- Guo, J., Marsh, H., Parker, P., Morin, A., & Yeung, A. (2015). Expectancy-value in mathematics, gender and socioeconomic background as predictors of achievement and aspirations: A multi-cohort study. *Learning and Individual Differences*, 37(), 161-168. <http://doi:10.1016/j.lindif.2015.01.008>
- Guo, L. (2022). The effects of self-monitoring on strategy use and academic performance: A meta-analysis. *International Journal of Educational Research*, 112, 101939.
- Güven, M., & Babayigit, B. B. (2020). Self-regulated learning skills of undergraduate students and the role of higher education in promoting self-regulation. *Eurasian Journal of Educational Research*, 20(89), 47-70.
- Hess, T., Growney, C., O'Brien, E., Neupert, S., & Sherwood, A. (2018). The role of cognitive costs, attitudes about aging, and intrinsic motivation in predicting engagement in everyday activities. *Psychology and Aging*,

- 33(6), 953-964. <https://doi.org/10.1037/pag0000289>
- Holtby, N. M. (2018). Grit, coping, and math anxiety: Examining the pathways through which devotion to long-term goals may promote student well-being. University of Toronto (Canada).
- Kaphesi, E. (2017). Exploring motivational factors and self-regulated learning strategies as predictors of students' anxiety in mathematics learning. *US-China Education Review*, 7(1), 27-38.
- Kryshko, O., Fleischer, J., Grunschel, C., & Leutner, D. (2022). Self-efficacy for motivational regulation and satisfaction with academic studies in STEM undergraduates: The mediating role of study motivation. *Learning and Individual Differences*, 93, 102096.
- Leana-Tascilar, M. Z. (2016). The relationships between self-regulated learning skills, causal attributions and academic success of trainee teachers preparing to teach gifted students. *Educational Research and Reviews*, 11(13), 1217-1227.
- 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*, 1-33.
- Li, Y., & Lin, X. (2024). Research on the correlation between academic emotion and grit among chinese college students. *Dimension*, 7(2), 112-119.
- Losenno, K. M., Muis, K. R., Munzar, B., Denton, C. A., & Perry, N. E. (2020). The dynamic roles of cognitive reappraisal and self-regulated learning during mathematics problem solving: A mixed methods investigation. *Contemporary Educational Psychology*, 61, 101869.
- Lucieer, S. M., Jonker, L., Visscher, C., Rikers, R. M., & Themmen, A. P. (2016). Self-regulated learning and academic performance in medical education. *Medical teacher*, 38(6), 585-593.
- Mamolo, L. A. (2022). Online learning and students' mathematics motivation, self-efficacy, and anxiety in the "new normal". *Education Research International*, 2022, 1-10.
- Mata, P. V. (2020). Grit and academic self-efficacy as predictors of senior high school academic performance. *Journal of Agriculture and Technology Management (JATM)*, 23(1), 35-42.
- Morell, M., Yang, J., Gladstone, J., Faust, L., Ponnock, A., Lim, H., & Wigfield, A. (2021). Grit: the long and short of it. *Journal of Educational Psychology*, 113(5), 1038-1058. <https://doi.org/10.1037/edu0000594>
- Morsanyi, K., Busdraghi, C., & Primi, C. (2014). Mathematical anxiety is linked to reduced cognitive reflection: a potential road from discomfort in the

- mathematics classroom to susceptibility to biases. *Behavioral and Brain Functions*, 10(1), 31. <https://doi.org/10.1186/1744-9081-10-31>
- Naeimi, L., Abbaszadeh, M., Mirzazadeh, A., Sima, A. R., Nedjat, S., & Hejri, S. M. (2019). Validating self-reflection and insight scale to measure readiness for self-regulated learning. *Journal of Education and Health Promotion*, 8(1), 150.
- Perez, T., Cromley, J., & Kaplan, A. (2014). The role of identity development, values, and costs in college stem retention. *Journal of Educational Psychology*, 106(1), 315-329. <https://doi.org/10.1037/a0034027>
- Perez, T., Dai, T., Kaplan, A., Cromley, J., Brooks, W., White, A., Mara, K., & Balsai, M. (2019). Interrelations among expectancies, task values, and perceived costs in undergraduate biology achievement. *Learning and Individual Differences*, 72(), 26–38. <http://doi:10.1016/j.lindif.2019.04.001>
- Pirrone, C., Di Corrado, D., Privitera, A., Castellano, S., & Varrasi, S. (2022). Students' mathematics anxiety at distance and in-person learning conditions during COVID-19 pandemic: Are there any differences? An exploratory study. *Education Sciences*, 12(6), 379.
- Putwain, D. W., & Wood, P. (2023). Anxiety in the mathematics classroom: reciprocal relations with control and value, and relations with subsequent achievement. *ZDM—Mathematics Education*, 55(2), 285-298.
- Putwain, D., Nicholson, L., Pekrun, R., Becker, Sandra, & Symes, Wendy (2019). Expectancy of success, attainment value, engagement, and Achievement: A moderated mediation analysis. *Learning and Instruction*, 60(), 117–125. <http://doi:10.1016/j.learninstruc.2018.11.005>
- Quing, K. A., & Baudin, J. S. (2021). The roles of internal locus of control and grit in managing the academic stress of senior high school students in Southern Luzon State University. *Journal of Education, Management and Development Studies*, 1(1), 1-9.
- Raković, M., Bernacki, M. L., Greene, J. A., Plumley, R. D., Hogan, K. A., Gates, K. M., & Panter, A. T. (2022). Examining the critical role of evaluation and adaptation in self-regulated learning. *Contemporary Educational Psychology*, 68, 102027.
- Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational psychologist*, 53(3), 145-164.
- Rolison, J. J., Morsanyi, K., & Peters, E. (2020). Understanding health risk comprehension: The role of math anxiety, subjective numeracy, and

