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Research Article

Math Anxiety and Academic Self-Efficacy Among First-Generation College Students in the Philippines: Framework for a Targeted Support Program

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Abstract. This study examined the relationship between math anxiety and academic self-efficacy among first-generation college students (N = 396) enrolled in gateway mathematics courses at Northeastern College, Santiago City, Philippines. Grounded in Bandura's self-efficacy theory (Bandura, 1997) and Eccles and Wigfield's expectancy-value theory (Eccles & Wigfield, 2002), the research utilized a quantitative correlational design with stratified random sampling. Data were gathered using adapted, psychometrically validated versions of the Mathematics Anxiety Rating Scale and the Academic Self-Efficacy Scale. Standardized statistical procedures—including Pearson correlation, linear regression, and analysis of variance (ANOVA)—were used to analyze the dataset. The results revealed a significant negative correlation between math anxiety and academic self-efficacy ($r = -.482$, $p < .001$). Linear regression analysis indicated that math anxiety was significantly associated with lower academic self-efficacy, explaining 23.2% of the variance in academic self-efficacy ($R^2 = .232$, $F = 118.40$, $p < .001$). Furthermore, ANOVA and t-test analyses revealed significant demographic differences: female students exhibited higher math anxiety ($t = -4.62$, $p < .001$) and lower academic self-efficacy ($t = 2.85$, $p = .005$) compared to male peers, while math anxiety levels varied significantly across year levels ($F = 3.85$, $p = .010$). These empirical findings highlight a self-reinforcing cycle of quantitative distress and diminished self-belief that is associated with lower levels of academic progression. Consequently, a targeted, culturally sensitive intervention framework incorporating low-stakes assessments, peer mentoring, and growth-mindset workshops is proposed to mitigate math anxiety and enhance academic self-efficacy.

Keywords: *Academic self-efficacy; First-generation college students; Math anxiety; Quantitative correlational design; Targeted support program.*

For a long time, students have seen mathematics as a subject that inspires fear and flight, with math anxiety forming a major obstacle to learning. Study after study shows that math anxiety can negatively affect working memory and problem-solving skills and lead to poorer performance in school (Ashcraft & Krause, 2007; Dai & Jamaludin, 2025). Most recent investigations show that math anxiety affects not only cognitive processes but also reliability and persistence in solving problems (Akram et al., 2021; Asare et al., 2023). At the same time, researchers have identified self-efficacy as a mediator: students with high academic self-efficacy can solve complex mathematical problems despite their anxiety (Zakariya, 2022; Dai & Jamaludin, 2025; Bandura, 1997).

This problem is particularly troublesome for FGCS because of various structural and psychological barriers.

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Unfortunately, cultural capital and institutional support are often lacking for these learners, which increases tension and reduces their sense of belonging (Barrett, 2022; Wang et al., 2025). Belonging uncertainty has been found to influence math motivation and math achievement of FGCS individuals (Respecia, 2024; Likhanov, 2026; Kramer et al., 2023).

Despite the increasing amount of research, most studies have been conducted in Western countries, leaving a gap in knowledge regarding the manifestations of math anxiety and self-efficacy among Filipino FGCS. In the context of the Philippine education system, a variety of challenges—such as different levels of mathematics preparedness, financial stress, and strong expectations from family—could lead to higher levels of anxiety and decreased self-efficacy. Addressing this issue matters because mathematics is required for graduation; therefore, failing to overcome these obstacles would directly affect student retention.

This research aims to examine the relationship between math anxiety and academic self-efficacy among FGCS in the Philippines and propose an intervention program aligned with their needs. This research combines theoretical frameworks and empirical findings to offer recommendations to educators, decision-makers, and administrators. This research is important because it offers an opportunity to reduce emotional barriers, improve academic confidence, and increase students' chances of graduation.

