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Research Paper

Student and Lecturer Perception of Difficult Mathematics Courses in Tertiary Institution

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ABSTRACT
This study investigated student and lecturer perception of difficult Mathematics courses in tertiary institutions in Rivers State. The analytical survey research design was adopted for the study with all undergraduate Mathematics students from the seven tertiary institutions in Rivers State constituting the population of the study. A sample of 100 respondents constituting 63 students (23 male; 40 female) and 37 lecturers from three tertiary institutions were selected by simple random sampling. Student and Lecturer Perception of Difficult Mathematics Courses (SLPDMC) was the instrument used for data collection. SLPDMC which was validated by three experts in Mathematics Education with reliability index of 0.87 obtained by test and re-test method contained four sections and 64 items. The criterion cut-off point of 2.50 was used for decision making. The six research questions were answered with mean and standard deviation while the two hypotheses were tested using independent sample t-test at 0.05 level of significance. The study identified some students and lecturers perceived difficult Mathematics courses, their causes and possible remedies. Findings of the study also showed that the differences between the male and the female students and students and lecturers perceptions of difficult Mathematics courses in tertiary institutions were not significant. The study recommended the use of qualified lecturers and active and innovative instructional strategies that enhances students' learning interest and study habit, provision of adequate learning facilities and materials, covering of course contents during instruction and attending conferences and workshops to remediate perceived difficulties in teaching and learning of some Mathematics courses in tertiary institution.

KEYWORDS: *Student, lecturer, perception, difficult, Mathematics courses, tertiary institution*

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I. INTRODUCTION

Tertiary education which is the highest level of the educational system is fundamental to national development. Tertiary education is the education given in tertiary institutions of learning such as universities, colleges of education, polytechnics, monotechnics and institutions offering correspondence courses. George, *et al.* (2020) described tertiary education as the level of education that produces graduates from different fields of learning after four to seven years of study depending on the course of study. The Federal Republic of Nigeria (2014) defined tertiary education as the education given after post-basic education in institutions such as universities and inter-university centres such as the Nigeria French Language Village, Nigeria Arabic Language Village, National Institute of Nigerian Languages, institutions such as Innovative Enterprise Institutions (IEIs) and Colleges of Education, Monotechnics, Polytechnics, Schools of Health and Technology and the National Teachers' Institutes (NTI).

Educational programmes in Nigerian tertiary institutions are designed with the goals of contributing to national development through high level relevant manpower training; developing and inculcating proper values for the survival of the individual and society; developing the intellectual capacity of individuals to understand and appreciate their local and external environments; acquiring both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society; promoting scholarship, community service, national and international understanding and interaction as well as forging and cementing national unity (FRN, 2014). Some of the goals of tertiary education are achievable through Mathematics and Mathematics Education. Mathematics education is indispensable to achieving the goals of tertiary education (George, *et al.*, 2020). In the area of manpower development, 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. Mathematical knowledge is a necessity for the scientific and technological development of any nation.

Mathematics education is the practice of teaching and learning Mathematics with associated scholarly research. Mathematics education particularly at the tertiary education level prepares students for quantitative and symbolic reasoning and advanced mathematical skills through undergraduate and graduate programmes. Mathematics has been one of the most important courses in tertiary education programmes. In most institutions of higher learning, basic Mathematics courses such as algebra and trigonometry, statistics and calculus are part of the compulsory general courses for level one hundred undergraduate students. These basic Mathematics courses are necessary to develop basic computational and problem-solving skills. Mathematics is the science of numbers, algebra, statistics, geometry and calculus. The importance of Mathematics cannot be underestimated in human endeavors. Mathematics develops the economy, cultivates problem-solving and computational skills and enhances positive attitudes.

Mathematics is one of the compulsory cross-cutting subjects at primary and secondary levels of education due to its indispensable nature in daily living and many professional career developments. Study of Mathematics promotes habits of accuracy and exactitude, and prevents a man from being careless and slipshod. It sharpens the reasoning powers of a man and increases his mental alertness. Mathematics simplifies lengthy statements through its symbols. Mathematics fulfills the educational values such as intellectual, aesthetic, social, vocational, inter-disciplinary and others. In order to appreciate the educational values and instructional objectives of Mathematics, the subject must be practiced in classrooms by utilizing the service of traditional methods, educational innovations and technological advancements (Ampadu, 2012; Etuk, *et al.*, 2013). A mathematically minded man is usually more dependable than one who is otherwise disposed. In Nigeria, Mathematics education is compulsory at the pre-primary, primary and secondary levels of education so as to give a sound basis for scientific and reflective thinking and prepare them for the next level of education (FRN, 2014).

However, the fact remains that students have very low interest in learning Mathematics and performs poorly in the subject. Students have phobia for Mathematics at all levels of education. At the tertiary level of education, Wonu and Zalmon (2019) reported that most Mathematics students in tertiary institutions in Nigeria graduate with third class and lower division second class honours. Several variables are responsible for undergraduate students' under-achievement in Mathematics such as poor socio-economic background, abstract nature of Mathematics and lack of qualified or competent Mathematics teachers. 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 recommended among others that the government and the school management should effectively manage the lecturers, students and collaborate with the parents to ensure improved undergraduate students' performance in Mathematics. Meanwhile, this study seeks to determine the perception of students and lecturers on difficult Mathematics courses in tertiary institutions as it affects the teaching and learning of Mathematics at the tertiary education level.

