(Review)

The Mediating Effect of Self–Efficacy on the Relationship Between Goal Setting and Academic Motivation among College Students in Mathematics

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Abstract. *Academic motivation in mathematics remains a critical factor influencing student engagement and performance. This study examined the mediating effect of self-efficacy on the relationship between goal setting and academic motivation among college students. Using mediation analysis, 100 participants were selected through stratified random sampling. Results indicated that self-efficacy partially mediates the relationship, but goal setting unexpectedly had a negative effect on self-efficacy, suggesting that specific goal-setting strategies may introduce pressure or unrealistic expectations. This finding challenges the assumption that goal setting always enhances confidence and motivation. Future research may explore alternative mediating factors and variations in goal-setting strategies. Additionally, educational interventions should integrate self-efficacy-enhancing techniques such as mastery experiences and peer support to maximize student motivation and achievement in mathematics.*

Keywords: *Goal setting, self-efficacy, academic motivation, mediation analysis, mathematics education*

1. INTRODUCTION

College students often face challenges in maintaining academic motivation in mathematics, leading to decreased performance and persistence in the subject. Goal setting has been identified as a significant factor influencing academic motivation, as it provides students with clear objectives and a sense of direction (Schippers et al., 2015). However, the effectiveness of goal setting may be contingent upon students' self-efficacy—the belief in their own ability to succeed in specific tasks. Self-efficacy influences the effort students invest in their studies, their resilience in the face of challenges, and their overall academic achievements (Bandura, 1982). Recent studies have emphasized that students with strong self-efficacy tend to engage more actively in mathematics, demonstrating improved problem-solving skills and performance outcomes (Usher & Pajares, 2019). Furthermore, research suggests that self-efficacy plays a mediating role in the relationship between goal setting and motivation, as it enhances students' commitment to their learning objectives and their ability to overcome academic challenges (Honicke & Broadbent, 2016). Understanding the mediating role of self-efficacy in the relationship between goal setting and academic motivation is crucial for developing interventions that enhance student engagement and success in mathematics.

Challenges related to goal setting, self-efficacy, and academic motivation in mathematics are not limited to a single educational setting but are evident in various countries. In the United States, students often struggle with sustaining self-efficacy in mathematics, leading to low engagement and inconsistent motivation despite structured goal-setting interventions (Sides & Cuevas, 2020). In China, students' academic motivation in mathematics is significantly affected by their self-efficacy, yet research suggests that low peer support and high academic pressure hinder self-confidence and engagement in the subject (Li et al., 2020). Similarly, in Mexico, pre-college students encounter difficulties in maintaining long-term motivation in mathematics due to a lack of self-efficacy and ineffective goal-setting strategies, leading to reduced persistence in learning (Valenzuela-Peñuñuri et al., 2024).

The Philippines faces similar challenges, where many students struggle with low self-efficacy in mathematics, resulting in poor motivation and academic disengagement. A study by Comahig and Abuzo (2024) found that Filipino high school students with low self-confidence in their mathematical abilities tend to exhibit weaker academic motivation, further limiting their performance in the subject. Likewise, research by Dua et al. (2022) highlights that pre-service teachers in the country often experience difficulties in setting clear academic goals, leading to lower self-efficacy and reduced motivation to engage in mathematics learning. Additionally, a study on problem-solving skills by Mariano-Dolesh et al. (2022) revealed that Filipino students with negative self-perceptions struggle to stay motivated in mathematics, underscoring the impact of self-efficacy as a key factor in academic engagement. These findings highlight the persistent issue of low mathematics motivation and the crucial role of self-efficacy in addressing the problem, emphasizing the need to examine its mediating effect on goal setting and academic motivation in mathematics.

The persistent challenges in goal setting, self-efficacy, and academic motivation in mathematics significantly impact students' learning experiences and academic success. Research suggests that students with low self-efficacy struggle to sustain motivation and persistence in mathematics, leading to reduced engagement and lower achievement (Buzza & Dol, 2018). Moreover, ineffective goal-setting strategies contribute to inconsistent motivation and disengagement, preventing students from effectively managing their learning progress (Kaya, 2017). Despite the well-established relationship among these factors, limited research has examined the mediating role of self-efficacy in linking goal setting and academic motivation in mathematics, leaving a critical gap in understanding how students develop sustained engagement in the subject (Khosiyah, 2022). Addressing this gap is essential for developing evidence-based interventions that enhance goal-directed behaviors, reinforce self-efficacy, and improve motivation among mathematics students. This study aims to provide insights that can inform instructional strategies, curriculum development, and targeted interventions to improve learning outcomes in mathematics education.