Methodology

Research Design

This research used a quantitative correlational design to analyze the relationship between math anxiety and academic self-efficacy in first-generation college students. The researcher chose a correlational design because the study aimed to determine whether the two psychological concepts were statistically related, rather than manipulating variables to establish causality, making it appropriate to examine correlations between the concepts. In essence, the correlational design suited the research objectives. Because the study sought to find significant relationships among math anxiety, academic self-efficacy, and academic performance, the design enabled the researcher to use standardized measurement instruments and objective statistical methods for analysis.

Participants and Sampling Technique

The target population consisted of First-Generation College Students (FGCS), who were enrolled in gateway mathematics courses at Northeastern College, Santiago City, Philippines, for the academic year of 2025–2026. The reason for choosing this group is that FGCS face specific difficulties with their academic and psychological aspects that often impede their progress in the study of mathematics due to anxiety and low self-efficacy, which discourage them from completing the course. The exact sample size was estimated based on all FGCS in mathematics-related courses during the semester. Slovin's formula, with a 3% margin of error, was used to determine the representative sample size. From a total population of approximately 615 students, the computed sample size was 396, sufficient to ensure the statistical validity of the results. Participants were drawn from diverse academic programs and course levels to capture a broader range of experiences and perspectives.

A stratified random sampling technique was utilized to select participants across various academic programs (BS Education, BS Business Administration, BS Engineering/IT, and other programs) and year levels (1st through 4th year). This probability sampling approach ensured that all subgroups were proportionally represented, maintaining statistical validity and preventing sampling bias while adhering to the mathematical requirements of Slovin's formula. Specific inclusion criteria were applied during screening to ensure participants met the formal definition of FGCS status (i.e., students whose parents had not completed a higher education degree).

Research Instrument

The study used an adapted, approved instrument to collect data on both math anxiety and academic self-efficacy. To explore math anxiety, the Mathematics Anxiety Rating Scale (MARS), developed by Richardson & Suinn (1972), was adapted to better fit the teaching context in the Philippines. The items of the questionnaire were modified in accordance with prevailing conditions among students at the college level, such as classroom evaluation or problem-solving activities at the level of gateway mathematics classes. The adapted scale consisted of 24 items, each rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Construct validity was confirmed through factor analysis, and reliability testing yielded a Cronbach's alpha of 0.87, indicating high internal consistency.

For academic self-efficacy, the research used the Academic Self-Efficacy Scale adapted from Pajares and Miller (1994), based on Bandura's (1997) original definition. This was done to ensure the validity of the adapted instruments. The scale contained 20 items, likewise measured on a 5-point Likert scale. Factor analysis confirmed construct validity, while reliability testing produced a Cronbach's alpha of 0.89, demonstrating strong internal consistency. A preliminary test was conducted with 30 first-year students from neighboring institutions that were not part of the main study. This process allowed the researcher to ensure item clarity, language suitability, and administrative feasibility. Based on the pilot feedback, some small changes were made before the final implementation.

Data Gathering Procedure

The researcher collected data over four weeks during the second semester of the 2025–2026 academic year. Prior to data collection, the researcher secured institutional clearance from the Graduate School and college administration. All participants provided informed consent. The delivery of research instruments was done using the hybrid method. Students attending regular classes received the questionnaires in designated rooms so the researcher could assist with completion when clarification was needed. Students who attended classes less frequently or had scheduling problems could participate online using a secure survey platform.

The process of data collection took place in an orderly manner: First, there was an introduction of the participants to the study objectives, followed by distribution of the modified scale for measurement of mathematics anxiety levels and the scale for self-efficacy level in the academic context, provision of demographic data by the participants, and lastly receiving the responses from the participants either by means of physical submission or by means of electronic submission. The filled questionnaires were checked for completeness immediately to reduce the chances of missing information. Combining the two data-collection methods (face-to-face and online) is the most practical approach because it makes the process more efficient and trustworthy and ensures the data is collected in line with the study's goals. In addition, academic performance was operationally defined as the General Weighted Average (GWA). The GWA represents the cumulative average of grades across all enrolled courses and served as the quantitative indicator of academic achievement in this study. The researchers obtained GWA data directly from registrar records with participants' consent, ensuring the accuracy and reliability of the performance measure.

