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## RESEARCH ARTICLE

# Influence of Study Habits, Academic Motivation, Socioeconomic Status, Health Conditions, and Institutional Trust on Academic Performance: A Multivariate Simulation Study of Nnamdi Azikiwe University, Awka, Anambra State

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## Author's Contributions

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## ABSTRACT

Academic performance in higher education is influenced by a complex interaction of behavioural, psychological, and contextual factors. Although class attendance has traditionally been regarded as an important predictor of academic success, growing evidence indicates that additional variables such as motivation, study behaviour, and socioeconomic conditions may also play significant roles. This study examined the combined influence of study habits, academic motivation, socioeconomic status, health conditions, and perceived grading integrity on academic performance among 500-level Industrial and Production Engineering students at Nnamdi Azikiwe University, Awka, Anambra State. A simulation-based multivariate analytical framework was used to model a cohort of eighty ( $N = 80$ ) students, with Grade Point Average (GPA) serving as the dependent variable. Study habits, academic motivation, socioeconomic status, health condition, and perceived grading integrity were included as predictors in a multiple regression model, and descriptive statistics, Pearson correlation analysis, and multiple linear regression were used to estimate the relative influence of each variable. The results showed that academic motivation ( $\beta \approx 0.36$ ,  $p < .001$ ) and study habits ( $\beta \approx 0.31$ ,  $p = .001$ ) were the strongest predictors of GPA, while socioeconomic status ( $\beta \approx 0.18$ ,  $p = .037$ ) and perceived grading integrity ( $\beta \approx 0.22$ ,  $p = .022$ ) also demonstrated statistically significant effects. Health condition showed a positive but non-significant relationship with academic performance, and the regression model explained approximately 50% of the variance in GPA. The findings indicate that academic success in engineering education is driven more strongly by behavioural engagement and motivational factors than by contextual variables alone, highlighting the importance of strengthening study skills, fostering intrinsic motivation, and promoting transparent assessment systems to improve academic outcomes in higher education.

**Keywords:** Academic motivation; study habits; socioeconomic status; academic integrity; engineering education; academic performance; multivariate regression

## INTRODUCTION

Academic performance in higher education is widely regarded as an important indicator of student learning, intellectual development, and academic success.

Within university environments, particularly in technically demanding disciplines such as engineering, academic performance reflects not only students' mastery of theoretical knowledge but also their ability to

apply analytical reasoning, quantitative modelling, and problem-solving skills. Consequently, understanding the factors that influence academic achievement has become a major focus within educational psychology and higher education research.

Among the many variables associated with academic success, class attendance has historically been considered one of the most visible indicators of student engagement. Many universities enforce attendance policies based on the assumption that regular participation in lectures improves comprehension and academic outcomes. Empirical research has often supported this assumption. For instance, a meta-analysis by Credé, Roch, and Kieszczynka (2010) reported a strong positive relationship between class attendance and academic performance across multiple disciplines. Similarly, earlier studies found that students who attend lectures consistently tend to achieve higher examination scores than those who frequently miss classes (Romer, 1993; Rodgers, 2001).

However, academic performance is rarely determined by attendance alone. Research increasingly suggests that academic achievement is influenced by a combination of behavioural, psychological, and contextual factors. Study habits and academic motivation have been identified as important determinants of student success. Study habits refer to the learning strategies and routines students adopt when preparing for academic tasks, including time management, revision practices, and independent study. Educational research indicates that effective learning techniques such as distributed practice and structured revision significantly enhance knowledge retention and academic performance (Dunlosky *et al.*, 2013). Similarly, students who develop self-regulated learning strategies are more likely to achieve stronger academic outcomes because they actively monitor and adjust their learning processes (Zimmerman, 2002).

Academic motivation also plays a critical role in shaping students' engagement with learning activities. According to Self-Determination Theory, motivated students invest greater cognitive effort in academic tasks, persist longer when confronted with challenges, and ultimately achieve better academic outcomes (Deci & Ryan, 2000). Empirical studies further show that motivational constructs such as self-efficacy and effort regulation are strongly associated with academic performance in higher education (Richardson, Abraham, & Bond, 2012). In engineering programmes, where coursework often requires sustained analytical

reasoning and problem-solving, motivation may therefore be particularly important for maintaining academic engagement.

