Comparative Assessment of Student and Teacher Perception of the Curriculum Content Difficulty in Further Mathematics

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Abstract: **The study comparatively assessed the extent of student and teacher perception of content difficulty in the Further Mathematics Curriculum (FMC).The analytical survey research design was adopted for the study. The study was conducted in Gokana local government area of Rivers State with a population of sixty (60) senior secondary class three students offering Further Mathematics from the twelve (12) public senior secondary schools in the area. Census sampling technique was used to select the sample of 60 students used for the study. The instrument for data collection was the researchers' made and validated Further Mathematics Curriculum Content Difficulty Assessment Questionnaire (FMCCDAQ). The test and retest method and Pearson's Product Moment Correlation (PPMC) were used to obtain 0.73 reliability coefficient of the FMCCDAQ. Six research questions and one hypothesis guided the study. Mean and standard deviation were used for data analysis. The study found out that students perceived all the FMC themes of pure mathematics, coordinate geometry, statistics, mechanics and operations research difficult to learn. Teachers perceived all the themes of the FMC easy to teach. There is significant difference between student and teacher perception of the FMC content difficulty. The study among others recommended that teachers should employ diagnostic and remedial instructional strategy and active learning strategies such as problem solving and problem-based learning strategies to remediate the learning difficulties among students in the FMC.**

Key words: **Assessment, perception, content, difficulty, Further Mathematics, curriculum**

I. INTRODUCTION

Mathematics philosophy greatly influences mathematical pedagogy. Philosophy of Mathematics sheds light on what Mathematics is about and the very methodology of Mathematics hangs on the answers to some of the philosophical questions that imposed themselves upon us(Odili, 2019). The three major movements in the philosophy of Mathematics which includes intuitionism, logicism and formalism are charming; each take one particular aspect of mathematical methodology as central to understanding Mathematics (Odili, 2019).In modern times, the absolutist and the fallibilist philosophical views of Mathematics are greatly influencing Mathematics pedagogy. Eves (1976) as cited in Odili (2019) defined philosophy of Mathematics as an attempted reconstruction in which the chaotic mass of mathematical knowledge accumulated over the years is given a certain sense or order. Philosophy of Mathematics deals with the views, conceptions, perceptions or thoughts of people about Mathematics. 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.

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. Bem (1972), in his self-perception theory opined that individual's perception about a thing, concept, idea or knowledge affect his or her action. According to the theory, we interpret our own actions the way we interpret others' actions, and our actions are often socially influenced and not produced out of our own free will, as we might expect. Self-perception theory describes the process in which people, lacking initial attitudes or emotional responses develop them by observing their own behavior and coming to conclusions as to what attitudes must have driven that behavior (Bem, 1972). Students' perception about Mathematics determines their attitudes towards learning General and Further Mathematics.

Further Mathematics is one of the subjects that students offer at the post-basic level of senior secondary education.The educational policy provided for students to offer the compulsory cross-cutting General Mathematics and the optional Further Mathematics recommended for students with high ability in General Mathematics who require a good foundation for future studies in Mathematics or Mathematics related courses at the senior secondary education level (Zalmon & George, 2020).The Further Mathematics curriculum has advance contents than the General Mathematics curriculum content designed to help the students develop conceptual and manipulative skills in Mathematics so as to prepare them for further studies in Mathematics and its application; reflect continuity with those used in Universities, Polytechnics, Federal Colleges of Education and Colleges of Science and Technology, so that graduates of the curriculum have nothing to unlearn on entering any of the above mentioned institutions and prepare potential Mathematicians, Engineers and Scientists (Nigerian Educational Research and Development Council (NERDC), 2012). Further Mathematics as the name implies is a subject-based curriculum designed to help students develop mathematical skills, attitudes and competencies which will prepare them for further studies in Mathematics at the higher or tertiary level of education in Nigeria. The Further Mathematics curriculum was developed with potential Mathematicians, Engineers, Technologists and Scientists in mind.

Further Mathematics Curriculum (FMC) is the formal document which prescribes the content of advance mathematical concepts that the teacher is expected to implement in the classroom alongside with performance objectives, teacher and student activities, the instructional strategies and materials (Zalmon & George, 2020). The curriculum content of Further Mathematics can simply be referred to as advance Mathematics. The five themes or content areas of the Further Mathematics are pure mathematics, mechanics, statistics, coordinate geometry and operations research (NERDC, 2012).Empirical reviews of literature revealed that students perceived the contents of the General Mathematics and the Further Mathematics curriculum difficult to learn at varying degree.

