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Research Article

Brains and Bounce: Predicting Mathematics Self-Efficacy through Metacognitive Awareness and Academic Resilience

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Abstract

Mathematics self-efficacy is a critical psychological factor that influences students' motivation, persistence, and performance in mathematics. This study examined the levels of metacognitive awareness, academic resilience, and mathematics self-efficacy among Grade 10 students and determined the relationships and predictive influence of metacognitive awareness and academic resilience on mathematics self-efficacy. A quantitative descriptive-correlational research design was employed involving 165 Grade 10 students from New Bataan National High School, Davao de Oro, Philippines, selected through stratified random sampling. Data were collected using the Metacognitive Awareness Inventory, the Academic Resilience Scale (ARS-30), and the Mathematics Self-Efficacy Scale. Descriptive statistics, Pearson product-moment correlation, and multiple linear regression were used to analyze the data. The findings revealed that students exhibited high levels of metacognitive awareness, academic resilience, and mathematics self-efficacy. Metacognitive awareness and academic resilience were both positively and significantly associated with mathematics self-efficacy. Regression analyses further identified evaluation, reflecting and adaptive help-seeking, and emotional response as significant predictors of mathematics self-efficacy. The study concludes that students' confidence in mathematics is strengthened by reflective evaluation of learning, adaptive help-seeking behaviors, and effective emotional regulation. It is recommended that mathematics teachers integrate metacognitive strategy instruction and resilience-building activities into classroom practice, while schools strengthen learner-support programs that foster self-regulated learning, emotional well-being, and positive mathematics learning experiences.

Keywords

mathematics, metacognitive awareness, academic resilience, mathematics self-efficacy, descriptive-correlational research

How to Cite

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INTRODUCTION

Mathematics self-efficacy is a fundamental psychological factor that influences students' confidence, persistence, motivation, and academic achievement in mathematics. According to Social Cognitive Theory, learners with stronger efficacy beliefs are more likely to engage in challenging mathematical tasks, persist despite difficulties, and employ effective learning

strategies because they believe in their capability to succeed (Bandura, 2012). Mathematics self-efficacy has consistently been associated with higher academic performance, stronger intrinsic motivation, and more positive attitudes toward mathematics (Skaalvik et al., 2015; Yang et al., 2024). Recent evidence further demonstrates that instructional interventions emphasizing mastery experiences, constructive feedback, and supportive classroom environments significantly improve students' mathematical confidence (Zakariya, 2022). The Sources of Mathematics Self-Efficacy framework likewise identifies mastery experiences, vicarious experiences, verbal persuasion, and physiological or emotional states as the principal sources of efficacy beliefs (Usher & Pajares, 2009). More recent work has expanded these principles by providing practical guidance for educators in fostering students' self-efficacy across different educational stages (Usher et al., 2023). Studies also indicate that mathematics anxiety and emotional experiences influence students' confidence and achievement (Živković et al., 2023), while mathematics self-efficacy is strengthened by various sources of confidence across educational settings (Awofala, 2023). Moreover, the development of mathematics-specific self-efficacy measures has enhanced researchers' understanding of the relationship between efficacy beliefs, learning approaches, and mathematics achievement (Zakariya et al., 2019).

Among the factors that contribute to mathematics self-efficacy, metacognitive awareness has received considerable attention because it enables learners to plan, monitor, regulate, and evaluate their cognitive processes during mathematical problem solving (Flavell, 1979; Schraw & Dennison, 1994). Students who possess stronger metacognitive awareness demonstrate greater ability to employ appropriate learning strategies, regulate thinking, and adapt to increasingly complex mathematical tasks (Alzahrani, 2017; Kallio et al., 2018). Research has shown that explicit metacognitive instruction enhances mathematical reasoning, self-regulated learning, and problem-solving performance (Van der Stel et al., 2010; Tak et al., 2022). Innovative instructional approaches, including metacognitive scaffolding and STEAM-based learning, likewise promote students' mathematical thinking and awareness of their cognitive processes (Cariaga et al., 2025; Tang et al., 2016; Wahba et al., 2022). Studies further reveal that declarative metacognitive knowledge develops progressively during secondary education and contributes significantly to comprehension and self-regulated learning (Edossa et al., 2019), whereas achievement motivation and metacognitive behaviors interact to improve academic performance (Hong et al., 2020). Likewise, learners with stronger number sense tend to exhibit higher metacognitive awareness, demonstrating the close relationship between cognitive regulation and mathematics learning across educational levels (Yorulmaz et al., 2023). Recent bibliometric evidence also identifies metacognition as one of the most influential and rapidly expanding research areas in mathematics education because of its consistent association with higher-order thinking and academic achievement (Thi-Nga et al., 2024).

