

Factors Affecting Student Performance Enrolled in Master of Arts in Teaching Mathematics: A Factorial Analysis

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ABSTRACT

This study examined the factors affecting the academic performance of students enrolled in the Master of Arts in Teaching Mathematics (MATM) program, focusing on variables such as academic engagement, institutional support, external responsibilities, and work-life balance. Utilizing a factorial analysis, the research aimed to identify the key predictors of student success. The findings revealed that academic engagement was strongly positively correlated with GPA ($r = 0.65, p < 0.01$), while institutional support showed a moderate correlation with student satisfaction ($r = 0.48, p < 0.05$). External responsibilities were negatively correlated with GPA ($r = -0.42, p < 0.01$), indicating that increased external obligations, such as work and family commitments, hinder academic performance. Further, a multiple regression analysis demonstrated that academic engagement ($\beta = 0.60, p < 0.001$) and institutional support ($\beta = 0.35, p < 0.01$) were significant positive predictors of GPA, while external responsibilities ($\beta = -0.30, p < 0.01$) negatively impacted performance. The regression model explained 62% of the variance in academic performance (Adjusted $R^2 = 0.62$). These results suggest that active student engagement and robust institutional support are crucial for academic success in the MATM program, while external responsibilities pose significant challenges to student performance. The study highlights the need for targeted interventions, including flexible learning options and enhanced academic resources, to support students in balancing their academic and external obligations.

Keywords: Factors, Performance, MATM, factorial analysis, graduate school

INTRODUCTION

Background of the Study

Graduate education plays a crucial role in equipping educators with advanced skills and knowledge to meet the evolving demands of teaching, particularly in specialized disciplines like mathematics. The Master of Arts in Teaching Mathematics (MATM) program is designed to develop competent professionals capable of addressing mathematical complexities and delivering effective instruction. However, despite its importance, many students in such programs face challenges that hinder optimal performance. These challenges stem from a range of factors, including individual capabilities, institutional policies, and external circumstances.

Research indicates that student performance in graduate programs is influenced by a complex interplay of personal, academic, and environmental variables. Studies by Darling-Hammond et al. (2023) and Kim & Lee (2024) emphasize the role of teaching strategies, motivation, and institutional support systems in determining academic success. Additionally, advances in educational technology and the integration of innovative pedagogical practices have significantly impacted learning experiences, necessitating an investigation into how these elements influence graduate students in mathematics education (Reis et al., 2024).

In the context of the MATM program, it is imperative to understand the dynamics affecting student performance to address existing gaps and optimize learning outcomes. A factorial analysis enables the identification of underlying patterns and relationships among variables, providing a comprehensive understanding of the factors at play. This study aims to contribute to the body of knowledge by offering empirical insights that can guide curriculum design, instructional strategies, and policy-making for graduate programs in mathematics education.

Through this research, educators and administrators can implement targeted interventions to improve student performance, enhance program effectiveness, and ultimately contribute to the development of highly skilled mathematics educators.



Objectives of the Study

1. To explore personal, institutional, and external factors that significantly affect the performance of MATM students.
2. To determine the relationships and interactions among identified variables affecting student performance.
3. To evaluate how institutional policies, support services, and resources influence academic outcomes.
4. To propose evidence-based recommendations for enhancing teaching methodologies, curriculum design, and support systems in the MATM program.

METHODS

This study employs a quantitative exploratory design using factorial analysis to investigate the variables affecting student performance. This method allows for the identification of latent factors and their interactions, providing a nuanced understanding of the influences on academic outcomes. Students enrolled in the MATM program at Guimaras State University during the academic year 2023-2024. A sample of 35 students was selected using random sampling to ensure representation across demographics, including age, gender, and employment status. A structured questionnaire was developed to collect data on personal characteristics (e.g., motivation, time management), institutional factors (e.g., teaching strategies, access to technology), and external influences (e.g., family support, work commitments). The survey instrument has undergone pilot testing among 30 students to establish reliability and validity (Cronbach's Alpha = 0.892). All data obtained is anonymized to protect the identity of the respondents. Permission is secured from the respondents and relevant institutional offices for the use of IPCR data. The researchers ensure that data is accurately represented without manipulation or bias. Descriptive statistics, Exploratory Factor Analysis, and Regression Analysis were used to analyze the data.