2. METHOD

This study employed a non-experimental quantitative research design, utilizing a descriptive-correlational and mediation approach to examine the mediating effect of self-efficacy on the relationship between goal setting and academic motivation among college students in mathematics. A total of 100 college students from City College of Davao were selected using stratified random sampling, ensuring diverse representation from different programs. A sample size of 100 was deemed appropriate for mediation analysis based on prior research guidelines in statistical modeling (Field, 2013). Data collection took place during the 2023-2024 academic year, and the study was conducted at one of the Local Colleges in Region XI, Philippines, chosen for its diverse student population and relevant academic challenges in mathematics. Ethical clearance was secured, and all participants provided informed consent, ensuring voluntary participation and confidentiality under the Data Privacy Act of 2012.

To measure the study variables, three validated questionnaires were used. The Self-Efficacy Questionnaire (Usher & Pajares, 2008) assessed self-efficacy across four subscales: mastery experience, vicarious experience, social persuasion, and physiological state, achieving a Cronbach's alpha of .892. The Goal-Setting Questionnaire (Gaumer & Noonan, 2018) measured meaningful goals, personal improvement, and data-based decision-making (Cronbach's alpha = .933). The Academic Motivation Questionnaire (Nurkarim et al., 2023) assessed intrinsic and extrinsic motivation, achieving Cronbach's alpha = .841. These instruments underwent expert validation and pilot testing, and responses were collected through Google Forms and printed surveys.

For data analysis, descriptive and inferential statistical techniques were applied. Mean and standard deviation measured the central tendency of responses, while the Pearson Product-Moment Correlation determined the strength of relationships between variables. Mediation analysis using Baron and Kenny's (1986) framework and Hayes' Process Macro for SPSS (Hayes, 2018) was employed to examine self-efficacy's mediating role. The study ensured ethical compliance, with participants retaining the right to withdraw at any time. Findings were reported objectively and transparently, maintaining the integrity of the research.

3. RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics for self-efficacy, goal setting, and academic motivation among college students in mathematics. The mean values and standard deviations (SD) indicate the overall levels of these variables and their respective subcomponents.

Table 1. Descriptive Levels

	SD	Mean	Descriptive Level
Self-Efficacy	**0.45**	**3.23**	**Moderate**
Mastery Experience	0.55	3.22	Moderate
Vicarious Experience	0.61	3.23	Moderate
Social Persuasions	0.79	3.04	Moderate
Physiological State	0.76	3.44	High
Goal Setting	**0.55**	**3.87**	**High**
Meaningful	0.73	3.78	High
Personal Improvement	0.67	3.95	High
Data-Based	0.60	3.87	High
Academic Motivation	**0.34**	**3.55**	**High**
Intrinsic Motivation	0.48	3.44	High
Extrinsic Motivation	0.52	3.65	High

The overall self-efficacy mean score of 3.23 (SD = 0.45) falls within a moderate range, indicating that while students are somewhat confident in their mathematical abilities, there is room for improvement. Among its subcomponents, physiological state (M = 3.44, SD = 0.76) was rated high, suggesting positive emotional responses to mathematics. However, mastery experience (M = 3.22, SD = 0.55), vicarious experience (M = 3.23, SD = 0.61), and social persuasion (M = 3.04, SD = 0.79) were moderate, indicating that students may not consistently draw confidence from past successes, peer influence, or external encouragement.

Goal setting received the highest mean score (M = 3.87, SD = 0.55, high level), signifying that students actively establish and pursue academic goals in mathematics. All sub-components—meaningful goals (M = 3.78, SD = 0.73), personal improvement (M = 3.95, SD = 0.67), and data-based goal setting (M = 3.87, SD = 0.60)—were also rated high, demonstrating that students recognize the value of meaningful, self-improvement-oriented, and data-driven goals. Academic motivation was also high (M = 3.55, SD = 0.34), with both intrinsic (M = 3.44, SD = 0.48) and extrinsic motivation (M = 3.65, SD = 0.52) contributing significantly, indicating that students are driven by both internal interests and external rewards.

