Lecture Contact Hours and Academic Performance of Undergraduate Mathematics Students

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Abstract- The study determined the effect of lecture contact hours on the academic performance of undergraduate Mathematics students in Mathematics in Ignatius Ajuru University of Education. Ex-post facto analytic survey research design was used for this study. The population of the study was 159 undergraduate Mathematics students from the department of Mathematics/Statistics of the University for 2020/2021 academic session. The sample data set from the 143 sampled students used for the study was 460. Simple random sampling technique was used to select the sample. The research instrument for this study was Attendance and Performance Course Sheet (APCS). Test-retest method was used to obtain the reliability index of 0.78 for APCS through Pearson's Product Moment Correlation (PPMC). Simple percentage, mean, standard deviation, t-test and analysis of variance were used for data analysis. Findings of the study revealed that the extent of undergraduate Mathematics students' attendance to lectures is high and their academic performance is good. Further findings of the study showed that undergraduate students with high lecture contact hours significantly outperformed their counterparts with low lecture contact hours but there was no significant effect of lecture contact hours on the mathematics performance of the male and the female undergraduate students. The study recommended among others that University management should make and enforce the policy that students without 70% lecture attendance should not be allowed to write semester examination while lecturers should ensure that they take lecture attendance and enforce compliance on policy statements on examination attendance and examination writing to encourage students attending lectures.

Indexed Terms- Lecture, contact hours, academic performance, undergraduate students, Mathematics

I. INTRODUCTION

There is increasing concern and advocacy for effective Mathematics instruction at all levels of education including tertiary education because of the pivotal role of Mathematics in national building. The required scientists, technologists, engineers and technicians for national advancement in science, technology, engineering and innovation are realisable through sound Mathematics education in tertiary institutions of learning (Zalmon, *et al.,* 2021). However, achieving sound Mathematics education in tertiary institutions has been confronted with several challenges. An assessment of the achievements of undergraduate students in Mathematics revealed that most Mathematics students in tertiary institutions in Nigeria graduate with third class and second-class honours (lower division) (Wonu & Zalmon, 2019). This is not a good report for a nation seeking to advance economically, scientifically and technologically.

The challenge of Mathematics teaching and learning in public tertiary institution is multifaceted with students, lecturers, university management, parents and government contributing their quota. George *et al.,* (2020) investigated the factors affecting undergraduate students' performance in Mathematics and found out that the lecturer, student and parental factors have significant positive relationship while school and governmental factors have insignificant but positive relationship with undergraduate students' performance in Mathematics. The study further revealed that irregularity of some lecturers to lectures and student absenteeism to lectures are among the factors affecting undergraduate students' performance in Mathematics. Recommendations were made that government and school management should effectively manage the lecturers, students and collaborate with the parents to ensure improved undergraduate students' performance in Mathematics.

Effective management of lecturers and students is necessary in ensuring that lecturers keep to their lecture time schedule or contact hours while students attend lectures regularly and in time.

Lecture contact hours refer to the time allotted to a particular course for teaching and learning in the classroom. In tertiary education, the term lecture contact hour is used very broadly to refer to the amount of time the students spend with their lecturers learning a particular course. The time allotment is based on the flexibility, complicity and credit unit of a course. A course with two credit units has two hours of lecture while a three-credit unit course has three hours of lecture in a week in that order. Contact time or hours provides support to the student in developing subject content knowledge and skills. Contact hours can take a wide variety of forms such as lectures, seminars, tutorials, project supervisions, and many others. Effective teaching and learning process centers on the learner. Students basically take responsibility for their own learning. In this context, contact time with the lecturer is meant to help shape and guide the student to learn independently. The contact time with the lecturer is used to introduce new ideas and equip the learner with certain knowledge or skills, demonstrate practical skills for independent practice, offer guidance on project work and provide personalized feedback. Private or independent study alongside with lecture contact hour is very necessary for better learning of Mathematics. Private study is the time the learner spent learning without direct contact with the lecturer.

The amount of contact hours that students have with lecturers as part of their overall learning experience in higher education is receiving considerable attention over the last few years. The introduction of tuition fees shone a spotlight on students' experiences as students and their funders and supporters are now searching for indicators of quality and value for money spent on education. Despite the emphasis on quality and flexibility, and the introduction of new technologies, lecturing, problem solving and problem-based learning remain at the centre of most Universities approaches to teaching and learning Mathematics. But lecturers increasingly face very low levels of lecture attendance. It is commonly assumed that University students benefit from attending lectures. However,

Kirby and McElroy (2003) examined the relationship between students' attendance and academic performance and reported that attendance does matter for academic achievement. This kind of evidence has led some authors calling for measures to increase student attendance and even consider the possibility of making attendance mandatory in some courses. Lee and Barro (2001) found no effects of the length of the school year on internationally comparable test scores. Meanwhile, this study seeks to extend the frontier of knowledge by investigating the effect of lecture contact hours on the academic performance of undergraduate Mathematics students in Ignatius Ajuru University of Education. This study also investigated the effect of lecture contact hours on the mathematics performance of undergraduate students by gender.