Academic resilience likewise plays a vital role in strengthening students' mathematics self-efficacy by enabling them to persist, adapt, and recover from academic challenges. Academic resilience refers to learners' capacity to maintain positive academic functioning through perseverance, adaptive help-seeking, and emotional regulation despite adversity (Cassidy, 2016). Students with greater resilience demonstrate stronger academic engagement, psychological well-being, and successful adaptation across diverse educational settings (Masten et al., 2021; Cassidy et al., 2023; Elnaem et al., 2024). Supportive school environments and positive teacher–student relationships likewise reduce academic burnout while enhancing resilience and school adjustment (Romano et al., 2021). Research further indicates that adaptive help-seeking enables students to seek appropriate assistance while developing independent problem-solving skills (Cariaga & Gerodias, 2025; Chou & Chang, 2021), whereas conceptual thinking scaffolds promote perseverance in solving complex mathematical problems (DiNapoli & Miller, 2022). Emotional regulation also contributes significantly to resilience and academic confidence (Uygur et al., 2023), while sustained perseverance and academic interest have been associated with higher levels of academic resilience and educational achievement over time (Thorsen et al., 2021). Collectively, these findings suggest that cognitive regulation, adaptive coping strategies, and emotional well-being interact to strengthen students' confidence and success in mathematics.

Within the Philippine educational context, many learners continue to demonstrate limited confidence in mathematics, particularly when confronted with unfamiliar mathematical tasks or when comparing their abilities with those of their peers. Similar classroom observations were evident among Grade 10 students of New Bataan National High School, where learners frequently hesitated to participate in mathematical discussions, depended heavily on classmates during problem-solving activities, and displayed low confidence when solving unfamiliar problems. Although previous studies have independently examined metacognitive awareness, academic resilience, and mathematics self-efficacy, relatively few have simultaneously investigated these constructs among Filipino junior high school students, particularly in rural public secondary schools. This gap limits understanding of how cognitive regulation and resilience collectively contribute to mathematics self-efficacy within the Philippine educational setting. Accordingly, this study determined the levels of metacognitive awareness, academic resilience, and mathematics self-efficacy among Grade 10 students of New Bataan National High School, examined the relationships among these variables, and identified the dimensions of metacognitive awareness and academic resilience that significantly predict mathematics self-efficacy. The findings are expected to provide empirical evidence that will guide teachers, school leaders, curriculum planners, and future researchers in designing interventions that strengthen students' confidence, resilience, and self-regulated learning in mathematics.

METHODOLOGY

Design

This study employed a quantitative research approach using a descriptive-correlational design. The design was appropriate because it enabled the researcher to describe the levels of metacognitive awareness, academic resilience, and mathematics self-efficacy among Grade 10 students and to examine the relationships among these variables without manipulating the research setting. Furthermore, multiple linear regression analysis was utilized to determine which

dimensions of metacognitive awareness and academic resilience significantly predict mathematics self-efficacy. Consistent with the post-positivist research paradigm, the study relied on standardized instruments and statistical analyses to generate objective and empirical evidence regarding the relationships among the variables (Creswell & Creswell, 2023).

Setting and Respondents

The study was conducted at New Bataan National High School in New Bataan, Davao de Oro, Philippines. The respondents were 165 Grade 10 students enrolled during the School Year 2025–2026, selected from a population of 287 through stratified random sampling with proportional allocation. The sample size was determined using the Raosoft Sample Size Calculator at a 95% confidence level and a 5% margin of error. Only officially enrolled Grade 10 students with complete mathematics records were included, while students with incomplete records, irregular enrollment, recent transfers, prolonged absences, or those who declined participation were excluded.