Perception simply refers to the way in which something is regarded, understood, or interpreted. Perception is the ability to see, hear or become aware of something through the senses. Perception is the way people judge others with whom they are in contact (Dauda, *et al.*, 2016). The perception of students about Mathematics is vital for effective teaching and learning. According to Daudu, *et al.* (2016), the way students perceive a subject determines their success or failure in that subject. Mutodi and Ngirande (2014) found that the perceptions shared by the students in South Africa about Mathematics performance are due to one's self-confidence, family background, teaching strategy, learning materials, interest in Mathematics, traditions, and beliefs. According to Daso, *et al.* (2021), different people perceive Mathematics differently; minority of the people view Mathematics as a simple, fallible and interesting subject while majority of the people perceived Mathematics as dreaded, bored, difficult, unfriendly, absolute and very abstract. According to Audu (1995) as cited in Daudu, *et al.* (2016), some students perceived Mathematics as a no go area because of the negative impression passed down to them by the past generations who had bad experience with unqualified Mathematics teachers; that Mathematics is difficult, it is not meant for everybody, not everybody passes Mathematics, that Mathematics is meant for those with special talent and that some were born to do Mathematics while others were not. The different perceptions of Mathematics by students reflect during classroom instruction through their attitudes and performance. Students with negative perception in Mathematics exhibit inattentiveness, class avoidance, teacher avoidance, mathophobia, poor study habit and abysmal performance. Daso, *et al.* (2021) also revealed that students' perception about Mathematics determines their attitudes towards learning it. Mutodi and Ngirande (2014) confirmed that students, who accredited their success to their interest, self-confidence, as well

as good family background, have a chance to come up with higher achievements than those who point their academic success to chance and natural talent.

Mathematics contents or courses are classified into two branches. The two branches of Mathematics are pure and applied Mathematics. Pure Mathematics refers to the part of mathematical activity that is done without explicit or immediate consideration of direct application. Jaggi (2006) defined pure Mathematics as a branch of Mathematics that deals with the mathematical theory and structures without intending to apply it to any field. Pure Mathematics treats only theories and principles involving systematic and deductive reasoning without regard to their application to concrete things (Sidhu, 2006). Pure Mathematics is abstract (Jaggi, 2006). Some courses in pure Mathematics are algebra (linear and abstract), Calculus, analysis (real, complex, functional, numerical etc.), topology, Lebesgue measure and integration and many others. Sidhu (2006) described applied Mathematics as the application of pure Mathematics in the service of a given purpose while Jaggi (2006) viewed applied Mathematics as the study of the mathematical methods applied to solve physical problems. Applied Mathematics is the aspect of Mathematics used to solve problems in other field of study. Applied Mathematics is Mathematics used in Physics, Chemistry, Biology, Computer Science, Economics, Science, Engineering, Technology, Agricultural Science, Medicine, Social Science and lots more. Examples of some applied Mathematics are Statistics, Differential Equations (ordinary and partial), Mathematical Physics, Mathematical Economics, Econometrics, Bio-Mathematics. Fluid (mechanics and dynamics), Operations Research, Mathematical Methods, Quantum Mechanics, Electromagnetism, Elasticity, General Relativity and others. This study is interested in identifying perceived difficult Mathematics courses in institution of higher learning.

Investigating the student and lecturer perception of difficulty of Mathematics courses in public tertiary institutions in Rivers State is the focus of this study. The seven public tertiary institutions in Rivers State are Ignatius Ajuru University of Education (IAUE), Rivers State University (RSU), University of Port Harcourt (UNIPORT), Elechi Amadi Polytechnic, Ken Saro-Wiwa Polytechnic, Federal College of Education (Technical) and Rivers State College of Health Science and Management Technology. The seven tertiary institutions in the State have department of Mathematics/Statistics which again underscores the importance of Mathematics in manpower development.

Statement of the Problem

It is widely known that larger number of students prefer to offer non-mathematics and non-mathematical related courses in higher institutions. The number of students offering non-mathematics related courses in higher institutions is outrageous compared to those offering Mathematics and mathematical courses. This can be related to Mathematics anxiety or phobia. Students perceive Mathematics as a very difficult course and hence, should be avoided. Avoiding offering Mathematics and mathematical courses in tertiary institutions will lead to shortage of manpower requirement for the scientific and technological advancement of the nation. Therefore, identifying student and lecturer perceived difficult Mathematics courses, the causes of the learning difficulty and proffering remedial measures is a sure way to enhancing Mathematics learning in tertiary institutions.

Aim and Objectives of the Study

The aim of the study is to investigate student and lecture perception of difficult Mathematics courses in tertiary institutions in Rivers State. The objectives of the study are to:

1. Determine the Mathematics courses in tertiary institution perceived difficult to learn by students.
2. Find out the Mathematics courses in tertiary institution perceived difficult to learn by the male and the female students.
3 Ascertain the Mathematics courses in tertiary institution perceived difficult to teach by lecturers.
4 Identify the Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers.
5 Identify the possible causes of the perceived Mathematics learning difficulty.
6 Suggest possible remedial measures to learning difficulties in Mathematics courses in tertiary institutions.

