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# Uncovering Key Predictors of Statistics Achievement among Postgraduate Students: A Stepwise Regression Model

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**Abstract**

Academic performance in statistics remains a significant challenge for many postgraduate students, despite its vital role in fostering research competence and overall academic success. This study aimed to identify key predictors of academic performance in statistics among postgraduate students enrolled in higher education institutions. Employing a quantitative approach with a descriptive correlational design, the study examined three potential predictors: satisfaction with the statistics class, basic computer literacy, and prior academic performance in statistics. The outcome variable was students' final performance in the statistics course. Data were collected through a complete enumeration of all 587 postgraduate students who enrolled in the course during the academic years 2021-2023. As the entire target population was included, no sampling technique was applied. Pearson's product-moment correlation was used to assess the associations among variables, while stepwise multiple linear regression was employed to develop a predictive model for academic performance in statistics. Model adequacy and the proportion of variance explained were evaluated using standard fit indices and the coefficient of determination ($R^2$). The findings revealed statistically significant correlations between the predictors and academic performance. Moreover, the regression model demonstrated acceptable fit, although the explained variance was relatively low. Among the predictors, satisfaction with the statistics class emerged as the most influential factor affecting academic performance.

**Keywords:** Academic performance; class satisfaction; computer literacy; statistics

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## 1. Introduction

The level of academic success that students achieve in their first semesters of college has far-reaching implications for their personal and professional lives. Students' academic success has an immediate influence on their academic self-esteem and determination to persevere in higher education. Success in early semesters at college also impacts students' post-college experiences, such as career choice, level of success and degree, and nature of participation in community life. Hence, the students' experience in introductory college courses can have a significant influence on their adult life. Ironically, introductory college mathematics courses such as statistics is one of the least enjoyed and least understood subjects in the post-college academic career. Aside from this, many students detest mathematics because according to them, it is a worthless, dreary, and even difficult course. This could be the reason why many students perceive mathematics as one of the most challenging academic disciplines. [1] As a consequence, many students perform poorly in their mathematics class and because of that, they discontinue attending class. Poor performance in introductory college courses has become a global serious problem and despite the high regard and recognition of the importance of mathematics as a precursor for most science courses, poor achievement and lack of interest in mathematics among students remain a lingering issue in educational institutions at all levels. [2]

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At Ifugao State University, many graduate students exhibit poor academic performance in statistics demonstrated by their passiveness in class discussions, sluggish grasp of basic concepts and generally below-average performance ratings in every assessment task. These adverse performances of the students in statistics can be attributed to several factors, such as the level of academic preparation which includes students' previous exposure to statistics classes; the quality of preparation with regards to the entry-level knowledge and skills particularly on the functional use of technology in learning mathematics; and the attitudes and feelings of the students concerning their experience with the way teachers handle statistics course.

The review of related literature on the predictors of academic performance in statistics offers valuable insights into the various factors that impact student learning outcomes [3-7]. It underscores the significant impacts of class satisfaction [8-11], prior knowledge, [12-14] and computer literacy [15-19] as key predictors of academic performance. Several research works have shown a favorable association between these variables and improved academic achievement, emphasizing their significance for educators and those seeking to improve student academic achievement. The literature has identified several predictors of academic performance thus far, and much of the research has looked at these variables separately. However, few studies have systematically looked into how computer literacy and prior knowledge interact with class satisfaction to affect academic performance. By taking a more thorough approach and looking at how these three predictor variables interact and affect academic performance as a whole, this study seeks to bridge this gap. This study fills a significant gap in the existing literature by emphasizing the interactions between these factors rather than examining each one independently. This study not only adds new insights to the subject matter but also establishes the framework for further research undertakings.

## 2. Methods

### 2.1 Research Design

employed a quantitative research approach using a correlational design to investigate the relationships among key variables. The dependent variable was the academic performance of the students, while the independent or predictor variables included class satisfaction level, basic computer literacy, and previous statistics course performance level. Data were gathered through complete enumeration involving all 587 postgraduate students at Ifugao State University who took the statistics course during the 2021–2023 academic years. No sampling technique was applied, as the entire population relevant to the study was included

Pearson product-moment coefficient of correlation (Pearson's r) was utilized to identify the degree and magnitude of relationships between the academic performance in statistics course and each of the independent variables such as basic computer literacy level, academic performance level in previous statistics course and statistics class satisfaction level. The study employed regression analysis as the modeling technique which was intended to determine the causal effect of the relationship between academic performance in statistics course and the multiple independent variables. In relation, Multiple Linear Regression (MLR) analysis was utilized since multiple identified independent variables were analyzed against a lone dependent variable. Further, the selection of the best grouping of predictor variables that account for the most variance in the academic performance in the statistics course was carried out through stepwise regression. From a pool of structural models resulting from stepwise regression, the best model was selected based on the R-squared value.