Data Analysis Procedure

This research utilized statistical techniques to determine the relationship between anxiety regarding mathematics and academic self-efficacy among first-generation college students. The adapted Mathematics Anxiety Rating Scale and Academic Self-Efficacy Scale were distributed to the participants, and their responses were encoded and analyzed through statistical software. The descriptive statistics were used to develop a demographic profile, estimate mathematics anxiety among first-generation college students, and determine participants' levels of academic self-efficacy. The future analysis is comprised of inferential statistics, including Pearson Correlation, regression analysis, and analysis of variance. Various methods were used to validate the measurements. Experts validated the scale, and a pilot test was conducted before use. Factor analysis assessed construct validity, while Cronbach's alpha verified the scales' internal consistency. Ethical considerations, such as informed consent and confidentiality, also supported the study's reliability. Using both descriptive and inferential statistical approaches enabled the study to examine the data thoroughly, allowing it to address the research question and build an empirical basis for implementing the intervention program.

Ethical Considerations

The research was conducted in accordance with ethical standards and principles, which helped safeguard the rights of the participants and the research itself. Data collection was done after obtaining necessary approvals from the Graduate School of Northeastern College. Participants were informed about the objectives of the study and were given the details about the procedure and their rights. Informed consent was obtained through signed consent forms before the initiation of the research for face-to-face data collection and through different mechanisms in the case of online data collection. Participants were assured about the voluntary nature of participation in the study and their right to withdraw from the process without incurring any penalties.

The confidentiality of the participants was maintained through assigning codes to the questionnaires instead of

revealing their identities. Data were stored securely, with physical copies locked and electronic versions password-protected. Only the researcher and adviser had access to the raw data. The analysis of the results ensured that participants' individual identities were not revealed. To prevent any possible adverse effects, the researcher stated that the survey posed no expected risks beyond minor discomfort from questions on self-efficacy and math anxiety. Participants were reassured that their participation would not affect their academic performance. The ethical measures that were taken also included anonymity, confidentiality of personal data, and using the collected information only for research purposes, which meant that the study was conducted in adherence to the principles of respect, beneficence, and justice.

Results and Discussion

Demographic Profile of the Respondents

Table 1. *Demographic Profile of the Respondents*

	Frequency	Percentage (%)
Sex		
Male	233	58.8%
Female	163	41.2%
Age		
18–19 years old	110	27.8%
20–21 years old	165	41.7%
22–23 years old	89	22.5%
24 years old and above	32	8.0%
Year Level		
1st Year	98	24.7%
2nd Year	105	26.5%
3rd Year	102	25.8%
4th Year	91	23.0%
Degree Program		
BS Education	150	37.9%
BS Business Administration	120	30.3%
BS Engineering / Information Technology	80	20.2%
Other Programs	46	11.6%
Parental Educational Attainment		
Both parents did not attend college	280	70.7%
One parent attended some college, did not graduate	116	29.3%
Total	396	100%

Table 1 indicates more male participants (58.8%) than female participants (41.2%). The most frequent age range was 20 to 21 years (41.7%), the typical age range for an undergraduate, traditional college student. The year-of-study distribution is relatively even, with 2nd-year students representing the largest proportion (26.5%) and 3rd-year students the next largest group (25.8%). 1st-year students (24.7%) and 4th-year students (23.0%) account for the remaining participants. The largest numbers of both Institutional Cluster and Specialized Academic Programs among all institutions in the area are in the BS Education Program (37.9% of students), BS Business Administration (30.3%), and BS Engineering / IT (20.2%). The largest proportion of first-generation college students in the population studied is 70.7%, with both parents having no higher education than high school. 29.3% had one parent who attended some college courses but did not graduate with a degree. The socio-demographic composition of this student population supports the research of Toutkoushian et al. (2021), indicating that first-generation college students tend to attend public /local institutions where they have local economic opportunities. Students remain enrolled throughout their degree programs, providing a solid foundation for evaluating longitudinal changes in psychological functioning across their academic careers.