Zalmon and George (2018) indicated that students and Mathematics teachers perceived 33% and 14% of the senior secondary Mathematics curriculum content difficult respectively with students perceiving geometry and introductory calculus themes difficult to learn while the Mathematics teachers perceived only introductory calculus difficult to teach. There exists also, a significant difference between students and teachers' perception of content difficulty in the senior secondary Mathematics curriculum. Zalmon, Efet and Ogunsola (2018) reported that there was no significant difference between the gender perceptions of students on the senior secondary Mathematics curriculum content difficulty. Deficiency in cognitive skills, lack of instructional materials and job mismatch among others were the causes of learning difficulty in Mathematics but that using appropriate instructional materials and varying instructional approach among others will remediate learning difficulties in Mathematics. Zalmon and George (2020) found out that students perceived 88.20% of the Further Mathematics curriculum content difficult to learn with learning difficulties in all the FMC themes of pure mathematics, coordinate geometry, statistics, mechanics and operations research indicating poor FMC implementation. The study among others recommended a holistic review of the Nigerian FMC contents and improved instructional effectiveness through training and re-training of Further Mathematics teachers.However, this study comparatively assessed the extent of students and teachers'perception of content difficulty in the Further Mathematics curriculum and also determined if significant difference exist between their perceptions.

Statement of the Problem

Available empirical reports revealed that the extent to which students perceived the Further Mathematics curriculum contents difficult to learn was very high. There is every possibility that the students perceived difficulties stems from their teachers' difficulties in understanding and effectively delivering the FMC contents to them. Therefore, this study shall provide an answer to this question: What is the difference between student and teacher perception of the difficult contents in the Further Mathematics curriculum?

Aim and Objectives of the Study

The study comparatively assessed the extent of student and teacher perception of content difficulty in the Further Mathematics Curriculum (FMC).The objectives of the study are to:

1. Determine the difference between student and teacher perception of the pure mathematics content difficulty in the FMC.
2. Assess the difference between student and teacher perception of the coordinate geometry content difficulty in the FMC.
3. Ascertain the difference between student and teacher perception of the statistics content difficulty in the FMC.
4. Evaluate the difference between student and teacher perception of the mechanics content difficulty in the FMC.
5. Find out the difference between student and teacher perception of the operations research content difficulty in the FMC.
6. Determine the difference between student and teacher perception of the FMC content difficulty.

Research Questions

The following research questions guided the study:

1. What is the difference between student and teacher perception of the pure mathematics content difficulty in the FMC?
2. What is the difference between student and teacher perception of the coordinate geometry content difficulty in the FMC?
3. What is the difference between student and teacher perception of the statistics content difficulty in the FMC?
4. What is the difference between student and teacher perception of the mechanics content difficulty in the FMC?
5. What is the difference between student and teacher perception of the operations research content difficulty in the FMC?
6. What is the difference between student and teacher perception of the FMC content difficulty?

Hypothesis

The null hypothesis below was formulated and tested at 0.05 level of significance to guide the study:

1. There is no significant difference between student and teacher perception of the FMC content difficulty.

II. METHODOLOGY

The analytical survey research design was adopted for the study. The study was conducted in Gokana local government area of Rivers State with a population of sixty (60) senior secondary class three students offering Further Mathematics from the twelve (12) public senior secondary schools in the area. The senior secondary class three students constituted the population of the study because the study is interested in assessing the perception of difficulty of students who had been taught all or most of the Further Mathematics curriculum content. Further Mathematics is optional and few schools and students offer the subject. Census sampling technique was used to select the 60 sample size used for the study. The instrument for data collection was the researchers made Further Mathematics Curriculum Content Difficulty Assessment Questionnaire (FMCCDAQ). The FMCCDAQ consisted of 263 content items patterned after the four-point Likert like scale of Very Difficult (VD) – 4 points, Difficult (D) – 3 points, Easy (E) – 2 points and Very Easy (VE) – 1 point with a mean criterion cut-off mark of 2.50. The decision rule was: Difficult content (mean$\geq$ 2.50); Easy content (mean$<$ 2.50). The FMCCDAQ had two sections. Section A and section B. Section A was used to illicit demographic information from the respondents such as class and gender while section B was used to obtain the response of the respondents on their perception of the Further Mathematics curriculum content difficulty based on the five themes of the curriculum: pure mathematics, coordinate geometry, statistics, mechanics and operations research. Three experts in Curriculum Studies and Educational Technology validated the instrument face and content wise. The test and retest method and Pearson's Product Moment Correlation (PPMC) were used to obtain 0.73 reliability coefficient of the FMCCDAQ. The FMCCDAQ was administered by the researchers with the assistants of the Further Mathematics teachers. Mean and standard deviation were used for data analysis. The decision rule was: Difficult content (mean$\geq$ 2.50); Easy content (mean$<$ 2.50).

