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Constraints to instructional effectiveness and undergraduate student Mathematics learning achievement

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Abstract
This study used the case study and correlational research designs to identify the factors affecting student Mathematics learning achievement and the nature of the relationship between the factors and student learning achievement in Mathematics. A sample of 44 undergraduate students with an average age of 23 years, from the Department of Mathematics/Statistics, Ignatius Ajuru University of Education, Port Harcourt took part in the study. A validated 92-item instrument titled Mathematics Achievement Factor Scale (MAFS) was used to collect data. This instrument was used to measure the constraints to Mathematics learning achievement, student study habits and solutions to Mathematics learning constraints. The CGPA of the students was used as the achievement scores. The MAFS had a 0.87 reliability coefficient using the Cronbach method. Four research questions guided the study. Relative Importance Index (RII), Ranking (R_k), percentages and Spearman Rho were used for data analysis. The findings revealed among others that parental factors were the most pressing factor associated with student achievement in Mathematics (RII=0.80, R_k=1.0). This was followed by student factor (RII=0.79, R_k=2.0) and then school factor (RII=0.76, R_k =3.0) and the least was lecturer factor (RII=0.70, R_k =4.0). It was also found that 75% of the students had a personal study timetable but only 34.1% of the students operate a personal timetable. About 56.8% of the students indicated that Mathematics courses, especially the difficult ones appear twice per week. More than half (59.1%) of the students don't belong to groups, 86.3% of the students study Mathematics by reading up topics from a textbook and 72.7% of the students study in a conducive environment among others. The lecturer factor (ρ=-0.349, $p<.05$) and school factor (ρ=-0.332, $p<.05$) had negative, strong and significant relationships with student achievement. Parental factor (ρ=-0.007, $p>.05$) also had a negative but weak relationship with student achievement in Mathematics. Student factor (ρ=0.098, $p>.05$) had a direct but weak relationship with student achievement in Mathematics. It was therefore recommended among others that the parents should try to be involved in the affairs of their children who are studying Mathematics at the University.

Keywords: mathematics achievement, student, parents, school and lecturer, constraints, study habits

Introduction

Education in Nigeria is an instrument for national development and social change; promotion of a progressive and united Nigeria; maximizing the creative potentials and skills of the individual for self-fulfillment and general development of the society. This philosophy of Nigeria education is based on the development of the individual into a morally sound, patriotic and effective citizen; inculcation of national consciousness, values and unity; and development of appropriate skills, mental, physical and social abilities and competencies to empower the individual to live in and contribute positively to the society (FRN, 2014). In order to achieve these goals of education, the Nigerian education system is structured into early child care and development, basic education, post-basic education and tertiary education (FRN, 2014).

Tertiary education is the education given after post-basic education in institutions such as universities, Interuniversity Centres Polytechnics, Monotechnics, Colleges of Education, Innovative Enterprise institutions such as Colleges of Agriculture, Schools of Health and Technology and the National Teachers' Institutes (NTI). Mathematics education is an instrument for achieving the goals of tertiary education in Nigeria, which includes: contributing to national development through high accessible and affordable quality learning opportunities in formal and informal education in response to the needs and interests of all Nigerians; providing high-quality career counseling and lifelong learning programmes that prepare students with the knowledge and skills for self-reliance and the world of work; reducing skill shortages through the production of skilled manpower relevant to the needs of the labour market; promoting and encouraging scholarship, entrepreneurship and community service; forgiving and cementing national unity and promoting national and international understanding and interaction. Mathematics education is indispensable for scientific, technological and entrepreneurial development. However, there are factors affecting the effective teaching and learning of Mathematics at the tertiary level of education.

Undergraduates are students in the tertiary institutions pursuing a first degree in a course of study. There are Mathematics and mathematical course in tertiary institutions. Some students studying Mathematics or Mathematics related courses are faced with ineffective teaching, poor parental socio-economic status, high cost of education, poor study habit, sex grade examination malpractice and many more; these factors are affecting undergraduate student achievement in Mathematics. Ekwueme (2013) [2] noted that Mathematics teaching is

faced with so many problems. The study classified the problems or challenges facing the teaching and learning of Mathematics in schools as poor secondary school environment, societal attitudes, curricula problems, student problems, teacher problems evaluation problems, and administrative and bureaucratic problems. The author added that Mathematics is generally made up of concepts that are hierarchical in nature. In the understanding of the subsequent higher-order concepts, Ekwueme (2013) [2] suggested that Mathematics teaching should proceed from simple to complex, lower to the higher-order concept because Mathematics cannot be effectively taught without making sure that the lower order concepts or the pre-requisites have been thoroughly understood.

Odili (2006) [5] classified issues in Mathematics education in schools today as mathematical issues, pedagogical issues, and psychological issues. Mathematical issues include difficult content, issues of curriculum integration and poor understanding of Mathematics. Odili (2006) [5] itemised pedagogical issues like lack of instructional materials, poor classroom organisation, lack of qualified teachers and government impact. The author, interest, motivation and backwardness are psychological issues affecting the effective teaching and learning of Mathematics in institutions of learning Odogwu (2015) [6] agrees with Odili (2006) [5] that individual differences, motivation, attitude and interest and issues in Mathematics teaching and learning but also mention the use of Mathematics laboratory, mathematical games instructional materials and resources as vital approaches to Mathematics instruction. Understanding mathematical language; methods, moves, and strategies; effective Mathematics teacher and planning Mathematics lessons are some of the issues in Mathematics instruction addressed by Odogwu (2015) [6].