- Statement Of the Problem

Undergraduate students' negative attitude towards lecture attendance in tertiary institutions of learning is becoming worrisome. This negative attitude of students to learning is capable of affecting their achievements in Mathematics courses. Mathematics is an abstract science which requires the assistance of a more knowledgeable order to scaffold the students into their zone of proximal development. Mathematics lecturers in this case are the knowledgeable orders. Lecture contacts with students and Mathematics lecturers provide an opportunity for learning. Students' learning difficulties in Mathematics during independent study is remediated through questioning, interaction and positive student-lecturer relationship. Undergraduate students who absent themselves from Mathematics lectures regularly will certainly be deficient in the content knowledge of the particular course. The extent to which this deficiency affects the overall performance of undergraduate students in Mathematics is the focus of this study. Hence, this study shall answer this question: what is the effect of lecture contact hours on undergraduate students' performance in Mathematics?

- Aim And Objectives of The Study

The aim of this study was to investigate the effects of lecture contact hours on the academic performance of undergraduate Mathematics students in Mathematics. The objectives of the study are to:
1. Determine the extent of undergraduate Mathematics students' attendance to lecture.

2. Investigate the extent of undergraduate Mathematics students' academic performance.
3. Find out the difference between the male and the female undergraduate Mathematics students lecture contact hours.
4. Ascertain the difference in the mathematics performance of undergraduate students with high and low lecture contact hours.
5. Investigate the effect of lecture contact hours on the mathematics performance of the male and the female Undergraduate students.

- Research Questions
1. What is the extent of undergraduate Mathematics students' attendance to lectures?
2. What is the extent of undergraduate Mathematics students' academic performance?
3. What is the difference between the male and the female undergraduate Mathematics students lecture contact hours?
4. What is the difference in the mathematics performance of undergraduate students with high and low lecture contact hours?
5. What is the effect of lecture contact hours on the mathematics performance of the male and the female undergraduate students?

- Hypotheses

Ho_1: There is no significant difference between the mathematics performance of undergraduate students with high and low lecture contact hours.

Ho_2: There is no significant difference between the male and the female undergraduate Mathematics students lecture contact hours.

Ho_3: There are no significant effects of lecture contact hours on the mathematics performance of the male and the female undergraduate students.

II. METHODOLOGY

- Research Design
Ex-post facto analytic survey research design was used for this study because data of students' lecture attendance and Mathematics course grades already exist.

- Population of the Study
The population of the study was 159 (BSc. Ed, 75; BSc, 84) undergraduate students of Mathematics/Statistics department of Ignatius Ajuru University of Education from level one hundred to level four hundred for 2020/2021 academic session (Department of Mathematics/Statistics, Ignatius Ajuru University of Education, 2021).

- Sample and Sampling Techniques
A sample of 143 students out of which 99 were male while 44 were female was used for the study. The sampled students offered several Mathematics courses across the academic levels and semesters. The sample data set from the 143 sampled students used for the study was 460. Simple random sampling technique was used to select the sample from the total number of undergraduate students.

- Instrument for Data Collection
The research instrument for this study was Attendance and Performance Course Sheet (APCS). APCS was designed and used to collect data from Student Lecture Attendance Sheet (SLAS) and Student Mathematics Score Sheet (SMSS). APCS contains provision for students' matriculation number, gender, course code, course title, attendance score and performance score. Student Lecture Attendance Sheets or Booklets for the Mathematics courses taught were obtained from the course lecturers while students' Mathematics scores were gotten through the available Result Mark Sheet (RMS) page of students assessable on their phones and verified using their score sheets.

- Validity and Reliability of the Instruments
Three lecturers in Mathematics Education validated the instrument. Test-retest method was used to obtain the reliability index of 0.78 for APCS through the Pearson's Product Moment Correlation (PPMC).

- Methods of Data Collection
Due permission was obtained from the Department of Mathematics/Statistics to collect data from the students, lecturers and departments for purpose of this research. The instruments were administered directly to the students in their lecture rooms and retrieved immediately after their responses.