Instruments

Data were collected using three standardized instruments: the Metacognitive Awareness Inventory (Schraw & Dennison, 1994), the Academic Resilience Scale (Cassidy, 2016), and the Sources of Mathematics Self-Efficacy Scale (Usher & Pajares, 2009). These instruments measured metacognitive awareness, academic resilience, and mathematics self-efficacy, respectively, and have established validity and reliability. Responses were obtained using a four-point Likert scale ranging from 1 (Very Low) to 4 (Very High), with higher scores indicating higher levels of the measured constructs.

Validity and Reliability

Prior to data collection, the research instruments underwent expert validation to evaluate their content validity, clarity, readability, and appropriateness for the target respondents. Suggestions and recommendations from the validators were incorporated to improve the quality of the instruments before administration. A pilot test involving twenty Grade 10 students from a school not included in the actual study was conducted to determine the internal consistency reliability of the instruments. The resulting Cronbach's alpha coefficients indicated acceptable reliability, confirming that the questionnaires were appropriate for collecting data in the main study.

Data Collection Procedure

Following approval from the Graduate School and the appropriate educational authorities, permission to conduct the study was secured from the Schools Division Office, district supervisors, and the school principal. Ethical clearance was obtained before data collection commenced. Participants and their parents or legal guardians received information regarding the objectives, procedures, voluntary nature of participation, confidentiality measures, and the potential benefits and risks of the study. Written parental consent and student assent were obtained prior to questionnaire administration. The researcher personally administered the questionnaires during scheduled class sessions. Completed questionnaires were checked for completeness before data encoding. The responses were entered into Microsoft Excel, verified for accuracy, and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS).

Data Analysis

Descriptive and inferential statistical techniques were employed to address the research objectives. Arithmetic mean was used to determine the levels of metacognitive awareness, academic resilience, and mathematics self-efficacy. Pearson product-moment correlation coefficient was employed to examine the relationships among the study variables. Multiple linear regression analysis was conducted to identify the dimensions of metacognitive awareness and academic resilience that significantly predict mathematics self-efficacy. Statistical significance was evaluated at the .05 level. Prior to regression analysis, the assumptions of linearity, normality, independence of errors, homoscedasticity, and multicollinearity were examined to ensure the appropriateness of the statistical model.

Ethical Considerations

The study adhered to recognized ethical standards for research involving human participants. Ethical approval was obtained from the appropriate institutional ethics review body before the commencement of data collection. Participation was entirely voluntary, and respondents were informed of their right to decline or withdraw from the study at any stage without penalty. Because the participants were minors, written parental consent and student assent were secured before questionnaire administration. Confidentiality and anonymity were maintained by assigning identification codes instead of collecting personally identifiable information. All research data were stored securely, used solely for academic purposes, and managed in accordance with the provisions of the Philippine Data Privacy Act of 2012 (Republic Act No. 10173). Only the researchers had access to the research data, which will be retained and disposed of in accordance with institutional data management policies.

Limitations and Rigor

The findings should be interpreted within the context of several methodological considerations. The study relied on self-reported questionnaire responses, which may have been influenced by social desirability and response bias. In addition, the participants were drawn from a single public secondary school, which may limit the generalizability of the findings to other educational settings. Despite these limitations, methodological rigor was maintained through the use of standardized and previously validated instruments, expert validation of the research tools, pilot testing to establish reliability, probability sampling, standardized data collection procedures, and appropriate statistical analyses. These measures enhanced the validity, reliability, and credibility of the study findings.

