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Connecting the Dots: Multivariate Analysis of the Link between Lecture Attendance, Reading Time, and Student Success

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ABSTRACT

This study, "Connecting the Dots: Multivariate Analysis on the links between lecture attendance, reading time, resource materials utilization and student success," investigates the interplay between critical academic factors and their combined impact on tertiary students' performance. A cross-sectional survey was conducted using probability sampling techniques in picking four out of six faculties in the Southern Delta University, Ozoro, Nigeria. Four hundred students were chosen into the study from 200 and 300 levels, and structured questionnaire was employed in data collection on personal interviews. Multivariate analysis was carried out using SPSS (version 26) to examine the relationship and connectivity between lecture attendance, reading time, reference material utilization, and grade point average respectively. Findings indicate strong positive correlation (R = 0.728, p<0.05) between lecture attendance and academic performance. While a higher correlation (R-value of 0.748, p=0.000) among students who regularly attend lectures and success was observed. Findings also show a positive relationship between frequency of lectures' attendance and academic performance (R=.601, p-value =0.000), indicating this variable is statistically significant. Similarly, students who dedicated more hours to reading outside of classroom show better academic outcomes (R-value of 0.355, p=0.000), and those with less hours in reading recorded lower success (R = 0.315, p=0.000) level. Equally, the study noted an optimal range of 2-3 hours of self-study among the students. Hence, individual student should identify his/her optimal study hours capability and adhere to it for maximum comprehension, assimilation and retention. Stakeholders in educational sector should provide solutions to factors causing absenteeism in the class.

Keywords: Connecting the Dots, Education, GPAs, Lecture Attendance, Reading Time.

INTRODUCTION

Achieving academic success is one of the primary goals of tertiary education, yet understanding the factors that contribute to student performance remains an ongoing challenge for students, educators and researchers alike [1-2]. While previous studies have identified a range of influencers which including socio-economic status, teaching quality, and learning environments, two factors that consistently stand out in the literature are lecture attendance, and reading time (Romer, D. 1993) [3-4]. Notwithstanding, these two factors are not sufficient

enough to achieving better results without complementing them with other related factors. Lecture attendance, study hour after school and utilization of resource materials [5-6] will make meaning in the minds of students when they are sensitized and educated about what it entails to achieve academic success. Another factor that inhibits learning is lack of right mindset, and ideation (self-belief) [7-8] that they can make it and be determined to go for success.

In developing countries like Nigeria, Ghana, Cameroon, Gambia, Tanzania, Uganda, etc., there are many factors that easily derailed students from attending lectures as at when due. Poverty, unemployment, underemployed and finance are major bottlenecks in educational attainment in the developing countries [9-12]. Parents sent their children to school half-prepared, no adequate food stuff, small stipend for a semester, and no further plan to visit their wards to check on how they are faring, hence, such students plagued with these challenges are easily distracted in the course of studies [13]. For example, when a student has not taken breakfast before leaving the house and possibly there was no possibility of having something to eat during lunch period as result of socio-economic challenges, lack of community support and financial crisis at home [14-16], it would be difficult for a student passing through this ordeal to regularly attend lectures and take good notes. Why? It is because their attention would be divided and this leads to absent mindedness in the class. Poverty-stricken, unemployment or under-employed parents (17-19] might not be able to adequately provide all the basic needs that the student will take to school. Hence, community support and government in developing countries have roles to play in educating their citizenry by providing necessary support, free education [2-3, 20-21] to certain level or subsidize the higher institution fees and provision of meals as it was in Nigeria back in the early 80s. These aids to students will reduce too much burden and enhance the development of right mindset and attend lectures as at when due. Lecture attendance provides students with direct engagement with course materials and instructors promoting comprehension and participation [22-23]. Reading time, which reflects independent learning and preparation outside the classroom reinforces learning and deepens understanding for mastering complex topics and achieving academic excellence, opined by Nonis, S.A., & Hudson, G.I. (2010) [24]; while reference materials, such as textbooks, journal articles, dailies or online resources, serve as valuable tools to bridge knowledge gaps. These could be possible if every student in higher institutions can boast of what to eat at the end of the class or during break period.

Background of the Study

Educational institutions often emphasized the importance of both regular class attendance and independent study as cornerstones to academic success. Lecture attendance ensures that students are exposed to in-depth explanations, discussions, interactions and give room for students to ask questions which invariably deepen their understanding of the course content. Reading and study habits [25-26] are necessary for reinforcing and expanding on this knowledge. However, despite the acknowledged importance of these activities, attendance rates, study habits, and use of reference materials vary widely among students, and their impact on academic performance is not always straightforward. Some students may excel academically with minimal lecture attendance but with extensive self-directed study [27], while others may benefit more from regular attendance complemented by moderate reading time and use of other resource materials [28-29]. There is a belief that consistent lecture attendance and adequate reading time are essential for academic success, but the precise

impact of these factors on educational performance remains insufficiently explored [30]. Students in higher institutions face declining attendance rates and varying levels of student engagement, leading to concerns about the root-causes of poor academic performance. Without gainsaying, while students are encouraged to dedicate ample time to reading and studying outside of lectures, the link between this self-directed learning, lecture attendance, group study, resource materials utilizations and academic achievement has not been rigorously quantified. This study aims to "connect the dots" by examining how lecture attendance, reading time independently, group study, and utilization of resource materials jointly affect educational performance, with the view to providing empirical evidence that can inform educational policy, practice and ultimately enhance student learning experiences, support services and outcomes.