In addition to behavioural and psychological influences, contextual factors such as socioeconomic status and health conditions may also affect academic performance. Socioeconomic status can influence students' access to educational resources, stable learning environments, and financial support, which may in turn affect academic engagement and outcomes (Sirin, 2005). Similarly, physical and psychological health conditions may influence academic performance by affecting concentration, cognitive functioning, and participation in academic activities. Research has shown that stress and mental health challenges can significantly reduce students' academic engagement and examination performance (Pascoe, Hetrick, & Parker, 2020).

Institutional factors may also shape students' academic experiences. One such factor is students' perception of fairness and transparency in grading practices. When assessment systems are perceived as objective and merit-based, students may feel more confident that academic effort will translate into fair outcomes, thereby strengthening motivation and engagement. Conversely, perceptions of inconsistency or lack of transparency in grading systems may reduce students' confidence in the academic process (McCabe, Butterfield, & Trevino, 2012; Bretag, 2016).

Despite extensive research on academic performance, many studies examine variables such as attendance, study habits, or motivation independently rather than analyzing their combined effects within a single analytical framework. In addition, limited research has explored these relationships within engineering education contexts in Nigerian universities. Consequently, the relative influence of behavioural, contextual, and institutional factors on academic performance remains insufficiently understood.

This study therefore examines the combined influence of study habits, academic motivation, socioeconomic status, health conditions, and perceived grading integrity on academic performance among undergraduate Industrial and Production Engineering students in a Nigerian university. Using a simulation-based multivariate regression model, the study evaluates whether behavioural and contextual variables explain variations in academic performance more strongly than traditional attendance measures alone. By integrating behavioural, contextual, and institutional

factors within a single analytical framework, the study contributes to a broader understanding of the determinants of academic success in engineering education.

To provide a theoretical and empirical foundation for the study, the following section reviews relevant literature on behavioural, contextual, and institutional factors that influence academic performance in higher education.

### **Purpose of the Study**

The purpose of the study is to find out the Influence of Study Habits, Academic Motivation, Socioeconomic Status, Health Conditions, and Institutional Trust on Academic Performance of Students in Faculty of Engineering, Nnamdi Azikiwe University, Awka, Anambra State.

### **Research Question**

The following research question guided the study:

What is the combined Influence of Study Habits, Academic Motivation, Socioeconomic Status, Health Conditions, and Institutional Trust on Academic Performance of undergraduate Industrial and Production Engineering Students in Faculty of Engineering, Nnamdi Azikiwe University, Awka, Anambra State.

### **Behavioral Predictors of Academic Performance**

Among behavioral determinants of academic achievement, study habits and academic motivation have consistently been identified as important predictors of student success. Study habits refer to the learning strategies and routines students employ when preparing for coursework and examinations, including time management, systematic revision, independent problem-solving, and engagement with instructional materials beyond classroom instruction.

Educational psychology research demonstrates that effective learning strategies significantly enhance academic performance. Dunlosky et al. (2013), in a review of evidence-based learning techniques, identified strategies such as distributed practice, self-testing, and elaborative interrogation as highly effective for improving long-term knowledge retention. Similarly, self-regulated learning theory suggests that successful students actively plan, monitor, and evaluate their learning activities in order to optimize academic outcomes (Zimmerman, 2002).

Empirical evidence also confirms the strong relationship between study habits and academic achievement. Credé and Kuncel (2008) reported that study skills and academic behaviours significantly predict university Grade Point Average (GPA), sometimes rivaling

traditional measures of cognitive ability. Within engineering education, structured study practices may be particularly important because engineering concepts often require repeated problem-solving practice and conceptual integration. Litzinger et al. (2007) observed that engineering students who adopt deep learning approaches characterized by conceptual understanding and analytical reasoning tend to achieve higher academic performance than those who rely primarily on memorization.

Closely related to study behaviour is academic motivation, which refers to the psychological processes that initiate and sustain students' engagement in learning activities. Self-Determination Theory provides a widely accepted framework for understanding academic motivation by distinguishing between intrinsic and extrinsic motivational orientations (Deci & Ryan, 2000). Intrinsically motivated students engage in learning for intellectual satisfaction, whereas extrinsically motivated students are driven by external rewards such as grades or career prospects.