RESULTS AND DISCUSSION

Table 1 presents the level of students' metacognitive awareness across the dimensions of knowledge of cognition and regulation of cognition. Overall, the respondents demonstrated a high level of metacognitive awareness (M = 3.01), indicating that they generally possess the ability to understand, monitor, and regulate their cognitive processes while learning

mathematics. Among the dimensions, debugging strategies obtained the highest mean, followed by planning, while evaluation recorded the lowest mean, although all dimensions remained within the high descriptive category. The findings suggest that the respondents are generally capable of selecting appropriate learning strategies, monitoring their understanding, and modifying ineffective approaches when solving mathematical problems. The relatively lower rating for evaluation, however, indicates that students may have fewer opportunities to critically assess the effectiveness of their own learning after completing mathematical tasks. Self-evaluation is an essential component of self-regulated learning because it enables learners to identify strengths and weaknesses and to make informed adjustments to future learning strategies. The present findings support previous studies emphasizing the importance of metacognitive awareness in mathematics learning. Students who actively plan, monitor, and evaluate their cognitive processes tend to demonstrate greater conceptual understanding and improved problem-solving performance (Schraw & Dennison, 1994; Stanton et al., 2021). Similarly, recent bibliometric evidence identified metacognition as one of the most influential research themes in mathematics education because of its consistent association with higher-order thinking and academic achievement (Thi-Nga et al., 2024). The findings also agree with Tak et al. (2022), who reported that enhanced metacognitive awareness facilitates mathematical reasoning by enabling learners to regulate cognitive strategies more effectively. From a theoretical perspective, these findings are consistent with Flavell's (1979) theory of metacognition, which proposes that learners who possess greater awareness of their thinking processes are better able to regulate cognition and solve complex academic tasks successfully. Consequently, mathematics teachers should integrate instructional practices such as reflective questioning, think-aloud activities, learning journals, and self-assessment exercises to strengthen students' evaluative skills and promote deeper self-regulated learning.

Table 1
Summary of the Level of Students' Metacognitive Awareness

Dimension	Mean	Interpretation
Declarative Knowledge	2.96	High
Procedural Knowledge	3.05	High
Conditional Knowledge	3.05	High
Planning	3.09	High
Comprehension Monitoring	2.93	High
Information Management Strategies	2.94	High
Debugging Strategies	3.15	High
Evaluation	2.89	High
Overall Metacognitive Awareness	3.01	High

Table 2 presents the level of students' academic resilience. The overall mean indicates a high level of academic resilience (M = 3.10), suggesting that the respondents generally demonstrate persistence and adaptability when confronted with academic difficulties. Among the three dimensions, perseverance obtained the highest rating, followed by reflecting and adaptive help-seeking, whereas emotional response received the lowest mean, although it remained within the high descriptive level. These findings indicate that the students generally exhibit determination to complete academic tasks despite challenges and are willing to seek assistance when necessary. However, the comparatively lower emotional response score suggests that some learners may still experience anxiety or emotional discomfort when encountering demanding mathematical situations. Emotional regulation remains an important component of resilience because students' ability to manage stress influences both persistence and confidence in learning. The results are consistent with Cassidy (2016), who conceptualized academic resilience as students' capacity to persevere, regulate emotional reactions, and utilize adaptive coping strategies during academic adversity. Recent international studies likewise reported that resilient students are more capable of maintaining academic engagement and psychological well-being despite learning challenges (Elnaem et al., 2024; Sheehan & Hadfield, 2024). Furthermore, Masten et al. (2021) emphasized that resilience develops through dynamic interactions among personal, social, and educational support systems that enable learners to overcome adversity and sustain positive academic functioning. The findings suggest that mathematics classrooms should intentionally cultivate resilience by promoting supportive teacher–student relationships, collaborative learning opportunities, constructive feedback, and opportunities for students to learn from mistakes without fear of failure. Such practices may strengthen students' emotional regulation and enhance their capacity to cope with increasingly complex mathematical tasks.

Table 2
Summary of the Level of Students' Academic Resilience

Dimension	Mean	Interpretation
Perseverance	3.31	High
Reflecting and Adaptive Help-Seeking	3.18	High
Emotional Response	2.81	High
Overall Academic Resilience	3.10	High

Note. Scale: 3.50–4.00 = Very High; 2.50–3.49 = High; 1.50–2.49 = Low; 1.00–1.49 = Very Low.