III. RESULTS

Table 1: Mean and standard deviation on student and teacher perception of pure mathematics, coordinate geometry, statistics, mechanics and operations research content difficulty in the FMC

S/N	Item	Students (n=60)		Teachers (n=11)	
		Mean	Std	Mean	Std
	Pure Mathematics				
1. 1.	Definition of sets	1.58	0.67	1.36	0.50
2.	Set notation methods	2.38	1.15	1.55	0.52
3.	Null set	2.52	1.16	1.55	0.52
4.	Singleton set	2.45	1.11	1.55	0.69
5.	Finite and infinite set	1.98	0.83	1.45	0.52
6.	Subsets	1.85	1.01	1.55	0.52
7.	Universal set	1.50	0.72	1.27	0.47
8.	Power set	1.95	0.83	1.91	0.83
9.	Union of sets	1.70	0.77	1.27	0.47
10.	Intersection of set	1.62	0.72	1.45	0.52
11.	Complements of set	1.90	0.82	1.45	0.52
12.	Number of element in a set	2.18	0.98	1.27	0.47
13.	Venn diagram and applications up to 3 set problem	2.35	1.04	1.45	0.52
14.	Definition of binary operation	2.08	1.01	1.18	0.40
15.	Association law of binary operation	2.57	1.06	1.18	0.40
16.	Commutative law of binary operation	2.48	1.08	1.45	0.52
17.	Distributive law of binary operation	2.60	1.15	1.82	0.87
18.	Laws of complementation as insets	2.95	0.98	1.73	0.90
19.	Identify elements	2.75	0.91	1.45	0.52
20.	Inverse of an element	3.02	0.89	1.73	0.90
21.	Multiplication tables of binary operation	2.48	1.10	1.73	0.90
22.	Definition of indices	2.00	1.04	1.09	0.30
23.	Multiplicative laws of indices	2.05	0.98	1.45	0.52
24.	Divisional law of indices	2.28	1.06	1.45	0.52
25.	Power law of indices	2.25	1.11	1.45	0.52
26.	Zero power law of indices	2.20	1.05	1.55	0.93
27.	Negative power law of indices	2.33	1.14	2.00	1.10
28.	Inverse power law of indices	2.40	1.01	1.73	0.90
29.	Applications of indices, solution of indicial equations up to quadratic equation	2.95	1.19	1.82	0.87
30.	Logarithms	1.77	0.67	1.73	0.90
31.	Definition of logarithm	1.70	0.67	1.09	0.30
32.	Multiplicative laws of logarithm	2.17	0.74	1.55	0.52
33.	Divisional law of logarithm	2.33	0.90	1.73	0.90
34.	Power law of logarithm	2.37	0.92	1.45	0.52
35.	Logarithm of number in the same base	2.53	1.00	1.36	0.50
36.	Logarithm of number equal to 1	2.82	0.85	1.55	0.93
37.	Logarithm of a number equal to zero	2.78	0.87	1.09	0.30
38.	Change of base of logarithm	2.53	1.07	1.45	0.52
39.	Definition of surds	2.37	0.92	1.18	0.40
40.	Rules for manipulating	3.05	0.93	1.91	0.83