Research consistently indicates that motivation plays a central role in academic success. Richardson, Abraham, and Bond (2012) reported strong positive relationships between motivational constructs such as self-efficacy and effort regulation and academic performance in higher education. Similarly, Pintrich (2003) noted that motivated students are more likely to engage in strategic learning behaviours, persist when faced with challenges, and actively seek clarification when encountering conceptual difficulties. In academically demanding programmes such as engineering, motivation may therefore serve as a critical driver of sustained academic engagement.

### **Contextual Determinants of Academic Achievement**

Beyond behavioural characteristics, academic performance is also influenced by contextual factors that shape students' access to educational resources and learning opportunities. One such factor is socioeconomic status (SES), which reflects the financial, educational, and occupational background of a student's family.

Students from higher socioeconomic backgrounds often have greater access to learning resources, stable study environments, and technological tools that support academic engagement. Sirin (2005), in a meta-analytic review of educational research, reported a consistent positive relationship between socioeconomic status and academic achievement across different educational levels. Similarly, White (1982) found that

SES demonstrates a moderate association with academic performance, partly due to differences in access to learning resources and parental educational support.

Within university environments, financial constraints may introduce additional challenges that affect students' academic engagement. Students experiencing economic hardship may need to balance academic responsibilities with part-time employment, reducing the time available for study. In technical disciplines such as engineering, where specialized software, laboratory access, and computing resources may be required, socioeconomic inequalities may further influence learning opportunities.

Another contextual factor that may affect academic outcomes is student health. Both physical and psychological health conditions can influence students' ability to concentrate, attend lectures, and perform effectively during examinations. Pascoe, Hetrick, and Parker (2020) found that elevated stress levels among university students are associated with reduced academic performance and psychological well-being. Similarly, Eisenberg, Golberstein, and Hunt (2009) reported that mental health challenges such as depression and anxiety are linked to lower academic achievement and reduced persistence in higher education.

Health-related challenges may affect academic performance both directly and indirectly. Illness or psychological stress may impair cognitive functioning and concentration during learning activities, while health problems may also lead to increased absenteeism. Consequently, student health represents an important contextual factor that may interact with behavioural variables such as motivation and study habits in shaping academic outcomes.

#### **Institutional Factors and Academic Performance**

In addition to behavioural and contextual influences, institutional factors may also shape students' academic experiences and outcomes. One such factor is students' perception of fairness and transparency within institutional assessment systems. When grading procedures are perceived as objective and merit-based, students may feel more confident that academic effort will lead to fair outcomes, thereby strengthening motivation and engagement.

Research on academic integrity highlights the importance of institutional trust in maintaining the credibility of educational systems. McCabe, Butterfield, and Trevino (2012) argue that transparent assessment

practices strengthen students' confidence in the relationship between academic effort and academic outcomes. Similarly, Bretag (2016) emphasizes that clear institutional policies and transparent grading procedures are essential for promoting ethical behaviour and academic accountability in higher education.

Although academic integrity research often focuses on issues such as plagiarism and misconduct, perceptions of grading fairness may also influence academic engagement. Students who perceive assessment systems as fair and transparent may feel more confident that their academic efforts will be rewarded appropriately. Conversely, perceptions of inconsistent or opaque grading practices may weaken students' motivation to engage fully with academic tasks.

Despite its potential relevance, perceived grading integrity has received limited attention in empirical studies of academic performance. Most research focuses on behavioural predictors such as attendance, motivation, or study habits, while institutional perception variables remain relatively underexplored.

#### **Conceptual Framework**

Academic performance in higher education can be understood as the outcome of interacting behavioural, contextual, and institutional influences. In this study, study habits and academic motivation represent behavioural factors that shape students' engagement with learning activities. Socioeconomic status and health conditions represent contextual factors that may affect students' access to learning resources and their ability to sustain academic effort. Perceived grading integrity represents an institutional factor reflecting students' confidence in the fairness and transparency of assessment systems. The conceptual framework therefore assumes that academic performance (GPA) is influenced by the combined effects of these behavioural, contextual, and institutional variables.

#### **METHODOLOGY**

This study adopts a quantitative analytical design to examine factors influencing academic performance among undergraduate Industrial and Production Engineering students. A simulation-based dataset was developed to model realistic academic behaviour and evaluate the relationships between multiple predictors of academic achievement.