These findings indicate that while students demonstrate strong goal-setting behaviors and motivation, their self-efficacy remains moderate, particularly in mastery experience, vicarious learning, and social persuasion. This suggests that despite setting goals, students may lack the confidence to fully engage in mathematical tasks. To improve engagement and performance, interventions should strengthen self-efficacy through mastery experiences, peer modeling, and external encouragement while

reinforcing goal-setting strategies. Research underscores self-efficacy's role in academic motivation, perseverance, and problem-solving (Sihite & Elfrianto, 2023; Izzati & Widyastuti, 2021), as low self-efficacy can hinder students from tackling mathematical challenges (Paudel & Ghimire, 2024). Given its close connection to goal setting, fostering clear, achievable goals is essential for enhancing mathematical engagement.

Additionally, high goal-setting scores suggest that students are goal-oriented, actively seeking academic progress. Structured goal-setting interventions have been shown to improve mathematical self-regulation and problem-solving skills (Aswin & Herman, 2022). However, students who struggle with effective goal-setting strategies may experience lower motivation and persistence (Baxter et al., 2017). Meaningful goal-setting approaches are particularly beneficial, as they enhance mathematical reasoning performance (Leong, 2021), reinforcing the idea that goal setting bridges self-efficacy and academic motivation.

Furthermore, the high academic motivation scores reflect students' drive from both intrinsic (interest, enjoyment) and extrinsic factors (grades, rewards). While intrinsic motivation fosters long-term engagement, extrinsic motivation can enhance performance, particularly in mathematics (Toland & Usher, 2016; Zientek et al., 2017). However, over-reliance on extrinsic motivators may lead to disengagement if rewards are removed (Amien et al., 2023). Ultimately, motivation and self-efficacy are interconnected with students who believe in their abilities are more likely to develop intrinsic motivation toward mathematics (Liu et al., 2023). These findings emphasize the interdependent roles of self-efficacy, goal setting, and motivation, highlighting the need for targeted interventions, goal-setting training, and motivation-enhancing strategies to improve mathematical performance and persistence.

Table 2 presents the correlation between self-efficacy, goal setting, and academic motivation among college students. The correlation between self-efficacy and academic motivation ($r = 0.191$, $p = 0.055$) is weak and statistically non-significant, suggesting that self-efficacy alone may not strongly influence motivation in mathematics. This implies that other factors, such as instructional strategies, learning environments, or external reinforcements, may play a more substantial role. In contrast, the correlation between goal setting and academic motivation ($r = 0.461$, $p = 0.000$) is moderate and statistically significant, confirming that structured goal-setting behaviors are positively associated with academic motivation. This supports research emphasizing goal setting as a driver of self-regulated learning, persistence, and performance.

Table 2. Relationship Between Variables

Academic Motivation				
	r	p-value	Interpretation	Decision on H_o
Self-Efficacy	.191	.055	Fail to Reject	Not Significant
Goal Setting	.461	.000	Reject	Significant
Self-Efficacy				
	r	p-value	Interpretation	Decision on H_o
Goal Setting	-.202	.043	Reject	Significant

Additionally, the relationship between goal setting and self-efficacy is negative ($r = -.202$) and statistically significant ($p = .043$). This finding suggests that as goal setting increases, self-efficacy slightly decreases, which may appear counterintuitive. However, it could indicate complexities in how individuals perceive their capabilities when setting challenging goals. Since the p-value is below .05, the null hypothesis is rejected, and the relationship is considered statistically significant.

These results suggest that while self-efficacy is often linked to academic motivation, it may not be a strong predictor in this context. Instead, goal setting emerges as a more influential factor, highlighting the importance of integrating structured goal-setting strategies into educational practices to enhance both intrinsic and extrinsic motivation. Future interventions should focus on fostering realistic,

attainable goals while also exploring additional factors that may strengthen the connection between self-efficacy and motivation.

Research supports the significant role of goal setting in motivation and academic achievement. Ye (2021) found that goal-setting behaviors were strongly linked to academic performance and persistence, while Sides and Cuevas (2020) demonstrated that goal-setting interventions improved students' engagement, reinforcing the role of goal clarity in sustaining motivation. Additionally, Al-Bataineh et al. (2019) highlighted that goal setting fosters both self-efficacy and motivation over time, ultimately enhancing academic success.