Research Questions

Six questions guided the research as follows:

1. What are the Mathematics courses in tertiary institution perceived difficult to learn by students?
2. What are the Mathematics courses in tertiary institution perceived difficult to learn by the male and female students?
3. What are the Mathematics courses in tertiary institution perceived difficult to teach by lecturers?

4. What are the Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers?
5. What are the causes of the perceived Mathematics learning difficulty?
6. How can we remediate learning difficulties in Mathematics courses in tertiary institutions?

Hypotheses

Two hypotheses were formulated and tested at 0.05 level of significance to guide the study:

H_{01}: There is no significant difference between the male and the female students' perception of difficult Mathematics courses in tertiary institutions.

H_{02}: There is no significant difference in the perceptions of students and lecturers on difficult Mathematics courses in tertiary institutions.

II. METHODOLOGY

The analytical survey research design was adopted for the study with all undergraduate Mathematics students from the seven tertiary institutions in Rivers State constituting the population of the study. A sample of 100 respondents constituting 63 students (23 male; 40 female) and 37 lecturers from three tertiary institutions were selected by simple random sampling. Student and Lecturer Perception of Difficult Mathematics Courses (SLPDMC) was the instrument used for data collection. SLPDMC which was validated by three experts in Mathematics Education with reliability index of 0.87 obtained by test and re-test method contained four sections and 64 items. Section A was designed to obtain the demographic information of the respondents. Section B contained 30 items of Mathematics courses offered in tertiary institutions for the respondents to rate their perception of the difficult Mathematics courses on a four-point Likert-like scale of Very Difficult (VD)- 4 point, Difficult (D)- 3 point, Easy (E)- 2 point or Very Easy (VE)- 1 point. Sections C and D consisted of 17 items each on the causes and remedies of learning difficulties in Mathematics courses respectively. The items were structured and patterned after four point Likert scale of Strongly Agree (SA)- 4 point, Agree (A)- 3 point, Disagree (D)-2 point and Strongly Disagree (SD)- 1 point. The criterion cut-off point of 2.50 was used for decision making. The decision rule was: Easy/Disagree if the mean is less than 2.50 and Difficult/Agree if the mean is greater than or equal to 2.50. The six research questions were answered with mean and standard deviation while the two hypotheses were tested using independent sample t-test at 0.05 level of significance.

III. RESULTS

Research Question One: What are the Mathematics courses in tertiary institution perceived difficult to learn by students?

Table 1: Descriptive statistics of mean and standard deviation on the Mathematics courses in tertiary institution perceived difficult to learn by students

S/N	Courses	VD	D	E	VE	Mean	Std	Remark
1	Algebra and Trigonometry	--	19	24	20	1.98	0.79	Easy
2	Coordinate Geometry	--	23	27	13	2.16	0.75	Easy
3	Vectors, Geometry and Dynamics	1	24	25	13	2.21	0.79	Easy
4	Calculus	--	28	28	7	2.33	0.67	Easy
5	Statistics	--	26	22	15	2.17	0.79	Easy
6	Sets, Logic and Function	8	1	43	11	2.10	0.84	Easy
7	Probability	4	14	20	25	1.95	0.94	Easy
8	Mechanics	4	12	31	16	2.06	0.84	Easy
9	Linear Algebra	3	19	20	21	2.06	0.91	Easy
10	Abstract Algebra	7	17	31	8	2.37	0.85	Easy
11	Real Analysis	--	13	33	17	1.94	0.69	Easy
12	Mathematical Method	7	17	27	13	2.30	0.91	Easy
13	Complex Analysis	8	17	30	8	2.40	0.87	Easy
14	Ordinary Differential Equations	8	27	16	12	2.49	0.95	Easy
15	Vector and Tensor Analysis	4	9	34	16	2.02	0.81	Easy
16	Numerical Analysis	1	22	328		2.25	0.69	Easy
17	Classical Mechanics	4	14	36	9	2.21	0.77	Easy
18	Functional Analysis	1	25	21	16	2.17	0.83	Easy
19	Fluid Mechanics	1	19	43		2.33	0.51	Easy
20	Mathematical Modeling	10	15	26	12	2.37	0.97	Easy
21	Operational Research	1	26	32	4	2.38	0.63	Easy
22	Optional Theory	14	25	11	13	2.63	1.05	Difficult
23	General Topology		19	32	12	2.11	0.70	Easy
24	Partial Differential Equations	11	24	14	14	2.51	1.03	Difficult
25	Advanced Algebra	5	28	18	12	2.41	0.89	Easy
26	Discrete Mathematics	5	25	29	4	2.49	0.74	Easy
27	Field Theory	5	13	41	4	2.30	0.71	Easy
28	Lebesgue Measure and Integration	8	20	27	8	2.44	0.88	Easy
29	Quantum Mechanics	8	28	19	8	2.57	0.87	Difficult

30	Metric Space Topology	4	18	32	9	2.27	0.79	Easy
	Grand Mean					**2.27**	**0.82**	**Easy**

n=63, Criterion mean=2.50

Data in table 1 showed that the Mathematics courses in tertiary institution perceived difficult to learn by students are optional theory (Mean=2.63, Std=1.05), quantum mechanics (Mean=2.57, Std=0.87) and partial differential equations (Mean=2.51, Std=1.03) to be difficult. Generally, students perceived Mathematics courses easy to learn (Mean=2.27, Std=0.82).

