Academic Burnout, Self-Esteem, and Buoyancy: Predictors of Mathematics Performance among Pre-Service Teachers

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Article Info

Abstract

This study examined how non-cognitive factors such as academic burnout, self-esteem, and academic buoyancy influence pre-service teachers' (PSTs) mathematics performance. Utilizing a descriptive-survey correlational design, data were gathered from 108 PSTs, and the results revealed that most PSTs performed within the middle range, with some demonstrating higher proficiency while others struggled, particularly those who scored low in mathematics. Additionally, academic buoyancy in mathematics was found to be moderately high, while academic burnout and self-esteem were at moderate levels. In terms of non-cognitive factors, academic burnout exhibited a significant negative correlation with mathematics performance, whereas self-esteem showed a strong positive relationship with mathematics performance. However, academic buoyancy did not have a statistically significant correlation with performance. Furthermore, among the non-cognitive factors, self-esteem emerged as the strongest predictor of mathematics performance, while academic burnout significantly reduced performance. In contrast, academic buoyancy was not a significant predictor, suggesting that its influence on mathematics performance might be mediated by other variables not covered in this study. Although academic buoyancy did not significantly predict mathematics performance, its role in long-term academic resilience warrants further exploration. It is also recommended that instructors adjust workload demands to minimize PSTs' disengagement and emotional exhaustion. Additionally, promoting healthy study habits, work-life balance, and relaxation techniques may help PSTs manage burnout more effectively.

Introduction

Equipping pre-service teachers (PSTs) with strong fundamental knowledge of mathematics is crucial for fostering a generation of mathematically literate students. However, PSTs often encounter challenges at school that can hinder their academic performance in mathematics. A study has shown that the majority of first-year PSTs did not perform well in the mathematics content courses and still fall within the weak performance bracket despite program changes (Tetteh & Agyei, 2022). In the Philippines, PSTs have difficulties in answering algebra problems, which may affect them when they take the licensure examination for teachers and try to fulfill their responsibilities. They performed poorly on items demanding knowledge of algebra procedures, and their capacity in mathematics problem-solving was insufficient and weak (Pentang, Andrade, Golben, Talua, Bautista, Sercenia, & Viernes, 2024).

Understanding the factors that influence pre-service teachers' academic performance in mathematics is critical for improving teacher training programs. These improvements can then empower future educators to cultivate a deeper understanding of mathematics in their students, ultimately leading to enhancements in overall learning outcomes (Maamin, Maat, & Iksan, 2021; Twohill, NicMhuirí, Harbison, & Karakolidis, 2023; Edo, Vivian, Asare, & Arthur, 2024). The demanding nature of teacher education programs can lead to burnout, characterized by emotional exhaustion, cynicism, and a sense of reduced effectiveness (Rahmatpour, Chehrzad, Ghanbari, & Sadat-Ebrahimi, 2019). Pre-service teachers experiencing burnout may struggle to maintain focus and enthusiasm for their studies, potentially hindering their mathematics performance and future teaching effectiveness (Liu, Xie, Sun, Liu, Yin, & Shi, 2023; Oloidi, Sewagegn, Amanambu, Umeano, & Ilechukwu, 2022).

Likewise, academic buoyancy refers to an individual's capacity to effectively deal with academic setbacks and challenges, bouncing back from difficulties and maintaining high levels of motivation and engagement. For pre-service teachers, the ability to navigate through the complexities of mathematics coursework buoyantly is linked to their mathematics performance (Weißenfels, Hoffmann, Dörrenbächer-Ulrich, & Perels, 2023). Moreover, PSTs with high academic buoyancy are likely to approach mathematics learning with a positive attitude and effective coping mechanisms (Putwain, Jansen in de Wal, & van Alphen, 2023). Furthermore, self-esteem plays a critical role in shaping individuals' perceptions of their own abilities and worth. Higher levels of self-esteem are associated with increased motivation, resilience, and academic success (Çiftçi & Yildiz, 2019). Pre-service teachers with positive self-esteem may approach mathematics learning with confidence and determination, leading to enhanced achievement outcomes (Booth & Gerard, 2011; Siregar, Suryadi, Prabawanto, & Mujib, 2022).

