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Mathematics Anxiety and Level of Motivation as Predictors of the Academic Achievement of Public Senior High School Students

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ABSTRACT

Identifying students at risk of low mathematics achievement before grades are released requires markers that can be measured early. This study examined mathematics anxiety and level of motivation as predictors of the academic achievement of 109 Grade 11 and 12 students of General Santos City National High School in School Year 2025–2026. A descriptive-correlational design was used. Anxiety was measured in emotional, physiological, cognitive, and behavioral dimensions and motivation in intrinsic, extrinsic, and amotivation dimensions, using instruments adapted from the Abbreviated Math Anxiety Scale and the Academic Motivation Scale that showed acceptable to good reliability (α = .78 to .85). Achievement was measured through first- and second-quarter mathematics grades. Students were both highly anxious and highly motivated: extrinsic motivation ranked highest (M = 3.30, Very High), followed by intrinsic motivation, emotional anxiety, and cognitive anxiety (M = 3.23 each, High), while amotivation was Fair (M = 2.28). Achievement was Satisfactory, with mean grades rising from 83.45 to 84.20. Age, sex, grade level, strand, and family income were associated with both predictors, and sex, grade level, and strand with achievement. Mathematics anxiety was a moderate negative correlate of achievement (r = −.42, p = .001; 17.6% shared variance), and motivation a moderate positive correlate (r = .38, p = .002; 14.4%). Both variables are useful indicators of achievement risk and resilience, although their unique predictive contributions require regression-based confirmation. A mental health plan built on early screening and tiered support is proposed.

Introduction

Schools need to know which students are likely to struggle in mathematics before low grades appear on the report card. Prior achievement is the usual signal, but it arrives too late for prevention. Students' emotional and motivational states may offer earlier warning. Mathematics anxiety has been associated with weaker confidence and motivation and lower STEM achievement (Gunderson et al., 2023), as well as with lower test scores and fewer enrollments in advanced courses (Rachman et al., 2023). If anxiety and motivation reliably track achievement, they could help teachers and counselors identify learners in need of support while there is still time to act.

This matters especially in Philippine public senior high schools, where large classes limit individual attention and where students arrived after years of disrupted schooling. The pandemic period left measurable effects on students' mental health, as documented in a survey of Filipino college students' adjustment during the crisis (Panela, 2025b). Previous local

research on mathematics anxiety has examined it largely on its own (Colinares & Ucang, 2025; Ablian & Parangat, 2021), without testing motivation alongside it as a possible marker of achievement. At General Santos City National High School, teachers report frequent signs of anxiety among senior high school students in mathematics.

This study examined mathematics anxiety and level of motivation as predictors of the academic achievement of public senior high school students. It determined (1) the students' levels of mathematics anxiety, motivation, and achievement; (2) the profile characteristics associated with these variables; and (3) the strength and direction of the relationships of anxiety and motivation with achievement. Because the data are correlational, "predictor" is used in its statistical sense of a variable that covaries with and anticipates an outcome, not as a demonstrated cause. The results informed a proposed mental health plan.

Literature Review

Anxiety as a marker of achievement risk. Mathematics anxiety is a reaction of tension, fear, and apprehension to mathematical tasks that interferes with performance (Ashcraft, 2002; Suren, 2020). Its negative association with achievement is robust across meta-analyses (Barroso et al., 2020; Zhang et al., 2019) and has been replicated among Filipino senior high school students (Ablian & Parangat, 2021; Jeffry, 2025; Colinares & Ucang, 2025) and in other developing countries (Essuman et al., 2021; Mutodi & Ngirande, 2014). The mechanism is well described: worry and emotional distress consume working memory (Demedts et al., 2022), working memory mediates the anxiety–performance link (Finell et al., 2022), and numerical updating is impaired (Pelegrina et al., 2020). Physiological arousal adds to the load (Esposito et al., 2025; Lievore et al., 2024; Luttenberger et al., 2018), emotional reactions reduce interest (Baas, 2020; Ramirez et al., 2025), and avoidance and procrastination reduce practice (Siaw, 2021; Choe et al., 2019). Anxiety also develops early and tends to persist, which makes it a useful marker of future risk (Vanbinst et al., 2020; Ahmmed, 2024; Rubinsten et al., 2015).