RESULTS AND DISCUSSIONS

The analysis of the study, "Factors Affecting Student Performance Enrolled in Master of Arts in Teaching Mathematics: A Factorial Analysis," revealed critical insights into the interplay of personal, institutional, and external factors influencing academic outcomes. A total of 35 respondents enrolled in Master of Arts in Teaching Mathematics (MATM) at Guimaras State University-Graduate School participated in the study, providing a representative sample of MATM students across age groups, employment statuses, and gender. The findings indicated that the mean academic performance, measured by GPA, was 1.25 (SD = 0.15), reflecting generally high performance among the respondents. Students also reported a high level of satisfaction with the program, with a mean score of 4.2 (SD = 0.6) on a 5-point Likert scale.

Table 1. The descriptive statistics of the key variables studied.

Variable	Mean	SD	Interpretation
Academic Performance (GPA)	1.25	0.15	High
Satisfaction with Program	4.20	0.6	High

Factors Affecting the Performance of MATM students

Table 2 provides a summary of key variables that potentially influence the academic performance of Master of Arts in Teaching Mathematics (MATM) students. The table presents the mean, standard deviation (SD), and interpretations of the responses regarding six critical factors: access to learning resources, effectiveness of teaching methods, institutional support, time management skills, work-life balance, and family support.

Access to learning resources refers to the availability and quality of materials such as textbooks, online resources, research articles, and technological tools required for studying. With a mean score of 3.90, this suggests that students generally have adequate access to learning resources in the MATM program. The relatively high standard deviation (0.8) indicates variability in responses, with some students perceiving resource access to be better than others. This variability may reflect differences in institutional support, such as the availability of digital resources, library services, or access to specialized software for mathematics learning. While the overall perception is positive, there may still be gaps in resource availability, particularly in institutions with fewer technological investments or smaller libraries.

The effectiveness of teaching methods refers to how well instructional strategies and pedagogical approaches facilitate students' learning and comprehension. With a mean of 4.10, the students indicated a high level of satisfaction with the teaching methods employed in the program. The standard deviation of 0.7 suggests a fairly consistent response among students, with most agreeing that the teaching strategies used are effective in helping them grasp mathematical concepts. The effectiveness may stem from interactive teaching approaches, the use of technology, and an emphasis on applied learning methods that engage students in problem-solving. This finding aligns with the importance of active learning techniques, as indicated in the literature (e.g., Darling-Hammond et al., 2023), which emphasizes that effective pedagogy significantly impacts student outcomes.

Institutional support encompasses the availability of services such as academic advising, mentoring, technological support, and administrative assistance. A mean of 3.80 indicates that students perceive institutional support as moderate. While many students might feel that they receive adequate assistance, the higher standard deviation (0.9) points to significant variability in responses. This variability suggests that while some students are highly satisfied with institutional support, others may feel that they lack the necessary resources or guidance. Strengthening academic advising, providing better access to mentoring programs, and enhancing the availability of technological tools could help improve overall institutional support, as research suggests that such resources are critical for student success (Kim & Lee, 2024).

Time management skills are essential for graduate students, especially those juggling academic, professional, and personal responsibilities. The mean score of 3.70 indicates that, on average, students consider their time management skills to be adequate. However, the relatively lower mean compared to other factors, coupled with a standard deviation of 0.6, suggests that time management is an area that could benefit from further development. Some students may struggle to balance their academic workload with other responsibilities, potentially affecting their overall performance. Institutions could consider providing workshops or resources on time management and prioritization, which could help students improve in this area, as highlighted by Reis et al. (2024).

Work-life balance reflects how well students are able to manage their academic responsibilities alongside their personal and professional commitments. With a mean of 3.50, the perception of work-life balance is moderate, indicating that students face challenges in achieving an optimal balance between their studies and other obligations. The standard deviation of 0.7 further suggests that there is considerable variation in how students manage this balance, with some managing better than others. For those with significant work or family responsibilities, the challenge of balancing academic and personal life can lead to stress and lower academic performance. Addressing this issue through flexible course scheduling, extended deadlines, or support for working students could improve the overall work-life balance, as advocated by Darling-Hammond et al. (2023).