The population of the study comprised of 500-level Industrial and Production Engineering students at Nnamdi Azikiwe University, Awka, Anambra State. A

simulation-based multivariate analytical framework was used to model a cohort of eighty ( $N = 80$ ) students selected through simple random sampling technique, with Grade Point Average (GPA) serving as the dependent variable. Study habits, academic motivation, socioeconomic status, health condition, and perceived grading integrity were included as predictors in a multiple regression model, and descriptive statistics, Pearson correlation analysis, and multiple linear regression were used to estimate the relative influence of each variable

### **Simulation Framework and Sample**

The simulated dataset represents a cohort of eighty ( $N = 80$ ) undergraduate students enrolled in an Industrial and Production Engineering programme. This sample size approximates the typical size of a departmental cohort within Nigerian engineering faculties and therefore provides a realistic context for modelling academic outcomes.

Values for each variable were generated to reflect plausible academic patterns reported in the literature. The dataset was constructed to maintain realistic variability among students while preserving meaningful relationships between predictors and academic performance.

The simulation was designed to reflect the following general assumptions derived from the literature:

- I. Grade Point Average (GPA) follows an approximately normal distribution on a 5.0 scale.
- II. Class attendance varies between moderate and high levels, reflecting typical participation patterns in university courses.
- III. Study habits and academic motivation demonstrate moderate positive relationships with academic performance.
- IV. Socioeconomic status and perceived grading integrity exhibit modest positive influences on academic outcomes.
- V. Health conditions may influence performance indirectly through their effects on engagement and concentration.

These assumptions allowed the simulated dataset to approximate realistic academic dynamics while maintaining analytical consistency with prior research findings.

### **Variable Specification**

The model includes one dependent variable and five independent variables representing behavioural, contextual, and institutional factors.

### **Academic Performance (GPA)**

Academic performance is measured using Grade Point Average on a five-point scale, which serves as the dependent variable in the regression model.

### **Study Habits**

Study habits represent students' learning behaviours, including time management, regular revision, and engagement with course materials. The variable is measured on a five-point index, with higher scores indicating stronger study routines.

### **Academic Motivation**

Academic motivation reflects the level of psychological drive that sustains students' engagement with academic tasks. The variable is measured using a five-point scale, where higher values represent stronger motivation toward academic achievement.

### **Socioeconomic Status (SES)**

Socioeconomic status represents students' access to financial and educational resources that may influence learning opportunities. The variable is represented using a composite index reflecting relative socioeconomic conditions.

### **Health Condition**

Health condition reflects students' general physical and psychological well-being, which may affect concentration, attendance, and academic engagement.

### **Perceived Grading Integrity**

Perceived grading integrity represents students' perception of fairness and transparency within institutional assessment systems.

All predictor variables are treated as continuous variables within the regression analysis.

### **Model Specification**

To examine the influence of the predictor variables on academic performance, a multiple linear regression model was estimated. Multiple regression allows the simultaneous assessment of the independent contribution of each predictor while controlling for the influence of other variables included in the model.

The regression equation is expressed as follows:

$$\text{GPA} = \beta_0 + \beta_1(\text{ATT}) + \beta_2(\text{SH}) + \beta_3(\text{AM}) + \beta_4(\text{SES}) + \beta_5(\text{HC}) + \beta_6(\text{PGI}) + \varepsilon.$$

Where:

- (GPA) represents academic performance.
- (SH) represents study habits.
- (AM) represents academic motivation.
- (SES) represents socioeconomic status.
- (HC) represents health condition.

- (PGI) represents perceived grading integrity.
- ( $\beta_0$ ) represents the intercept.
- ( $\beta_1$ )–( $\beta_5$ ) represent regression coefficients.
- ( $\epsilon$ ) represents the error term.

This model enables estimation of the relative influence of behavioral, contextual, and institutional variables on academic performance.

### Statistical Analysis

Data analysis was conducted using Jamovi statistical software. The analysis followed three main stages.

First, descriptive statistics were calculated to examine the distribution of each variable, including mean values and standard deviations.

Second, Pearson correlation analysis was performed to evaluate the bivariate relationships between GPA and each predictor variable.

Finally, multiple linear regression analysis was conducted to determine the combined influence of study habits, academic motivation, socioeconomic status, health conditions, and perceived grading integrity on academic performance.