Motivation as a marker of resilience. Students with strong motivation persist under difficulty and reframe challenges positively, while those with low motivation disengage (Jeffry, 2025; Garcia, 2023; Cohen et al., 2021). Self-efficacy predicts both stronger motivation and lower anxiety (Zou & Mustakim, 2025), and self-efficacy and emotional intelligence can moderate the impact of anxiety on performance (Demets et al., 2022). Motivated students achieve even when moderately anxious (Gunderson et al., 2023; Jameson, 2023; Ramirez et al., 2023). Motivation is therefore a candidate for a positive marker of achievement.

Contextual predictors. Students' characteristics and environments also predict anxiety and achievement. Gender stereotypes affect some students' anxiety and performance (Schmader et al., 2021; Lyons & Beilock, 2021), parents' and teachers' beliefs shape children's anxiety (Gunderson et al., 2022; Beilock & Maloney, 2020), and early self-efficacy expectations influence choices in mathematics-related fields (Hackett & Betz, 2021). Mastery-oriented and collaborative classrooms and targeted interventions reduce anxiety (Bicer et al., 2020; Garba, 2019; Codding et al., 2023; Pizzie & Kraemer, 2021).

Framework. The study drew on the Integrated Cognitive-Emotional Theory of mathematics anxiety (Ashcraft, 2001) and on Self-Determination Theory's distinction among intrinsic

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motivation, extrinsic motivation, and amotivation. It is supported by Philippine policies that mandate learner-centered education (DepEd, 2013), the removal of barriers to learning (Congress of the Philippines, 2001), and research-informed instruction (DepEd, 2016), and by the Magna Carta for Public School Teachers, which supports teachers' professional growth (Congress of the Philippines, 1966).

Methodology

Design and Sample

A descriptive-correlational design was used. The sample consisted of 109 Grade 11 and 12 students of General Santos City National High School, School Year 2025–2026, selected through stratified random sampling across strands and sections. Two experienced mathematics teachers contributed contextual information.

Variables and Instruments

The predictor variables were mathematics anxiety and level of motivation. Anxiety was measured with 20 items adapted from the Abbreviated Math Anxiety Scale and the Modified Abbreviated Math Anxiety Scale, five per dimension (emotional, physiological, cognitive, behavioral). Motivation was measured with 15 items adapted from the Academic Motivation Scale, five per dimension (intrinsic, extrinsic, amotivation). Items used a four-point scale, and means were classified as Very High (3.26–4.00), High (2.51–3.25), Fair (1.76–2.50), or Low (1.00–1.75). The outcome variable, academic achievement, was the student's first- and second-quarter mathematics grades from school records. Profile variables were age, sex, civil status, grade level, track, strand, parents' education and occupation, and monthly family income.

Table 1

Reliability of the Anxiety and Motivation Scales in the Pilot Test (n = 30)

Scale Dimension	Items	Cronbach's α	Interpretation
Anxiety – emotional	5	.82	Good
Anxiety – physiological	5	.79	Acceptable
Anxiety – cognitive	5	.81	Good
Anxiety – behavioral	5	.84	Good
Motivation – intrinsic	5	.85	Good
Motivation – extrinsic	5	.80	Good
Amotivation	5	.78	Acceptable

The instruments were pilot tested with 30 students at Fatima National High School. All dimensions exceeded the .70 criterion (Table 1), and minor wording changes were made afterward.

Procedure and Analysis

Permission was obtained from the Graduate School, the Schools Division Superintendent, and the school head. Questionnaires were administered during class hours, and grades were retrieved through the school head's office. Initial reluctance among some students was

addressed through assurances of confidentiality, and sessions were rescheduled when classes conflicted. The analysis used frequencies, percentages, and weighted means for description; chi-square tests for profile relationships; and Pearson's *r* for the relationships of the predictors with achievement ($\alpha = .05$). Shapiro-Wilk tests showed no significant departure from normality for any dimension ($W = .968$ to $.978$; $p = .089$ to $.152$).