However, current issues in Mathematics education are classified as curricular issues, pedagogical issues, technological issues, environmental (natural) and socio-cultural issues, psychological issues and government (policy) issues. The issues and sub-issues are outlined below:

1. Curricular Issues
a. curricular charge in Mathematics
b. Mathematics curriculum content difficulty
c. Mathematics curriculum content load
d. Understanding Mathematics
e. Curriculum integration
f. ICT integration in Mathematics curriculum

2. Pedagogical issues
a. Learning environment
b. Qualification of teachers
c. Use of innovative instructional methods
d. Use of innovative instructional materials
e. Effective Mathematics instruction
f. Psychosocial learning environment (student-teacher-relationship)
g. classroom management and organization
h. ICT-based instructional approaches
i. Computer-based test (CBT)

3. Technological issues
a. The use of ICT in Mathematics education (Mathematical software, games, and puzzle)
b. the use of technological pedagogical and content knowledge (TPACK)
c. Open and distance Mathematics Learning
d. Online instructional platforms

4. Environmental (natural) and socio-cultural issues
a. Ethno Mathematics
b. Language and Mathematics learning
c. Psychosocial classroom environment
d. Socio-economic status
e. Culture and socialization
f. Rural, semi-urban, and urban location and Mathematics leaning

5. Psychological Issues
a. Individual differences
b. Attitude
c. Interest
d. Motivation
e. Backwardness

6. Government Issues
a. policy issues
b. Undue interference on the school calendar
c. Inadequate funding of Mathematics education

In this study, the extent to which some of these issues affect the undergraduate student achievement in Mathematics at the Ignatius Ajuru University of Education shall be investigated.

Problem Specification

The abysmal performance of students in Mathematics is not only recorded in the post-basic level of education examinations in Nigeria but it is also seen among undergraduate Mathematics students in Nigeria tertiary institutions. Wonu and Nwagor (2018) [7] explored the impact of time between cognitive tasks on undergraduate Mathematical performance in Rivers State, Nigeria, in an attempt to uncover the reasons why students perform poorly in university Mathematics courses. The study established that overall student achievement of the students in the first-semester Mathematics courses was low. Massed examination time had an inverse relationship with student achievement in differential equations and numerical methods. The interrelationships between student performances in the first semester were positive and significant. More effort is required to identify more constraints for the learning of Mathematics and how to fix the constraints. Identification of student learning difficulties or constraints is vital in education (Wonu & Zalmon, 2017) [12]. Most of the studies carried out in Rivers State with the aim of improving the learning achievement of students in Mathematics through instructions were done in the senior secondary schools (Wonu & Arokoyu, 2016; Wonu & Charles-Ogan, 2017; Wonu & Harrison, 2018; Wonu & Paul-Worika, 2019; Arokoyu & Wonu, 2019) [1, 9, 10, 11, 1].

The information in Figure 1 and Table 1 show that the percentage of students who graduated in all the sessions was higher than that of those who did not graduate within the period under review except in the 2013/2014 academic session. A notable improvement in student achievement commenced in 2015/2016 with a peak (95%) in the 2017/2018 session.

Table 1: Performance statistics for students of Bachelor of Science in Education (B.SCED) in Mathematics for 2012/2013 to 2017/2018 academic sessions.

S/N	Academic Session	Total number of students	Number of students who graduated (passes)	Number of students who did not graduate (fail)	No of graduates with first-class and 2^1	No of graduates with between 2^2 and 3^{rd} class
1.	2012/2013	35	22 (63%)	13 (37%)	8 (36%)	14(64%)
2.	2013/2014	56	23 (41%)	33 (59%)	9 (39%)	14 (61%)
3.	2014/2015	47	36(77%)	11 (23%)	6 (17%)	30 (83%)
4.	2015/2016	32	22 (69%)	10 (31%)	7 (32%)	15 (68%)
5.	2016/2017	30	25 (83%)	5 (17%)	11 (44%)	14 (56%)
6.	2017/2018	22	21 (95%)	1 (5%)	16 (76%)	5 (24%)
	Average		**71%**	**29%**	**41 %**	**59%**

***Source*:** Department of Mathematics/ Statistics, IAUE 2019.

The data in Figure 2 shows that the improvement in the percentage of students who graduated with first-class and second class upper had a parabolic shape where they had the minimum values (17%) in the 2014/2015 academic session and the maximum (76%) in the 2017/2018 academic session. Most Mathematics students in tertiary institutions in Nigeria graduate with third class and second class honours (Lower division). Several factors may be responsible for these low grades in Mathematics. Therefore, the study is poised to answer the question: What are the factors affecting undergraduate students' achievement in Mathematics?

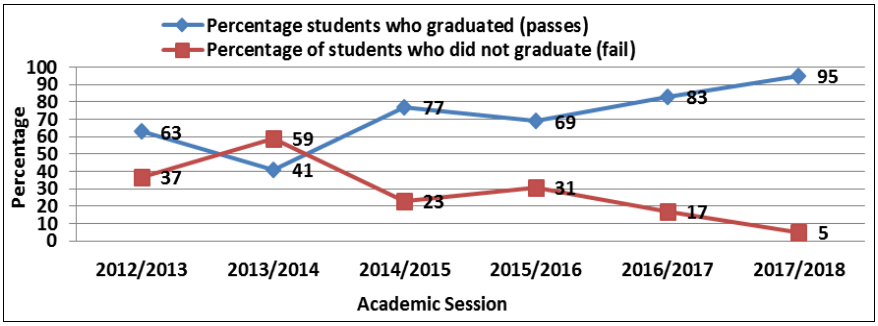

Fig 1: Percentage of students who graduated and those who failed based on academic session