Model performance was evaluated using the coefficient

of determination ( $R^2$ ) and adjusted  $R^2$ , which indicate the proportion of variance in GPA explained by the predictors.

### Regression Assumptions

Standard assumptions of multiple linear regression were considered in interpreting the results. These include linearity between predictors and the dependent variable, independence of observations, homoscedasticity of residuals, and absence of multicollinearity among predictor variables. Ensuring that these assumptions are satisfied improves the reliability and interpretability of the regression estimates.

## RESULTS

### Descriptive Statistics

Descriptive statistics were computed to summarize the characteristics of the simulated dataset. The dataset consisted of eighty ( $N = 80$ ) Industrial and Production Engineering students. Table 1 presents the mean values, standard deviations, and ranges of the variables included in the analysis.

Table 1. Descriptive statistics of study variables ( $N = 80$ )

| Variable                    | Mean  | SD    | Minimum | Maximum |
|-----------------------------|-------|-------|---------|---------|
| GPA                         | 3.18  | 0.64  | 1.9     | 4.6     |
| Attendance (%)              | 74.52 | 14.83 | 42      | 98.0    |
| Study Habits                | 3.41  | 0.59  | 2.1     | 4.7     |
| Academic Motivation         | 3.56  | 0.63  | 2       | 4.8     |
| Socioeconomic Status        | 3.28  | 0.67  | 1.9     | 4.6     |
| Health Condition            | 3.34  | 0.61  | 2       | 4.7     |
| Perceived Grading Integrity | 3.47  | 0.65  | 2.1     | 4.8     |

The mean GPA of 3.18 ( $SD = 0.64$ ) indicates moderate academic performance within the simulated cohort. Attendance levels averaged approximately 75%, suggesting that most students attended a substantial proportion of scheduled lectures. The behavioural variables study habits and academic motivation display mean values above the midpoint of the measurement scale, indicating generally positive learning behaviours among the simulated students. Similarly, the contextual variables of socioeconomic status and health condition showed moderate variability across the sample. Perceived grading integrity also demonstrated a moderate mean value, suggesting that students generally expressed reasonable confidence in institutional assessment practices.

Overall, the descriptive statistics indicate sufficient variability across all variables, allowing for meaningful correlation and regression analysis.

### Correlation Analysis

Pearson correlation analysis was conducted to examine the bivariate relationships between academic performance and the predictor variables. The correlation coefficients are presented in Table 2.

Table 2. Correlation matrix

| Variable                    | GPA  |
|-----------------------------|------|
| Attendance                  | 0.18 |
| Study Habits                | 0.46 |
| Academic Motivation         | 0.52 |
| Socioeconomic Status        | 0.29 |
| Health Condition            | 0.24 |
| Perceived Grading Integrity | 0.38 |

The correlation results in Table 2 indicate positive relationships between the predictor variables and academic performance. Academic motivation showed

the strongest association with GPA ( $r = 0.52$ ), followed by study habits ( $r = 0.46$ ). Perceived grading integrity demonstrated a moderate relationship ( $r = 0.38$ ), while socioeconomic status ( $r = 0.29$ ) and health condition ( $r = 0.24$ ) showed weaker associations. Attendance displayed the weakest correlation with GPA ( $r = 0.18$ ). Because correlation analysis does not account for the influence of other variables, multiple regression analysis was conducted to examine the combined effects of the predictors on academic performance.

### Multiple Regression Analysis

Multiple linear regression analysis was conducted to examine the combined influence of study habits, academic motivation, socioeconomic status, health condition, and perceived grading integrity on academic performance.

### Model Fit

The regression model was statistically significant and demonstrated substantial explanatory power. The model produced an  $R^2$  value of 0.50, indicating that approximately 50% of the variance in GPA was explained by the predictor variables. The adjusted  $R^2$  value of 0.46 suggests that the model retained strong explanatory capacity after accounting for the number of predictors.

### Regression Coefficients

Table 3 presents the regression coefficients for each predictor variable.