Objectives of the Study

The objectives of this study are to:

1. assess the correlation between lecture attendance and academic performance among tertiary students
2. evaluate the impact of reading time on academic success
3. investigate the combined effect of lecture attendance, reading time and use of resource materials on students' overall educational performance and
4. develop data-driven recommendations for academic support services

Significance of the Study

This research is significant for several reasons. First, it provides a data-driven analysis of factors that directly impact academic performance, contributing to the broader understanding of student success determinants in tertiary education [31]. The findings show more insight to stakeholders, educators, and administrators to better understand the role of lecture attendance, reading time and resource materials usage [32-34], enabling them to design strategies that encourage student engagement both in and out of the classroom. Findings benefit students by highlighting the importance of balancing attendance with self-directed learning, engaging in group study, and regular use of library, and reference materials, thereby helping them to optimize their academic outcomes.

Limitations: The study limitations include time constraint and financial resources.

LITERATURE REVIEW

Oti Eric U, Olusola Michael O., Alvan Wariebi K., Areh Onome C. (2023) conducted a study on the effects of effective reading on students' performance [5-6, 35]. Their findings show a significant positive linear relationship between the number of hours student spent reading over weekends and their grade point average (GPA) [36]. Hence, the study concluded that increased reading time is associated with higher academic performance.

Gebru, H.T., and Verstegen, D. (2023), in assessing the predictors of students' academic performance in Ethiopia in a "New Medical Schools" found out that stress negatively impacted academic performance with (Adjusted B= -2.218, 95% CI: -3.734 to -0.702) [37]. Students with prior education in health sciences outperformed those with other backgrounds (Adjusted B= -6.089, 95% CI: -8.103 TO -4.076). Higher cumulative grade point average (CGPA) in prior education correlated with better performance (Adjusted B= 5.976, 95% CI: 2.909 to 9.044). Higher entrance examination scores were associated with improved performance (Adjusted B=

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0.201, 95% CI: 0.067 to 0.336). The model fit recorded R-Squared value of 0.71 and F-test had 6.56, $p<0.001$.

Another study findings of the effects of class attendance on academic performance: evidence from synchronous courses during COVID-19 (2024) indicated a one standard deviation increase in class attendance that led to a 0.08 standard deviation increase in academic performance. The positive effect of attendance was more pronounced among lower-performing students and in smaller classes [37].

In the same vein, an "Intelligent Analytic Framework for Predicting Students' Academic Performance Using Multiple Linear Regression and Random Forest (2024)" utilized to analyzed data on attendance and socio-economic background. Reading Frequently outperformed MLR in predictive accuracy, demonstrating lower error rates and higher R- Squared scores [38].

The meta-analysis conducted by Crede, M., Roch, S.G., & Kieszczynka, U.M. (2010) examined over 28 studies and found a strong positive relationship between class attendance and academic performance [38]. According to the investigators, the more students attended lectures, the higher their grades tended to be [39]. Attendance was also linked to other variables like motivation and study habits [40]. The study didn't look deeply into the role of independent study (e.g., reading time). However, their recommendation included examination of how reading time complements attendance in achieving better academic outcomes.

Romer's study found that a significant number of students did not attend lectures regularly, and those who did attend less frequently tend to perform worse academically [41]. The study observed that lecture attendance was often more beneficial for students in quantitative or technical courses than for those in more theoretical fields (Romer, D. (1993) [42]. However, the investigator did not focus on how self-study or reading time might mitigate the negative effects of poor attendance; notwithstanding, he recommended that institutions should take attendance more seriously, implementing measures to boost attendance [43]. He also suggested that future studies should examine other forms of academic engagement, such as reading and self-study, alongside attendance [44-45].

The study effects of attendance on academic performance using panel data evidence for introductory microeconomics, provided empirical result that regular attendance had a significant positive effect on students' academic performance in an introductory microeconomics course. Stanca recommended that while lecture attendance should be encouraged, more personalized interventions are needed for students who struggle academically. Future research should focus on other forms of learning, such as independent reading, and how it interacts with lecture attendance, Stanca, L. (2006) [46].

Marburger, D.R. (2001) conducted research on absenteeism and undergraduate examination performance and found out a clear negative relationship between absenteeism and examination performance among undergraduate students in economics courses. His study suggested that skipping classes directly contributed to lower grades [47], regardless of the subject matter. The study was limited in scope to economics students, leaving gaps in understanding whether the same effects would have been seen in other fields. It also did not

explore whether students who skipped classes but engaged in reading time or other study activities could compensate for their absences [48].

Nonis, S.A., & Hudson, G.I. (2010) in their study explored the effects of various factors, including study time, on students' academic performance [49]. It found that study time had a significant positive effect, especially for students who were already moderately engaged in their courses. The quality of study time was found to be more important than the quantity. While the study considered self-study, it did not explicitly differentiate between reading time and other forms of academic engagement (e.g., group study or assignments). Additionally, it did not analyze how study time interacts with lecture attendance. However, the study recommended that students be encouraged to focus on the quality of their study time rather than just quantity. Future research should explore the relationship between reading time and lecture attendance to see how these factors jointly affect academic performance. Schuman et al. (1985) recommended that institutions should focus on fostering both effort and quality in learning activities [50]. The researcher also called for more studies to examine how specific academic activities like reading and attendance combine to influence grades [51].