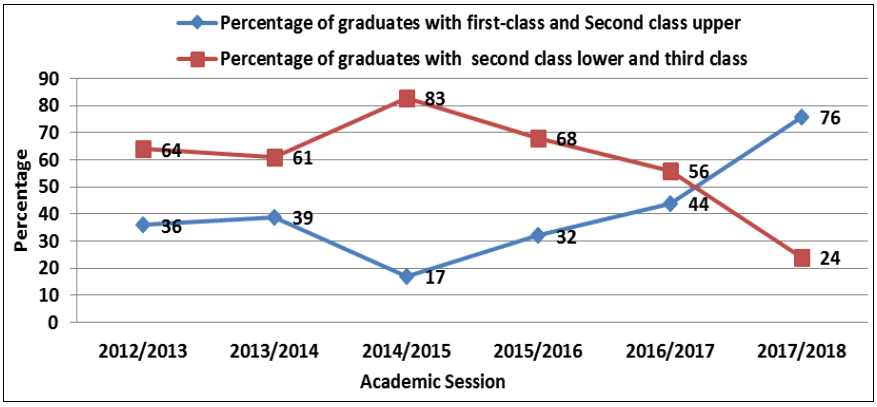

Fig 2: A line graph showing the percentage of students based on class of degree

Aim and objectives

The aim of this study is to explore the factors affecting undergraduate student achievement in Mathematics. In more specific terms, the objectives of the study are:

1. determine the factors related to student failure in Mathematics courses
2. describe the study habit of undergraduate students
3. find out the relationship between the factors associated with student failure in Mathematics courses and their achievement in Mathematics
4. find out the likely solutions to undergraduate students failure in Mathematics

Research questions

The following research questions guided the study

1. What are the factors associated with student failure in Mathematics courses?
2. How might we describe the study habit of undergraduate students?
3. What is the relationship between the factors associated with student failure in Mathematics courses and their achievement in Mathematics?
4. What are the likely solutions to undergraduate students failure in Mathematics

Methods and Materials

Design

The case study and correlational research designs were adopted in this study. The aim was to identify the factors affecting student Mathematics learning achievement and the nature of the relationship between the factors and student achievement.

Participants

A total of 44 undergraduate students with an average age of 23 years, from the Department of Mathematics/Statistics, Ignatius Ajuru University of Education, Port Harcourt, Nigeria took part in the study. The accidental sampling technique was used for data collection as only the students available during the time of administration of the instrument were used for the study

Instrumentation

A validated 92-item instrument titled Mathematics Achievement Factor Scale (MAFS) was used to collect data. This instrument was used to measure the student, lecturer, school and parental factors affecting student achievement in Mathematics; student study habits and solutions the constraints to student Mathematics learning achievement. The instrument had two major sections, I and II. The section I elicited information on the demographic variables of the study, such as the sex, level of study, age of student and CGPA. Section II was further subdivided into two subsections (A & B). Sub-section A (items 1-73) elicited information on the constraints to student effective instruction and learning achievement in Mathematics. Specifically, items 1-15 were used quantified lecturer factor, items 16-21 were used to measure the parental factor, items 22-38 were used to measure the school factor and items 39-73 were used to measure the student factor. The Sub-section B (74-84) elicited information on the study habits of the students. In more specific terms, items 85-92 quantified the solutions to Mathematics learning problems. A total of 50 copies of the instrument were administered to the respondents by the researchers and only 44 completely filled out copies were retrieved and used for data analysis. The CGPA of the students in the 2015/2016 academic session was used as the Mathematics achievement scores. The MAFS had a 0.87 reliability coefficient using the Cronbach method. Four research questions guided the study.

Data analysis

The data collected was ordinal, therefore, Relative Importance Index (RII), Ranking (R_k), percentages and Spearman Rho were used for data analysis.

Results

Demographic variables of the respondents

Table 2a: Percentage distribution of the demographic variables of the respondents

Demographics	Category	Frequency	Percent	Remark
Sex	Male	27	61.4	Dominant
	Female	17	38.6	
Level	200	14	31.8	
	300	17	38.6	Dominant
	400	13	29.5	

Table 2b: Mean and standard deviation of the age and CGPA of the respondents

Variable	Minimum	Maximum	Mean	SD
CGPA	1.50	4.83	3.41	0.78
AGE	18.00	28.00	23.36	2.39

The data in Table 2a shows the distribution of the demographic variables of the respondents. It shows that 27(61.7%) of the respondents are male undergraduate students whereas 17(38.6%) of them are females. Table 2a further shows that 14 (31.8%) of the respondents were in level 200 whereas 17(38.9%) were at 300 level and 13(29.5%) were in the 400 level. The data on Table 2b shows that the minimum CGPA obtained by the respondents was 1.50 whereas the maximum value was 4.83. The average CGPA of the students was 3.41 with a standard deviation of 0.78. Table 2b further shows that the minimum age of the respondents was 18 years whereas their maximum age was 28 years. The average age was 23 years with a standard deviation of 2.39.

Table 3: Summary of Relative Importance Index (RII) on the lecturer factor associated with student achievement in Mathematics

		Percentage (%) of respondent score (n=44)					
S/N	Lecturer factor	SD	D	A	SA	RII	Rank
1	Ineffective teaching methods/technique	2.27	13.64	31.82	52.27	0.84	1.0
2	Lecturer-student knowledge transfer problem	6.82	13.64	40.91	38.64	0.78	2.0
3	Lack of motivation on the side of the lecturers	13.64	9.09	43.18	34.09	0.74	5.0
4	Lecturers' poor knowledge of student individual differences	11.36	15.91	27.27	45.45	0.77	3.5
5	Teachers force students to apply their own method of problem-solving	11.36	45.45	22.73	20.45	0.63	13.0
6	Lectures' negative attitude to student understanding of concepts	2.27	31.82	22.73	43.18	0.77	3.5
7	Lecturers don't cover the course outline but set exam questions on it	13.64	34.09	20.45	31.82	0.68	10.0
8	Lecturers' lateness to lectures	22.73	40.91	15.91	20.45	0.59	15.0
9	Some lecturers do not give students notes but advice to go and read up	18.18	31.82	25.00	25.00	0.64	12.0
10	Some lecturers are very strict during lectures	18.18	20.45	31.82	29.55	0.68	10.0
11	Teaching without research base	11.36	29.55	27.27	31.82	0.70	7.5
12	Irregularity of some lecturers to classes	6.82	31.82	43.18	18.18	0.68	10.0
13	Similarities of topics taught in Mathematics	25.00	31.82	22.73	20.45	0.60	14.0
14	Difficult questions set my lecturers	11.36	25.00	25.00	38.64	0.73	6.0
15	Some lecturers attach textbook purchase to assignment	20.45	22.73	11.36	45.45	0.70	7.5
	Grand mean					0.70	7.5

The result from Table 3 shows the summary of the Relative Importance Index (RII) on the lecturer factor associated constraints to student achievement in Mathematics, based on the RII values and ranks. The grand RII was 0.70 with a Rank (R_k) of 7.5. Specifically, the result shows that the key lecturer factor associated with student achievement in Mathematics was ineffective teaching methods/technique (RII=0.84, R_k =1.0).