	surds (√ab)				
41.	Multiplicative rule of surds (√ab)	3.00	0.96	1.64	0.50
42.	Divisional rule of surds (√ab)	3.15	0.94	1.64	0.50
43.	Power rule of surds (√ab)	2.85	0.95	1.73	0.90
44.	Inverse power rule of surd	3.23	0.96	1.73	0.90
45.	Rationalization of the denominator	3.25	1.00	1.73	0.90
46.	Definition of function	3.22	0.99	1.36	0.50
47.	One to one function	3.02	1.05	1.91	0.70
48.	Onto function	3.15	0.97	1.91	0.83
49.	Inverse function	3.10	0.97	1.73	0.90
50.	Identify function	3.17	0.91	1.91	0.83
51.	Constant function	2.98	1.05	1.91	0.83
52.	Circular function	3.12	0.94	1.91	0.83
53.	Logarithmic function	2.68	0.93	1.73	0.90
54.	Experiential function	2.80	1.04	1.73	0.90
55.	Composite function	3.13	0.95	2.00	1.10
56.	Application of functions	3.12	0.99	1.91	0.94
57.	Solutions of problems of function	3.12	0.96	1.91	0.94
58.	Definition of sequence	2.43	1.05	1.45	0.93
59.	The nth them of a sequence	2.13	1.08	1.27	0.90
60.	Definition of series	2.42	1.11	1.64	0.92
61.	The nth term of a series	2.30	1.12	1.82	0.60
62.	Arithmetic and geometric progressive	2.48	1.21	1.91	0.83
63.	Linear inequalities in one variable	2.65	1.18	1.82	0.60
64.	Linear inequalities in two variables	2.75	1.17	2.00	1.10
65.	Graphs of linear inequalities in two variables	3.08	0.98	2.09	0.83
66.	Quadratic inequalities	2.92	0.79	2.00	0.77
67.	Inequalities in two dimensions	3.15	0.84	2.09	0.83
68.	Calculating devices	3.22	0.80	1.82	0.60
69.	Abacus calculating devices	2.88	1.03	2.09	0.94
70.	Decimal system	2.42	0.81	2.00	0.77
71.	Binary system	2.47	0.98	1.91	0.70
72.	Flow charts	3.22	0.98	1.91	0.83
73.	Application of flow charts	3.17	0.98	1.73	0.47
74.	Trigonometric ratios of 30^0, 45^0,60^0	3.17	0.98	1.73	0.47
75.	Application of trigonometric ratio of 30^0, 45^0, 60^0	3.40	0.91	1.82	0.60
76.	Knowledge of six trigonometric functions of angles of any magnitude (sine, cosine, tangent secant cosecant cotangent)	3.17	1.03	2.00	0.77
77.	Range or specified	3.30	0.81	2.09	0.83

	trigonometry				
78.	Domain of specified trigonometry	3.18	0.91	2.00	0.77
79.	Graphs of trigonometric ratios with emphasis on their amplitude and periodicity	3.25	0.89	2.09	0.83
80.	Relationship between graphs of t trigonometric ratios (y= a sin (bx) +c, y=a cos (bx) + c, y=atan (bx) +c	3.40	0.85	2.09	0.83
81.	Graphs of inverse by ratios	3.27	0.90	2.00	0.77
82.	Solutions of simple equation involving the six trigonometric function	3.00	1.06	2.00	0.77
83.	Proofs of simple trigonometric identities (sin^{2}x + cos^{2}x=1, sec^{2}x = 1+ tan^2 x	3.07	1.10	2.36	1.03
84.	Sum of roots of quadratic equation (α+β=$-b/a$)	2.72	1.06	1.73	0.47
85.	Product of roots of quadratic equation (α β= c/a	2.53	0.91	1.73	0.47
86.	Finding quadratic equation given sum and products of roots (x^2- (sum of roots) + product) = 0	2.63	0.96	2.09	0.83
87.	Condition for quadratic equation to have equal roots (b^2 =4ac)	3.13	1.05	2.00	0.77
88.	Condition for quadratic equation to have real roots (b^2>4ac)	3.18	1.07	1.82	0.60
89.	Condition for quadratic equation to have no roots (b^2< 4ac)	3.02	1.03	2.00	0.77
90.	Condition for given line to intersect a curve	2.93	1.06	2.00	0.77
91.	Condition for given line to be tangent to curve	2.90	0.95	2.00	0.77
92.	Condition for given line not to intersect a curve	2.85	1.01	2.27	0.90
93.	Solution of problems on roots quadratic equation	2.88	1.08	1.91	0.83
94.	Definition of polynomials	2.77	1.13	1.73	0.47
95.	Division of polynomials by a polynomial of lesser degree	3.17	1.06	1.82	0.60
96.	Remainder theorem	3.17	1.03	1.55	0.69
97.	Factorization of polynomial	2.93	1.12	2.09	0.83
98.	Roots of cubic equation	3.12	0.99	2.27	1.19
99.	Sum of roots	2.82	0.91	1.73	0.47
100.	Product of roots	2.72	0.88	1.73	0.47
101.	Sum of products of two roots	2.85	0.94	2.00	0.77
102.	Logical reasoning	2.97	0.96	1.55	0.69
103.	Definition of statement	2.75	1.07	1.55	0.69
104.	Negation of statement	2.83	0.94	1.55	0.69
105.	Contrapositive of statement	2.87	1.03	2.18	0.98
106.	Antecedents and consequence of statement	3.07	1.06	1.73	0.47