Each of these studies highlights the importance of lecture attendance and study habits like reading time in influencing academic performance [5-6, 52], but gaps remain in understanding how these factors interact and vary across disciplines [53].

RESEARCH METHODOLOGY

Study Design

The study adopted a cross-sectional study design, which is suitable for collecting data at a single point in time to exploring the interplay and links between lecture attendance, reading time, resource materials utilization, and academic performance in tertiary institution. This design was chosen for its efficiency in gathering a broad range of data from diverse populations within a constrained timeframe and budget. The study focused on capturing variations in connecting the “Dots” on the study among the students to ensure a comprehensive understanding of the research topic.

Study Population

The study applies stratified sampling (equal allocation) and simple random sampling method to select faculties and ensure adequate representation of students from the randomly selected four out of six faculties in the institution on August 2024. Five departments were chosen from each faculty to form Strata, out which a sample of 400 students were randomly drawn from twenty departments of the tertiary institution into the sample. This means a minimum of 20 students were drawn from each stratum called department. A rule of thumb was used to determine the sample size. This sample size ensures results are representative with a ±5% margin of error and a 95% confidence level.

Table 1: The distribution of sample size in the faculty

Faculty	No. of Department	Sample Size	Response Rate
Administration	5	100	100
Engineering	5	100	97
Environmental Management	5	100	100
Science	5	100	100

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Agriculture	Not Included		
Computing	"		
Total	20	400	397 (99.25%)

Data Collection

Interviewers were trained on the act of conducting interviews among the students. Data were collected using a structured questionnaire that was pretested in the faculty that was not included in the sample to ensure reliability and validity. The result of the pretest was used to fine-tune the questionnaire. The questionnaire covered key themes such as lectures attendance, reading habits, use of resource materials, attending tutorial, perceptions, taking complete notes during lecture period and engaging in active participation in the class. Personal interview technique was used to elicit information from the respondents. Research ethics were strictly adhered to and none of the respondents were coerced to participate in the study.

Data Analysis

Data were analyzed using SPSS statistical software version 26.0. Descriptive statistics were used to summarize demographic and study responses. Inferential statistics (e.g., multivariate regression analysis) was applied to explore relationships between variables. Confidence intervals were set at 95%, and statistical significance was determined at α = 0.05. Regression analysis helps the researchers to examine the relationship between the dependent variable and independent variables. The regression linear model was written as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_n X_n + e$$

where,

- Y = Outcomes (Explained Variables)
- β_0 = Intercept (constant)
- $\beta_1 + \beta_2 + \beta_3 + \ldots\ldots\ldots + \beta_n$ = Coefficient for each variable
- $X_1 \setminus X_2 \setminus \ldots, X_n$ = Values of each independent variables (Predicted Variables)
- ε = Error term

$$Performance = \beta_0 + \beta_1(Lectureattendance) + \beta_2(\mathrm{Re}\,adingtime) + \beta_3(Useresourcematerials) + \varepsilon$$

The model examines the interplay between lecture attendance, reading time and use of resource materials as it impacts on academic performance among tertiary students.

- Y= Academic Performance (Explained Variable)
- X1 = Lecture Attendance
- X2 = Reading Time
- X3 = Use of Resources Materials
- ε = Random Errors

ANALYSIS AND RESULTS

The percentage gender distribution of the surveyed students per faculty is shown in the chart below. The ratio of females to males interviewed was 47:53. The faculty of environmental and management has more females interviewed than male counterparts [54]; while other three

faculties (Administration, Engineering and Science) have more males than females [55] in the study.

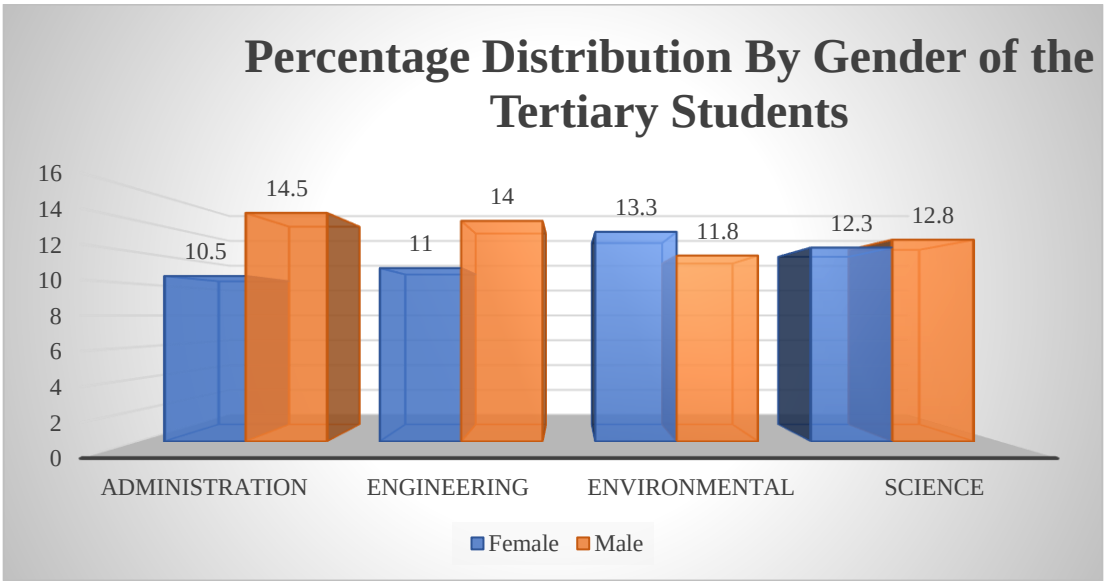

Figure 1: Gender distribution per faculty

The study findings indicated a strong positive relationship between having good grade, regular lecture attendance and reading time [55-57] among the tertiary institution students. This relationship can be viewed in two major dimensions: individual relationship with academic performance and combined effects on academic performance [58-59].