## 3. Results and Discussion

### 3.1 Results

**Performance Level of the Respondents**

The basic computer literacy level, previous Statistics course performance level, and statistics course satisfaction level is summarized in Table 1.

**Table 1.** Descriptive Statistics

| Predictor Variables | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Statistics Class Satisfaction Level | 587 | 1.00 | 5.00 | 3.49 | 1.28 |
| Basic Computer Literacy Level | 587 | 1.00 | 5.00 | 2.71 | 1.28 |
| Previous Performance in Statistics Course | 587 | 1.00 | 5.00 | 2.92 | 1.10 |

*Scale*

| Rate | Statistics Class Satisfaction | Previous Statistics Course Performance | Basic Computer Literacy level |
|---|---|---|---|
| 4.50 – 5.00 | Very much satisfied | Excellent | Very much proficient |
| 3.50 – 4.49 | Much satisfied | Above Average | Very proficient |
| 2.50 – 3.49 | Satisfied | Average | Proficient |
| 1.50 – 2.49 | Moderately satisfied | Below Average | Minimum knowledge |
| 0 – 1.49 | Not satisfied | Poor | No knowledge |

A descriptive statistic, particularly the mean, was used to represent the statistics course class satisfaction level, previous statistics course performance level, and basic computer literacy level. A qualitative description of the respondents' report on their experiences about the identified predictor variables was likewise provided. Results revealed that the statistics class satisfaction level (M=3.49) emerged as the predictor with the highest mean rating followed by previous performance in statistics course (M=2.92). Basic computer literacy level (M=2.71) had the lowest mean. As regards qualitative description, class satisfaction level was reported as 'satisfied', previous statistics course performance level as 'average', whereas basic literacy level was reported as 'proficient'.

**Table 2.** Correlation matrix of Academic Performance in Statistics Course and Basic Computer Literacy Level, Previous Performance in Statistics course and Statistics Course Satisfaction Level

| Variables | | SCSL | BCLL | PPSC | APS |
|---|---|---|---|---|---|
| SCSL | Pearson Correlation | 1 | 0.104 | 0.400** | 0.484** |
| | Sig. (2-tailed) | | 0.204 | 0.000 | 0.000 |
| BCLL | Pearson Correlation | 0.104 | 1 | 0.402** | 0.233** |
| | Sig. (2-tailed) | 0.204 | | 0.000 | 0.004 |
| PPSC | Pearson Correlation | 0.400** | 0.402** | 1 | 0.415** |
| | Sig. (2-tailed) | 0.000 | 0.000 | | 0.000 |
| APS | Pearson Correlation | 0.484** | 0.233** | 0.415** | 1 |
| | Sig. (2-tailed) | 0.000 | 0.004 | 0.000 | |

*Note: ** correlation is significant at the 0.01 level (2-tailed)*

Legend

SCSL - Statistics Class Satisfaction Level
BCLL - Basic Computer Literacy Level
PPSC - Previous Performance Statistics Course
APS - Academic Performance in Statistics

**Relationship Between the Dependent Variable and the Independent Variables**

Table 2 shows the correlation coefficient between academic performance in

Bivariate correlation analysis using Pearson Product-moment coefficient of correlation was pursued to determine the relationship between academic performance and the identified predictor variables. Results revealed significant relationship between academic performance and class satisfaction level ($r = 0.484$, $p<0.001$), previous performance in statistics ($r = 0.415$, $p<0.001$) and basic computer literacy level ($r = 0.233$, $p<0.001$). This validates the research hypothesis, stating that academic performance of students in statistics is related to their class statistics and class satisfaction level, previous academic performance in mathematics, and basic computer literacy level. The coefficients describe the strength of linear relationship between each pair of variables. [20]
satisfaction level, prior academic performance level and basic computer literacy level.