107.	Conditional statement	2.97	1.13	1.91	0.83
108.	Fundamental issues in intelligent system	3.22	0.96	1.82	0.60
109.	Fundamental definition	3.12	1.01	1.55	0.69
110.	Modeling the world	3.12	1.09	1.82	0.60
111.	Introduction to propositional and predicate logical resolution	3.42	0.94	2.18	0.98
112.	Introduction to theorem proving	3.27	1.06	1.64	0.92
113.	Pascal triangle	3.22	1.11	1.91	0.83
114.	Binomial expansion of $(a+b)^n$ where n is the positive integer	3.17	0.96	2.36	1.03
115.	Binomial expansion of $(a+b)^{-n}$ where n is the negative integer	3.12	0.99	2.36	1.03
116.	Binomial expansion of $(a+b)^{1/n}$ where 1/n is the fractional value	3.32	0.83	2.36	1.03
117.	Finding the nth term	2.87	1.02	1.91	0.83
118.	Application of binomial expansion	3.17	0.94	2.18	0.98
119.	Limits of a function	3.25	1.02	2.09	0.94
120.	Differentiation of polynomial	3.32	0.93	1.91	0.83
121.	Differentiation of transcendental functions such as sin x, e^{ax}, log 3x	3.27	0.92	2.45	1.29
122.	Product rule of differentiation	3.23	0.96	1.82	0.60
123.	Quotient rule of differentiation	3.02	1.02	1.73	0.47
124.	Function of function	2.95	1.02	1.73	0.47
125.	Application of differentiation to rate of change	3.13	1.05	2.18	0.98
126.	Application of differentiation to gradient	3.03	1.02	2.00	0.77
127.	Application of differentiation to maximum and minimum values	3.10	1.00	1.91	0.83
128.	Application of differentiation to equation of motion	3.12	0.96	1.82	0.60
129.	Higher derivative	3.25	0.99	2.09	0.83
130.	Differentiation implicit function	3.42	0.89	2.36	1.21
131.	Matrices as linear transformations	3.38	0.88	2.36	1.21
132.	Determinants	3.32	0.93	1.82	0.60
133.	Solutions of 2 and 3 simultaneous equations	2.78	0.98	2.09	0.83
134.	Proper rational functions with denominators as linear factors (distinct and repeated) and others	3.27	0.94	2.18	0.98
135.	Understand integration as the reverse process of differentiation	3.43	0.89	1.64	0.67
136.	Integration of algebraic polynomials including 1/x, logarithmic functions	3.38	0.85	2.18	0.98
137.	Definite integrals and application to kinematics apply to v-t and s-t graphs	3.47	0.79	2.45	1.29
138.	Areas under the curve	3.15	0.99	1.82	1.08
139.	Trapezoidal rule	3.17	1.01	1.73	0.90
140.	Volume of solids of revolution	3.18	0.95	2.09	0.94
	Mean	2.82	0.98	1.80	0.75
	Coordinate Geometry				
141.	Mid-point of a line segment	3.10	1.04	1.64	0.92
142.	Gradient of a straight line	3.03	1.12	1.55	0.93
143.	Distance between two points	2.85	1.10	1.45	0.52
144.	Condition for parallelism	3.13	1.03	1.64	0.92
145.	Condition for perpendicularity	3.07	0.94	1.82	0.60
146.	Equation of a line	3.05	0.98	1.55	0.69
147.	Transform relationship into linear form	2.97	1.04	1.91	0.83
148.	Areas of triangles and quadrilateral	3.13	0.89	1.73	0.90
149.	Definition of circle	2.65	1.05	1.45	0.52
150.	Equation of circle given center and radius	2.90	1.00	1.73	0.47
151.	General equation of a circle	2.97	1.06	1.45	0.52
152.	Finding center and radius of a given circle	2.87	1.13	1.73	0.47
153.	Finding equation of a circle given the end point of the diameter	3.08	1.05	1.91	0.70
154.	Equation of circle passing through 3 points	3.40	1.03	2.00	0.77
155.	Equation of tangent to a circle	3.12	1.01	1.91	0.70
156.	Length of tangent to a circle	3.30	0.85	1.82	0.60
157.	Equation of parabola in rectangular Cartesian coordinate	3.23	0.81	2.09	0.83
158.	Equation of ellipse in rectangular Cartesian coordinate	3.25	0.79	2.09	0.83
159.	Parametric equation	3.37	0.84	2.27	0.90
	Mean	3.08	0.99	1.78	0.72
	Statistics				
160.	Mean	2.27	1.02	1.45	0.93
161.	Mode	2.12	0.96	1.45	0.93
162.	Median	2.32	1.00	1.36	0.67
163.	Decile	2.75	1.08	1.82	0.60
164.	Percentile	2.77	1.11	1.82	0.60
165.	Quartiles	2.53	1.05	1.82	0.60
166.	Range	2.27	0.90	1.73	0.90
167.	Inter-quartiles	2.90	0.93	2.18	0.98
168.	Mean deviation	2.43	1.03	1.91	0.83
169.	Standard deviation	2.45	0.93	1.91	0.83
170.	Coefficient of variation	2.55	1.03	2.18	0.98