However, some studies suggest that self-efficacy may play a more substantial role than goal setting. Saks (2024) found that self-efficacy significantly predicted learning outcomes, with goal setting acting as a mediator rather than the primary motivator. Similarly, Fernández et al. (2020) demonstrated that students with high self-efficacy exhibited greater perseverance and intrinsic motivation, emphasizing the importance of confidence in sustaining academic engagement.

These findings highlight the need for educational strategies that integrate both goal-setting and self-efficacy-building techniques. While goal setting appears to be the stronger predictor of academic motivation in this study, fostering self-efficacy remains crucial for long-term engagement. Future interventions should combine goal-setting strategies with confidence-building techniques to maximize students' academic success.

Table 3. Regression Weights (Total Effect)

			Estimate	S.E.	P	Decision on Ho	Interpretation
Goal Setting	→	Academic Motivation	.370	.070	.000	Reject	Significant

Figure 1. Path Diagram for Goal Setting on Academic Motivation

Figure 1 presents the regression analysis results, showing that goal setting significantly enhances academic motivation ($\beta = 0.370$, $p = 0.000$). The low standard error (0.070) confirms the estimate's reliability, and the rejection of the null hypothesis reinforces the role of goal setting in shaping students' academic drive. The path diagram further supports this, illustrating a direct path coefficient of 0.37 from goal setting to academic motivation. However, the error variance (0.15) suggests that other external factors, such as personal interest, learning environment, and external support systems, also contribute to motivation.

The results align with previous studies, confirming goal setting's positive impact on self-directed learning, achievement motivation, and student engagement (Hematian et al., 2016). Research in elementary and secondary education also supports goal-setting interventions as effective in boosting student motivation and performance (McMillan, 2019), including in language learning (Cheng, 2023). However, some studies challenge this conclusion. For instance, goal-setting training improved students' understanding of the strategy but did not significantly increase motivation (Zuldha & Kaihatu, 2020). Additionally, research on students with varying academic performance levels suggests that those with average achievement may struggle to implement goal-setting strategies effectively, reducing their motivational benefits (Litvinova, 2022). These mixed findings indicate that while goal setting is generally

beneficial, its effectiveness depends on student characteristics, instructional support, and implementation strategies.

Table 4. Mediating Effect

Step			Estimate	Std. Error	p-value	Decision on Ho	Interpretation
Goal Setting	→	Self-efficacy	-.166	0.081	.039	Reject	Significant
Self-efficacy	→	Academic Motivation	0.413	0.068	.000	Reject	Significant
Goal Setting	→	Academic Motivation	0.286	0.083	.000	Reject	Significant

Table 4 highlights the mediating effect of self-efficacy in the relationship between goal setting and academic motivation. Results show that goal setting negatively affects self-efficacy (-0.166, p = 0.039), possibly due to pressure or unrealistic expectations. However, self-efficacy significantly enhances academic motivation (0.413, p = 0.000), reinforcing its role in fostering student engagement. Additionally, goal setting directly boosts academic motivation (0.286, p = 0.000), confirming its importance despite its negative impact on self-efficacy. Since both direct and indirect effects are significant, self-efficacy acts as a partial mediator. The unexpected negative link between goal setting and self-efficacy suggests that factors such as goal difficulty, clarity, and individual differences may influence this dynamic. These findings emphasize the complex interaction between goal setting, self-efficacy, and motivation, highlighting the need for future research on how mastery- and performance-oriented goal-setting strategies affect self-efficacy and academic motivation.
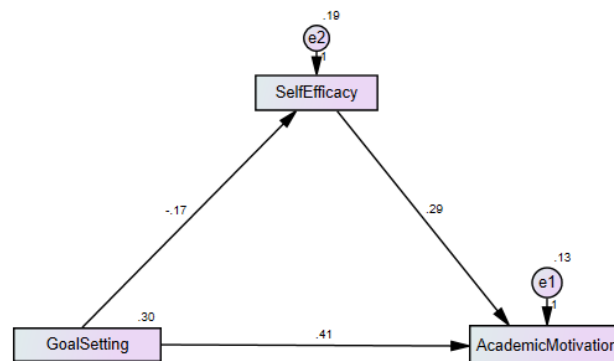