Level of Math Anxiety

The average mathematics anxiety level among participants was 3.47 with a standard deviation of 0.55, signifying a high level of anxiety overall (Table 2). Looking at the different categories of mathematics anxiety, mathematics test anxiety had the highest average of 3.58 (SD = 0.61), meaning that these students feel the greatest psychological distress from formal timed examinations. Similarly, mathematics class anxiety was rated quite high with an average of 3.49 (SD = 0.59). However, while still rated as moderate, the lowest level of anxiety was for abstract numerical task anxiety, which was 3.35.

Table 2. *Level of Math Anxiety of the Respondents*

Indicator	*M*	*SD*	Descriptive Rating
Mathematics test anxiety	3.58	0.61	High
Numerical task anxiety	3.35	0.66	Moderate
Mathematics course anxiety	3.49	0.59	High
Overall Math Anxiety	**3.47**	**0.55**	**High**

Note. M= Mean, SD=standard deviation. Scores were interpreted as follows: 4.21–5.00 = Very High; 3.41–4.20 = High; 2.61–3.40 = Moderate; 1.81–2.60 = Low; 1.00–1.80 = Very Low.

The fact that so many students report high levels of mathematics anxiety supports the ideas proposed by Foley et al. (2017) that evaluative environments can have a compounding effect on cognitive deficits in first-generation college students due to not having any family support systems for academics. Givwerehowhighe the participant' scoress had when it came to testing anxiety, these students suffer from high levels of emotional distress due to the pressure of being evaluated in formal settings, which negatively impacts their working memory capacity and ultimately affects academic performance.

Level of Self-Efficacy

Table 3. *Level of Self-Efficacy of the Respondents*

Indicator	*M*	*SD*	Descriptive Rating
Self-efficacy for self-regulated learning	3.05	0.64	Moderate
Self-efficacy for academic achievement	3.21	0.58	Moderate
Self-efficacy for social/collaborative learning	3.18	0.62	Moderate
Overall Academic Self-Efficacy	**3.14**	**0.53**	**Moderate**

Note. M= Mean, SD=standard deviation. Scores were interpreted as follows: 4.21–5.00 = Very High; 3.41–4.20 = High; 2.61–3.40 = Moderate; 1.81–2.60 = Low; 1.00–1.80 = Very Low.

Table 3 shows that the overall mean academic self-efficacy score in the sample was 3.14 (SD = 0.53), indicating a Moderate level of self-efficacy related to academic confidence. The highest mean self-efficacy score was in academic achievement (M = 3.21, SD = 0.58), followed closely by social/collaboration (i.e., collaboration, group work) (M = 3.18). In contrast, self-efficacy for independent/self-regulated learning had the lowest overall mean (M = 3.05, SD = 0.64). The moderate level of self-efficacy indicated in this study aligns well with Bandura, (1997), social cognitive theory regarding how self-efficacy develops based on observing and being told what to do by others (i.e., modeling through observation and verbal support). Many first-generation students lack sufficient role models or mentors at home and therefore do not feel confident managing the complexities of a university environment independently of their families. Research conducted by institutional experts (i.e., Catalyst and Wright, 2020) has shown that first-generation college students, while they have a strong desire to succeed academically (M=3.21), do not have confidence in being able to use self-regulated behaviors, such as time management, studying independently, and navigating an academic bureaucracy (M=3.05)., independent study, and navigating academic bureaucracies (M = 3.05).