Table 2: Pearson Correlation of the Indicator

Indicator	Correlation (R)	p-value
Lecture Attendance	.728	0.000
Regular Lecture Attendance	.748	0.000
Less Hour (30 minutes-1 hour) of Reading	.315	0.000
High Reading Time (2-3 Hours)	.355	0.000

All the indicators' correlation are significant at the 0.01 level (2-tailed)

Lecture Attendance and Academic Performance

Findings indicate strong positive correlation ($R = 0.728$, $p<0.05$) between lecture attendance and academic performance [5-6, 60]. However, a higher correlation (R-value of 0.748, p=0.000) among students who regularly attended lectures and academic performance was observed; indicating stronger positive relationship between regular lectures attendance and success. This means, the more regular students attended lectures, the higher the likelihood of achieving better results [61].

Frequency of Lecture Attendance and Academic Performance

The frequency of attending lectures plays a significant role in deciding student academic success. Findings show a positive relationship between frequency of lectures' attendance and academic performance (R=.601, p-value =0.000) [62], indicating this variable is statistically

significant. Nevertheless, those students that were absent or skipped lectures attributed far distance from their homes, high cost of transportation and inadequate finances [63-65] to be the reasons for their actions.

Perceptions about Lecture Attendance and Academic Success

In terms of perceptions from the open-ended questions' analysis about lecture attendance and academic success, the beliefs system of the students reveal positive impact on their academic performance, but unavoidable circumstances beyond their power lead to occasional skipping of lectures. When they were asked about the circumstances that warrant their absenteeism or skipping of lectures, responses include poverty, lack of financial empowerment, far distance to lecture halls, uninteresting lectures and unfriendly attitudes of some of the lecturers [66-69]. Virtually, all the students opined that all lectures are beneficial depending on the modality of presentation by the lecturers [70]. They said, the most difficult lectures can still be made simple by the lecturers and this can lead to easy comprehension and assimilation.

Reading Time and Academic Performance

The "reading time" and "academic performance" can be considered as function of the quality time students invest in reading outside the class. According to the findings, the less hours ((30 minutes -1 hours) spent on reading outside the classroom, the lower the academic performance as revealed in correlation (R = 0.315, p=0.000) level (2-tailed) [72]. While the more quality time (2-3 hours) spent on self-study, the higher the correlation R-value of 0.355, p=0.000 [73]. It is statistically significant which invariably, leads to better academic performance. Notwithstanding, it's a slightly weak positive correlation which suggests that reading time has a modest relationship with academic performance [74]. The reading time is positively significant, nevertheless, it doesn't appear as strongly influential as lecture attendance.

Model Summary of Lecture Attendance and Reading Time

The regular lecture attendance is important for academic success which has R=0.841. But when reading hours between 2-3 hours was added, there was appreciation in the correlation of R =0.852, and p-value=0.000. This indicated the relationship between regular lecture attendance and quality reading time are both correlated [75].

According to the students, attending lectures helped them to reduce the amount of time needed to study independently. Hence, many of the students felt that if they can attend lectures regularly coupled with little time to revise or read their books [76-77], would be enough for them to pass their examination. However, some of them said putting more hours in reading [78] would be beneficial to achieving greater academic performance without stress or begging for marks. Over half of the students claimed on average, they spent between 5 to 10 hours in reading and studying outside of lectures each week [79]. While other said they spent 12 to 18 hours uninterrupted in a week [80].

Utilization of resource materials have their roles to play in achieving success among students in the tertiary institutions. Reference materials complement what the lecturers taught in class and through the materials utilization, more knowledge is gained and new ideas are acquired [81-82] that enhance the academic performance of the students. Knowledge is dynamic and has no end, therefore, the more students read, the better performance outcomes and the more knowledgeable the students are.

Effects of Regular Lectures Attendance and Hours of Studying

The study examined the combined effects of "Lecture Attendance" and "Reading Time" on "Academic Performance". The resultant effects produced an R-value close to that of lecture attendance alone [83]. However, this combined model remains significant at (p = 0.000), indicating the combination of the variables that explained a significant portion of the variance in academic performance [84]. Nonetheless, lecture attendance has comparative advantage and is stronger predictor that reading time [85] that only adds a small amount of meaningful explanatory power and positive outcomes. The joint effect of reading time and lecture attendance on academic performance, provided a more vivid understanding of how independent study complements classroom engagement in tertiary institution among the students. The correlation (R=.671, p=0.000) reveals the relationship between regular attendance in lectures and academic performance, while the joint effects on regular attendance in lectures and reading time outside school class show a higher relationship value of R=.675 and p<0.05) [86-88]; indicating upward movement and statistically significant with grade point average (GPA) [89]. The lesson from the study is that dedication of additional time to reading outside lectures period is equally important and useful because these variables indicate an essential aspect of study habits linked to improved academic outcomes. The study finding is in consonant with M.M. van den Hurk, H. Wolfhagen and C.V.D. van den Vleuten (1998) that opined that time spent on individual study correlates poorly with scores on the test measuring short- and long-term knowledge [90]. Notwithstanding, judicious utilization of quality study time would enhance students' performance [91], provided such students are not distracted. Students who have identified their optimal study hours and adhered to it have comparative advantage of assimilation and retention over the students who reads without knowing the time diminishing returns set in [92].