Ethical Safeguards

Students and the parents or guardians of minors gave informed consent. Participation was voluntary, responses were anonymized and kept in secure files, and data were handled in line with the Data Privacy Act of 2012 (Congress of the Philippines, 2012).

Results and Discussion

Respondents

The sample was mostly 17 to 18 years old (53.21%), female (56.88%), single (97.25%), and in the Academic track (87.16%), with Grade 11 at 51.38% and Grade 12 at 48.62%. STEM (27.52%), ABM (25.69%), and HUMSS (23.85%) were the main strands. Parents had most commonly completed high school (fathers 22.94%, mothers 25.69%), fathers were most often skilled workers (22.94%), mothers were most often professionals or overseas workers (22.94% each), and 55.05% of families earned ₱20,000 or less per month.

Standing of the Students on the Predictors

Table 2

Anxiety and Motivation Dimensions Ranked by Mean

Dimension	Construct	Mean	Interpretation
Extrinsic	Motivation	3.30	Very High
Emotional	Anxiety	3.23	High
Cognitive	Anxiety	3.23	High
Intrinsic	Motivation	3.23	High
Physiological	Anxiety	3.12	High
Behavioral	Anxiety	2.95	High
Amotivation	Motivation	2.28	Fair

Note. 3.26–4.00 = Very High; 2.51–3.25 = High; 1.76–2.50 = Fair; 1.00–1.75 = Low.

Ranking all seven dimensions together shows how the two predictors relate (Table 2). Extrinsic motivation stood highest (3.30, Very High), followed by intrinsic motivation, emotional anxiety, and cognitive anxiety, all at 3.23 (High). Physiological (3.12) and behavioral anxiety (2.95) followed, and amotivation was lowest (2.28, Fair). The students were therefore simultaneously highly anxious and highly motivated, a combination that matters for prediction: neither variable alone describes the students' readiness to achieve.

Within anxiety, the Very High indicators were nervousness in solving problems before the class (3.40), a faster heartbeat before examinations (3.35), difficulty recalling formulas during examinations (3.30), and fear of difficult topics (3.28). These point to anxiety that peaks during evaluation, consistent with accounts of working memory disruption and physiological arousal under pressure (Demedts et al., 2022; Finell et al., 2022; Esposito et al., 2025; Lievore et al.,

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2024). Procrastination (3.12) was the leading behavioral indicator, a form of avoidance that limits practice without open disengagement (Siaw, 2021; Choe et al., 2019). Within motivation, studying for grades (3.40) and for a future career (3.38) led, but the satisfaction of understanding difficult concepts was also Very High (3.35). The leading amotivation indicators were lacking the drive to study (2.40) and not seeing the relevance of mathematics (2.35). These results are consistent with literature describing anxiety as a mix of emotional and cognitive reactions to evaluation (Baas, 2020; Ramirez et al., 2025) and motivation as a resource that can buffer it (Cohen et al., 2021; Jameson, 2023).

Standing on the Outcome

Achievement was Satisfactory. The mean grade was 83.45 in the first quarter and 84.20 in the second (overall 83.83). The proportion of Outstanding grades increased from 16.51% to 20.18%, Very Satisfactory grades from 29.36% to 32.11%, and failing grades declined from 3.67% to 1.83%. Satisfactory grades (80–84) remained the modal category (34.86% and 33.03%).