Table 3 presents the level of students' mathematics self-efficacy. Overall, the respondents demonstrated a high level of mathematics self-efficacy (M = 2.71), indicating that they generally believe in their capability to perform mathematics-related tasks successfully. Among the four dimensions, vicarious experience obtained the highest mean, whereas social persuasion was rated low, making it the only dimension below the high descriptive level. The findings indicate that students

derive confidence primarily by observing successful peers and through their own learning experiences rather than from verbal encouragement or external affirmation. The relatively lower level of social persuasion suggests that students may receive insufficient positive feedback, recognition, or encouragement from teachers, parents, or classmates, potentially limiting the development of stronger confidence in mathematics. These findings are supported by the work of Usher and Pajares (2009), who identified mastery experiences, vicarious experiences, social persuasion, and physiological or emotional states as the primary sources of mathematics self-efficacy. Recent evidence likewise demonstrates that mastery experiences and positive social learning environments significantly strengthen learners' mathematical confidence (Street et al., 2024; Yang et al., 2024). Furthermore, systematic review findings indicate that interventions emphasizing constructive feedback, supportive classroom climates, and successful learning experiences consistently improve mathematics self-efficacy (Zakariya, 2022). Bandura's (2012) Social Cognitive Theory provides additional explanation for these findings by emphasizing that efficacy beliefs develop through successful experiences, observation of competent models, verbal encouragement, and emotional regulation. Consequently, mathematics teachers should provide timely positive feedback, scaffold challenging tasks, recognize incremental improvement, and encourage collaborative learning experiences that enable students to observe peers successfully solving mathematical problems.

Table 3
Summary of the Level of Students' Mathematics Self-Efficacy

Dimension	Mean	Interpretation
Mastery Experience	2.74	High
Vicarious Experience	2.91	High
Social Persuasion	2.43	Low
Physiological State	2.76	High
Overall Mathematics Self-Efficacy	2.71	High

Note. Scale: 3.50–4.00 = Very High; 2.50–3.49 = High; 1.50–2.49 = Low; 1.00–1.49 = Very Low.

Table 4 presents the relationships between metacognitive awareness, academic resilience, and mathematics self-efficacy. The findings reveal that both metacognitive awareness ($r = .345$, $p < .001$) and academic resilience ($r = .369$, $p < .001$) are positively and significantly associated with mathematics self-efficacy. Although the correlations are classified as low positive, they indicate that students with stronger metacognitive skills and greater academic resilience generally report higher confidence in learning mathematics. These findings suggest that mathematics self-efficacy is influenced by students' capacity to regulate their cognitive processes and persist when faced with academic challenges. Learners who effectively monitor their understanding, evaluate learning strategies, and adapt to setbacks appear more likely to develop confidence in solving mathematical problems. The modest strength of the relationships also indicates that mathematics self-efficacy is a multifaceted construct influenced by additional factors beyond metacognition and resilience, including prior achievement, teacher support, classroom climate, motivation, and mathematics anxiety. The present findings are consistent with previous studies reporting positive relationships between metacognitive awareness and mathematics performance, self-regulated learning, and self-efficacy (Stanton et al., 2021; Tak et al., 2022). Likewise, recent investigations have demonstrated that academically resilient learners exhibit greater confidence, motivation, and persistence across diverse educational settings (Kleppang et al., 2023; Uygur et al., 2023). Moreover, contemporary reviews conclude that mathematics self-efficacy develops through the interaction of cognitive, motivational, emotional, and environmental factors rather than any single psychological characteristic (Street et al., 2024). These findings reinforce the proposition of Social Cognitive Theory (Bandura, 2012), which explains that cognitive regulation and adaptive responses to challenges contribute to stronger efficacy beliefs through successful learning experiences. Therefore, mathematics instruction should simultaneously promote metacognitive strategy instruction and resilience-building practices to foster students' confidence, persistence, and long-term success in mathematics learning.

Table 4
Correlation Between Metacognitive Awareness, Academic Resilience, and Mathematics Self-Efficacy

Predictor	r	p	Interpretation
Metacognitive Awareness	0.345	< .001	Significant, Low Positive
Academic Resilience	0.369	< .001	Significant, Low Positive

Note. Pearson product–moment correlation.