This was followed by the lecturer-student knowledge transfer problem (RII=0.78, R_k =2.0) and the third lecturer factors were lecturers' poor knowledge of student individual differences (RII=0.77, R_k =3.5) and lectures' negative

attitude to student understanding of concepts (RII=0.77, R_k =3.5) respectively. The least lecturer factor associated with student achievement was lecturers' lateness to lectures (RII=0.59, R_k =15.0).

Table 4: Summary of the RII on the parental factor associated with achievement in Mathematics

		Percentage (%) of respondent score (n=44)					
S/N	**Parental factors**	**SD**	**D**	**A**	**SA**	**RII**	**Rank**
16	Inadequate fund to purchase necessary study materials	6.82	9.09	31.82	52.27	0.82	1.0
17	Poor feeding habit due to insufficient finance	2.27	18.18	27.27	52.27	0.82	1.0
18	Poor socio-economic status in terms of delay in school fee payment	4.55	25.00	25.00	45.45	0.78	5.0
19	Parental negligence in terms of providing for student education	6.82	11.36	34.09	47.73	0.80	4.0
20	Low parental guidance and involvement	4.55	25.00	36.36	34.09	0.75	6.0
21	Poor parental support	4.55	20.45	18.18	56.82	0.82	1.0
	Grand mean					0.80	4.0

The result from Table 4 shows a summary of the Relative Importance Index (RII) on the parental factor associated with student achievement in Mathematics. The grand RII was 0.80 with a Rank of 4.0. Specifically, the result shows that the key parental factors associated with student achievement in Mathematics were inadequate funding to purchase necessary study materials (RII=0.82, R_k =1.0), poor feeding habit due to insufficient finance (RII=0.82, R_k =1.0) and Poor parental support (RII=0.82, R_k =1.0) respectively. The next factor was parental negligence in terms of providing for student education (RII=0.80, R_k =4.0) and the first factor was poor socioeconomic status in terms of delay in school fee payment (RII=0.78, R_k =5.0). The least factor was low parental guidance and involvement (RII=0.75, R_k =6.0).

Table 5: Summary of RII on the school factor associated with student achievement Mathematics

		Percentage(%) of respondent score (n=44)					
S/N	**School Factor**	**SD**	**D**	**A**	**SA**	**RII**	**Rank**
22	School /administrative factor (eg poor library collection)	9.09	15.91	34.09	40.91	0.77	6.5
23	Impatience in supervision by the examiners	4.55	22.73	34.09	38.64	0.77	6.5
24	Large workload given to the students by the school	9.09	25.00	22.73	43.18	0.75	10.0
25	Poor spacing in examination hall	13.64	31.82	18.18	36.36	0.69	17.0
26	Overcrowding of the lecture time table	15.91	6.82	29.55	47.73	0.77	6.5
27	Forced choice of Mathematics as a career	25.00	13.64	6.82	54.55	0.73	13.0
28	Unavailability of qualified lecturers on the staff roll	13.64	13.64	38.64	34.09	0.73	13.0
29	Inadequate library facilities for student personal study	6.82	11.36	38.64	43.18	0.80	2.5
30	Lack of student accommodation	4.55	15.91	38.64	40.91	0.79	4.0
31	Overcrowding of the examination timetable	0.00	18.18	22.73	59.09	0.85	1.0
32	High cost of Mathematics textbooks	20.45	15.91	22.73	40.91	0.71	15.5
33	Poor study/learning environment	4.55	15.91	36.36	43.18	0.80	2.5
34	Inadequate infrastructure	13.64	13.64	38.64	34.09	0.73	13.0
35	Admission of unqualified students into the department	4.55	31.82	20.45	43.18	0.76	9.0
36	Poor orientation on the importance of Mathematics	6.82	25.00	22.73	45.45	0.77	6.5
37	Difficult concepts taught in Mathematics	9.09	27.27	34.09	29.55	0.71	15.5
38	Unavailability of instructional facilities/materials	11.36	13.64	40.91	34.09	0.74	11.0
	Grand mean					0.76	9.0

The result from Table 5 shows a summary of the Relative Importance Index (RII) on the school factor associated with student achievement in Mathematics. The grand RII was 0.76 with a Rank of 9.0. Specifically, the result shows that the key school factor associated with student achievement in Mathematics was overcrowding of the examination timetable (RII=0.85, R_k =1.0). This was followed by inadequate library facilities for student personal study (RII=0.80, R_k =2.5) and poor study/learning environment (RII=0.80, R_k =2.5). The next was a lack of student accommodation (RII=0.79, R_k =4.0) and the least school-related factor affecting student Mathematics achievement was poor spacing in the examination hall (RII=0.69, R_k =17.0).