Profile Characteristics Associated With the Predictors and the Outcome

Table 3

Chi-Square Tests of Profile Variables Against the Two Predictors and the Outcome

Profile Variable	Anxiety χ^2 (p)	Motivation χ^2 (p)	Achievement χ^2 (p)
Age	10.42 (.03)*	9.84 (.02)*	6.42 (.11)
Sex	8.15 (.04)*	7.65 (.04)*	8.36 (.04)*
Civil status	2.25 (.32)	3.12 (.28)	2.25 (.33)
Grade level	9.36 (.02)*	10.25 (.01)*	9.12 (.02)*
Track	5.84 (.11)	6.42 (.08)	5.84 (.09)
Strand	12.28 (.01)*	11.38 (.02)*	7.28 (.03)*
Parents' educational attainment	7.92 (.06)	8.92 (.05)	6.45 (.08)
Parents' occupation	6.45 (.09)	5.76 (.12)	4.92 (.12)
Combined monthly family income	11.35 (.02)*	12.41 (.01)*	7.15 (.07)

Note. *p < .05.

Placing the two predictors beside the outcome reveals a clear pattern (Table 3). Age, sex, grade level, strand, and income were associated with both anxiety and motivation, whereas only sex, grade level, and strand were associated with achievement. Age and income were thus linked to the predictors but not directly to the outcome. One plausible account, which a mediation analysis would be needed to test, is that age and income relate to grades through their association with students' anxiety and motivation. Response patterns showed more anxiety among younger, female, Grade 11, STEM, and lower-income students, and more motivation among older, Grade 12, STEM and ABM, and higher-income students.

These patterns match local and international evidence. Higher anxiety among younger and female students has been reported among Filipino senior high school learners (Ablian & Parangat, 2021), and demographic characteristics moderate the anxiety–achievement relationship in meta-analyses (Barroso et al., 2020; Zhang et al., 2019). The finding on sex

echoes research on stereotype threat (Schmader et al., 2021). For screening purposes, however, a sex difference in a questionnaire score is only useful if the items work equally well for both groups, which is why recent Philippine scale validation has tested differential item functioning by gender before comparing scores (Panela, 2025a).

Anxiety and Motivation as Predictors of Achievement

Table 4

Correlation of the Predictor Variables with Academic Achievement

Predictor	r	p	Shared Variance	Direction and Strength
Mathematics anxiety	−.42	.001	17.6%	Negative, moderate
Motivation	.38	.002	14.4%	Positive, moderate

Note. Shared variance = $r^2 \times 100$. The manuscript's summary table also lists a combined coefficient of .382 ($p = .002$); no regression model was reported.

Both predictors were significantly related to achievement (Table 4). Mathematics anxiety had a moderate negative relationship ($r = -.42$, $p = .001$), sharing about 17.6% of its variance with grades, and motivation had a moderate positive relationship ($r = .38$, $p = .002$), sharing about 14.4%. Anxiety was the slightly stronger of the two markers. Students with higher anxiety tended to earn lower mathematics grades, and students with higher motivation tended to earn higher ones.

These results support the use of both variables as indicators of achievement risk and resilience. The negative coefficient for anxiety is comparable to those in meta-analytic syntheses and local studies (Barroso et al., 2020; Zhang et al., 2019; Jeffry, 2025), and the positive coefficient for motivation is consistent with studies on motivation and self-efficacy as protective factors (Gunderson et al., 2023; Demets et al., 2022; Zou & Mustakim, 2025). In practice, a brief screening of anxiety and motivation at the start of the school year could help teachers and guidance counselors flag students who combine high anxiety with low motivation, the group at greatest risk, before first-quarter grades are released. Because the two predictors are of similar magnitude and opposite sign, support efforts should both reduce anxiety and strengthen motivation rather than target only one.

Limitations

Several limitations qualify these conclusions. First, the design is cross-sectional and correlational, and although the study's framework anticipated a regression test of predictive power, no regression model was reported. The predictive claim therefore rests on bivariate correlations, and the unique contribution of each predictor, controlling for the other, remains untested. The combined coefficient of .382 in the original summary table cannot be interpreted as a multiple correlation without the underlying model. Second, chi-square tests show association but not direction, so the subgroup patterns described above are descriptive. Third, the sample came from one school, and some profile counts (for example, the distribution of track and strand) did not fully reconcile in the source data. Fourth, anxiety and motivation were self-reported. Future studies should use multiple regression or structural equation modeling,

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test whether motivation moderates the effect of anxiety, and follow students over several grading periods.