171.	Classical	3.35	0.90	1.82	0.60
172.	Frequential	3.25	0.95	1.73	0.90
173.	Axiomative approaches to probability	3.32	0.91	2.00	0.77
174.	Sample space	3.33	0.95	1.91	0.83
175.	Event space	3.15	0.97	2.00	0.77
176.	Mutually exclusive event	3.32	0.97	2.09	0.94
177.	Independent event	3.20	1.01	2.00	0.77
178.	Conditional event	3.38	0.94	2.09	0.94
179.	Conditional probability	3.08	1.12	1.91	0.83
180.	Probability trees	3.00	1.13	1.45	0.52
181.	Permutation on arrangement	2.88	1.15	1.82	0.60
182.	Cyclic permutation	3.02	1.13	2.18	0.98
183.	Arrangement of identical objects	2.98	1.13	1.82	0.60
184.	Arrangement in which repetitions are allowed	3.08	1.18	1.91	0.83
185.	Introduction to combination on selection	3.22	0.98	2.09	0.94
186.	Conditional arrangements and selection	3.12	0.98	2.36	1.03
187.	Probability arrangement problem involving arrangement and selection	3.07	1.04	2.09	0.83
188.	Variance	3.22	0.92	1.91	0.83
189.	Coefficient of variance of binomial distributions	3.27	0.97	1.82	0.60
190.	Coefficient of variance of Poisson distribution	3.25	1.00	2.18	0.98
191.	Coefficient of variance of normal distributions	3.23	1.00	2.09	0.83
192.	Binomial distribution	3.12	0.87	2.18	0.98
193.	Poisson distribution	3.18	0.87	2.36	1.03
194.	Normal distribution	3.33	0.82	2.36	1.03
195.	Binomial approximations by Poisson distributions	3.30	0.87	2.36	1.03
196.	Normal approximations by binomial distributions	3.23	0.95	2.45	1.29
197.	Concept of correlations as measure of relationship	3.10	0.99	2.36	1.21
198.	Scatter diagrams	3.18	1.02	2.36	1.03
199.	Rank correlation	3.05	1.06	2.00	0.77
200.	Tied ranks	3.32	0.87	2.27	0.90
201.	Classical	2.97	1.07	2.18	0.87
	Mean	3.00	0.99	1.99	0.86
	Mechanics				
202.	Scalars quantity	2.72	1.08	1.45	0.52
203.	Vectors quantity	2.53	1.13	1.45	0.52
204.	Zero vector	2.57	1.05	1.45	0.52
205.	Negative vector	2.32	1.07	1.73	0.47
206.	Vectors	2.32	0.98	1.82	0.60
207.	Vector addition and subtraction	2.45	1.11	1.73	0.47
208.	Scalar multiplication of vectors	2.30	1.15	1.82	0.60
209.	Magnitude and direction of a vector	2.75	1.08	1.73	0.47
210.	Unit vector	2.68	1.02	1.64	0.67
211.	The triangle law	2.80	1.18	1.82	0.60
212.	The parallelogram law	2.58	1.21	1.73	0.47
213.	Resolution of vectors	2.67	1.17	1.82	0.60
214.	Scalar (dot) product	2.80	1.10	1.73	0.47
215.	Application of scalar (dot) product	3.05	1.10	1.64	0.67
216.	Scalar product of vectors in three dimensions	2.92	1.12	1.91	0.94
217.	Application of scalar product	3.02	1.08	2.00	1.10
218.	Vector or cross product in three dimensions	3.05	1.05	1.91	0.94
219.	Application of cross product	3.32	0.97	2.00	1.10
220.	Newton's law of motion	2.80	1.22	1.27	0.47
221.	Motion along inclined plane	3.00	1.25	1.64	0.67
222.	Motion of connected particles	2.98	1.14	1.91	0.94
223.	Work	2.48	1.00	1.55	0.69
224.	Power	2.28	0.90	1.45	0.52
225.	Energy	2.40	1.06	1.27	0.47
226.	Impulse and momentum	2.75	1.20	1.27	0.47
227.	Projectiles	2.70	1.25	1.55	0.52
228.	Trajectory of projectiles	2.97	1.22	1.36	0.67
229.	Greatest height reached	2.93	1.22	1.36	0.67
230.	Time of flight	2.88	1.19	1.36	0.67
231.	Range	2.42	1.11	1.36	0.67
232.	Projection along inclined plane	3.08	1.14	1.91	0.94
233.	Forces in equilibrium	3.10	1.12	1.64	0.67
234.	Resultant of parallel forces (in the same direction and in opposite directions) acting on a rigid body	3.13	1.10	1.91	0.94
235.	Moment of a force (2 and 3 force) acting at a point	2.97	1.09	1.55	0.52
236.	Polygon of forces	3.13	1.02	1.82	0.87
237.	Resolution of forces of friction	2.80	1.05	1.82	0.60
238.	Application of scalar (dot) product	3.00	1.10	1.64	0.92
	Mean	2.77	1.11	1.65	0.67
	Operations Research				
239.	Definition of operations research	3.22	1.06	1.64	0.92
240.	History and nature operation research	3.25	0.99	1.91	0.83
241.	Models of operation research	3.08	0.98	1.91	0.83
242.	Linear programming model	3.35	0.95	1.91	0.83
243.	Transportation model (least cost and not west corner)	3.50	0.89	2.18	0.98