Table 5 presents the correlation analysis between metacognitive awareness and mathematics self-efficacy. The findings revealed a statistically significant positive relationship between the two variables ($r = .345$, $p < .001$), indicating that students with higher levels of metacognitive awareness generally exhibit greater confidence in their ability to perform mathematics-related tasks. Although the relationship is classified as low positive, it demonstrates that metacognitive awareness contributes meaningfully to students' mathematics self-efficacy. The findings suggest that learners who consciously regulate their thinking through planning, monitoring, and evaluating their learning strategies are more likely to develop confidence in solving mathematical problems. Students who understand how they learn and who regularly assess the effectiveness of their problem-solving approaches are better prepared to manage challenging mathematical tasks, thereby strengthening their efficacy beliefs. The present findings are consistent with previous research demonstrating that metacognitive awareness enhances self-regulated learning and promotes greater academic confidence (Schraw & Dennison, 1994; Stanton et al., 2021). Likewise, Tak et al. (2022) reported that metacognitive awareness significantly supports mathematical reasoning by enabling students to employ appropriate cognitive strategies during problem solving. A recent bibliometric review also identified metacognition as a central determinant of mathematics learning because of its consistent association

with improved academic achievement and self-regulated learning (Thi-Nga et al., 2024). These findings are supported by Flavell's Theory of Metacognition, which explains that learners who actively monitor and regulate their cognitive processes become more effective problem solvers and develop stronger confidence in their academic abilities (Flavell, 1979). Consequently, mathematics teachers should provide opportunities for students to engage in reflective learning, self-assessment, and strategy evaluation to strengthen both metacognitive awareness and mathematics self-efficacy.

Table 5
Correlation Analysis between Metacognitive Awareness and Mathematics Self-Efficacy of Students

Variable	Mathematics Self-Efficacy		
	p-value	Correlation Coefficient (r)	Interpretation
Metacognitive Awareness	< .001	.345	Significant, Low Positive Correlation

Note. Pearson product-moment correlation. Correlation is significant at the .05 level (2-tailed).

Table 6 presents the relationship between academic resilience and mathematics self-efficacy. The results indicated a statistically significant positive relationship (r = .369, p < .001), suggesting that students who demonstrate higher levels of academic resilience also tend to possess greater confidence in learning mathematics. Although the strength of the relationship is relatively low, the findings confirm that resilience contributes significantly to students' mathematics self-efficacy. The results imply that resilient students are more capable of maintaining confidence despite encountering academic setbacks or difficult mathematical tasks. Students who persist through challenges, regulate their emotional responses, and seek appropriate assistance are better able to sustain motivation and confidence during mathematics learning. These findings support Cassidy (2016), who described academic resilience as the capacity to respond positively to academic adversity through perseverance, adaptive help-seeking, and emotional regulation. Similarly, Sheehan and Hadfield (2024) found that resilient learners demonstrate higher mathematics achievement because they maintain confidence despite socioeconomic and academic challenges. Elnaem et al. (2024) likewise reported that students with stronger academic resilience exhibit higher academic engagement and psychological well-being, which contribute to improved academic confidence. Furthermore, Masten et al. (2021) emphasized that resilience develops through dynamic interactions between personal characteristics and supportive educational environments that foster successful adaptation to adversity. Bandura's (2012) Social Cognitive Theory further explains these findings by proposing that successful experiences in overcoming academic challenges strengthen efficacy beliefs. As students repeatedly cope with difficulties and achieve success, they become increasingly confident in their mathematical abilities. These findings highlight the importance of creating supportive mathematics classrooms that encourage persistence, normalize mistakes as part of learning, and provide constructive academic and emotional support.

Table 6
Correlation Analysis between Academic Resilience and Mathematics Self-Efficacy of Students

Variable	Mathematics Self-Efficacy		
	p-value	Correlation Coefficient (r)	Interpretation
Academic Resilience	< .001	.369	Significant, Low Positive Correlation

Note. Pearson product-moment correlation. Correlation is significant at the .05 level (2-tailed).

