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Exploring the Connections between Students' Motivation, Self-Efficacy, Personality, and Academic Achievement through Ordinary Least Squares Estimation

Mohd Azry Abdul Malik[1]*, Jasrul Nizam Ghazali[2], Alya' Nabihah Rusli[3], Nur Syahirah Alya Sabaruddin[4], Nurin Adriana Ahmad Huzami[5], Nurul Syahira Ismail[6], Surhana Amani Zakaria[7], Mohd Faiez Suhaimin[8], Mohamad Norzamani Sahroni[9]

[1,3,4,5,6,7]College of Computing, Informatics, and Mathematics, Universiti Teknologi MARA (UiTM), 18500 Machang, Kelantan, Malaysia
[2,9]Centre of Foundation Studies, Universiti Teknologi MARA Selangor, Dengkil Campuses, 43800 Dengkil, Selangor, Malaysia.

Authors' email: azry056@uitm.edu.my*, jasrul@uitm.edu.my, alya@gmail.com, syahirah@gmail.com, nurin@gmail.com, syahira@gmail.com, amani@gmail.com, mdfaiez821@uitm.edu.my, mohamadnorzamani@uitm.edu.my

*Corresponding author

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Abstract: The inability to anticipate students' academic performance may lead to insufficient preparation upon facing upcoming global challenges. This study aims to measure the relationship between students' motivation, self-efficacy, and personality on academic achievement. Additionally, the study aims to compare students' academic achievement levels between different genders. Employing simple random sampling with a 95% confidence level and a 10% margin of error, the study involved 78 participants from the Diploma in Mathematical Science program at a prominent higher education campus in Kelantan, Malaysia. Data collection was done through self-administered questionnaires, and data analysis employed ordinary least squares estimation and an independent t-test. The findings reveal only Motivation (p-value = 0.041) has significant relationships with students' academic achievement. Notably, no discernible differences in academic achievement were observed between genders (p-value = 0.913). The study offers valuable insights for higher education administrators and policymakers seeking to enhance students' academic achievement.

Keywords: Academic achievement, Motivation, Personality, Performance, Self-efficacy

1 Introduction

Academic achievement is a multifaceted concept reflecting students' success in meeting educational objectives, often evaluated through exams or continuous assessments. Various factors, including socio-demographic, psychological, and environmental factors, influence students' academic performance [1]. Self-efficacy, a psychological term denoting individuals' belief in their ability to achieve specific goals, emerges as a significant indicator of educational achievement [2]. High self-efficacy influences individuals' perceptions of their ability to navigate challenges competently and make effective decisions, impacting academic achievement [3].

As posited by social cognition theory, modifications in academic self-efficacy may influence students' academic achievement, often mediated through environmental factors [3]. Studies have consistently shown that students with high self-efficacy tend to perform better in various aspects of learning and cognition [4-5]. Conversely, low self-efficacy correlates with a belief in one's inability to successfully perform tasks, potentially leading to diminished academic achievement [5].

Student motivation shapes academic achievement by driving goal-oriented behaviours. Motivated learners engage in self-regulatory activities, exhibit improved performance, and are likelier

to adopt deep learning approaches [6]. Additionally, students with positive attitudes and high motivation demonstrate self-regulatory and achievement-oriented behaviours, contributing to academic success [7].

Personality traits also influence academic achievement, with conscientiousness positively associated with achievement [8]. Students with adaptable and engaged personalities tend to perform better academically, concentrating effectively on tasks and exhibiting higher achievement growth [1,9]. Moreover, certain personality traits, such as optimism, play a significant role in students' adaptation to the academic environment, particularly among college students [10-12].

Despite extensive research, there remains a need for further studies to comprehensively understand the factors influencing academic achievement, especially among higher education students. Therefore, this study aims to explore the significant influences of motivation, self-efficacy, and personality on academic achievement of university students. The findings hold implications for educators, administrators, and policymakers in creating supportive environments conducive to enhancing students' educational attainment.