Research question two: What are the Mathematics courses in tertiary institution perceived difficult to learn by the male and the female students?

Table 2: Descriptive statistics of mean and standard deviation on the Mathematics courses in tertiary institution perceived difficult to learn by gender
n=63, Criterion mean=2.50

S/N	Courses	Male (n=23)			Female(n=40)		
		Mean	Std.	Remark	Mean	Std.	Remark
1.	Algebra and Trigonometry	2.17	0.76	Easy	1.87	0.80	Easy
2.	Coordinate Geometry	2.25	0.79	Easy	2.10	0.72	Easy
3.	Vectors, Geometry and Dynamics	2.25	0.68	Easy	2.18	0.85	Easy
4.	Calculus	2.10	0.72	Easy	2.25	0.68	Easy
5.	Statistics	2.18	0.85	Easy	2.46	0.59	Easy
6.	Sets, Logic and Function	2.26	0.72	Easy	2.08	0.83	Easy
7.	Probability	1.79	0.93	Easy	2.05	0.94	Easy
8.	Mechanics	2.25	0.90	Easy	1.95	0.79	Easy
9.	Linear Algebra	2.25	1.03	Easy	1.95	0.83	Easy
10.	Abstract Algebra	2.50	0.93	Difficult	2.28	0.79	Easy
11.	Real Analysis	2.04	0.75	Easy	1.87	0.66	Easy
12.	Mathematical Method	2.42	0.93	Easy	2.23	0.90	Easy
13.	Complex Analysis	2.25	0.90	Easy	2.49	0.85	Easy
14.	Ordinary Differential Equations	2.75	0.79	Difficult	2.33	1.01	Easy
15.	Vector and Tensor Analysis	2.25	0.90	Easy	1.87	0.73	Easy
16.	Numerical Analysis	2.50	0.59	Difficult	2.10	0.72	Easy
17.	Classical Mechanics	2.50	0.78	Difficult	2.03	0.71	Easy
18.	Functional Analysis	2.21	0.78	Easy	2.15	0.87	Easy
19.	Fluid Mechanics	2.33	0.48	Easy	2.33	0.53	Easy
20.	Mathematical Modeling	2.21	1.06	Easy	2.46	0.91	Easy
21.	Operational Research	2.42	0.58	Easy	2.36	0.67	Easy
22.	Optional Theory	2.67	1.17	Difficult	2.62	0.99	Difficult
23.	General Topology	2.38	0.65	Easy	1.95	0.69	Easy
24.	Partial Differential Equations	2.50	1.02	Difficult	2.51	1.05	Difficult
25.	Advanced Algebra	2.38	1.01	Easy	2.44	0.82	Easy
26.	Discrete Mathematics	2.54	0.78	Difficult	2.46	0.72	Easy
27.	Field Theory	2.42	0.78	Easy	2.23	0.67	Easy
28.	Lebesgue Measure and Integration	2.29	0.91	Easy	2.54	0.85	Difficult
29.	Quantum Mechanics	2.67	0.92	Difficult	2.51	0.85	Difficult
30.	Metric Space Topology	2.42	0.93	Easy	2.18	0.68	Easy
	Grand Mean	**2.34**	**0.83**	**Easy**	**2.23**	**0.79**	**Easy**

Data in table 2 showed that the Mathematics courses in tertiary institution perceived difficult to learn by the male students are optional theory (Mean=2.67, Std=1.17), partial differential equations (Mean=2.50, Std=1.02) and quantum mechanics (Mean=2.51, Std=0.85) abstract algebra (Mean=2.50, Std=0.93), ordinary differential equations (Mean=2.75, Std=0.79), numerical analysis (Mean=2.50, Std=0.59), classical mechanics (Mean=2.50, Std=0.78) and discrete Mathematics (Mean=2.54, Std=0.78) while the female students perceived difficult Mathematics courses are Lebesgue measure and integration (Mean=2.54, Std=0.85), optional theory (Mean=2.67, Std=1.17), partial differential equations (Mean=2.51, Std=1.05) and quantum mechanics (Mean=2.51, Std=0.85). The male (Mean=2.34, Std=0.83) and the female (Mean=2.23, Std=0.79) students generally perceived the Mathematics courses easy to learn but learning difficulty was higher among the male students than their female counterparts.

Research question three: What are the Mathematics courses in tertiary institution perceived difficult to teach by lecturers?