Figure 2. Path Analysis Showing the Variables of the Study

The path analysis diagram in Figure 2 illustrates the relationships among goal setting, self-efficacy, and academic motivation, with standardized path coefficients representing the strength and direction of these connections. The negative path coefficient (-0.17) between goal setting and self-efficacy suggests that as goal setting increases, self-efficacy decreases. This finding is consistent with Table 4 and may indicate that certain goal-setting strategies, particularly those that are overly difficult or unrealistic, can lower students' confidence in their abilities. In contrast, self-efficacy has a positive influence on academic motivation (0.29), meaning that students who believe in their ability to succeed are more likely to feel motivated academically. This aligns with existing research emphasizing the critical role of self-efficacy in fostering motivation and achievement.

The direct relationship between goal setting and academic motivation is the strongest in the model, with a path coefficient of 0.41, indicating that goal setting significantly enhances students' academic motivation. This suggests that structured goal-setting strategies positively impact motivation, even if they slightly diminish self-efficacy. Despite this negative effect on self-efficacy, the overall contribution

of goal setting to motivation remains substantial. The error terms (e1 = 0.13, e2 = 0.19) indicate that most of the variability in academic motivation and self-efficacy is explained by the model, though some external factors still influence these constructs. Thus, the findings highlight a complex interplay between goal setting, self-efficacy, and academic motivation. While goal setting plays a crucial role in fostering motivation, its unexpected negative impact on self-efficacy suggests that certain goal-setting methods may need to be adjusted to enhance both confidence and motivation simultaneously. Future research could explore how different goal-setting strategies such as mastery-oriented versus performance-oriented goals affect self-efficacy and motivation differently. Understanding these nuances could help educators develop more effective goal-setting frameworks that promote both confidence and motivation in students.

The finding that self-efficacy partially mediates the relationship between goal setting and academic motivation aligns with Bandura's Social Cognitive Theory (SCT), which emphasizes the role of self-efficacy in shaping goal-directed behavior and motivation. According to SCT, individuals with higher self-efficacy are more likely to set challenging goals, persist through difficulties, and maintain motivation. Empirical studies support this; Honicke et al. (2020) found that self-efficacy mediated the link between goal orientation and achievement, particularly for mastery-oriented students (Honicke et al., 2020). Similarly, Shofiah et al. (2023) confirmed that self-efficacy bridges academic motivation and achievement, reinforcing its role in strengthening the motivational effects of goal setting (Shofiah et al., 2023). However, Saks (2024) argued that self-efficacy is a stronger predictor of learning outcomes than goal setting, suggesting that confidence in one's abilities may outweigh structured goal-setting strategies (Saks, 2024). These findings suggest that while goal setting enhances motivation, its impact is more effective when paired with strong self-efficacy beliefs, consistent with SCT's emphasis on personal agency. Future research should explore how different goal-setting approaches interact with self-efficacy to optimize student motivation and achievement.

4. CONCLUSION

Based on the findings of this study, it is concluded that self-efficacy partially mediates the relationship between goal setting and academic motivation among college students in mathematics. While goal setting significantly enhances academic motivation, its effectiveness is influenced by students' self-efficacy levels, reinforcing Bandura's Social Cognitive Theory (SCT), which highlights the role of self-efficacy in shaping motivation and persistence. However, the negative relationship between goal setting and self-efficacy suggests that specific goal-setting strategies may introduce pressure, potentially diminishing students' confidence. This challenges the assumption that structured goal setting alone guarantees increased motivation, emphasizing the need for interventions that integrate self-efficacy-enhancing strategies such as mastery experiences, social support, and positive reinforcement.

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NOVELTY

This study introduces new insights into the complex relationship between goal setting, self-efficacy, and academic motivation among college mathematics students, an area with limited prior research. Grounded in Bandura's Social Cognitive Theory (1986), it challenges the assumption that goal setting

inherently enhances self-efficacy, revealing that certain goal-setting strategies may inadvertently lower confidence, impacting motivation. By examining self-efficacy as a partial mediator, this study contributes to discovering new problem-solving concepts that can address motivation-related challenges in mathematics education. The findings provide a foundation for refining goal-setting frameworks and instructional strategies, ensuring they enhance both motivation and self-efficacy to improve student engagement and academic success.

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