Existing research has extensively explored the individual impacts of academic buoyancy, burnout, and self-esteem on academic performance in various contexts. However, a significant gap remains in understanding how these factors collectively influence pre-service teachers, particularly in the domain of mathematics education. For pre-service teachers, navigating the complexities of mathematics requires resilience, motivation, and confidence. Low academic buoyancy may hinder their ability to handle setbacks, while burnout can lead to disengagement and reduced mathematics performance (Qin, Lu, Zhou, Wijaya, Huang, & Fauziddin, 2022). Additionally, self-esteem plays a pivotal role in shaping pre-service teachers' beliefs about their competence in the subject (Akdeniz &

Gürefe, 2021). Addressing these non-cognitive factors collectively is essential in informing targeted interventions and support systems to enhance the academic performance of pre-service teachers in mathematics education, thereby nurturing a more effective cohort of educators in this critical subject area. Hence, the purpose of this study is to assess the level and examine the relationship between non-cognitive factors—academic burnout, self-esteem, and academic buoyancy—and the mathematics performance of pre-service teachers.

Method

Research Design

This study employed a descriptive-correlational research design to investigate the relationships among the identified non-cognitive factors—academic burnout, self-esteem, and academic buoyancy—and pre-service teachers' academic performance in mathematics. This design is particularly appropriate as it enables the examination of existing associations between variables without direct manipulation, allowing for a more naturalistic exploration of their interplay in an educational setting.

Respondents and Sampling

The respondents in this study comprised first-year pre-service teachers across the secondary education program of the College of Education of Bukidnon State University. The inclusion criteria for the selection were preservice teachers currently enrolled in a general mathematics course for the S.Y. 2023- 2024. For this study, a simple random sampling method was employed. This means that each pre-service teacher in the population had an equal chance of being selected for the study. Participants were randomly chosen from the entire pool of first-year pre-service teachers. In total, one hundred eight (108) pre-service teachers served as respondents in this study. This sample size was determined to provide enough data for analysis while still being manageable within the scope of the research. Of the 108 participants, 63% were female and 37% were male.

Measure

The data were collected using survey questionnaires. The Academic Burnout scale was adopted from Carmona-Halty et al. (2022), which comprises eight (8) items. Also, the Academic Buoyancy scale was adopted from Martin and Marsh (2008), which covers four (4) items, and the Academic Self-Esteem was adopted from Tiwari (2011), which includes seven (7) items. The response key for the mentioned scales used in this study ranges from 1 (Strongly Disagree) to 7 (Strongly Agree). Meanwhile, the mathematics performance of the pre-service teachers was determined based on their final-term examination scores in the Mathematics in the Modern World course. These scores served as an objective measure of their academic performance, reflecting their comprehension and mastery of the subject matter.

Data Gathering Procedure

The data collection process followed a systematic approach to ensure accuracy, reliability, and ethical integrity.

First, formal approval was sought from the dean of the College of Education of Bukidnon State University and the relevant department to conduct the study. Since the researcher was the instructor handling all mathematics in the modern world courses, access to the pre-service teachers' final-term examination scores was readily available. These scores served as the measure of their academic performance. The study participants consisted of pre-service teachers enrolled in the Mathematics in the Modern World course. A total of N = 108 pre-service teachers participated in the study. Before data collection, the researcher informed the participants about the study's purpose, procedures, and ethical considerations, emphasizing confidentiality and voluntary participation.