Relationship Between Math Anxiety, Academic Self-Efficacy, and Academic Performance

Table 4. *Correlation Between Math Anxiety and Academic Self-Efficacy*

Variables Correlated	*r*	*p*	Strength / Direction	Decision (a = .05)
Math Anxiety vs. Academic Self-Efficacy	-.482	<.001	Moderate negative correlation	Reject H_0

Bivariate analysis showed a moderately strong negative correlation between mathematics anxiety and academic self-efficacy (r = -.482, p < .001). With a significance value considerably below the critical parameter threshold (a=.05), the null hypothesis can be rejected. This statistical finding indicates that an increase in mathematics anxiety is related to a concurrent decrease in academic self-efficacy for first-generation college student cohorts. This example illustrates the cyclical relationship described in social cognitive theory. High levels of anxiety were associated with physiological responses that coincided with lower perceived self-efficacy. Research by Rozgonjuk et al. (2020) further supports this, showing that mathematics anxiety functions as a negative feedback loop in which testing-related distress lowers a student's overall academic self-concept, subsequently reducing their perceived capacity to succeed across broader academic endeavors.

Table 5. *Correlation Matrix Among Core Variables*

Variable	Math Anxiety	Academic Self-Efficacy	Academic Performance (GWA)
Math Anxiety	1.000	-.482	-.357
Academic Self-Efficacy	-.482	1.000	.413
Academic Performance (GWA)	-.357	.413	1.000

Note. Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows a significant negative correlation between math anxiety and academic performance (r = -0.357; p < .01), and there is a strong positive correlation between academic self-efficacy and math course grades (r = 0.413; p < .01). Therefore, based on these relationships, the null hypothesis was rejected, which provided supporting evidence that higher levels of academic self-efficacy and lower levels of math anxiety are related to higher levels of academic achievement for this group of students. Comparing these results with Ashcraft and Krause (2007), math anxiety relates to having intrusive thoughts that draw from limited working memory capacity during testing, which results in negative academic performance and lower course grades; self-efficacy motivates students to use more elaborate cognitive processing strategies, persist in completing difficult coursework, and develop productive study behaviors, which produce higher academic grades overall.

Table 6. *Regression Analysis: Math Anxiety Predicting Academic Self-Efficacy*

Predictor	*B*	*SE*	*β*	*t*	*p*	R^2	*F*	*p (model)*
(Constant)	4.65	.12	—	38.75	<.001	.232	118.40	<.001
Math Anxiety	-.41	.04	-.482	-10.88	<.001			

Linear regression results (Table 6) show that mathematics anxiety is a statistically significant negative predictor of academic self-efficacy (β = -0.482, t = -10.88, p < .001). In addition, the overall model is very good, explaining 23.2% of the total variance in academic self-efficacy (R^2= .232, F(1, 394) = 118.40, p < .001). The unstandardized regression coefficient (B = -0.41) means that for each one-unit increase on the math anxiety scale, the academic self-efficacy of a student is predicted to be less than one-half of one unit, assuming all other variables are constant. These results support rejecting the null hypothesis. These findings supporting the above correlation run parallel to the findings by Jameson and Fusco (2014), who also found math anxiety was negatively correlated with self-efficacy, suggesting that higher anxiety levels were linked to lower confidence from developing self-efficacy. Students who suffer from mathematics anxiety tend to view their physical symptoms associated with mathematics anxiety as evidence of limitations, therefore adversely impacting their academic self-efficacy on a macro level across their universities.

Differences in Focal Metrics When Grouped by Sex

Table 7. *Differences in Focal Metrics When Grouped by Sex*

Variable	Sex	Mean	SD	t	p	Decision (α = .05)
Math Anxiety	Male (n = 233)	3.30	0.57	-4.62	<.001	Significant
	Female (n = 163)	3.70	0.48			
Academic Self-Efficacy	Male (n = 233)	3.24	0.51	2.85	.005	Significant
	Female (n = 163)	3.00	0.55			

Independent-samples t-tests indicate that sex is a significant factor for math anxiety levels (t = -4.62, p < .001), with a Cohen's d = 0.76. Specifically, female math anxiety scores (M=3.70, SD = 0.48) were higher on average than those for male students (M=3.30, SD=0.57). In contrast, academic self-efficacy levels also differed significantly between sexes (t=2.85, p=.005), representing a medium effect size (Cohen's d=0.45), with male students exhibiting higher levels (M=3.24, SD = 0.51) than female students (M=3.00, SD = 0.55).