Table 6: Summary of RII on the student factor associated with student achievement in Mathematics

		Percentage(%) of respondent score (n=44)					
S/N	**Student factor**	**SD**	**D**	**A**	**SA**	**RII**	**Rank**
39	Poor academic background of the students	4.55	4.55	18.18	72.73	0.90	1.5
40	Psychological or emotional problems	6.82	4.55	31.82	56.82	0.85	3.5
41	Student lack of interest in studying	0.00	6.82	25.00	68.18	0.90	1.5
42	Accumulation of carryover courses leading to confusion	2.27	20.45	20.45	56.82	0.83	8.5
43	Accumulation of assignments in different courses	4.55	6.82	52.27	36.36	0.80	15.5
44	Student inadequate preparation for the examination	4.55	11.36	36.36	47.73	0.82	10
45	Lack of concentration by the students during lecture	4.55	18.18	34.09	43.18	0.79	19
46	Poor student-student collaboration or participation	4.55	18.18	34.09	43.18	0.79	19
47	Student absenteeism from lectures	2.27	11.36	34.09	52.27	0.84	6

48	Student negative attitude to Mathematics	6.82	6.82	40.91	45.45	0.81	12.5
49	Poor Mathematics reading habits among the students	2.27	11.36	36.36	50.00	0.84	6
50	Lack of student understanding of some concepts in classroom	2.27	18.18	40.91	38.64	0.79	19
51	Poor student-lecturer interaction	6.82	11.36	47.73	34.09	0.77	25
52	Lack of self-esteem among students	6.82	18.18	43.18	31.82	0.75	28
53	Poor student concentration during lectures	2.27	9.09	36.36	52.27	0.85	3.5
54	Examination related fever, anxiety or phobia	2.27	20.45	36.36	40.91	0.79	19
55	Involvement in emotional relationship	0.00	38.64	31.82	29.55	0.73	32.5
56	Poor subject matter knowledge	4.55	15.91	50.00	29.55	0.76	27
57	Student focus on extra-curricular activities	2.27	31.82	47.73	18.18	0.70	34
58	Excessive time spent on social networking	6.82	22.73	38.64	31.82	0.74	30
59	Skipping of some assignment/assessment given by lecturers	0.00	20.45	36.36	43.18	0.81	12.5
60	Over reliance on examination malpractice	9.09	11.36	29.55	50.00	0.80	15.5
61	Bad peer group among students	2.27	18.18	31.82	47.73	0.81	12.5
62	Memorization before examination	6.82	18.18	47.73	27.27	0.74	30
63	Setting other priorities over study	9.09	11.36	43.18	36.36	0.77	25
64	Lack of readiness during examination	4.55	11.36	31.82	52.27	0.83	8.5
65	Poor understanding of the examination questions	9.09	13.64	34.09	43.18	0.78	22.5
66	Lack of commitment to entire academic work	6.82	22.73	36.36	34.09	0.74	30
67	Student drug addiction	15.91	22.73	31.82	29.55	0.69	35
68	Loss of loved ones by the students	4.55	13.64	43.18	38.64	0.79	19
69	Poor retention ability among students	9.09	9.09	61.36	20.45	0.73	32.5
70	Student procrastination of reading	6.82	15.91	40.91	36.36	0.77	25
71	Hunger among the students	4.55	13.64	34.09	47.73	0.81	12.5
72	Physiological problems such as health	2.27	6.82	45.45	45.45	0.84	6
73	Lack of hard work on the side of the students	9.09	13.64	34.09	43.18	0.78	22.5
	Grand mean					0.79	19

The result from Table 6 shows a summary of the Relative Importance Index (RII) on the student factor associated with student achievement in Mathematics. The grand RII was 0.79 with a Rank of 19.0. Specifically, the result shows that the key student factors associated with student achievement in Mathematics were the poor academic background of the students (RII=0.90, R_k =1.50) and student lack of interest in studying (RII=0.90, R_k =1.5). This was followed by psychological or emotional problems (RII=0.85, R_k =3.5) and poor student concentration during lectures (RII=0.85, R_k =3.5). The least factor was student drug addiction (RII=0.69, R_k =35).

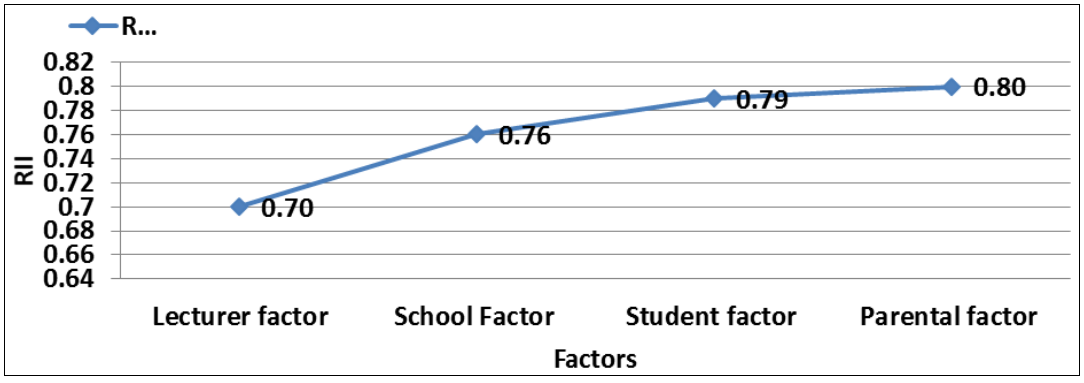

Fig 3: Line graph showing the RII of the various constraints to undergraduate student achievement in Mathematics

The result from Figure 3 shows the summary of RII on the most cogent factor associated with student achievement in Mathematics. It shows that parental factor was the most pressing factor associated with student achievement in Mathematics (RII=0.80, R_k =1.0). This was followed by student factor (RII=0.79, R_k =2.0) and then school factor (RII=0.76, R_k =3.0) and the least was lecturer factor (RII=0.70, R_k =4.0).