- Method of Data Analysis

Simple percentage, mean, standard deviation and t-test were used for data analysis. Simple percentage, mean and standard deviation were used to answer the research questions while t-test was used to test hypotheses one and two. Analysis of Variance (ANOVA) was used to test hypothesis three. All the hypotheses were tested at 0.05 level of significance.

III. RESULTS

- Research question one: What is the extent of undergraduate Mathematics students' attendance to lectures?

Table 1 Mean (M) and Standard Deviation (SD) on the extent of undergraduate Mathematics students' attendance to lectures

	n	Mean (%)	SD	Remark
Lecture Attendance	460	71.34	20.60	High

Table 1 showed that the extent of undergraduate Mathematics students' attendance to lectures is high (M=71.34%; SD=20.60).

- Research question two: What is the extent of undergraduate Mathematics students' academic performance?

Table 2 Mean (M) and Standard Deviation (SD) on the extent of undergraduate Mathematics students' academic performance

	n	Mean (%)	SD	Remark
Lecture Attendance	460	60.12	12.02	Good

Table 2 showed that the extent of undergraduate Mathematics students' academic performance is good (M=60.12%; SD=12.02).

- Research question three: What is the difference between the male and the female undergraduate Mathematics students lecture contact hours?

Table 3 Mean (M) and Standard Deviation (SD) on the extent of the male and the female undergraduate Mathematics students lecture contact hours

Gender	n	Mean (%)	SD	Difference Mean (%) SD
Male	313	70.87	20.68	1.48 0.20
Female	147	72.35	20.48	

Table 3 showed that the difference between the male (M=70.87%; SD=20.68) and the female (M=72.35%; SD=20.48) undergraduate Mathematics students lecture contact hours is (M=1.48%; SD=0.20) in favour of the female students.

- Research question four: What is the difference in the mathematics performance of undergraduate students with high and low lecture contact hours?

Table 4 Mean (M) and Standard Deviation (SD) on the difference in the mathematics performance of undergraduate students with high and low lecture contact hours

Lecture Contact Hours	n	Mean (%)	SD	Difference Mean (%) SD
High	232	63.43	11.00	6.68 110
Low	228	56.75	12.10	

Table 4 showed that the difference in the mathematics performance of undergraduate students with high (M=63.43%; SD=11.00) and low (M=56.75%; SD=12.10) lecture contact hours is (M=6.68%; SD=1.10) in favour of the students with high lecture contact hours.

- Research question five: What is the effect of lecture contact hours on the mathematics performance of the male and the female undergraduate students?

Table 5 Mean (M) and Standard Deviation (SD) on the effect of lecture contact hours on the mathematics performance of the male and the female undergraduate students

Gender	Lecture contact hours	Mean (%)	SD	n
Female	High	63.88	10.80	75
	Low	56.53	13.69	72
	Total	60.28	12.80	147
Male	High	63.23	11.12	157
	Low	56.86	11.33	156
	Total	60.05	11.65	313
Total	High	63.43	11.00	232
	Low	56.75	12.10	228
	Total	60.12	12.02	460

Table 5 showed that the male (M=63.23%; SD=11.122) and the female (M=63.88%; SD=10.80) students with high lecture contact hours performed better than the male (M=56.86%; SD=11.33) and the female (M=56.53%; SD=11.00) students with low lecture contact hours.

Ho_1: There is no significant difference between the mathematics performance of undergraduate students with high and low lecture contact hours.

Table 6: Summary of t-test analysis on the difference between the mathematics performance of undergraduate students with high and low lecture contact hours

	Lecture Contact Hours	n	F	t	df	Sig.
Performance	High	232	.998	6.20	458	.000
	Low	228				

Table 6 indicated that there was significant difference between the Mathematics performances of undergraduate students with high and low lecture contact hours ($t_{(458, 0.05)} = 6.20$, $p<0.05$). Therefore, the null hypothesis one was rejected and the alternate hypothesis retained.

Ho_2: There is no significant difference between the male and the female undergraduate Mathematics students lecture contact hours.

Table 7: Summary of t-test analysis on the difference between the male and the female undergraduate Mathematics students lecture contact hours

	Gender	n	F	t	df Sig.
Lecture Contact Hours	Male	313	.016	0.72	458 .471
	Female	147			

Table 7 showed that there was no significant difference between the male and the female undergraduate Mathematics students lecture contact hours ($t_{(458, 0.05)} = 0.72$, $p>0.05$). Therefore, the null hypothesis one was retained and the alternate hypothesis rejected.

Ho_3: There is no significant effect of lecture contact hours on the mathematics performance of the male and the female undergraduate students?