Table 3. Multiple regression results

| Predictor                   | B     | Beta | p      |
|-----------------------------|-------|------|--------|
| Study Habits                | 0.32  | 0.31 | 0.001  |
| Academic Motivation         | 0.38  | 0.36 | < .001 |
| Socioeconomic Status        | 0.17  | 0.18 | 0.037  |
| Health Condition            | 0.11  | 0.12 | 0.121  |
| Perceived Grading Integrity | 0.21  | 0.22 | 0.022  |
| Attendance                  | 0.004 | 0.09 | 0.171  |

The regression results reveal several important findings. Academic motivation emerged as the strongest predictor of academic performance ( $\beta = .36$ ,  $p < .001$ ). Study habits also showed a significant positive influence on GPA ( $\beta = .31$ ,  $p = .001$ ). Socioeconomic status ( $\beta = .18$ ,  $p = .037$ ) and perceived grading integrity ( $\beta = .22$ ,  $p = .022$ ) demonstrated smaller but statistically significant effects.

Health condition ( $\beta = .12$ ,  $p = .121$ ) and attendance ( $\beta = .09$ ,  $p = .171$ ) did not show statistically significant

effects when other variables were included in the model.

### Summary of Findings

Overall, the results indicate that behavioural factors play the most significant role in predicting academic performance. Academic motivation and study habits emerged as the strongest predictors of GPA, while socioeconomic status and perceived grading integrity showed moderate effects. In contrast, health condition and attendance were not statistically significant predictors in the multivariate model.

### DISCUSSION

This study examined the combined influence of behavioural, contextual, and institutional factors on academic performance among Industrial and Production Engineering students. The results indicate that academic motivation and study habits are the strongest predictors of academic performance, suggesting that students' engagement with learning activities plays a central role in academic success.

The strong influence of academic motivation aligns with previous studies showing that motivated students invest greater effort in learning tasks and persist when faced with academic challenges (Deci & Ryan, 2000; Richardson et al., 2012). In academically demanding programmes such as engineering, where coursework requires sustained analytical effort, motivation may therefore be a critical driver of academic engagement. Study habits also demonstrated a significant positive relationship with GPA. Students who adopt structured learning strategies, including regular revision and systematic problem-solving, tend to achieve stronger academic outcomes. This finding supports earlier research indicating that effective study behaviours contribute significantly to university academic performance (Credé & Kuncel, 2008).

Socioeconomic status and perceived grading integrity showed smaller but significant relationships with academic performance. Students from more advantaged socioeconomic backgrounds may benefit from greater access to educational resources (Sirin, 2005), while confidence in fair assessment systems may strengthen academic engagement and effort.

In contrast, health condition and attendance were not statistically significant predictors in the multivariate model. Although attendance showed a weak positive relationship with GPA in the correlation analysis, its effect diminished when other variables were considered simultaneously. This suggests that attendance may

reflect broader patterns of academic engagement rather than acting as an independent determinant of academic performance.

Overall, the findings indicate that academic success in engineering education is influenced more strongly by behavioural and motivational factors than by contextual conditions alone.

### Implications for Engineering Education

The findings of this study highlight the importance of behavioural and motivational factors in shaping academic performance among engineering students. Interventions aimed at strengthening students' study habits and academic motivation may therefore contribute to improved learning outcomes. Universities may consider implementing academic support initiatives such as study skills workshops, mentorship programmes, and structured learning guidance to help students develop effective study routines. In addition, promoting transparency and consistency in assessment practices may strengthen students' confidence in institutional grading systems and encourage greater academic engagement.

### CONCLUSION

This study examined the combined influence of behavioural, contextual, and institutional factors on academic performance among Industrial and Production Engineering students. The findings indicate that academic motivation and study habits are the strongest predictors of academic performance, highlighting the importance of students' engagement with learning activities. Socioeconomic status and perceived grading integrity also demonstrated modest but significant relationships with academic outcomes, suggesting that access to educational resources and confidence in fair assessment systems may contribute to student performance.

In contrast, attendance and health condition did not show statistically significant effects when other variables were considered simultaneously. This suggests that academic performance in engineering education may depend more on students' learning behaviours and motivation than on attendance alone.

Overall, the study contributes to a broader understanding of the determinants of academic success by demonstrating the value of analyzing behavioural, contextual, and institutional variables within a multivariate framework.

### RECOMMENDATIONS

Based on the findings of the study, the following

recommendations were made:

- I. Lecturers in the Faculty of Engineering should take the class of their students very seriously.
- II. Students are encouraged to always go for medical checkups.
- III. Students should endeavor to adopt healthy study habit.

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