From Prediction to Prevention

If anxiety and motivation predict achievement, the school can act on them early. A mental health plan could begin with screening at enrollment, followed by tiered support: classroom-wide strategies for all students, such as mistake-friendly instruction and relevance-based lessons (Bicer et al., 2020); small-group support for students with elevated anxiety, such as relaxation, reappraisal, and test-preparation sessions (Pizzie & Kraemer, 2021; Luttenberger et al., 2018); and individual counseling and peer mentoring for students who combine high anxiety with low motivation (Garba, 2019; Codding et al., 2023). Parent workshops should help families encourage rather than pressure (Gunderson et al., 2022). Implementation depends on teachers, whose readiness can be planned from a structured mapping of their skills and competencies (Panela, 2025d).

Conclusion

Senior high school students at General Santos City National High School are both highly anxious and highly motivated in mathematics. Their anxiety is concentrated in emotional and cognitive reactions during evaluation, and their motivation is led by grades and careers. Their achievement is Satisfactory and improving. Age, sex, grade level, strand, and income are associated with the predictors, and sex, grade level, and strand with the outcome. Mathematics anxiety is a moderate negative predictor and motivation a moderate positive predictor of achievement in the correlational sense, with anxiety slightly stronger.

The school should establish a mental health plan that screens students' anxiety and motivation early and provides tiered support through stress management, confidence-building instruction, peer mentoring and counseling, strand-specific help for STEM and ABM students, relevance-based lessons, parent engagement, equitable resources for lower-income learners, and quarterly monitoring. Teachers should be trained in anxiety-informed and autonomy-supportive pedagogy, with attention to the barriers that teachers typically face when building their capacity for new practices (Panela, 2025e). Workplace stress among teachers should also be addressed, and simple stress-relief tools have shown benefits for employees in the Philippines (Panela, 2026). Given the lingering effects of the pandemic on learners, students' mental health should continue to be monitored over time (Panela, 2025c). Future studies should test these predictors with regression-based and longitudinal designs.

References

Ablian, J. D., & Parangat, K. B. (2021). Mathematics anxiety and mathematics self-efficacy among senior high school students in public secondary schools in Botolan District. *Bigkis: ALCU Region III Research Journal*, 55–70.

Ahmmed, S. (2024). *Factors predicting the mathematics anxiety of adolescents*.

Ashcraft, M. H. (2001). The relationships among working memory, math anxiety, and performance. *Journal of Experimental Psychology: General*.

Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science*, *11*(5), 181–185.

Baas, K. (2020). Emotional responses in mathematics anxiety. *Journal of Educational Psychology*, *112*(4), 765–778.

Barroso, C., et al. (2020). A meta-analysis of the relation between math anxiety and math performance. *Frontiers in Psychology*, *11*, 1648.

Beilock, S. L., & Maloney, E. A. (2020). Math anxiety: A factor in math achievement and performance. *Policy Insights from the Behavioral and Brain Sciences*, *7*(1), 40–47.

Bicer, A., et al. (2020). School-based treatment on students' mathematics anxiety: A meta-analytic study. *International Electronic Journal of Mathematics Education*, *15*(2), 1–14.

Choe, K. W., et al. (2019). Math anxiety predicts math avoidance in effort-based decision making. *Journal of Experimental Psychology: General*.

Codding, R. S., et al. (2023). Meta-analysis of skill-based and therapeutic interventions on math anxiety and achievement outcomes. *Journal of School Psychology*.

Cohen, L. D., et al. (2021). Math anxiety is related to math difficulties and composed of emotion regulation and general anxiety components. *Scientific Reports*, *11*(1), 2345.

Colinares, I. P. J., & Ucang, J. T. (2025). Mathematics anxiety and academic performance of Grade 10 learners. *Sarcouncil Journal of Education and Sociology*, *4*(4), 1–12.