Table 7: Summary of the percentage responses of the study habit of undergraduate students

SN	Variables	Response	N	%
74	Do you have a personal study timetable?	Yes	33	75.0
		No	11	25.0
75	Do you operate a personal study timetable?	Yes	15	34.1
		Not always	18	40.9
		No	11	25.0
76	How many times per week do the Mathematics courses, especially the difficult ones appear on your personal time table?	Once	3	6.8
		Twice	25	56.8
		Thrice	12	27.3
		More than thrice	4	9.1
77	Do you always take problems you tried solving but could not solve back to your lecturers to put you through?	Yes	14	31.8

		Not always	17	38.6
		No	13	29.5
78	Do you have suitable textbooks for the Mathematics courses you take?	Yes	16	36.4
		Not always	21	47.7
		No	7	15.9
79	Are you off- or on campus?	Off campus	22	50.0
		On-campus	22	50.0
80	How conducive is where you stay for studying?	Very conducive	8	18.2
		Conducive	24	54.5
		Unconducive	10	22.7
		Very unconducive	2	4.5
81	Do you belong to any study group?	Yes	18	40.9
		No	26	59.1
82	If yes, how effective are you in the study group?	Very effective	9	20.5
		Effective	8	18.2
		Ineffective	1	2.3
83	I study my Mathematics course by reading my course lecturers' notes	SD	1	2.3
		DA	3	6.8
		AG	12	27.3
		SA	28	63.6
84	I study my Mathematics course by reading up topics from a textbook	SD	1	2.3
		DA	5	11.4
		AG	24	54.5
		SA	14	31.8

The result from Table 7 shows a summary of the percentage responses of the study habit of undergraduate students. It shows that only 75% of the students had a personal study timetable; only 34.1% of the students operate a personal timetable whereas 40.9% operate it sometimes. When asked how many times per week the Mathematics courses, especially the difficult ones appear on their personal time table, 56.8% of the students indicated that it appears twice per week whereas 27.3% indicated that it appears thrice per week. On whether they always take problems they tried solving but could not solve back to their lecturers to put them through; 31.8% indicated that they do so whereas 38.6% do that sometimes and 29.5% do not do it at all. About 36.4% of the students had suitable textbooks for the Mathematics courses they take whereas 47.70% had books sometimes and 15.90% do not have. About 50% of the respondents live on campus. Also, 72.7% of the respondents indicated that they study in a conducive environment whereas 27.3% do not live in a conducive environment. The result further shows that 59.1% of the respondents do not belong to groups whereas 40.9% belonged to study groups. When probed on how effective they were in the study groups, 20.5% indicated that they were very effective, whereas 18.2% indicated that they were effective and 2.3% indicated that they were ineffective. Most of the respondents (91%) agreed that they study Mathematics courses by reading their course lecturers' notes. About 86.3% of the respondents also study Mathematics by reading up topics from a textbook whereas 13.7% do not use textbooks to study.

Table 8: Spearman Rho on the relationships between the factors associated with student failure in Mathematics courses and their achievement in Mathematics

				Factor/CGPA				
SN		**Factor/CGPA**	**Rho/p-value**	**1**	**2**	**3**	**4**	**5**
1	Spearman's rho	Lecturer	ρ	1.000				
			p-value					
2		Parental	ρ	.432**	1.000			
			p-value	.003				
3		School	ρ	.535**	.566**	1.000		
			p-value	.000	.000			
4		Student	ρ	.049	.312*	.406**	1.000	
			p-value	.752	.039	.006		
5		Achievement(CGPA)	ρ	-.349*	-.007	-.332*	.098	1.000
			p-value	.020	.966	.028	.526	
			N	44	44	44	44	44

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The result from Table 8 shows the summary of the correlation matrix of Spearman Rho on the relationships between the factors associated with student failure in Mathematics courses and their achievement in Mathematics. It shows that the relationship between lecturer factor and student Mathematics achievement (CGPA) was inverse (negative), strong and significant at .05 level of significant at .05 level of significance(ρ=-0.349, $p<.05$). A similar result was obtained on the relationship between school factor and student Mathematics achievement (ρ=-0.332, $p<.05$). The relationship between the parental factor and student achievement in Mathematics (ρ=-0.007, $p>.05$) was also negative but weak and not significant at .05 level of significance. There was a very weak but positive relationship between student factor and student achievement in Mathematics (ρ=0.098, $p>.05$).

Table 9a: Summary of the percentage responses on the solutions to undergraduate student failures in Mathematics

SN	Variables	Response	N	%
85	Do you feel satisfied with the way Mathematics lectures are delivered in the class	Very satisfied	6	13.6
		Satisfied	21	47.7
		Unsatisfied	11	25.0
		Very unsatisfied	6	13.6
86	Did you really apply to study Mathematics at the university?	Yes	40	90.9
		No	4	9.1
87	If your answer to the item (87) above is "No" would you like a change to another department?	Yes	1	2.3
		No	3	6.8
88	Did you study further Mathematics at the ordinary level?	Yes	17	38.6
		No	27	61.4
89	Do you think what you are being taught is too high for you at your level?	Yes	1	2.3
		Some	21	47.7
		None	22	50.0
90	Are you satisfied with your general performance in Mathematics?	Very satisfied	6	13.6
		Satisfied	20	45.5
		Unsatisfied	16	36.4
		Very unsatisfied	2	4.5
91	What steps are you taking to improve yourself in Mathematics achievement status?	Attending lectures	2	4.5
		Extra classes	3	6.8
		Personal studies	21	47.7
		Problem-solving	2	4.5
		Textbook and internet	1	2.3
		No response	15	34.1

The result from Tables 9a and 9b show the summary of the percentage responses on the solution to undergraduate student failures in Mathematics. It shows that 63.7% of the respondents were satisfied with the way Mathematics lectures were delivered in the class, 90.9% of the students actually applied to study Mathematics and only 2.3% of the respondents would want to change to another department. The undergraduate students indicated that 61.4% did not study further Mathematics at the ordinary level, 47.7% opined that some of what they were being taught was too high for you at their level, and 59.1% were satisfied with their general performance in Mathematics whereas 40.9% were not satisfied. When asked the steps they are taking to improve in their Mathematics achievement status, 47.7% favoured personal studies whereas 34.1% had no response and 6.8% subscribed to extra classes among others.