Application of Multiple Linear Regression Analysis

Use of Resource Materials:

To assess the impact of explanatory variables over the response variable (dependent), the multiple regression model adopted step-wise approach through gradual adding of predictors in each model to observe how the relationship with grade point average (GPA) changes. The step-wise results revealed that the combination of the five predictors – "use of library, access to internet, resources utilized to support learning, attend lectures regularly and belief that regular attendance is important" [93-97] are the most robust, comprehensive and significantly influenced GPA among the students in the tertiary institution. The model explained a significant 76.3% of the variation in GPA [98]. Each added variable improved the model's ability to predict GPA, although the amount of improvement decreased as more predictors were added. The most significant increases in R-Squared were seen when "access to internet" and "resources utilized to support learning" [99] were added, alongside with "regular attendance is important" contributed meaningfully to the model. The Adjusted R2 indicates that the model generalizes well, and the low standard error shows that the model's predictions are accurate [100].

Table 3: Relationship between Higher Grade, Lecture Attendance, Reading Time and Reference Materials Usage

Model	Model	R	p-value
1	(Constant), Use of Library	.824	0.000
2	Use of Library + Access to Internet	.853	0.000

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3	Use of Library +Access to Internet + Resources Utilized to Support Learning outside of Lectures	.862	0.000
4	Use of Library +Access to Internet +Resources Utilized to Support Learning outside of Lectures + Regular Lectures Attendance	.867	0.000
5	Use of Library +Access to Internet + Resources Utilized to Support Learning outside of Lectures + Regular Attendance in Lectures is important for Academic Success	.873	0.000
Dependent Variable: Grade Point Average (GPA)			

Source: Fieldwork in the tertiary institution in August 2024

The modeling for connecting the dots is explained below:

In model one, the correlation coefficient (R) value 0.824, indicated a strong positive relationship between "Use of Library" and "GPA". The p -value= 0.000 suggested the relationship is statistically significant at 1% significance level ($p < 0.01$) [101]. Therefore, regular use of the library correlated with higher GPA scores [102]. When "access to internet" was added to the use of library, we observed further strengthened of the relationship ($R = 0.853$) between the predictors and GPA with $p = 0.000$ which means, the relationship remains highly significant [103]. Both "use of library" and "access to internet" are strong significant predictors of GPA. The increased in R value from 0.824 to 0.853 suggested that access to internet provided additional explanatory power, enhancing the model [104].

Adding resources utilized to support learning (e.g., online materials, study guides), a slightly increased of R value to 0.862, p=0.000 was observed. This model also remained statistically significant. This model suggested that, in addition to use of library and access to internet, resources utilized for learning [105] also positively contributed to GPA. This factor explained additional variance in GPA, albeit with a marginal increased in R value. It was also observed, by adding "regular attendance in lectures to the previous variables, slightly increased R= 0.867 value with $p = 0.000$ showing the model is important [106]. Regular lecture attendance adds further predictive power to the model, suggesting that students who attended lectures consistently tended to have higher GPAs. This predictor appeared to positively influenced academic performance alongside the other factors.

Finally, in the fifth model analysis, the real link and interplay between the explanatory variables and the response variable were observed. This was clearly seen when the perception that "regular attendance is important for academic success" was added, there was a slightly improvement in the model's R value of 0.873 with $p = 0.000$. The model remains statistically significant. This final model suggests in addition to the practical behaviors (e.g., library use, internet access, and lecture attendance), a belief in the importance of regular attendance in class is positively associated with better GPA outcomes [107]. This mindset [108] played a pivot role in motivating students to engage more in the utilization of learning resources, invariably, enhanced the academic performance.

Durbin-Watson Test:

In order to test whether there is autocorrelation in the residuals, we conducted Durbin-Watson test which is considered the most popular method of detecting autocorrelation. And this is valid only if the following conditions are satisfied:

(i) The data is the time series type,
(ii) Autocorrelation is of first order
(iii) There is a constant term in the regression.

We defined Durbin Watson Statistic as:

$$d = \sum_{i=1}^{n} (U - U_{t-1})^2 / \sum_{i=1}^{n} U_t^2$$

$$d = \sum_{i=1}^{n} U_i^2 + \sum_{i=1}^{n} U_{t-1}^2 - 2\sum_{i=1}^{n} U_t U_{t-1}^2 / \sum_{i=1}^{n} U_t^2$$

$$n \to \infty, t-1 \to t \text{ and } \sum_{i=1}^{n} U_t^2 \to \sum U_{t-1}^2$$

The findings revealed that Durbin-Watson has a value of 2.009. This value is close to 2, indicating that there is likely no significant autocorrelation in the residuals [109]. This is ideal, as it suggests the residuals are independent and the model's predictions are reliable without time-related autocorrelation effects [110].