2 Methodology

A Study Design, Sample and Instrumentation

The study framework is illustrated in Figure 1. This research employed a cross-sectional design and utilises a quantitative approach to assess the impact of independent variables, such as motivation, self-efficacy, and personality influence, on a dependent variable, students' academic achievement. By using simple random sampling with a 95% confidence level and a 10% margin of error, 78 samples were selected from students of the Diploma in Mathematical Science program at the Universiti Teknologi Mara (UiTM), Kelantan Branch, Machang Campus. The data collection method involved the use of primary data through a self-administered questionnaire. The questionnaire comprises two sections: Part A, which focusses on the demographic profile, and Part B, which contains questions related to the dependent and independent variables. Response options include Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). Table 1 provides a summary of the number of items and sources of instrumentation employed in the study.

Table 1: Instrumentation

Variable	Number of items	Measurement/Source
Academic achievement	1	CGPA
Motivation	5	(Umay, 2001)
Self-efficacy	5	(Navarro,2005)
Personality	6	(John, 2008)

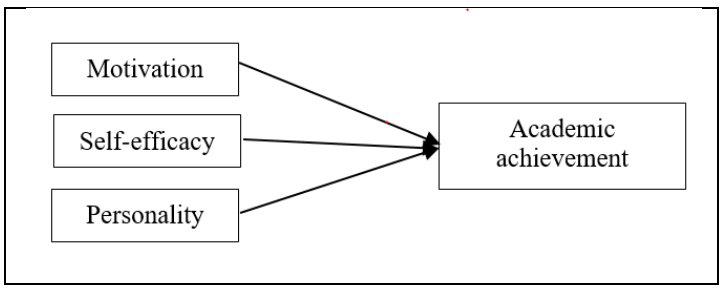

Figure 1: Theoretical Framework

B Method of Analyis

Descriptive statistics were utilised to delineate the demographic profiles of the respondents. Multiple Linear Regression (MLR) was applied to discern the connections between independent variables and

students' academic achievement. Furthermore, an independent t-test was performed to explore differences in academic achievement levels based on gender.

3. Findings

A Demographics of Respondents

Table 2 illustrates that most participants were female students, constituting 58.7% of the overall count, as opposed to male students. The respondents were predominantly around the age of 21 and above.

Table 2: Descriptive Table of Respondents Demographic

Demograhhic	Category	Percentage
Gender	Male	41.3
	Female	58.7
Age	18 – 20	9.3
	21 and above	90.7

B Model Adequacy Checking

Model adequacy checks include the assumption of linearity between independent and dependent variables, normality of residuals, homoscedasticity, and multicollinearity [13-15].

i. Linearity

Table 3 indicates that motivation has a significant linear association with students' academic achievement (r = 0.261, p-value = 0.024). By 90 percent significant level, self-efficacy and personality did not have a linear relationship with academic achievement (p-value > 0.10). Thus, self-efficacy and personality variables might not be deemed significant predictors under MLR analysis.

Table 3: Pearson Correlation

Dependent variable	Independent variable	r	p-value
Academic achievement	Motivation	0.261	0.024
	Self-efficacy	0.165	0.826
	Personality	-0.026	0.158

ii. Homoscedasticity

Figure 2 shows that the residuals are randomly dispersed without any discernible pattern, suggesting the fulfilment of homoscedasticity, where residuals exhibit constant variance and lack bias.

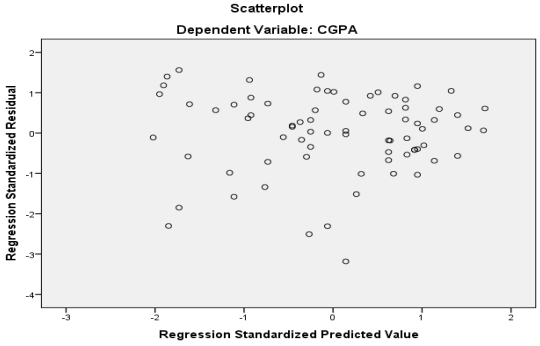

Figure 2: Scatter Plot for Academic Satisfaction

iii. Normality

In Figure 3, the plot aligns with a straight line, signifying that the residuals are normally distributed and, consequently, meet the assumption of normality of the residuals.