**Model for Predicting Academic Performance in Statistics Course**

Table 3 discloses the results of the analysis of variance (ANOVA), which indicate the statistical significance of the regression model. Table 4 also displays the model summary, including the R, R squared, and the adjusted R squared values. Lastly, Table 5 provides the estimated model coefficients for regression model

**Table 3.** ANOVA Results

| | Model | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 1856.530 | 3 | 618.843 | 21.322 | 0.000[b] |
| | Residual | 4295.541 | 148 | 29.024 | | |
| | Total | 6152.071 | 151 | | | |

a. Dependent Variable: APS

b. Predictors: (Constant), SCSL, BCLL, PPSC

**Table 4.** Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.549[a] | 0.302 | 0.288 | 5.38739 |

a. Predictors: (Constant), SCSL, BCLL, PPSC

**Table 5.** Coefficients Results

| | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| Model | | B | Std. Error | Beta | | |
| 1 | (Constant) | 76.208 | 0.437 | | 174.399 | 0.000 |
| | SCSL | 2.461 | 0.480 | 0.386 | -5.132 | 0.000 |
| | BCLL | 0.669 | 0.480 | 0.105 | 2.394 | 0.016 |
| | PPSC | 1.395 | 0.521 | 0.219 | 2.678 | 0.008 |

a. Dependent Variable: APS

Results of the multiple linear regression analysis conducted to predict academic performance in statistics based on the respondents' Statistics Class Satisfaction Level (SCSL), Basic Computer Literacy Level (BCLL), and Previous Performance in Statistics Course (PPSC) revealed a significant regression equation ($F(3,148) = 21.322, p < 0.001$), with an $R^2$ value of 0.302. Hence, the participants' predicted academic performance in statistics (APS) can be represented by the equation below;

$$APS = 1.395(PPSC) + 0.669(BCLL) + 2.461(SCSL) + 76.208$$

This means that an increase in one unit in PPSC results to an increase in the APS by 1.395 units holding the other independent variables constant. As regards prediction power of the each of the independent variables, it can be seen in Table 6 that basic computer literacy level (BCLL), previous performance in statistics course (PPSC) and statistics class satisfaction level (SCSL) were significant predictors of statistics course outcomes. In addition, among the three predictors, statistics class satisfaction level was found to the most potent predictor of academic achievement in statistics.

### 3.2 Discussion

This inquiry generally sought to determine the predictors of academic performance of postgraduate students in statistics at higher education institutions. It specifically aimed to: understand the perception of the respondents as regards their class satisfaction level, prior knowledge in mathematics level and basic computer literacy level; determine whether class satisfaction level, prior knowledge in mathematics level and basic computer literacy level is related to their academic performance; and determine the best regression model. With regards to the first specific objective, it was found that student-reported previous statistics course performance level had the highest mean rating while basic computer literacy level had the lowest mean. However, based on the qualitative description of the mean rating, it can be interpreted that the students had same level of experience with regards to their class satisfaction level, background knowledge in mathematics, and basic computer literacy. Understanding students' needs enables teachers to react, adjust and direct students towards a satisfying learning experience. More importantly understanding student satisfaction can help teachers identify areas that are exceeding expectations and which areas that are falling behind that need improvements. Regardless of year level, in general, the respondents of the study seem to be satisfied with their learning experience in statistics in the university. With this, it can be argued that postgraduate students taking statistics in the university are generally engaged with their studies and feel that they are part of the knowledge and skill-gaining process.

**With regards to the relationship between the dependent variable and the independent variables,** results revealed significant positive relationship between academic performance and class satisfaction level. This implies that students who reported high statistics class satisfaction rating, previous academic performance rating in statistics and basic computer literacy level were more likely to obtain high marks in statistics. This finding corroborates with the results of Martirosyan et al [9], Dhaqane & Afrah [10], and Kim [11]. However, this finding run contrary to that of Khan and Iqbal [21]. They argued that class satisfaction and class achievement were not significantly correlated. The linkage between class satisfaction and academic performance could be attributed to the fact that class satisfaction involves issues of perception and experiences of students on learning and teaching. [21] Furthermore, students' success or failure may depend on the following: their level of interest in course-related activities, passiveness towards tasks unless constantly encouraged by teachers and teacher-related factors that impacts negatively their self-esteem and future expectations. [22] Previous statistics class performance rating was likewise found to have a direct relationship with academic performance in postgraduate statistics, suggesting that students who possess great deal