Table 7 presents the multiple regression analysis examining the influence of the dimensions of metacognitive awareness on mathematics self-efficacy. Among the eight dimensions included in the model, only evaluation significantly predicted mathematics self-efficacy (β = .250, p = .009). Declarative knowledge, procedural knowledge, conditional knowledge, planning, comprehension monitoring, information management strategies, and debugging strategies did not significantly predict mathematics self-efficacy. The findings indicate that students' ability to evaluate the effectiveness of their learning strategies plays a more important role in developing mathematics self-efficacy than merely possessing metacognitive knowledge or employing individual cognitive regulation strategies. Learners who regularly reflect on the quality of their learning outcomes and determine whether their strategies are effective are more likely to develop confidence in solving mathematical problems. These findings are consistent with Schraw and Dennison (1994), who identified evaluation as one of the highest-order components of metacognitive regulation because it enables learners to judge the effectiveness of their cognitive strategies and make necessary adjustments. Similarly, Stanton et al. (2021) emphasized that reflective evaluation improves students' learning performance by encouraging continuous monitoring and refinement of learning strategies. Recent studies further suggest that reflective evaluation promotes mathematical reasoning and enhances students' confidence through repeated successful learning experiences (Tak et al., 2022; Thi-Nga et al., 2024). Flavell's (1979) metacognitive framework provides theoretical support for these findings by explaining that evaluation facilitates self-regulated learning through reflection on cognitive performance. Students who effectively evaluate their learning are better able to identify successful strategies, correct misconceptions, and strengthen their confidence for future mathematical tasks. Therefore, mathematics instruction should incorporate reflective journals, formative assessment, self-evaluation checklists, and structured feedback sessions that encourage students to evaluate their own learning processes.

Table 7
Multiple Regression Analysis of the Dimensions of Metacognitive Awareness Predicting Mathematics Self-Efficacy

Predictor	B	SE	β	t	p	Decision
Constant	1.035	0.380	—	2.721	.007	Significant
Declarative Knowledge	0.207	0.145	.131	1.429	.155	Not Significant
Procedural Knowledge	0.104	0.102	.102	1.019	.310	Not Significant

Predictor	B	SE	β	t	p	Decision
Conditional Knowledge	0.007	0.125	.006	0.057	.955	Not Significant
Planning	−0.063	0.133	−.052	−0.478	.634	Not Significant
Comprehension Monitoring	0.132	0.122	.121	1.082	.281	Not Significant
Information Management Strategies	0.031	0.136	.024	0.226	.821	Not Significant
Debugging Strategies	−0.089	0.091	−.091	−0.975	.331	Not Significant
Evaluation	0.250	0.095	.250	2.640	.009	Significant

Note. Dependent variable: Mathematics Self-Efficacy. Significant predictors were identified at α = .05.

Table 8 presents the regression analysis examining the predictive influence of the dimensions of academic resilience on mathematics self-efficacy. The findings revealed that reflecting and adaptive help-seeking (β = .240, p = .014) and emotional response (β = .216, p = .007) significantly predicted mathematics self-efficacy, whereas perseverance did not demonstrate a statistically significant predictive effect. The results suggest that students who actively seek appropriate academic assistance and effectively regulate their emotional responses during challenging learning situations are more likely to develop confidence in mathematics. Although perseverance remains an important component of resilience, the findings indicate that persistence alone may not be sufficient to strengthen mathematics self-efficacy without effective coping strategies and emotional regulation. The findings corroborate Cassidy (2016), who identified adaptive help-seeking and emotional regulation as critical components of academic resilience that facilitate successful academic adjustment. Likewise, Uygur et al. (2023) found that emotional and academic self-efficacy significantly predict resilience among adolescents. Kleppang et al. (2023) similarly reported that supportive social relationships and mastery experiences strengthen adolescents' self-efficacy by providing opportunities for encouragement and successful performance. Furthermore, Elnaem et al. (2024) demonstrated that students who effectively manage emotional challenges and utilize available academic support exhibit stronger resilience and greater confidence in their academic capabilities. These findings are consistent with Social Cognitive Theory (Bandura, 2012), which posits that efficacy beliefs develop through mastery experiences, verbal persuasion, and the regulation of emotional states. Students who successfully manage anxiety and confidently seek assistance are more likely to interpret academic challenges as opportunities for learning rather than threats to their competence. Consequently, mathematics teachers should cultivate classroom environments that encourage collaborative learning, normalize help-seeking behaviors, provide constructive feedback, and support students' emotional well-being. Such practices can strengthen both academic resilience and mathematics self-efficacy, thereby promoting sustained engagement and improved mathematics learning outcomes.