Non-linear Effect of Studying with Lecture Attendance:
The inclusion of "Hours of Studying Squared" allows us to examine whether the relationship between study time and academic performance increases at a decreasing rate or even reverses at very high levels. The combination of lecture attendance with hours of studying squared yields a slightly higher correlation (R = 0.675) with academic performance compared to using lecture attendance alone [111]. This result suggested that there is a non-linear (curvilinear) relationship between study hours and performance, meaning that studying for extremely long hours may have diminishing returns. The p-value (0.042) indicates that the effect is statistically significant, but not as strong as some of the other combinations, like "group study" [112]. This shows that the relationship between study time and performance, when considered in a non-linear way, is valid but more nuanced.

Optimal Study Time:
The researchers were curious about the maximum time a student can spend outside classroom for reading to complement lecture attendance and utilization of resource materials. In attempt to find solution to this, a quadratic (squared) analysis was conducted with the belief of unveiling hidden result. The quadratic analysis actually suggested the optimal range of 2-3 study hours [113] is where academic performance improves effectively with additional study. However, after this threshold of 2-3 hours, additional study hours might not continue to boost performance [114] for most students, and may even slightly reduce the efficiency and efficacy of learning due to factors like burnout, fatigue, or diminishing concentration [115].

Implications for Lecture Attendance:
Since lecture attendance remains a positive and linear predictor, combining it with a non-linear study time suggests that students benefit most from attending lectures and balancing their study hours [114]. Lecture attendance consistently supports learning, while study time only

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supports attending class within an optimal threshold range. The study scaling of time started from "Less than 1 hour", "1-2 hours", "2-3 hours", "3-4 hours", and "5 and above hours" per day. The study time which was common among students during reading time was 2-3 hours for most students, while few ones claimed 3-4 hours would be their threshold. This means students whose reading capability is less, read between 2 or 3 hours max, and called it a day. But those students whose GPAs are very high spent nothing less than 4 hours of serious reading outside the classroom on daily basis.

Attitude in Class:

Attitude of students toward educational attainment is a function of the mindset the students have developed. If the students possess right mindset, their attitude in the lecture hall will be great and such students will actively participate, takes notes and listen attentively, as well asked questions to clarifies any area that seems unclear to them in the class. Findings revealed strong positive correlation between obtaining high grade and attitude a student puts on during class lectures [115]. Multiple regression analysis revealed that when a student asked question, plus active participation, have completes notes, and sit closer to the front, record higher grade in the examination. Hence, having right mindset and willingness to learn, without distractions during lectures in the class enhance better academic performance.

Table 4: Attitude of Students in the Class

Model	Description of Model	R	Sig. F Change
1	Predictors (Constant), Ask questions	0.560	0.000
2	Ask question, Active participation	0.617	0.000
3	Ask question, Active participation, Have Complete Notes	0.629	0.002
4	Ask question, Active participation, Have Complete Notes, Sit Closer to the front	0.642	0.001
Dependent Variable: GPA			

Model 1 revealed correlation coefficient (R=.560), indicating a positive relationship between "asks questions in Class" and "GPA" [116]. The p -value= 0.000 suggests the relationship is statistically significant at the 1% significance level ($p < 0.01$). Therefore, asking questions in class is significantly associated with higher GPA scores.

By the time "active participation" was added to the first behaviour indicator asking questions in class, we observed further strengthened of the relationship of R = 0.617 between the predictors and GPA with p = 0.000. This means, the relationship remains above average significantly. Both "asks questions" and "active participation" are strong, and significant predictors of GPA [117]. The increased in R value from 0.560 to 0.617 suggested that active participation provided additional explanatory power, enhancing the model.

Combining "complete notes" to asks question and active participation in model 3, a slightly increase R value to 0.629, p = 0.002 was recorded; which remained statistically significant. This model suggests that, in addition to asks questions and active participation, having "complete notes" by a student also positively contributes to GPA. This factor explains additional variance in GPA, with a marginal increase in R.

By adding "sitting closer to the front while class is in session", an improvement in the model's R value (R = 0.642) with p = 0.001 was observed. The model remains statistically significant. This final model in the series of factors suggested that being physically present in lectures hall was not sufficient enough to have a high GPA without additional efforts (e.g., asks questions, active participation, having complete notes, sit closer to the front in order to see the board clearly while taking notes) associated with better GPA outcomes. This right attitude plays a major role in motivating students to regularly attend lectures and put extra hours in studying outside the lecture periods, which invariably, enhanced their academic performance.

DISCUSSIONS

In the empirical study of *Connecting the Dots: Multivariate analysis on the links between lecture attendance, reading time, resource material utilization, and student success in Nigeria*, the researchers found that better academic success cannot be achieved by attending lectures alone without complementing it with other critical variables leading to better success. These essential and necessary factors or variables that enhance success include: lecture attendance, study habits (reading time), use of other resource materials, engaging in group study, dedication to studies and ability to identify optimal threshold of study time.

The research consistently identified lecture attendance as a significant predictor of academic performance, with higher attendance correlating with better outcomes. Lecture attendance facilitates direct engagement with course materials and allows students to clarify concepts in real-time world. That is, the more regular students attend lectures, the higher the likelihood of achieving better results, hence, students are encouraged not to skip any lectures since such act will negatively impact on their academic performance. This study supports the findings of Crede et al. (2010) and Romer (1993) that claimed, *class attendance has a strong positive effect on achieving success if the student regularly attends lectures.* Being physically present in the class is necessary and essential in achieving academic performance especially in the developing countries than developed ones. Other factors that promote academic success are enabling environment, lecturers' commitment to impacting knowledge, affordable hostel, cheap transportation, and students' possession of basic needs of life that are essential for concentration in learning while in campus.