Congress of the Philippines. (1966). *Republic Act No. 4670: Magna Carta for Public School Teachers*. Official Gazette. https://www.officialgazette.gov.ph/1966/06/18/republic-act-no-4670/

Congress of the Philippines. (2001). *Republic Act No. 9155: Governance of Basic Education Act of 2001*. Official Gazette. https://www.officialgazette.gov.ph/2001/07/23/republic-act-no-9155/

Congress of the Philippines. (2012). *Republic Act No. 10173: Data Privacy Act of 2012*. Official Gazette. https://www.officialgazette.gov.ph/2012/08/15/republic-act-no-10173/

Demedts, P., et al. (2022). Cognitive interference in mathematics anxiety: Worry, working memory, and problem-solving. *Journal of Educational Psychology*, *114*(1), 55–68.

Demets, W., et al. (2022). Self-efficacy and emotional intelligence as moderators of math anxiety impact. *Psychology in the Schools*, *59*(4), 761–775.

Department of Education [DepEd]. (2013). *Republic Act No. 10533: Enhanced Basic Education Act of 2013*. https://www.deped.gov.ph/2013/05/15/republic-act-no-10533-2/

Department of Education [DepEd]. (2016). *DepEd Order No. 42, s. 2016: Policy guidelines on the national adoption and implementation of the K to 12 Basic Education Curriculum*. https://www.deped.gov.ph/2016/04/08/do-42-s-2016-policy-guidelines-on-the-national-adoption-and-implementation-of-the-k-to-12-basic-education-curriculum/

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DOI: https://doi.org/10.66206/eduheart.ijimr.46

Esposito, A., Chang, L., & Hu, M. (2025). Cognitive interference and math anxiety: The role of working memory and attentional resources. *Cognition and Emotion*, *39*(1), 71–85.

Essuman, S. A., Nyarko, J., & Frimpong, K. (2021). Impact of mathematics anxiety on the academic performance of junior high school pupils in the Bongo District of Ghana. *International Journal of Science and Social Studies*, *7*(1), 24–33.

Finell, J., Sammallahti, E., Korhonen, J., Eklöf, H., & Jonsson, B. (2022). Working memory and its mediating role on the relationship of math anxiety and math performance: A meta-analysis. *Frontiers in Psychology*, *13*, 798090. https://doi.org/10.3389/fpsyg.2021.798090

Garba, A. (2019). Exploring peer effect on mathematics anxiety among secondary school students of Sokoto State, Nigeria. *Journal of Education and Practice*, *10*(4), 48–55.

Garcia, R. (2023). The Interpretation Account: How appraisal processes influence math anxiety. *Educational Psychology Review*, *35*(2), 443–460.

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2022). The role of parents and teachers in fostering math anxiety and resilience. *Developmental Psychology*, *58*(4), 600–615.

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2023). The role of parents and teachers in fostering math anxiety and achievement. *npj Science of Learning*, *8*, 44. https://doi.org/10.1038/s41539-023-00188-5

Hackett, G., & Betz, N. E. (2021). A self-efficacy approach to the career development of women. *Journal of Vocational Behavior*, *38*(3), 326–339.

Jameson, M. (2023). How to solve for math anxiety? Studying the causes, consequences, and interventions. *APA Monitor*.

Jeffry, N. N. A. (2025). Students' mathematics anxiety and its correlation with achievement. *International Journal of Arts and Social Science*, *8*(2), 143.

Lievore, R., Arseneault, N., & Mammarella, I. C. (2024). How trait and state mathematics anxiety could affect performance: Emotional, cognitive, and psychophysiological components. *European Journal of Psychology of Education*.

Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on math anxiety. *Frontiers in Psychology*, *9*, 1664. https://doi.org/10.3389/fpsyg.2018.01664

Lyons, I. M., & Beilock, S. L. (2021). Mathematics anxiety: Separating the math from the anxiety. *Trends in Cognitive Sciences*, *25*(2), 132–141.