Table 3: Descriptive statistics of mean and standard deviation on the Mathematics courses in tertiary institution perceived difficult to teach by lecturers
n=37, Criterion mean=2.50

S/N	Courses	VD	D	E	VE	Mean	Std	Remark
1	Algebra and Trigonometry	1	9	18	9	2.05	0.78	Easy
2	Coordinate Geometry	4	5	15	13	2.00	0.97	Easy
3	Vectors, Geometry and Dynamics	5	11	15	6	2.41	0.93	Easy
4	Calculus	1	16	10	10	2.22	0.89	Easy
5	Statistics	6	17	14		1.78	0.71	Easy
6	Sets, Logic and Function	1	7	15	14	1.86	0.82	Easy
7	Probability	1	5	27	4	2.08	0.60	Easy
8	Mechanics	12	21	4		2.27	0.80	Easy
9	Linear Algebra	10	13	10	4	2.22	0.63	Easy
10	Abstract Algebra	10	13	10	4	2.78	0.98	Difficult
11	Real Analysis	9	15	12	1	2.86	0.82	Difficult
12	Mathematical Method	5	7	20	5	2.32	0.88	Easy
13	Complex Analysis	5	15	10	7	2.49	0.96	Easy
14	Ordinary Differential Equations	7	23	7		2.00	0.62	Easy
15	Vector and Tensor Analysis	9	7	16	5	2.54	1.02	Difficult
16	Numerical Analysis	17	13	7		2.27	0.77	Easy
17	Classical Mechanics	19	17	1		2.49	0.56	Easy
18	Functional Analysis	5	11	16	5	2.43	0.90	Easy
19	Fluid Mechanics	4	15	17	1	2.59	0.72	Difficult
20	Mathematical Modeling	9	11	10	7	2.59	1.07	Difficult
21	Operational Research	8	22	7		2.03	0.64	Easy
22	Optional Theory	1	8	21	7	2.08	0.72	Easy
23	General Topology	5	11	16	5	2.43	0.90	Easy
24	Partial Differential Equations	1	10	18	8	2.11	0.77	Easy
25	Advanced Algebra	5	7	18	7	2.27	0.93	Easy
26	Discrete Mathematics	2	18	10	7	2.41	0.86	Easy
27	Field Theory	11	7	15	4	2.68	1.03	Difficult
28	Lebesgue Measure and Integration	7	19	5	6	2.73	0.96	Difficult
29	Quantum Mechanics	6	21	7	3	2.81	0.81	Difficult
30	Metric Space Topology	6	11	16	4	2.51	0.90	Difficult
	Grand Mean					2.34	0.83	**Easy**

Data in table 3 showed that the Mathematics courses in tertiary institution perceived difficult to teach by lecturers are real analysis (Mean=2.86, Std=0.82), abstract algebra (Mean=2.78, Std=0.98), vector and tensor analysis (Mean=2.54, Std=1.02), fluid mechanics (Mean=2.59, Std=0.72), mathematical modeling (Mean=2.59, Std=1.07), field theory (Mean=2.68, Std=1.03), Lebesgue measure and integration (Mean=2.73, Std=0.96), quantum mechanics (Mean=2.81, Std=0.81) and metric space topology (Mean=2.51, Std=0.90). Lecturers generally perceived Mathematics courses easy to teach (Mean=2.34, Std=0.83).

Research question four: What are the Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers?

Table 4: Descriptive statistics of mean and standard deviation on the Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers

n=63, Criterion mean=2.50

Courses	Students(n=63)	Lecturers(n=37)

		Mean	Std.	Remark	Mean	Std.	Remark
1	Algebra and Trigonometry	1.98	0.79	Easy	2.05	0.78	Easy
2	Coordinate Geometry	2.16	0.75	Easy	2.00	0.97	Easy
3	Vectors, Geometry and Dynamics	2.21	0.79	Easy	2.41	0.93	Easy
4	Calculus	2.33	0.67	Easy	2.22	0.89	Easy
5	Statistics	2.17	0.79	Easy	1.78	0.71	Easy
6	Sets, Logic and Function	2.10	0.84	Easy	1.86	0.82	Easy
7	Probability	1.95	0.94	Easy	2.08	0.60	Easy
8	Mechanics	2.06	0.84	Easy	2.27	0.80	Easy
9	Linear Algebra	2.06	0.91	Easy	2.22	0.63	Easy
10	Abstract Algebra	2.37	0.85	Easy	2.78	0.98	Difficult
11	Real Analysis	1.94	0.69	Easy	2.86	0.82	Difficult
12	Mathematical Method	2.30	0.91	Easy	2.32	0.88	Easy
13	Complex Analysis	2.40	0.87	Easy	2.49	0.96	Easy
14	Ordinary Differential Equations	2.49	0.95	Easy	2.00	0.62	Easy
15	Vector and Tensor Analysis	2.02	0.81	Easy	2.54	1.02	Difficult
16	Numerical Analysis	2.25	0.69	Easy	2.27	0.77	Easy
17	Classical Mechanics	2.21	0.77	Easy	2.49	0.56	Easy
18	Functional Analysis	2.17	0.83	Easy	2.43	0.90	Easy
19	Fluid Mechanics	2.33	0.51	Easy	2.59	0.72	Difficult
20	Mathematical Modeling	2.37	0.97	Easy	2.59	1.07	Difficult
21	Operational Research	2.38	0.63	Easy	2.03	0.64	Easy
22	Optional Theory	2.63	1.05	Difficult	2.08	0.72	Easy
23	General Topology	2.11	0.70	Easy	2.43	0.90	Easy
24	Partial Differential Equations	2.51	1.03	Difficult	2.11	0.77	Easy
25	Advanced Algebra	2.41	0.89	Easy	2.27	0.93	Easy
26	Discrete Mathematics	2.49	0.74	Easy	2.41	0.86	Easy
27	Field Theory	2.30	0.71	Easy	2.68	1.03	Difficult
28	Lebesgue Measure and Integration	2.44	0.88	Easy	2.73	0.96	Difficult
29	Quantum Mechanics	2.57	0.87	Difficult	2.81	0.81	Difficult
30	Metric Space Topology	2.27	0.79	Easy	2.51	0.90	Difficult
	Grand Mean	**2.27**	**0.82**	**Easy**	**2.34**	**0.83**	**Easy**

Data in table 4 showed that the Mathematics courses in tertiary institution commonly perceived difficult by students (Mean=2.57, Std=0.87) and lecturers (Mean=2.57, Std=0.87) is quantum mechanics.