244.	Assignment models	3.52	0.89	2.18	0.98
245.	Practical application of the models	3.48	0.87	2.00	1.10
246.	Concept of inventory	3.45	0.95	1.64	0.92
247.	Definition of important terms in inventory	3.42	1.00	1.64	0.92
248.	Holding list	3.12	1.14	1.91	0.83
249.	Demand	3.10	0.97	1.91	0.83
250.	Ordering list	3.25	1.05	2.18	0.98
251.	Computation of optimal quantity (EOQ model)	3.42	0.93	1.91	0.83
252.	Concept of replacement	3.30	0.93	2.09	0.94
253.	Individual replacement sudden failure item	3.52	0.91	2.36	1.03
254.	Replacement of items that wear out gradually	3.32	0.98	1.82	1.08
255.	Introduction of modeling	3.47	0.96	2.36	1.03
256.	Dependent and independent variables in mathematical modeling	3.38	0.98	2.36	1.03
257.	Examples of some models	3.10	1.13	1.82	0.60
258.	Construction of model	3.12	1.09	2.55	1.21
259.	Methodology of modeling	3.30	1.08	2.09	0.94
260.	Application to physical, biological, social and behavioural services.	3.03	1.18	2.36	1.03
261.	Introduction to game theory.	3.05	1.19	2.09	0.94
262.	Description of types of games.	3.10	1.12	2.09	0.94
263.	Solution of two persons zero sum games using pure and mixed strategies.	3.08	1.20	2.36	1.03
264.	Matrix games.	3.07	1.18	2.36	1.03
	Mean	3.27	1.02	2.06	0.95
	Grand Mean	2.91	1.00	1.83	0.77

Data in table 1 showsthe difference between student and teacher perception of the content difficulty in pure mathematics (M=1.02; Std=0.23), coordinate geometry (M=1.30; Std=0.27), statistics (M=1.01; Std=0.13), mechanics (M=1.12; Std=0.44), operations research (M=1.21; Std=0.07) and the FMC (M=1.08; Std=0.23) in favour of the teachers. The pure mathematics content is difficult with students (Mean = 2.82; Std = 0.98) and easy with teachers (Mean = 1.80; Std = 0.75), coordinate geometry is difficult with the students (Mean = 3.08; Std = 0.99) and easy with teachers (Mean = 1.78; Std = 0.72), statistics is difficult with students (Mean = 3.00; Std = 0.99) but easy with teachers (Mean = 1.99; Std = 0.86), mechanics is difficult with the students (Mean = 2.77; Std = 1.11) but easy with the teachers (Mean = 1.65; Std = 0.67), operations research is difficult with the students (Mean = 3.27; Std = 1.02) and easy with the teachers (Mean = 2.06; Std = 0.95) and generally, the Further Mathematics content is difficult with the students (Mean = 2.91; Std = 1.00) but easy with the teachers (Mean = 1.83; Std = 0.77).