Mutodi, P., & Ngirande, H. (2014). Mathematics anxiety and its influence on students' academic performance. *Mediterranean Journal of Social Sciences*, *5*(3), 294–301.

Panela, T. L. V. (2025a). Gender-based analysis of Teacher Empowerment Scale: Examining factor structure and Rasch model fit in higher education. *Environment and Social Psychology*, *10*(11), 3570. https://doi.org/10.59429/esp.v10i11.3570

Panela, T. L. V. (2025b). Assessing Ways through Research and Augmentation (AWRA): Impact of COVID-19 pandemic on the mental health of college students in the

Philippines Phase 1. *Innovations*, *80*, 462–475. https://journal-innovations.com/assets/uploads/doc/346b3-462-475.16805.pdf

Panela, T. L. V. (2025c). Assessing Ways through Research and Augmentation (AWRA): Impact of COVID-19 pandemic on the mental health of college students in the Philippines Phase 2. *Innovations*, *80*, 476–489. https://journal-innovations.com/assets/uploads/doc/886c9-476-489.16806.pdf

Panela, T. L. V. (2025d). Mapping the research landscape: Evaluating skills and competencies of basic education teachers in Samar Island, Philippines. *Innovations*, *80*, 490–506. https://journal-innovations.com/assets/uploads/doc/1b29b-490-506.16830.pdf

Panela, T. L. V. (2025e). Navigating barriers and building capacity: A phenomenological study of teachers' action research experiences in Samar Island during the COVID-19 pandemic. *Innovations*, *80*, 507–530. https://journal-innovations.com/assets/uploads/doc/6f255-507-530.16831.pdf

Panela, T. L. V. (2026). Finding comfort in digital companions: University teachers' lived experiences using the Xiaopa AI companion toy for workplace stress management. *International Journal of Biosciences (IJB)*, *28*(5), 186–194. https://doi.org/10.12692/ijb/28.5.186-194

Pelegrina, S., Justicia-Galiano, M. J., Martín-Puga, M. E., & Linares, R. (2020). Math anxiety and working memory updating: Difficulties in retrieving numerical information from working memory. *Frontiers in Psychology*, *11*, 669.

Pizzie, R. G., & Kraemer, D. J. M. (2021). The association between emotion regulation strategies, physiological arousal, and math accuracy in math anxiety. *Frontiers in Psychology*, *12*, 626.

Rachman, M., Redzuan, M., & Sharif, S. (2023). Strategies for remediating the impact of math anxiety on high school math performance: Self-testing and emotion regulation interventions. *npj Science of Learning*, *8*, 44.

Ramirez, G., et al. (2025). Emotional dimensions of math anxiety: Internalized attitudes and beliefs. *Mathematics Education Research Journal*, *37*(1), 112–129.

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2023). Math anxiety: Past research, promising interventions, and a new direction. *Educational Researcher*, *52*(1), 24–32.

Rubinsten, O., et al. (2015). Physiological responses to math anxiety: Skin conductance and cardiovascular reactivity. *Journal of Experimental Psychology*.

Schmader, T., Johns, M., & Forbes, C. (2021). An integrated process model of stereotype threat effects on performance. *Psychological Review*, *128*(2), 172–193.

Siaw, L. (2021). The cycle of math anxiety and behavioral avoidance: Implications for learning. *Educational Psychology Review*.

Suren, N. (2020). *The effects of mathematics anxiety and motivation on students' achievement*.

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DOI: https://doi.org/10.66206/eduheart.ijimr.46

Vanbinst, K., Ghesquière, P., & De Smedt, B. (2020). Emotional responses to math and their impact on children's math performance: A cognitive and affective neuroscience perspective. *Frontiers in Psychology*, *11*, 533.

Zhang, J., et al. (2019). The relationship between math anxiety and math performance: A moderated mediation model. *Frontiers in Psychology*, *10*, 1648.

Zou, Y., & Mustakim, N. (2025). The mediating effect of math self-efficacy on math anxiety and achievement. *International Journal of Instruction*, *18*(3), 432–455.