Table 8
Multiple Regression Analysis of the Dimensions of Academic Resilience Predicting Mathematics Self-Efficacy

Predictor	B	SE	β	t	p	Decision
Constant	1.110	0.349	—	3.185	.002	Significant
Perseverance	0.056	0.139	.041	0.400	.690	Not Significant
Reflecting and Adaptive Help-Seeking	0.298	0.119	.240	2.497	.014	Significant
Emotional Response	0.167	0.061	.216	2.728	.007	Significant

Note. Dependent variable: Mathematics Self-Efficacy. Significant predictors were identified at α = .05.

Conclusion and Recommendations

The study examined the levels of metacognitive awareness, academic resilience, and mathematics self-efficacy among Grade 10 students of New Bataan National High School and investigated the relationships and predictive influence of metacognitive awareness and academic resilience on mathematics self-efficacy. The findings revealed that the respondents generally exhibited high levels of metacognitive awareness, academic resilience, and mathematics self-efficacy. Furthermore, both metacognitive awareness and academic resilience were significantly and positively associated with mathematics self-efficacy, indicating that students who effectively regulate their cognitive processes and demonstrate resilience in overcoming academic challenges tend to possess greater confidence in learning mathematics. Regression analyses further revealed that among the dimensions of metacognitive awareness, only evaluation significantly predicted mathematics self-efficacy, while reflecting and adaptive help-seeking and emotional response emerged as significant predictors among the dimensions of academic resilience. These findings emphasize that students' confidence in mathematics is strengthened not only by their ability to reflect on and evaluate their learning but also by their willingness to seek appropriate academic support and effectively regulate emotional responses when confronted with challenging mathematical tasks. The study contributes to the growing body of literature on mathematics education by providing empirical evidence that metacognitive regulation and academic resilience are important psychological factors associated with mathematics self-efficacy among Filipino junior high school students. The findings extend existing knowledge by demonstrating that reflective evaluation, adaptive help-seeking, and emotional regulation are more influential predictors of mathematics self-efficacy than other dimensions of metacognitive awareness and academic resilience within the present educational context. These results underscore the importance of integrating cognitive, motivational, and socio-emotional approaches into mathematics instruction to strengthen students' confidence, persistence, and engagement in learning.

Based on the findings, mathematics teachers are encouraged to integrate instructional strategies that strengthen students' evaluative metacognitive skills through reflective journals, self-assessment activities, formative feedback, and problem-solving reflections. Schools should implement learner-support programs that cultivate academic resilience by promoting adaptive help-seeking behaviors, mentoring initiatives, collaborative learning, and guidance interventions that enhance students' emotional well-being. School administrators and curriculum developers are likewise encouraged to incorporate

metacognitive strategy instruction and resilience-building activities into mathematics curricula and professional development programs to equip teachers with evidence-based approaches for improving mathematics self-efficacy. Parents and guardians should provide consistent encouragement and create supportive home learning environments that reinforce students' confidence and perseverance in mathematics. Future studies are encouraged to replicate the present investigation across different educational settings using larger and more diverse samples to improve the generalizability of the findings. Researchers may also examine additional variables, including mathematics anxiety, learning motivation, teacher instructional practices, parental involvement, classroom climate, digital learning environments, and academic achievement, to develop a more comprehensive understanding of the factors influencing mathematics self-efficacy. Longitudinal and mixed-methods research is likewise recommended to explore how metacognitive awareness, academic resilience, and mathematics self-efficacy develop over time and interact throughout students' educational experiences.

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