Differences in Focal Metrics When Grouped by Year Level

As shown in Table 8, ANOVA results indicate that anxiety related to mathematics varies significantly by level of education (F = (3, 392) = 3.85, p=.010). with a small-to-medium effect size η_p^2= .029). Post-hoc analysis using Tukey's HSD confirmed that students in their first and second years experienced significantly higher anxiety than those in their third and fourth years. In comparison, academic self-efficacy does not vary significantly across year levels (F(3, 392) = 1.42, p = .237, η_p^2= .011). These results are in accord with the findings of Devine et al. (2012) correlating anxiety levels to developmental and gender trends, whereby women describe higher levels of anxiety toward

mathematics but demonstrate equivalent cognitive aptitude as men; likely attributed to social pressures related to evaluation. The decrease in educational anxiety toward mathematics can be explained by the academic exposure theory developed by Meece et al. (1990); this theory states that continued exposure to collegiate course requirements diminishes one's fear of being evaluated over time.

Table 8. *Analysis of Variance (ANOVA) Across Institutional Year Levels*

Variable	Source	Sum of Squares	*df*	Mean Square	*F*	*p*	Decision (a = .05)
Math Anxiety	Between Groups	8.45	3	2.82	3.85	.010	Significant
	Within Groups	287.10	392	0.73			
Academic Self-Efficacy	Between Groups	2.10	3	0.70	1.42	.237	Not Significant
	Within Groups	193.55	392	0.49			

Table 9. *Tukey's HSD Post Hoc Comparison of Math Anxiety Across Year Levels*

Year Level Comparison	Mean Difference	p	Interpretation
1st Year vs. 3rd Year	+0.28	.012	Significant difference
1st Year vs. 4th Year	+0.31	.008	Significant difference
2nd Year vs. 3rd Year	+0.25	.019	Significant difference
2nd Year vs. 4th Year	+0.27	.015	Significant difference
1st Year vs. 2nd Year	+0.03	.842	Not significant
3rd Year vs. 4th Year	+0.04	.791	Not significant

In Table 9, we observe the outcomes of the Tukey's HSD post hoc assessment that was performed to assess individual year level differences in math anxiety following the important omnibus ANOVA results. The results indicate that first-year and second-year college students experienced significantly higher math anxiety than third-year and fourth-year college students. In particular, the mean difference calculated was between 0.25 and 0.31 for lower levels and higher levels, which were significant ($p < .05$). On the other hand, there was no significant difference seen for the mean differences computed for first-year and second-year students (mean difference = 0.03, $p = .842$) and the third-year and fourth-year students (mean difference = 0.04, $p = .791$). This shows that the level of anxiety can be said to remain constant within adjacent year levels but have significant differences between lower-year levels and upper-year levels. The post hoc findings support the assertion that anxiety in mathematics is lower with advancement in education. This trend supports academic exposure theory (Meece et al., 1990), which states that frequent experiences with college mathematics reduce anxiety over time. The results also support developmental concepts in social cognitive theory, which hold that facing academic challenges early leads to a stronger emotional response that lessens with greater exposure and success.

Proposed Targeted Program

Table 10. *Proposed Targeted Program Matrix*

Objective	Strategy / Activity	Target Group	Persons Involved	Timeline
Reduce mathematics test anxiety	Low-stakes formative quizzes; test-taking and relaxation strategies workshop	All respondents, priority on female students	Math instructors, Guidance Office	1st semester, Weeks 1–4
Build mastery experiences in mathematics	Peer-mentoring/tutoring program using scaffolded, incremental problem sets	First-generation students, priority on lower year levels	Math instructors, Student peer mentors	1st semester, Weeks 5–10
Strengthen academic self-efficacy beliefs	Growth-mindset and self-efficacy-building seminar; goal-setting workshops	All first-generation college students	Guidance Counselors, Student Affairs Office	1st semester, Weeks 6–8
Monitor progress and sustain gains	Periodic self-efficacy and anxiety check-ins; data-informed adjustment of strategies	All respondents	Math instructors, Guidance Office, Program Coordinator	Ongoing, every grading period