Research question five: What are the causes of the perceived Mathematics learning difficulty?

Table 5: Descriptive statistics of mean and standard deviation on the causes of the perceived Mathematics learning difficulty
n=63, Criterion mean=2.50

S/N	Items	SA	A	D	SD	Mean	Std	Remark
31	Lecturers' poor knowledge of the course	67	8	24	1	3.41	0.89	Agree
32	Inability of the lecturer to effectively teach the course	35	52	12	1	3.21	0.69	Agree
33	The abstract nature of the Mathematics course	38	39	20	3	3.12	0.83	Agree
34	Students' poor study habit	37		59	4	3.29	0.67	Agree
35	Inability of the lecturer to cover the course contents		37	33	30	3.07	0.82	Agree
36	Poor students attitude towards attending lectures	32		61	7	3.18	0.76	Agree
37	Inadequate students-lecturers lecture contact hour	34	29	24	13	2.84	1.04	Agree
38	Students' deficiency in prerequisites courses	40	32	23	5	3.07	0.91	Agree
39	Lateness of students to lectures	40	20	36	4	2.96	0.96	Agree
40	Lateness of lecturers to lectures	21	41	29	9	2.74	0.89	Agree
41	Use of poor teaching methods	39	34	19	8	3.04	0.95	Agree
42	Lecturer incompetency in Mathematics	34	36	13	17	2.87	1.07	Agree

	instruction							
43	Lecturers deliberating setting difficult questions in examinations	36	33	24	7	2.98	0.94	Agree
44	The difficult nature of the Mathematics courses	15	46	28	11	2.65	0.87	Agree
45	Inadequate qualified Mathematics lecturers	28	36	27	9	2.83	0.94	Agree
46	Poor student-lecturer relationship	11	48	29	12	2.58	0.84	Agree
47	Inadequate learning facilities and materials	42	42	12	4	3.22	0.81	Agree
	Grand Mean					**3.00**	**0.88**	**Agree**

Data in table 5 showed that all the items are the causes of the perceived Mathematics learning difficulty with major causes such as lecturers' poor knowledge of the course (Mean=3.41, Std=0.89), students' poor study habit (Mean=3.29, Std=0.67), Inadequate learning facilities and materials (Mean=3.22, Std=0.81), inability of the lecturer to effectively teach the course (Mean=3.21, Std=0.69), poor students attitude towards attending lectures (Mean=3.18, Std=0.76), the abstract nature of the Mathematics course (Mean=3.12, Std=0.83), poor students attitude towards attending lectures (Mean=3.18, Std=0.76), inadequate student-lecturer lecture contact hour (Mean=2.84, Std=1.04), students' deficiency in prerequisites courses (Mean=3.07, Std=0.91), inability of the lecturer to cover the course contents (Mean=3.07, Std=0.82), use of poor teaching methods (Mean=3.04, Std=0.95), lecturers deliberating setting difficult questions in examinations (Mean=2.98, Std=0.94), lateness of students to lectures (Mean=2.96, Std=0.96), lecturer incompetency in Mathematics instruction (Mean=2.87, Std=1.07) lateness of lecturers to lectures (Mean=2.74, Std=0.89), and the difficult nature of the Mathematics courses (Mean=2.65, Std=0.87).

Research question six: How can we remediate learning difficulties in Mathematics courses in tertiary institutions?

Table 6: Descriptive statistics of mean and standard deviation on how to remediate learning difficulties in Mathematics courses
n=63, Criterion mean=2.50

S/N	Items	SA	A	D	SD	Mean	Std	Remark
48	Engaging the service of qualified and knowledgeable Mathematics lecturers	66	27	7	--	3.59	0.62	Agree
49	Effective teaching and learning of Mathematics in tertiary institutions	71	28	1	--	3.70	0.48	Agree
50	Use of diagnosis and remedial teaching approach	54	37	9	--	3.45	0.66	Agree
51	Improved student study habit in mathematics	55	29	16	--	3.39	0.75	Agree
52	Lecturers should ensure high extent of course content coverage	55	33	11	1	3.42	0.73	Agree
53	Students should develop positive attitude towards attending lectures	46	53	1	--	3.45	0.52	Agree
54	Increasing students-lecturers lecture contact hour	40	36	20	4	3.12	0.87	Agree
55	Students should pass prerequisite courses before offering the required courses	32	60	4	4	3.20	0.70	Agree
56	Students timely lecture attendance	31	45	24	--	3.07	0.74	Agree
57	Prompt attendance to lectures by lecturers	39	45	12	4	3.19	0.80	Agree
58	Use of problem solving method	40	49	1	10	3.19	0.88	Agree
59	Lecturers of Mathematics should obtain a minimum of post-graduate diploma certificate in education to enhance their teaching competency and skills	50	37	10	3	3.34	0.78	Agree
60	Lecturers should set questions on the contents or topics taught during examination	60	29	1	--	3.49	0.69	Agree
61	Lecturers should take time to explain abstract concepts and contents in mathematics	67	31	1	1	3.64	0.56	Agree
62	Employment of qualified Mathematics lecturers with teaching qualification	68	19	9	4	3.51	0.82	Agree
63	Enhancing positive student-lecturer relationship	45	51	4	--	3.37	0.69	Agree
64	Adequate provision of learning resources	74	18	4	4	3.62	0.75	Agree
	Grand Mean					**3.40**	**0.71**	**Agree**