Table 8: Summary of two-way Analysis of Variance (ANOVA) on the effect of Lecture Contact Hours (LCH) on the mathematics performance of the male and the female undergraduate students

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	1445736.724	1	1445736.724	309.131	.037
	Error	4633.010	.991	4676.775[a]		
Gender	Hypothesis	2.760	1	2.760	.112	.795
	Error	24.731	1	24.731[b]		

LCH	Hypothesis	4698.747	1	4698.747	189.992	.046
	Error	24.731	1	24.731[b]		
Gend1er * LCH	Hypothesis	24.731	1	24.731	.185	.668
	Error	61123.399	456	34.043[c]		

a. MS (Gender) + MS (LCH) - MS (Gender * LCH)

b. MS (Gender * LCH)

c. MS (Error)

Table 8 showed that there was no significant effect of lecture contact hours on the Mathematics performance of the male and the female undergraduate students ($F_{(1, 456)} = 0.185$, $p>0.05$). Therefore, the null hypothesis three was retained and the alternate hypothesis was rejected.

IV.   DISCUSSION OF FINDINGS

- The extent of undergraduate Mathematics students' attendance to lecture

Table 1 showed that the extent of undergraduate Mathematics students' attendance to lecture is high in Ignatius Ajuru University of Education. Earlier study by George *et al.* (2020) revealed that irregularity of some lecturers to lectures and student absenteeism to Mathematics lectures are among the factors affecting undergraduate students' performance in Mathematics.

- The extent of undergraduate Mathematics students' academic performance

Table 2 showed that the extent of undergraduate Mathematics students' academic performance is good. An assessment of the achievements of undergraduate students in Mathematics revealed that most Mathematics students in tertiary institutions in Nigeria graduate with third class and second-class honours (lower division) (Wonu & Zalmon, 2019). This recent finding reveals that there is improvement in undergraduate students' Mathematics with time. Mallik and Lodewijks (2010) found out that higher level Mathematics with calculus and trigonometry in high school can increase the marks in first year introductory Mathematics course significantly.

- The difference between the male and the female undergraduate Mathematics students lecture contact hours

Table 3 showed that the female undergraduate Mathematics students had higher lecture contact hours than their male counterparts. Table 7 showed that there was no significant difference between the male and the female undergraduate Mathematics students lecture contact hours. Umoinyang and Ekwueme (2005) noted with surprise that girls have a more positive attitude towards learning Mathematics which is a subject generally acclaimed as masculine. In their views, one would have expected the attitude of boys to be significantly higher than that of the girls because of the widely acclaimed under representation of females in a range of technical, scientific and engineering fields for which Mathematics is a basic prerequisite. But they acknowledged that the female students might have seen the challenge in meeting up with their male counterparts and improved their attitude towards Mathematics as a gateway to technical, scientific and engineering fields. Alio and Harbor-Peters (2000) detected gender difference in the performance of secondary school students in Mathematics.

- The difference in the mathematics performance of undergraduate students with high and low lecture contact hours

Table 4 showed that the mathematics performance of undergraduate students with high lecture contact hours was better than that of their counterparts with low lecture contact hours. Table 6 indicated that there was significant difference between the mathematics performances of undergraduate students with high and low lecture contact hours. This finding is consistent with that of Kirby and McElroy (2003) who reported that attendance does matter for academic achievement.

- The effect of lecture contact hours on the mathematics performance of the male and the female Undergraduate students

Table 5 showed that the male and the female students with high lecture contact hours performed better than the male and the female students with low lecture contact hours. Table 8 showed that there was no significant effect of lecture contact hours on the

mathematics performance of the male and the female undergraduate students. Lavy (2009) indicated that the increase in girls' matriculation rates translated into an increased likelihood of college attendance. Oloda (2017) reported that there is no gender parity in the academic performance of students in Mathematics examinations with the male students performing significantly better than the female students.

CONCLUSION

This study investigated the effect of lecture contact hours on the academic performance of undergraduate Mathematics students in Mathematics and found out that students with high lecture contact hours significantly outperformed their counterparts with low lecture contact hours.

RECOMMENDATIONS

The following recommendations were made based on the findings of this study:

1. The high extent of undergraduate Mathematics students' attendance to lectures should be sustained while students with negative attitudes to lecture attendance should desist because of its negative effect on their academic performance.
2. Undergraduate Mathematics students' should sustain their good academic performance in Mathematics by attending lectures and improving their study habit.
3. The male undergraduate Mathematics students should improve on their lecture attendance by emulating from their female counterparts.
4. Lecturers should ensure that they take lecture attendance and enforce compliance on policy statements on examination attendance and examination writing.
5. University management should make and enforce the policy that students without 70% lecture attendance should not be allowed to write semester examination.

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