The data were collected using two sources: final-term examination scores and survey questionnaires measuring non-cognitive factors. Since the researcher was the instructor, the final-term exam scores were directly obtained from course records while maintaining objectivity and confidentiality. Additionally, adopted scales assessing academic burnout, self-esteem, and academic buoyancy were administered to the respondents. Clear instructions were provided to ensure accurate and honest responses. The completed questionnaires were collected, reviewed for completeness, and securely stored for analysis

Treatment of Data

Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to assess the pre-service teachers' mathematics performance, as well as their levels of academic burnout, self-esteem, and academic buoyancy. To determine the relationships between the non-cognitive factors (academic burnout, self-esteem, and academic buoyancy) and mathematics performance, Pearson's correlation coefficient (r) was computed. Furthermore, multiple regression analysis was conducted to examine the combined influence of these factors on mathematics performance. The regression model provided insights into the extent to which academic burnout, self-esteem, and academic buoyancy predicted pre-service teachers' mathematics performance. All statistical analyses were performed using SPSS version 23, ensuring the accuracy and reliability of the results. Additionally, assumptions of normality, multicollinearity, and autocorrelation were checked to validate the appropriateness of the statistical models.

Results and Discussion

Table 1 presents the frequency and percentage distribution of pre-service teachers' mathematics performance in their mathematics courses. The mean score of 22.45 suggests that, on average, students performed within the better than passing and passing range. The standard deviation of 5.767 indicates some variability in scores, reflecting differences in students' levels of proficiency. While a portion of the students achieved high scores, others encountered challenges in mastering the subject. A large percentage of students (28.70%) scored below 19, indicating the need for additional support in strengthening their mathematical skills.

Meanwhile, 16.67% achieved a passing level, and 8.33% performed better than passing, showing that many students were able to meet the basic requirements. Additionally, 12.04% and 13.89% attained less satisfactory and moderately satisfactory levels, respectively, demonstrating a solid foundation that can be further developed.

Higher levels of proficiency were also evident, with 10.19% reaching highly satisfactory, 6.48% achieving very highly satisfactory, 2.78% attaining outstanding, and 0.93% excelling at the highest level. Overall, while there is a wide range of performance levels, the results highlight both strengths and areas for improvement. Several students demonstrated strong mathematical abilities, while others may benefit from additional learning support (Adnan, Wai, Hamiza, Mohd, Bahurudin, & Mohd, 2024).

Table 1. Frequency and Percentage Distribution of the Pre-Service Teachers' Mathematics Performance

Range	Level of Proficiency	Frequency	%	Mean	SD
34-35	Excellent	1	0.93		
32-33	Outstanding	3	2.78		
30-31	Very Highly Satisfactory	7	6.48		
28-29	Highly Satisfactory	11	10.19		
26-27	Moderately Satisfactory	15	13.89	22.5	5.77
24-25	Less Satisfactory	13	12.04		
22-23	Better than Passing	9	8.33		
20-21	Passing	18	16.67		
Below-19	Failed	31	28.7		
	Total	108	100		

Based on Table 2, the moderate mean score of 4.12 for academic burnout in mathematics implies that preservice teachers experience a noticeable but manageable level of stress and disengagement related to their mathematics schoolwork. While they often feel overwhelmed and lack motivation, these feelings are not extreme but still noteworthy enough to affect their overall academic experience. The moderate level of burnout also suggests that these PSTs occasionally think of giving up or experience feelings of inadequacy, but these thoughts are not pervasive (Qin *et al*., 2022). Sleep disturbances and a gradual loss of interest in their studies are present, indicating that the stress from their mathematics coursework is impacting their well-being and engagement, though not to a severe degree (Jian, Wijaya, & Yu, 2022)

Additionally, these PSTs may find themselves questioning the meaning and value of their mathematics schoolwork, reflecting a moderate level of existential concern. They also tend to worry about mathematics-related issues during their free time, suggesting that their stress extends beyond the classroom. However, the moderate burnout level indicates that while these challenges are present, they are not overwhelming or constant, allowing the PSTs to continue with their studies despite these difficulties (Guse, Kienhues, & Jucks, 2023). Overall, moderate burnout reflects a balance between coping with and being affected by the demands of their mathematics schoolwork (Cakir & Dinc, 2021).