Study habits is a function of the quality time students invested in academic pursuit and consistent to achieving academic performance. The impact of reading outside school hours attracts different outcomes such as less hours spent which leads to low academic performance and the quality hours dedicated for the reading with a resultant of higher academic success. The students that read between ((30 minutes -1 hours) per day recorded the lower academic performance with correlation (R = 0.315, p=0.000) even though, it is statistically significant. But for those students that spent more quality time (2 hours -3 hours) per day on self-study, recorded higher correlation R-value of 0.714, p=0.000 [118-119]. This is more rewarding, which invariably leads to better academic outcome. The second outcome shows reading time is positively significant, and does appear as strongly influential as lecture attendance. Both findings have explanatory power that enhanced academic success notwithstanding, quality study hours per day have stronger relationship and influential as lecture attendance.

Students that complement attending class with good study habits, and regular use of library, utilization of reference materials, judicious use of internet, and engaging in group study always

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come out with academic success. It was noted also that active listening and participation, taking good notes, use of library, engages in group study, and asking questions to clarify grey areas are part of associated factors that influenced better academic performance.

On the reasons while students attend lectures, the response indicates attending lectures helped them to reduce the amount of time they need to study independently. This response portrays the category of students whose aim is to pass their examination and not aiming higher on performance. However, some of them said putting more hours in reading is beneficial to achieving greater academic performance without stress or begging for marks. Over half of the students claimed on average, they spent between 5 to 10 hours of time reading and studying outside the lectures each week. While other said they spent 12 to 18 hours uninterrupted in a week.

Other reasons for lectures attendance by the students include regular attendance in class acquaints the students with new technology, new ways of doing things, to learned and unlearned certain things that may be misleading academically. Findings also show the impact of access to reference materials and availability of regular internet and its utilization in campus gives access to new ideas, insight, new knowledge acquisition, and update of techniques for problem-solving as shown in the relationship value of (R=0.777). The students believed that regular attendance in the lecture class can influence high educational performance in the course of their studies if no unforeseen situations do not obstruct the learning [120].

Lack of access to appropriate resource materials, inadequate study time, lack of concentration or being focused during reading period could negatively impact comprehension, undoubtedly leads to poor academic performance [121-124].

This research finding does not align with (Schuman et al, (1985) and M.M. van den Hurk et al (1998)) conclusion that putting in time for reading doesn't guarantee academic high performance unless it is used along *with effective study strategies*. This outcome reaffirms the complexity of the relationship and emphasized the importance to search for qualitative factors about the way students learn. However, this study result agreed with Nonis & Hudson (2010) that claimed study time *positively influences academic outcomes if the students have right attitude, dedicated, focus, and consistent with the study habits.*

The connecting the dots (see table 2) suggests that a combination of library usage, internet access, access to learning resources, lecture attendance, and valuing regular attendance provide strong explanatory model for predicting GPA. This clearly shows the links between the lecture attendance, reading time, resources materials utilization, library use, and strong beliefs that regular lecture attendance positively impact academic performance in the tertiary institution [125]. Hence, students are encouraged to imbibe all these strategies in pursuit of their academic excellence in the school.

The correlation of regular lecture attendance and academic performance are key to success in higher institutions. When regular lectures attendance and group study were combined, an increase in the explained variance (as indicated by the slightly higher R-value in combined models) was recorded. The combined model 2 reveals an increase in correlation, indicating the relationship between regular lectures attendance and academic performance, while the joint

effects on regular attendance in lectures and reading time outside school class show a higher relationship value of R=.675 and $p<0.05$); showing upward movement and statistically significant with grade point average (GPA).

The lesson learnt from the group study is that dedication of additional time to reading together and sharing knowledge as well as engage in problem solving outside lectures period is equally important and useful [126-127], because these variables indicate an essential aspect of study habits linked to improved academic outcomes. Students who have identified their optimal study hours and adhere to it have comparative advantage of assimilation and retention over the students who reads without knowing the time diminishing returns will set in. This combined effect implies:

The slight increase in R when both variables are considered suggest that students who attended lectures regularly and engaged in group study have comparative academic advantage over those that practice only one [5-6, 126]. This combined effect reflects a synergistic relationship: *attending lectures builds foundational understanding, while group study reinforces and deepens learning through discussion and peer support.* This point is in agreement with the work of Crede, M., Roch, S.G., & Kieszczynka, U.M. (2010).

Lecture attendance, self-study after school hour and use of resource materials are positively correlated and each of the factors complement each other. The study showed that none of the three factors can stand alone to achieve better academic performance except they complement one another. Regular lecture attendance provides consistent access to course materials and structured instructions, while group study offers a space for clarifying concepts, sharing insights, and engaging in collaborative learning [128]. The slight increase in R-value implies that both habits together captured a broader range of beneficial learning behaviors than either one does individually. The significant level of both individual correlations has p-values of 0.000, they are highly significant, meaning each variable has a robust effect on academic performance. Even when combined, this remains statistically significant, showing that both lecture attendance and group study are reliable predictors of improved academic outcomes.