- objective numeracy. *Medical Decision Making*, 40(2), 222-234.
- Ryan, M., Fitzmaurice, O., & Johnson, P. (2023). Investigating mathematics anxiety among mature students in service mathematics courses using the mathematics anxiety scale UK. *International Journal of Mathematical Education in Science and Technology*, 1-25.
- Salimaco, R. J. (2020). Mathematics achievement of senior high school students: Impact of study habits and anxiety. *International Journal of English and Education*, 9(3), 202-213.
- Schillinger, F. L., Vogel, S. E., Diedrich, J., & Grabner, R. H. (2018). Math anxiety, intelligence, and performance in mathematics: Insights from the German adaptation of the Abbreviated Math Anxiety Scale (AMAS-G). *Learning and Individual Differences*, 61, 109–119. <http://doi:10.1016/j.lindif.2017.11.014>
- Schnettler, T., Bobe, J., Scheunemann, A., Fries, S., & Grunschel, C. (2020). Is it still worth it? Applying expectancy-value theory to investigate the intraindividual motivational process of forming intentions to drop out from university. *Motivation and Emotion*, 44, 491-507.
- Shimizu, Y. (2022). Learning engagement as a moderator between self-efficacy, math anxiety, problem-solving strategy, and vector problem-solving performance. *Psych*, 4(4), 816-832.
- Smith, A. (2021). The relationship of grit, mathematics self-efficacy, stem career interest, and academic achievement for middle school students in algebra I. University of Houston
- Sparks, S. (2022, March 31). Math Anxiety Weakens How Students Study. Here's What Teachers Can Do. Retrieved from Education Week: <https://www.edweek.org/teaching-learning/math-anxiety-weakens-how-students-study-heres-what-teachers-can-do/2022/03>
- Szczygieł, M. (2022). Math attitude and math anxiety of stem students needs more attention. *Polish Psychological Bulletin*, 53(3).
- Szczygieł, M. & Pieronkiewicz, B. (2022). Exploring the nature of math anxiety in young children: Intensity, prevalence, reasons. *Mathematical Thinking and Learning*, 24(3), 248-266.
- Szucs, D., & Toffalini, E. (2023). Maths anxiety and subjective perception of control, value and success expectancy in mathematics. *Royal Society Open Science*, 10(11), 231000.
- Tashtoush, M. A., Alshunaq, M. M., & Albarakat, A. A. (2020). The effect of using self-regulated learning learning strategy to reduce the level of mathematics anxiety among students of al-huson university college.

- Jordanian Educational Journal, 5(3), 306–329. Retrieved from <https://jaesjo.com/index.php/jaes/article/view/166>
- Tham, D. & Lua, T. (2022). The employment of self-regulated learning strategies in learning english at a ho chi minh city-based high school. *Vnu Journal of Science Education Research*. <https://doi.org/10.25073/2588-1159/vnuer.4623>
- Ting, L. C., & Datu, J. A. D. (2020). Triarchic model of grit dimensions as predictors of career outcomes. *The Career Development Quarterly*, 68(4), 348-360.
- Turan, Z., Kucuk, S., & Cilligol Karabey, S. (2022). The university students' self-regulated effort, flexibility and satisfaction in distance education. *International Journal of Educational Technology in Higher Education*, 19(1), 35.
- Unlu, M., Ertekin,E., & Dilmac, B. (2017). Predicting relationships between mathematics anxiety, mathematics teaching anxiety, self-efficacy beliefs towards mathematics and mathematics teaching. *International Journal of Research in Education and Science*, 3(2), 636-645.
- Victoria State Government. (2021, September 27). *Mathematics Anxiety*. https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/maths/Pages/research_overcomingmathsanxiety.aspx
- Wang, Z., Lukowski, S., Hart, S., Lyons, I., Thompson, L., Kovas, Y., ... & Petrill, S. (2015). Is math anxiety always bad for math learning? the role of math motivation. *Psychological Science*, 26(12), 1863-1876. <https://doi.org/10.1177/0956797615602471>
- Winandari, N. Z. P., & Naqiyah, N. (2022). The influence of the family environment and grit on student's academic self-efficacy. *Bisma The Journal of Counseling*, 6(2), 228-237.
- Xin, Z., Xiao, H., & Lin, G. (2023). Math anxiety and financial anxiety predicting individuals' financial management behavior. *Depression and Anxiety*, 2023.
- Yu, Y., Hua, L., Feng, X., Wang, Y., Yu, Z., Zi, T., & Li, J. (2021). True grit in learning math: the math anxiety-achievement link is mediated by math-specific grit. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.645793>
- Yurt, E. (2022). Mathematics self-efficacy as a mediator between task value and math anxiety in secondary school students. *International Journal of Curriculum and Instruction*, 14(2), 1204-1221.

- Zheng, B., Ward, A., & Stanulis, R. (2020). Self-regulated learning in a competency-based and flipped learning environment: learning strategies across achievement levels and years. *Medical education online*, 25(1), 1686949.
- Živković, M., Pellizzoni, S., & Doz, E. (2023). Math self-efficacy or anxiety? The role of emotional and motivational contribution in math performance. *Soc Psychol Educ* 26, 579–601. <https://doi.org/10.1007/s11218-023-09760-8>