Meanwhile, the PSTs self-esteem in mathematics, with a mean score of 4.13, is also moderate, indicating that while they generally have a positive view of their abilities, there is still room for improvement in their confidence. The standard deviation of 0.952 suggests a wider variation in self-esteem levels among the group, with some PSTs feeling more confident than others. This moderate self-esteem level suggests that preservice teachers often believe

they can perform well in mathematics, but their confidence is not unwavering. They may feel capable and generally pleased with their abilities, but they still experience moments of self-doubt, particularly when comparing themselves to their peers.

Despite this, the indicators show that most PSTs feel confident in their mathematics skills, believing they can do mathematics as well as or better than others at school. They are generally satisfied with their performance and often feel they can succeed in mathematics-related tasks. However, the moderate self-esteem score also indicates that this confidence is not absolute; some PSTs may occasionally struggle with feelings of inadequacy or uncertainty in their mathematics abilities. Overall, while they tend to have a positive self-view, there are fluctuations in their confidence levels, reflecting the challenges and pressures of their academic environment (Akdeniz & Gürefe, 2021).

Moreover, the PSTs academic buoyancy in mathematics, with a mean score of 4.46, is moderately high, indicating a generally strong ability to cope with challenges and setbacks in their mathematics studies. The standard deviation of 0.877 suggests some variability in how different PSTs handle academic stress, but overall, they are fairly resilient. This moderately high level of academic buoyancy suggests that most PSTs are confident in their ability to bounce back from difficulties, whether it be negative feedback, poor results, or other pressures related to their mathematics coursework. They are likely to maintain a positive outlook and not be easily discouraged by setbacks.

The indicators further illustrate that these PSTs are relatively skilled at managing the pressures associated with their mathematics schoolwork. They tend to handle negative feedback and stress without allowing it to overwhelm them, and they generally do not let a bad mark undermine their confidence. This resilience is crucial for sustaining their motivation and performance in mathematics, as it helps them stay focused and determined even in the face of challenges (Gellor, 2019). However, the moderately high score also implies that while they are good at managing academic stress, there is still some room for growth in their ability to fully navigate the demands of their mathematics studies without being affected by setbacks. Overall, their academic buoyancy reflects a positive but still developing capacity to thrive under pressure (Aksu, Kul, & Satıcı, 2024).

Table 2. Summary of the Mean and Standard Deviation of the Noncognitive Factors

Variables	Minimum	Maximum	Mean	SD	Descriptive Rating
Academic Burnout	2	6.11	4.12	0.696	Moderate
Self-Esteem	1.57	6.29	4.13	0.952	Moderate
Academic Buoyancy	1.75	7	4.46	0.877	Moderately High

Note: $N = 108$

Table 3 presents the correlations between mathematics performance and three non-cognitive variables: academic burnout, self-esteem, and academic buoyancy. The results show a significant negative correlation between academic burnout and mathematics performance ($r = -0.215, p = 0.026$), suggesting that preservice teachers

who experience higher levels of burnout tend to have lower mathematics scores. This implies that exhaustion and disengagement may hinder academic performance (May, Bauer, & Fincham, 2015). In contrast, self-esteem has a moderate positive and highly significant correlation with mathematics performance ($r = 0.437, p < 0.001$), meaning that PSTs with higher confidence in their abilities are more likely to achieve better results in mathematics. This strong relationship highlights the importance of fostering self-esteem to support mathematics academic success (Ugwuanyi, Okeke, & Asomugha, 2020; Yu, Qian, Abbey, Wang, Rozelle, Stoffel, & Dai, 2022; Anyanwu, Emesi, & Ezenwosu, 2024).