Table 9b: Summary of the percentage responses on the solutions to undergraduate student failures in Mathematics

92	State what areas you will want changes in the way lectures are given in Mathematics classes:	Response	N	%
		No response	19	43.2
		Abstract Algebra, Functional Analysis, Linear Algebra, Mathematics Methods, And Statistics should be looked into	3	6.8
		Abstract teaching should be made concrete	1	2.3
		Allocation of courses should be reconsidered	4	9.1
		Explanations and problem-solving	1	2.3
		Tutorial classes should be organized for the students	1	2.3
		Teacher-student interaction should be improved and the teaching method should be modified	3	6.8
		Lecturer lateness to class and failure to give detailed notes should be assessed	2	4.5
		The lecture time should be changed	1	2.3
		Zealous instructions with problem-solving strategy and more examples should be stressed	8	18.2
		The students should be given more orientation about the course study	1	2.3

Table 9b revealed more facts. The students would want changes in the way lectures were given in Mathematics classes; 43.2% had no opinion whereas 18.2% favoured the fact that zealous instructions with problem-solving strategy should be delivered with more examples given to the students, 9.1% opined that the course allocation should be reconsidered and 6.8% opined that courses such as Abstract Algebra, Functional Analysis, Linear Algebra, Mathematics Methods and Statistics should be looked into and teacher-student interaction should be improved and teaching method be modified among others.

Discussion

1. The constraints to Mathematics Achievement in Ignatius Ajuru University of Education

Lecturer factor: The result from Table 3 showed that the grand RII on the lecturer factor affecting student achievement was 0.70 with a Rank of 7.5. The result showed that the overarching lecturer factor associated with student achievement in Mathematics was ineffective teaching methods/technique, which was ranked first (RII=0.84, R_k =1.0) and the least lecturer factor associated with student achievement was lecturers' lateness to lectures

(RII=0.59, R_k =15.0) which was ranked the fifteenth position.

Parental factor: The result from Table 4 showed that the grand RII was 0.80 with a Rank of 4.0. It further showed that key parental factor associated with student achievement in Mathematics was inadequate funding to purchase necessary study materials (RII=0.82, R_k =1.0), poor feeding habit due to insufficient finance (RII=0.82, R_k =1.0) and Poor parental support (RII=0.82, R=1.0) which were respectively ranked the first position. The least factor was low parental guidance and involvement (RII=0.75, R_k =6.0) which was ranked the sixth position on the list of items.

School factor: The result from Table 5 showed that the grand RII was 0.76 with a Rank of 9.0. The major school factor associated with student achievement in Mathematics was overcrowding of the examination timetable (RII=0.85, R_k =1.0) which ranked the first position and the least school-related factor was poor spacing in the examination hall (RII=0.69, R_k =17.0), ranked seventeenth on the list.

Student factor: The result from Table 6 showed that the grand RII was 0.79 with a Rank of 19.0. Specifically, the result showed that the main student factors associated with student achievement in Mathematics were the poor academic background of the students (RII=0.90, R_k =1.50) and student lack of interest in studying (RII=0.90, R_k =1.5) which were ranked first. The least student factor associated with their learning achievement was student drug addiction (RII=0.69, R_k =35) which was raked thirty-fifth position.

The result from Figure 3 showed that parental factor was the most pressing factor associated with student achievement in Mathematics (RII=0.80, R_k =1.0), ranked first. This was followed by student factor (RII=0.79, R_k =2.0) and then school factor (RII=0.76, R_k =3.0) and the least was lecturer factor (RII=0.70, R_k =4.0).The above findings show that parental involvement remains a very significant factor in the determination of the learning outcomes of undergraduate students at the University. This corroborates earlier findings by Odogwu (2015) [6] which established that students understanding mathematical language; methods, moves and strategies; effective Mathematics teacher and planning Mathematics lessons are some of the issues in Mathematics instruction.

A closer look at Table 4 showed that three sub-factors; inadequate funding to purchase necessary study materials, poor feeding habits due to insufficient finance and poor parental support were ranked first as factors affecting the achievement of students in Mathematics. In as much as the respondents appear to blame their parents for their underachievement in Mathematics, it is worthy of note that student factor was ranked second on the list of most cogent factors affecting student Mathematics achievement amongst the four factors explored. A closer look at Table 6 showed that poor academic background of the students and students' lack of interest in studying were ranked first as sub-factors whereas psychological or emotional problems and poor student concentration during lectures were ranked second. The result in Table 9a revealed more about the fact that the failure of the students in Mathematics was associated with their poor background in Mathematics. It showed that 61.4% did not study further Mathematics at the ordinary level, 47.7% opined that some of what they were being taught was too high for you at their level. An earlier study by Odili (2006) [5] established that pedagogical constraints to student Mathematics learning included a lack of instructional materials, poor classroom organisation, lack of qualified teachers and government impact.

2. The study habit of undergraduate students in Mathematics

The result from Table 7 showed that only 75% of the students have a personal study timetable but only 34.1% of the students operate the personal timetable whereas 40.9% operate it sometimes. More than half of the students (56.8%) indicated that difficult Mathematics courses appear twice per week on the time table. It is worthy of note that 31.8% of the students indicated that they always take problems they tried solving but could not solve back to their lecturers to put them through whereas 38.6% do that sometimes and 29.5% do not do it at all. This corroborates the importance of student factor in tracking constraints to student Mathematics teaching and learning. It is disheartening to note that 47.7% of the respondents do not always have suitable textbooks whereas 15.9% do not have it at all. One might wonder, if 72.7% of the students live in a conducive environment, it becomes imperative to explore some other factors leading to their poor performance in Mathematics. More than half of the students (59.1%) do not belong to groups. About 38.7% indicated that they were effective in their study groups whereas 2.3% were ineffective. Most of the respondents (91%) study Mathematics courses by reading their course lecturers' notes and 86.3% of the respondents also study Mathematics by reading up topics from a textbook whereas 13.7% do not use textbooks to study. This finding corroborates with the earlier finding of Odogwu (2015) [6] that individual differences, motivation, attitude and interest are issues in Mathematics teaching and learning.