Family support is a crucial factor in academic success, particularly for graduate students who may have multiple responsibilities outside of school. A mean of 4.00, combined with a relatively low standard deviation of 0.5, suggests that students in the MATM program generally perceive strong support from their families. This support could manifest in various forms, including emotional encouragement, financial assistance, or assistance with domestic responsibilities, which allows students to focus more on their studies. Strong family support has been linked to improved academic outcomes in several studies (Reis et al., 2024), and it appears to be a significant contributor to students' ability to succeed in the program.

Table 2. Factors Affecting the Performance of MATM students

Variable	Mean	SD	Interpretation
Access to Learning Resources	3.90	0.8	Sufficient
Effectiveness of Teaching Methods	4.10	0.7	Effective
Institutional Support	3.80	0.9	Moderate
Time Management Skills	3.70	0.6	Adequate
Work-Life Balance	3.50	0.7	Moderate
Family Support	4.00	0.5	Strong

Exploratory Factor Analysis

The exploratory factor analysis (EFA) revealed four latent constructs that collectively explained 67% of the variance in student performance. Academic Engagement (30% variance) includes Motivation, active participation, and timely submission of assignments. Institutional Support (20% variance) such as Access to learning resources, mentoring, and administrative assistance. External Responsibilities (10% variance) composed of Work commitments, caregiving, and financial stress. Individual Capabilities (7% variance) comprising Prior academic preparation, mathematical aptitude, and self-regulation.

Table 3. Highlights of the factor loadings of key variables.

Factor	Key Variables	Variance Explained
Academic Engagement	Motivation, class participation, deadlines	30%
Institutional Support	Resources, mentoring, administration	20%
External Responsibilities	Work, caregiving, financial challenges	10%
Individual Capabilities	Academic preparation, aptitude, self-reg.	7%

Academic engagement demonstrated a strong positive correlation with GPA ($r = 0.65$, $p < 0.01$), indicating that higher levels of engagement are associated with better academic performance. Institutional support had a moderate positive correlation with satisfaction ($r = 0.48$, $p < 0.05$), suggesting that students who feel supported by their institution report higher levels of satisfaction. External responsibilities showed a negative correlation with GPA ($r = -0.42$, $p < 0.01$), indicating that students with more external obligations tend to have lower GPAs.

Academic engagement ($\beta = 0.60$, $p < 0.001$) was the most significant positive predictor of GPA, showing that more engaged students perform better. Institutional support ($\beta = 0.35$, $p < 0.01$) was also a significant positive predictor of GPA, highlighting the importance of institutional resources and support systems. External responsibilities ($\beta = -0.30$, $p < 0.01$) were a negative predictor, suggesting that increased external obligations negatively impact academic performance. The regression model explained 62% of the variance in GPA (Adjusted $R^2 = 0.62$), indicating that the factors studied accounted for a substantial portion of the variation in student performance.

Table 4. Correlation and Regression Analysis

Variable	Correlation with GPA	p-value (Correlation)	Regression Coefficient (β)	p-value (Regression)
Academic Engagement	0.65	< 0.01	0.60	< 0.001
Institutional Support			0.35	< 0.01
External Responsibilities	-0.42	< 0.01	-0.30	< 0.01

CONCLUSIONS

1. The findings underscore the pivotal role of academic engagement and institutional support in driving the success of graduate students in the MATM program. These factors directly enhance performance and serve as buffers against the negative effects of external responsibilities.
2. Conversely, the negative impact of external responsibilities reminds us of the challenges faced by working students, particularly in balancing employment and academic demands.

RECOMMENDATIONS

1. Institutions should prioritize investments in technological infrastructure and support services to meet the evolving needs of students.
2. Faculty development programs should emphasize student-centered teaching approaches and the use of technology in instruction.
3. Policies promoting flexibility in course delivery and assessments can accommodate the diverse needs of graduate students.

References

- [1] Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2023). *Effective Teaching in the Digital Age: A Practical Guide for Graduate Educators*. Cambridge University Press.
- [2] Kim, H., & Lee, J. (2024). "Technological Integration and Its Impact on Graduate Student Success." *Journal of Higher Education Studies*, 12(3), 45-60.
- [3] Reis, R., Delgado, C., & Torres, P. (2024). "Interdisciplinary Approaches in Mathematics Education: A Global Perspective." *Mathematics and Education*, 28(1), 12-30.