The combination of the five predictors: “use of library, access to internet, resources utilized to support learning, attend lectures regularly, and belief that regular attendance is important”, explained 76.3% of the variation in GPA. Each added variable improves the model’s ability to predict GPA, although the amount of improvement decreased as more predictors were added. The most significant increases in R^2 were seen when "access to internet" and "resources utilized to support learning" were added, nevertheless, "regular attendance” is important factor" that contributes meaningfully to the model. The adjusted R^2 indicates that the model generalizes well, and the low standard error shows that the model’s predictions are accurate.

The Durbin-Watson (2.002) value suggested no autocorrelation, which supported the assumption that the residuals are independent, enhancing the reliability of the regression results.

The addition of the non-linear term (Hours of Studying Squared) provides valuable insights such as:

- **Balanced Study Habits**: This analysis suggests that effective studying requires balance, rather than aiming to maximize study hours, hence, students should individually identify their optimal reading time, aiming for *consistent, and manageable study times that don't lead to exhaustion.*
- **Focused Attention on Lecture Attendance**: Since lecture attendance has a robust, positive effect on performance, attending lectures while maintaining moderate study habits appears to be an *optimal strategy for academic success.*

The use of reference materials is equally important for every student in the tertiary institutions. The usage of resource materials gives more insights to knowledge, understanding and retention. To achieve high academic performance, lecture attendance, study time and use of resource materials may not stand alone. Real success comes when the associated factors are combined as pivot to learning.

The researchers are of the view that including "hours of studying squared" with "lecture attendance" offers nuanced understanding. Lecture attendance remains a key factor, while hours of studying squared suggests there's a point beyond which additional study becomes less effective. This insight helps educators and students alike to understand the balance between consistent class participation and optimal study time.

The finding indicated the impact of study hours within the acceptable time-frame to avoid diminishing returns. An optimal range of study hours of 2-3 hours was recorded and after this range, diminishing returns set in for over 73 percent students and any additional time of study will negligibly impact learning and comprehension. Therefore, to prevent burnout, fatigue, or diminishing concentration, it is important for educators to educate students on how to individually identify their threshold of optimality and adhere to it while studying to achieve good success.

Effectively employed to discern the combined impact of various factors on student performance, offering insights for targeted interventions.

CONTRIBUTIONS TO KNOWLEDGE

This study fills a gap in the literature by offering a detailed statistical examination of how academic engagement, through lecture attendance, reading time and use of resource materials, directly influences student performance in higher education. Providing also, empirical evidence on the role of these key factors in enhancing academic achievement among tertiary students. The study's findings can inform institutional policies makers aimed at improving student engagement and academic success through targeted interventions that encouraged regular attendance and effective study practices. By identifying the key factors affecting performance, it paved way for targeted interventions such as attendance tracking, academic counseling, tutorials, and support services aimed at improving study habits. Future research should explore the moderating effects of socio-demographic factors as regard attendance and reading strategies and utilization of other resource materials.

SUMMARY

The lecture attendance remained a key factor, while hours of studying squared suggested there's a point beyond which additional study becomes less effective. This non-linear approach

enables educators and students alike to understand and take a decision on balancing the consistent class participation and optimal study time to avoid exhaustion. This research uncovered potential interaction effects between lecture attendance, reading time, and use of resource materials, offering a more nuanced understanding of how these factors complement or offset each other in influencing academic outcomes. Students who combined regular lecture attendance with a balanced amount of study time (avoiding excessive hours) are likely to experience the best academic outcomes. Group study also has a vital role to play in the academic pursuit, due to collaborative learning, peer support, and shared problem-solving. Performance across the selected faculties did not show any significant difference among the students interviewed. The reason may be due to non-inclusion of faculties that are majorly theoretical-based courses.

CONCLUSION

This study reveals that lecture attendance, study hours, utilization of library and other resource materials as well as engaging in study group are keys to achieving success in someone's educational pursuit in life. Finally, the study concludes that addressing factors that impinged on lecture attendance, adequate study hour and access to resource materials utilization are critical to solving lectures skipping and exposure to hazard while engaging in menial jobs for upkeep at the tertiary institutions.

RECOMMENDATIONS

Students are encouraged to form positive habits of attending lectures, create study time, and engage in group study to enhance their capabilities. Provision of adequate reference materials in the school library is very essential and necessary and every student should have access to materials and internet. Access and judicious utilization of reference materials contribute to academic success, offering evidence-based recommendations for improving educational outcomes in tertiary institutions. The students must be counseled at the point of enrolment into the tertiary institutions on the need to have right perceptions or right beliefs system that regular attendance in the class, study time and use of reference materials influence high success in educational career. On the part of the lecturers, they should strive to be friendly and make lectures more interesting and participatory for the students to open up and actively engage in the class. The Educators, Lecturers and Course Advisers to always counsel and remind the students at each level, the importance of having positive mindset, self-determination and be ready to make necessary sacrifice that enhances better academic success. Right mindset, dedication to studies, being focus and ready to make sacrifice on the part of the students will enhance better academic success. Lecturers can introduce scoring for active participation in the class that can promote healthy competition, regular lecture attendance, eagerness to learn, zeal to read ahead of the class can be made possible among students. There is a need to conduct qualitative study to explore more of the socio-economic and cultural reasons that impinged on lecture attendance absenteeism and unseriousness among tertiary institutions.

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