Data in table 6 showed the remedy to the causes of learning difficulties in Mathematics courses in tertiary institutions. The remedies includes engaging the service of qualified and knowledgeable Mathematics lecturers (Mean=3.59,Std=0.62), effective teaching and learning of Mathematics in tertiary institutions (Mean=3.70, Std=0.48), use of diagnostic and remedial teaching approach (Mean=3.45, Std=0.66), improved student study habit in Mathematics (Mean=3.39, Std=0.75), lecturers should ensure high extent of course content coverage (Mean=3.42, Std=0.73), students should develop positive attitude towards attending lectures (Mean=3.45, Std=0.52), lecturers should set questions on the contents or topics taught during examination (Mean=3.49, Std=0.69), lecturers should take time to explain abstract concepts and contents in Mathematics (Mean=3.64, Std=0.56) among others.

H_{01}: There is no significant difference between the male and the female students' perception of difficult Mathematics courses in tertiary institutions.

Table 7: Summary of t-test on the difference between the male and the female students' perception of difficult Mathematics courses in tertiary institutions

Gender	n	Mean	Std	df	t-test	Sig.	Remark
Male	23	2.34	0.83	61	0.62	0.43	Not Significant
Female	40	2.22	0.80				

Data in table 7 showed that there is no significant difference between the male and the female students' perception of difficult Mathematics courses in tertiary institutions ($t_{(61,\ 0.05)} = 0.62$; $p>0.05$). Hence, the null hypothesis one is retained and the alternate rejected at 0.05 level of significance and 61 degrees of freedom.

H_{02}: There is no significant difference in the perceptions of students and lecturers on difficult Mathematics courses in tertiary institutions.

Table 8: Summary of t-test on the difference in the perceptions of students and lecturers on difficult Mathematics courses in tertiary institutions

Category	n	Mean	Std	df	t-test	Sig.	Remark
Student	63	2.27	0.82	98	0.47	0.26	Not Significant
Lecturer	37	2.34	0.83				

Data in table 8 showed that there is no significant difference in the perceptions of students and lecturers on difficult Mathematics courses in tertiary institutions ($t_{(98,\ 0.05)} = 0.47$; $p>0.05$). Hence, the null hypothesis two is retained and the alternate rejected at 0.05 level of significance and 98 degrees of freedom.

IV. DISCUSSION OF FINDINGS

Perception of students on difficult Mathematics courses in tertiary institutions

Data in table 1 showed that the Mathematics courses in tertiary institution perceived difficult to learn by students are optional theory, quantum mechanics and partial differential equations to be difficult. Generally, students perceived Mathematics courses easy to learn. Daso, *et al.* (2021) comparatively assessed the extent of student and teacher perception of content difficulty in the Further Mathematics curriculum and found out that students perceived pure mathematics, coordinate geometry, statistics, mechanics and operations research difficult to learn. Zalmon and George (2018) investigated the difficult contents in the Nigerian Senior Secondary Mathematics Curriculum (SSMC) as perceived by students and Mathematics teachers and reported that students perceived geometry and introductory calculus themes difficult to learn.

Perceptions of the male and the female students on difficult Mathematics courses in tertiary institutions

Data in table 2 showed that the Mathematics courses in tertiary institution perceived difficult to learn by the male students are optional theory, partial differential equations and quantum mechanics abstract algebra, ordinary differential equations, numerical analysis, classical mechanics and discrete Mathematics while the female students perceived difficult Mathematics courses are Lebesgue measure and integration, optional theory, partial differential equations and quantum mechanics. The male and the female students generally perceived the Mathematics courses easy to learn but learning difficulty was higher among the male students than their female counterparts. Data in table 7 showed that there is no significant difference between the male and the female students' perception of difficult Mathematics courses in tertiary institutions. Hence, the null hypothesis one is retained and the alternate rejected at 0.05 level of significance and 61 degrees of freedom. Zalmon, *et al.* (2021) revealed that there was no significant difference between the gender perceptions of students on Mathematics content difficulty.