3. The relationship between the factors and student achievement in Mathematics

The result from Table 8 showed that the relationship between lecturer factor and student Mathematics achievement (CGPA) was negative, strong and significant at .05 level of significant at .05 level of significance(ρ=-0.349, $p<.05$). Similarly, the relationship between school factor and student Mathematics achievement negative, strong and significant at .05 level of significance (ρ=-0.332, $p<.05$). The relationship between the parental factor and student achievement in Mathematics (ρ=-0.007, $p>.05$) was also negative but weak and not significant at .05 level of significance. This also indicates that an increase in the value of lecturer, school factor and parental factors respectively will lead to a decrease in student achievement in Mathematics and vice versa. The present findings indicate that the lecturer, school factor and parental factors are respectively affecting the student achievement in Mathematics. The present findings show that there was a very weak but positive relationship between student factor and student achievement in Mathematics (ρ=0.098, $p>.05$). The weak but direct relationship between student factor and achievement in Mathematics indicates that the student factor is not likely to lead to underachievement in Mathematics. This corroborates the finding of Ekwueme (2013) [2] who classified the problems or challenges facing the teaching and learning of Mathematics in schools as poor secondary school environments, societal attitudes, curricula problems, student problems, teacher problem evaluation problems and administrative and bureaucratic problems. This implies that

each of these issues is negatively associated with student Mathematics achievement.

4. The solutions to the constraints associated with Mathematics Achievement in Ignatius Ajuru University of Education

The result as shown in Table 9a showed that 63.7% of the respondents were satisfied with the way Mathematics lectures were delivered in the class, 90.9% of the students actually applied to study Mathematics, only 2.3% of the respondents would want to change to another department. About 59.1% were satisfied with their general performance in Mathematics. This established the fact that the most of the undergraduate students were comfortable studying Mathematics and were willing to stud harder as reflected in the response where 47.7% indicated that they would improve in Mathematics through personal studies and it is believed that the 34.1% did not respond to the item, had no issues with Mathematics learning and 6.8% subscribed to extra classes among others. Table 9b revealed more facts on the way forward. The students indicated that they would want changes in the way lectures were delivered in Mathematics classes; 43.2% had no opinion about this whereas 18.2% favoured the fact that effective instructions with problem-solving strategy should be delivered with more examples given to the students, 9.1% opined that the course allocation should be reconsidered and 6.8% opined that courses such as Abstract Algebra, Functional Analysis, Linear Algebra, Mathematics Methods and Statistics should be taken seriously and teacher-student interaction should be improved and teaching method be modified among others. The finding corroborated Ekwueme (2013) [2] who suggested that Mathematics teaching should proceed from simple to complex, lower to the higher-order concept because Mathematics cannot be effectively taught without making sure that the lower order concepts or the pre-requisites have been thoroughly understood.

Conclusion

The study explored the constraints to instructional effectiveness and Mathematics learning achievement of undergraduate students in the department of Mathematics/Statistics at the Ignatius Ajuru University of Education, Port Harcourt. Based on the findings of the study it was concluded that: The parental factor was core among the factors affecting student achievement in Mathematics. Next to this were student factor, school factor and lecturer factor, in that order. In more specific terms, the key parental factors were inadequate funding to purchase necessary study materials, poor feeding habits due to insufficient finance and Poor parental support respectively, whereas the key student factors were the poor academic background of the students and student lack of interest in studying. The key school factor overcrowding of the examination timetable and the key lecturer factor was ineffective teaching methods/technique. In their study habit, it was established that most of the students had a personal timetable but less than half of them operate it. More than half of the participants find Mathematics courses difficult; they do not belong to any study group and even about eighty-six percent of the students study Mathematics by reading up topics from a textbook in addition to their difficult Mathematics classes. The students, however, study in a conducive environment, but this doesn't seem to translate to enhanced learning achievement in Mathematics. The lecturer factor and school factor had negative, strong and significant relationships with student achievement whereas parental factors had a negative but weak relationship with student achievement in Mathematics. The student factor had a direct but weak relationship with student achievement.

Some of the students were satisfied with their performance and the majority of them actually applied to study Mathematics. The students suggested that effective instructions with problem-solving strategy should be delivered with more examples given to them, the course allocation should be reconsidered and that seemingly difficult courses such as Abstract Algebra, Functional Analysis, Linear Algebra, Mathematics Methods and Statistics should be taken seriously and teacher-student interaction should be improved. The implication of the present findings is that irrespective of how conducive the study environment might be parental involvement and student personal effort is crucial to improving student learning achievement in Mathematics. Irrespective of how the students are taught if they do not engage in regular personal studies with relevant textbooks with the support of their parents their performance in Mathematics is not likely to improve.

Recommendations

Based on the findings of the study the following recommendations were made:

1. The parents should try to be involved in the affairs of their children who are studying Mathematics at the university in terms of provision of necessary study materials to enhance their personal study and achievement in the course
2. The students should find time to develop a study timetable and operate it as often as possible. This is Mathematics is unless other courses, it requires regular personal study.
3. The university should continue to a conducive learning environment for meaningful academic pursuits. Relevant instructional materials should be made available where necessary to boost the understanding of Mathematics
4. The lecturers should continue to engage the study through lectures, extra classes, assignments, tests, and classwork among others. This study recommends the utilization of the problem-solving instructional model where students could be engaged in Mathematics task performance in small groups.

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