Table 2: Summary of t-test analysis on the significance difference between student and teacher perception of the FMC content difficulty

Designation	n	Mean	Std	Df	t_{cal}	Sig.	Decision
Teacher	11	1.83	0.77	69	-3.71	0.027	Significant
Student	60	2.91	1.00				

Data in table 2 shows that there is significant difference between student and teacher perception of the FMC content difficulty ($t_{(69,\ 0.05)} = -3.71; p < 0.05$). Therefore, the null hypothesis is rejected and the alternate hypothesis retained at 0.05 significant level.

IV. DISCUSSION OF FINDINGS

Data in table 1 shows the difference between student and teacher perception of the content difficulty in pure mathematics (M=1.02; Std=0.23), coordinate geometry (M=1.30; Std=0.27), statistics (M=1.01; Std=0.13), mechanics (M=1.12; Std=0.44), operations research (M=1.21; Std=0.07) and the FMC (M=1.08; Std=0.23) in favour of the teachers. The pure mathematics content is difficult with students (Mean = 2.82; Std = 0.98) and easy with teachers (Mean = 1.80; Std = 0.75), coordinate geometry is difficult with the students (Mean = 3.08; Std = 0.99) and easy with teachers (Mean = 1.78; Std = 0.72), statistics is difficult with students (Mean = 3.00; Std = 0.99) but easy with teachers (Mean = 1.99; Std = 0.86), mechanics is difficult with the students (Mean = 2.77; Std = 1.11) but easy with the teachers (Mean = 1.65; Std = 0.67), operations research is difficult with the students (Mean = 3.27; Std = 1.02) and easy with the teachers (Mean = 2.06; Std = 0.95) and generally, the Further Mathematics content is difficult with the students (Mean = 2.91; Std = 1.00) but easy with the teachers (Mean = 1.83; Std = 0.77).Data in table 2 shows that there is significant difference between student and teacher perception of the FMC content difficulty ($t_{(69,\ 0.05)} = -3.71; p < 0.05$). Therefore, student perceived content difficulties are not attributed to their teachers' perceived content difficulty since the teachers perceived the FMC content easy. It implies that there are other factors responsible for the students' perceived FMC content difficulty.

Findings of this study corroborate with those of Zalmon and George (2020), Mills (2011) and Zalmon and George (2018). Zalmon and George (2020) reported that students perceived 88.20% of the Further Mathematics curriculum content difficult to learn with learning difficulties in all the FMC themes of pure mathematics, coordinate geometry, statistics, mechanics and operations research. According to Mills (2011), more than 30% of students in schools today have significant difficulties in learning Further Mathematics in spite of normal intelligence. There exists also, a significant difference between students and teachers' perception of content difficulty in the senior secondary Mathematics curriculum (Zalmon & George, 2018).Iji and Omenka (2015) found out that students found the operations research content difficult to learn due to lack of instructional material. Analysis of topics perceived difficulty by Nigerian students and teachers in secondary schools Further Mathematics curriculum revealed that differential and integral calculus and the theme operations research were difficult with students and even teachers (Ifamuyiwa, 2014). Concepts of angle measurement are among the most difficult topics in Mathematics (Chinn, 2004).

V. CONCLUSION

The study comparatively assessed the extent of student and teacher perception of content difficulty in the Further Mathematics curriculum and found out that there is a significant difference between student and teacher perception of the FMC content difficulty with very high perception of content difficulty among students. Students' perceived content difficulties are not attributed to their teachers' perceived content difficulty since the teachers perceived the FMC content easy.

VI. RECOMMENDATIONS

1. Mathematics teachers should employ diagnostic and remedial instructional strategy and active learning strategies such as teaching for understanding, problem solving and problem-based learning to remediate the learning difficulties among students in the Further Mathematics curriculum.
2. Students offering Further Mathematics should develop positive and hard-working attitudes toward learning the subject.
3. The contents of the Further Mathematics curriculum should be reviewed to the academic level of students in senior secondary schools.

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