On the other hand, academic buoyancy, which refers to PSTs ability to cope with academic challenges, shows a weak positive but non-significant correlation with mathematics performance ($r = 0.153, p = 0.114$). This suggests that while PSTs with higher academic buoyancy may perform slightly better, the relationship is not strong enough to be considered statistically significant. However, academic buoyancy is associated with better academic performance, but the relationship is often mediated by other factors such as academic self-concept and self-regulated learning (Collie, Martin, Malmberg, Hall, & Ginns, 2015; Colmar, Liem, Connor, & Martin, 2019; Rustam, Rameli, Syuhada, Alhassora, Mazlan, Hoon, Rosiah, Boon, & Hong, 2024).

Overall, the findings emphasize the importance of addressing academic burnout and promoting self-esteem to enhance mathematics performance since the results suggest that academic burnout may hinder mathematics performance (Qin *et al*., 2022), while self-esteem plays a crucial role in the pre-service academic performance in mathematics. Efforts to boost PSTs confidence and reduce burnout could lead to improved performance. While academic buoyancy showed a positive trend, result suggests that other factors may influence preservice teachers' ability to handle academic difficulties in relation to their mathematics scores (Bates, Latham, & Kim, 2011).

Table 3. Bivariate Correlation Between the Preservice Teachers' Noncognitive Factors and Mathematics Performance

Variable			Pearson's r	p-values
Academic Burnout	-	Scores	-.215[*]	0.026
Self-Esteem	-	Scores	.437[***]	<.001
Academic Buoyancy	-	Scores	0.153	0.114

Note: N=108, *p <.05, **p <.01, ***p<.001

The table 4 presents the results of a multiple regression analysis examining the influence of non-cognitive factors—academic burnout, self-esteem, and academic buoyancy—on pre-service teachers' academic performance in mathematics. The model explains 24.6% of the variance ($R^2 = .246$) in mathematics performance, with an adjusted R² of .224, indicating that approximately 22.4% of the variation in academic performance is accounted for after adjusting for the number of predictors. The overall model is statistically significant ($F = 11.289, p < .001$), suggesting that these non-cognitive factors collectively have a meaningful effect on mathematics performance. The Durbin-Watson (DW) statistic of 1.914 falls within the acceptable range (close to 2), indicating that there is no significant autocorrelation in the residuals, ensuring the validity of the model.

Among the predictors, self-esteem is the strongest and most significant positive predictor of mathematics performance ($\beta = .434, t = 4.662, p = .000$). This means that for every one-unit increase in self-esteem, mathematics performance is expected to increase by 2.629 points, holding other variables constant. The standardized coefficient ($\beta = .434$) indicates a moderate-to-strong positive effect, highlighting the importance of self-esteem in improving academic outcomes. Academic burnout, on the other hand, has a significant negative relationship with mathematics performance ($\beta = -.238, t = -2.728, p = .007$), implying that higher burnout levels are associated with lower mathematics scores. Specifically, for every one-unit increase in academic burnout, mathematics performance is predicted to decrease by 1.976 points. The variance inflation factor (VIF) values for all predictors are close to 1, indicating no issues with multicollinearity, and the independent variables do not overlap excessively.

In contrast, academic buoyancy does not show a statistically significant relationship with mathematics performance ($\beta = .031, t = 0.321, p = .749$). This suggests that, after accounting for self-esteem and burnout, the ability to bounce back from academic setbacks does not have a measurable effect on mathematics achievement. Overall, the regression analysis indicates that self-esteem positively predicts better mathematics performance, while academic burnout negatively influences it. Academic buoyancy, however, does not significantly contribute to the model. These findings highlight the importance of fostering self-esteem and reducing burnout to improve mathematics performance among pre-service teachers.