Mathematics courses in tertiary institution perceived difficult to teach by lecturers

Data in table 3 showed that the Mathematics courses in tertiary institution perceived difficult to teach by lecturers are real analysis, abstract algebra, vector and tensor analysis, fluid mechanics, mathematical modeling, field theory, Lebesgue measure and integration, quantum mechanics and metric space topology. The study observed that some courses like Lebesgue measure and integration and field theory which lecturers perceived difficult were viewed to be easy with students, probability because the students had not learnt the courses or were not conversant with the contents of the courses. Lecturers generally perceived Mathematics courses easy to teach. Daso, *et al.* (2021) revealed that teachers perceived pure mathematics, coordinate geometry, statistics, mechanics and operations research easy to teach. Zalmon and George (2018) indicated that teachers perceived introductory calculus theme of the senior secondary Mathematics curriculum difficult to teach.

Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers

Data in table 4 showed that the Mathematics courses in tertiary institution commonly perceived difficult by students and lecturers is quantum mechanics. Data in table 8 showed that there is no significant difference in the perceptions of students and lecturers on difficult Mathematics courses in tertiary institutions. Hence, the null hypothesis two is retained and the alternate rejected at 0.05 level of significance and 98 degrees of freedom. Daso, *et al.* (2021) comparatively assessed student and teacher perception of content difficulty in the Further Mathematics Curriculum (FMC) and found out that students perceived pure mathematics, coordinate geometry, statistics, mechanics and operations research difficult to learn while teachers perceived all the themes of FMC easy to teach. The study further reported significant difference between student and teacher perception of the FMC content difficulty. Zalmon and George (2018) investigated the difficult contents in the Nigerian Senior Secondary Mathematics Curriculum (SSMC) as perceived by students and Mathematics teachers and reported that students perceived geometry and introductory calculus themes difficult to learn while the Mathematics teachers perceived only introductory calculus difficult to teach. The study found significant difference between students and teachers perception of content difficulty in the SSMC.

Causes of the perceived Mathematics learning difficulty in tertiary institutions

Data in table 5 showed that all the items are the causes of the perceived Mathematics learning difficulty with major causes such as lecturers' poor knowledge of the course, students' poor study habit, inadequate learning facilities and materials, inability of the lecturer to effectively teach the course, poor students attitude towards attending lectures, the abstract nature of the Mathematics course, poor students attitude towards attending lectures, inadequate student-lecturer lecture contact hour, students' deficiency in prerequisites courses, inability of the lecturer to cover the course contents, use of poor teaching methods, lecturers deliberating setting difficult questions in examinations, lateness of students to lectures, lecturer incompetency in Mathematics instruction, lateness of lecturers to lectures, and the difficult nature of the Mathematics courses. Zalmon and Njoku (2018) investigated students' perception of the causes and remediation measures of content difficulty in the Senior Secondary Mathematics Curriculum (SSMC). Findings from the study revealed that deficiency in cognitive skills, lack of instructional materials and job mismatch among others were some of the causes of learning difficulty in Mathematics. However, using appropriate instructional materials and varying instructional approach among others will remediate learning difficulties in mathematics.

Remedial measures to learning difficulties in Mathematics courses in tertiary institutions

Data in table 6 showed the remedy to the causes of learning difficulties in Mathematics courses in tertiary institutions. The remedies includes engaging the service of qualified and knowledgeable Mathematics lecturers, effective teaching and learning of Mathematics in tertiary institutions, use of diagnostic and remedial teaching approach, improved student study habit in Mathematics, lecturers should ensure high extent of course content coverage, students should develop positive attitude towards attending lectures, lecturers should set questions on the contents or topics taught during examination, lecturers should take time to explain abstract concepts and contents in Mathematics among others. Zalmon and Njoku (2018) suggested using appropriate instructional materials and varying instructional approach among others to remediate learning difficulties in Mathematics.

V. CONCLUSION

The study investigated student and lecturer perception of difficult Mathematics courses in tertiary institutions. Some perceived difficult Mathematics courses are real analysis, abstract algebra, optional theory, quantum mechanics, ordinary and partial differential equations, numerical analysis, classical mechanics, discrete Mathematics, Lebesgue measure and integration, vector and tensor analysis, fluid mechanics, mathematical modeling, field theory, and metric space topology. Some of the causes of Mathematics learning difficulties are

lecturers' poor knowledge of the course, inadequate learning facilities and materials, inability of the lecturer to effectively teach the course, the abstract nature of the Mathematics course, students' poor study habit, inability of the lecturer to cover the course contents, poor students attitude towards attending lectures, inadequate students-lecturers lecture contact hour, students' deficiency in prerequisites courses, lateness of students to lectures, lateness of lecturers to lectures, use of poor teaching methods, lecturer incompetency in Mathematics instruction and many others.

VI. RECOMMENDATIONS

To tackle the difficulties identified in the teaching and learning of Mathematics courses in tertiary institutions, the study recommended as follows:

1. School management should engage the services of qualified and knowledgeable Mathematics lecturers.
2. Proprietors of tertiary institutions should provide adequate learning facilities and materials.
3. Lecturers should attend conferences, workshops and seminars in their field of specialization to remediate their difficulties in teaching some Mathematics courses.
4. Lecturers should use active and innovative instructional approaches such as diagnostic and remedial instruction, peer learning/tutoring, problem-solving and problem-based learning.
5. Lecturers should be encouraged to cover course contents during instruction.
6. The male and the female undergraduate students should be encouraged to improve on their learning interest and study habit particularly for perceived difficult Mathematics courses.

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