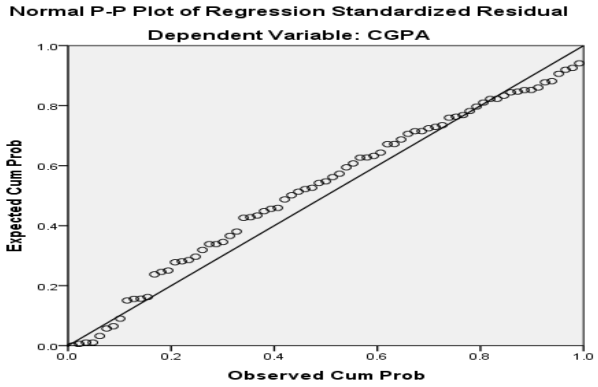

Figure 3: Distribution of Residual for Satisfaction

iv. Multicollinearity

The multicollinearity test aims to ascertain the degree of interrelation among the independent variables in the model. Table 4 reveals no indication of multicollinearity for all variables, given that the tolerance values for Motivation (0.870), Self-Efficacy (0.794), and Personality (0.835) surpass the threshold of 0.1. The VIF values are also below 10, specifically 1.150, 1.259, and 1.197. Consequently, this model does not exhibit multicollinearity issues.

Table 4: Coefficients form multicollinearity assumption

Variables	Collinearity Statistics		Findings
	Tolerance (> 0.1)	VIF (< 10)	
Motivation	0.870	1.150	
Self-Efficacy	0.794	1.259	No Multicollinearity
Personality	0.835	1.197	

C Significance of Model

The model's significance was assessed to determine its suitability for the data in the linear regression. Subsequently, the R2 value gauges how much of the variance in the dependent variable is accounted for by the independent variables. A higher R2 value, approaching 1, indicates a better fit for the model. In Table 5, by 90 percent significant level, the F-statistic holds a significant value (F = 2.384, p-value = 0.076), signifying the existence of a noteworthy regression model.

Table 5: Analysis of Variance for MLR test

Model	ANOVA	F	Sig
1	Regression	2.384	0.076

D Significance of Independent Variables

Based on the findings in Table 6, it can be inferred that only Motivation (p-value = 0.041) significantly influences students' academic achievement at a 90 percent confident level. The variables of self-efficacy (p-value = 0.292) and personality (p-value = 0.256) did not exhibit a statistically significant impact on the dependent variable.

Table 6: Coefficient for MLR test

Variable	Unstandardized coefficient	T-statistics	95% confidence interval		Significant
			Lower	Upper	
Constant	8.784	2.564	3.572	0.000	3.068
Motivation	0.074	0.863	0.003	0.145	0.041
Self-Efficacy	0.043	0.799	-0.037	0.122	0.292
Personality	-0.041	-0.303	-0.112	0.030	0.256

E Independent T-test (Gender)

In assessing whether a statistically significant difference exists between the means of two unrelated groups, the independent t-test, an inferential statistical test, was employed. The findings, presented in Table 7, reveal that the F-value for Levene's test (p-value = 0.047) indicates homogeneity of variance. Furthermore, the independent t-test suggests no significant difference in students' academic achievement level between male and female students (t-statistic = 0.109, p-value = 0.913).

Table 7: Independent T-test Result

	Levene's Test for Equality of Variances	T-test for Equality Means	
Academic achievement	4.086 (p-value= 0.047)	T	P-value
		0.109	0.913

F Summary of The Findings

The results of the entire study are summarized in Table 8.

Table 8: Summary of The Findings

Relationships	Findings
There is a relationship between motivation and academic achievement	Supported
There is a relationship between self-efficacy and academic achievement	Not Supported
There is a relationship between personality and academic achievement	Not Supported
There is a significant difference in students' academic achievement between genders.	Not Supported

4. Conclusion

The MLR findings indicate that only motivation significantly influences students' academic achievement. Subsequently, an independent t-test was employed to address the second objective, revealing no significant difference in students' academic achievement between genders. These results are anticipated to aid the management team in formulating effective strategies for delivering high-quality education and fostering a supportive academic environment to attain students' academic achievement. To replicate this study and enquire into the various factors influencing students' academic achievement, a longitudinal design is recommended for its ability to yield more pertinent information. Furthermore, it is proposed that future investigations incorporate additional independent variables, considering the potential influence of various factors on students' academic achievement.

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