of knowledge or adept on basic statistics concepts were more likely to obtain high academic performance in postgraduate statistics. This supports the argument that higher academic achievement rating can be attained by students with high prior knowledge than those with low prior knowledge. [13] This could be explained by the fact that when learning complex concepts, new experiences and ideas interact with existing knowledge to form understanding through cognitive adaptation. Moreover, it was discovered that performance in statistics was directly correlated with basic computer literacy suggesting that students who are adept at using computers are more likely to receive good grades. This conforms with the findings of Aitokhuehi & Ojogho [18], Gabejan & Takenaka [15], Simoes et al [17], and Schenker [23]. The capacity to use technology to navigate the ever-changing digital environment is known as computer literacy. It gives the users the information and abilities they need to use computers, software, and the internet. Students with computer literacy are better able to efficiently access opportunities, resources, and information. They can conduct research, engage in online groups, and communicate effectively thanks to it. Students may use technology to advance both personally and professionally if they know how to use it. Additionally, self-directed learning via online courses and interactive learning environments is made possible by computer literacy, opening new learning opportunities. Furthermore, given the increasing reliance on technology in the classroom, computer literacy might be necessary for students to interact with statistical software and resources in an efficient manner, which could improve their academic performance. As regards model predicting academic performance in statistics, the R squared value of 0.302 suggests that approximately 30.2% of the variance in students' academic performance in statistics can be explained by the model. This implies that the remaining 69.8% of the source of variance can be attributed to other factors other than the three factors. Although the predictors have a significant relationship with academic performance in statistics, the moderate effect size indicates that other factors, such as study habits, classroom amenities, personal motivation, and attitudes toward mathematics, should also be taken into account. The results of this study have important ramifications for educators, legislators, and other education stakeholders. The multiple linear regression analysis produces a robust regression model that provides insightful information about how to predict academic outcomes in statistics courses based on factors such as prior performance, computer proficiency, and satisfaction with learning. Notably, the finding that a one-unit increase in prior performance in statistics corresponds to a 1.395-unit increase in academic performance highlights the critical role of a strong foundational knowledge base for future success. Owing to this insight, educators can further emphasize the significance of continuous learning and skill improvement throughout their programs. Furthermore, the finding that a basic level of computer literacy is a major predictor highlights the increasing significance of technical abilities in modern education. To ensure that students can fully participate with the curriculum, educators should think about introducing support measures for students who might not have these necessary abilities.

Above all, the fact that the best indicator of students' academic success in statistics courses is how satisfied they are with their statistics classes emphasizes how vital it is to provide supportive learning environments. This insight suggests that motivation and student involvement are important factors that influence effective educational results. Therefore, to improve learning outcomes, educators should give top priority to approaches that raise student satisfaction and involvement in the classroom.

## 4. Conclusion

This study investigated the relationship between students' satisfaction with their statistics class, their performance in previous statistics courses, their basic computer literacy, and their academic achievement in statistics. The results showed that these factors play a significant role in helping students succeed in postgraduate statistics. Higher levels of satisfaction with the class are associated with increased motivation and engagement, which in turn can lead to improved academic performance. In addition, with the widespread reliance on technology in education, computer literacy may be essential for students to

effectively engage with statistical software and materials, potentially resulting in better performance. Moreover, prior academic performance is likewise essential as it may provide foundational knowledge and skills that are critical for success in advanced statistical analysis. With this, students should then be afforded with educational interventions to improve their satisfaction level. One of the approaches the college may adopt is to focus on the resources and tools in guiding these students to success. Concerning this, there is a need to foster a safe, conducive, and inclusive institution because an increase in student satisfaction is expected to occur when harmful actions are minimized, student support is strong, and a sense of well-being and belonging is promoted. As regards previous statistics course performance, students should be encouraged to activate their prior knowledge in statistical concepts through the use of anticipation guide. Students are surveyed through a series of statements to determine their perception of a particular topic. The purpose of the anticipation guide is for students to think about what they already know and identify what they do not know. Using anticipation guides as a strategy may increase interest and inquisitiveness about the succeeding lesson. However, while the multiple linear regression analysis revealed significant predictors of academic performance in statistics, it also highlighted the necessity for future research to examine additional variables that could contribute to a more comprehensive model of academic achievement in this field. Future studies could explore the influence of factors such as student motivation and engagement, diverse learning styles and strategies, as well as other contextual factors that may influence academic success in statistics.

## 5. Recommendations

Based on the study's findings, several key recommendations emerge to enhance students' academic performance in postgraduate statistics. Improving student satisfaction should be a priority, as it is closely linked to motivation and engagement. This can be achieved through student-centered teaching methods, relevant course content, supportive classroom environments, and strong institutional support services. Instructors should foster inclusive and safe learning spaces where students feel a sense of belonging, which is crucial for maintaining high levels of satisfaction and academic persistence.

In addition, equipping students with strong computer literacy skills is essential, given the increasing reliance on statistical software in postgraduate studies. Institutions should offer training sessions and ensure access to technological resources. To build on prior academic knowledge, instructional strategies like anticipation guides can be used to help students activate and assess their understanding before tackling new content. While the study identified satisfaction, prior performance, and computer literacy as significant predictors, future research should explore other factors such as motivation, learning styles, and contextual influences to develop a more comprehensive model of academic success in statistics.

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