Table 4. Summary of the Multiple Regression for Non-Cognitive Factors of Pre-Service Teachers' Academic Performance in Mathematics

Variables in the Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.	VIF	R^2
	B	Std Error	Beta				
Constant	18.838	3.766		5.002	.000		
Academic Burnout	-1.976	.724	-.238	-2.728	.007	1.053	
Self-Esteem	2.629	.564	.434	4.662	.000	1.196	.246
Academic Buoyancy	.202	.627	.031	.321	.749	1.254	
	R=.496	Adjusted R²=.224	DW=1.914	Sig. =.000			

Notes: N=108; F=11.289, (p<.001)

The regression analysis provides important insights into how non-cognitive factors—academic burnout, self-esteem, and academic buoyancy—influence the mathematics performance of pre-service teachers. The model explains 24.6% of the variance in mathematics performance, meaning that while these noncognitive factors play a role, other influences (such as prior knowledge, study habits, or instructional quality) also contribute to PSTs success in mathematics. However, the significance of the overall model (p < .001) confirms that non-cognitive factors meaningfully affect academic outcomes (Semeraro, Giofrè, Coppola, Lucangeli, & Cassibba, 2020).

Among the predictors, self-esteem emerges as the strongest and most significant positive factor influencing mathematics performance. This suggests that PSTs who believe in their abilities and have a strong sense of self-

worth tend to perform better in mathematics. Confidence in one's skills may lead to greater motivation, perseverance, and a willingness to engage with mathematical concepts, ultimately resulting in higher achievement (Ugwuanyi *et al*., 2020; Asika, 2021; Anyanwu *et al*., 2024).

On the other hand, academic burnout negatively influences mathematics performance, meaning that students who experience high levels of emotional exhaustion, disengagement, and stress tend to score lower. This highlights the importance of managing workload, reducing academic stress, and providing mental health support to prevent burnout. Strategies such as effective time management, well-being programs, and a balanced academic workload can help PSTs maintain their motivation and performance (May, Bauer, & Fincham, 2015; Widlund, Tuominen, & Korhonen, 2021; Widlund, Tuominen, & Korhonen, 2022).

Interestingly, academic buoyancy does not show a significant influence with mathematics performance. This suggests that while the ability to bounce back from academic setbacks is generally beneficial for students, it does not directly translate into better mathematics achievement when self-esteem and burnout are accounted for. It is possible that PSTs who are resilient in handling academic challenges may still struggle with mathematics if they lack confidence or experience high levels of burnout (Gellor, 2019; Colmar *et al*., 2019).

Conclusion and Recommendations

The findings of this study provide valuable insights into the academic performance of pre-service teachers in mathematics and how non-cognitive factors such as academic burnout, self-esteem, and academic buoyancy influence their academic performance. The results indicate that most PSTs perform within the middle range, with some demonstrating higher proficiency while others struggle, particularly those who scored below 19. Also, academic buoyancy in mathematics is moderately high while academic burnout and self-esteem are in moderate level. In terms of non-cognitive factors, academic burnout was found to have a significant negative correlation with mathematics performance while self-esteem showed a strong positive relationship with academic performance. However, academic buoyancy did not have a statistically significant correlation with their mathematics performance. The regression analysis further confirmed that self-esteem is the strongest predictor of mathematics performance, while academic burnout significantly lowers performance. Nevertheless, academic buoyancy was not a significant predictor of PSTs mathematics performance.

Based on these findings, several recommendations are proposed to improve the academic performance of PSTs in mathematics. Educators may implement strategies that foster a positive self-concept among PSTs, such as growth mindset interventions, personalized feedback, and encouragement of effort over innate ability. Also, instructors may adjust workload demands and incorporate more engaging, interactive teaching methods to reduce PSTs disengagement and emotional exhaustion. Furthermore, promoting healthy study habits, work-life balance, and relaxation techniques can further help PSTs manage burnout effectively. Although academic buoyancy did not significantly predict mathematics performance, its role in long-term academic resilience should be explored further. Future studies could examine how self-regulated learning, motivation, and problem-solving skills interact with academic buoyancy to influence performance.

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