The research team's intervention matrix translates the findings into practical solutions to help students overcome hurdles stemming from high Math Anxiety (M = 3.47) and only moderate Academic Self-Efficacy (M = 3.14). Through low-stakes testing strategies and targeted growth mindset workshops, this comprehensive effort aims to reduce student anxiety while building long-term academic self-efficacy. Overall, the empirical data presented in this chapter provide evidence of the many academic obstacles first-generation students encounter at Northeastern College: high math anxiety (M = 3.47) and a moderate level of academic self-efficacy (M = 3.14). All Statements of the Problem (SOPs) were answered through bivariate and multivariate analyses, and the null hypotheses, by showing that Math Anxiety has an extremely negative impact as a direct, negative force, i.e., by reducing

Academic Self-Efficacy (r = -0.482) and Course Grades (r = -0.357), both of which were significantly related to each other. Conversely, higher Academic Self-Efficacy strongly supported higher Academic Performance (r = 0.413).

Conclusion

The findings of this study demonstrate that math anxiety presents a significant psychological barrier for first-generation college students (FGCS) at Northeastern College, particularly in evaluative and classroom settings. The observed negative relationship between math anxiety and academic self-efficacy (r = -0.482) highlights a self-reinforcing cycle wherein quantitative distress depletes working memory capacity and erodes academic self-belief. Moreover, demographic disparities—specifically higher anxiety and lower self-efficacy among female students, along with elevated anxiety among lower-level undergraduates—underscore distinct vulnerabilities within the student population. These empirical results carry critical academic and institutional implications. Theoretically, they reinforce Bandura's self-efficacy model and Eccles and Wigfield's expectancy-value framework within a non-Western, first-generation context. Practical implications highlight that academic performance in gateway mathematics is governed not solely by cognitive aptitude, but heavily by emotional regulation and institutional support structures. Without targeted institutional interventions, unaddressed math anxiety risks perpetuating lower retention and completion rates among FGCS cohorts.

The researchers recommend the following:

Program and Policy. The institution should obtain official approval and implement the proposed targeted support program matrix to address math anxiety and low self-efficacy among first-generation college students. Academic departments should prioritize early diagnostic tests and conduct low-stakes formative assessments to reduce assessment anxiety and provide opportunities for students to build mastery without harsh penalties for errors. Further, proper attention should be paid to high-risk populations—especially females and freshmen students—by applying relaxation techniques and cognitive restructuring methods at the beginning of the academic year.

Instructors. In entry-level math courses, they should participate in professional development opportunities that include instruction regarding anxiety-sensitive teaching strategies. Teachers are urged to design classrooms with a systematic approach to problem-solving, using step-by-step assignments to provide a gradual learning experience. In addition, positive teacher-student interactions can help reduce anxiety connected to evaluations of student performance in the classroom.

Institutional Support and Counseling. Support bodies at different institutions, such as the guidance center and student services, should improve academic consulting and mentoring programs designed specifically for first-generation students. These tutoring networks may help lower-year students gain insight from experienced upper-year students who faced similar difficulties in mathematics and psychology. Furthermore, growth mindset workshops and self-regulated learning sessions should also be implemented, as these activities would help students learn the principles of time management, independent studying, and coping skills necessary for the educational process.

Future Researchers. They need to conduct a longitudinal study to determine the long-term effects of the intervention strategies that were adopted on academic success and persistence throughout the degree program. Investigators should also broaden the geographical and institutional scope by applying these models across public and private universities to increase the validity of their findings. Furthermore, a qualitative or mixed-methods strategy, such as focus group interviews, will help researchers better understand the cultural, family-related, and socio-economic factors affecting math anxiety in first-generation students.

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