

# African Research Review

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*International Multidisciplinary Journal, Ethiopia*

*Vol. 5 (5), Serial No. 22, October, 2011*

ISSN 1994-9057 (Print)

ISSN 2070--0083 (Online)

DOI: <http://dx.doi.org/10.4314/afrr.v5i5.28>

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## **Perceived and Actual Learning Difficulties of Students in Secondary School Mathematics**

*(Pp. 357-366)*

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### **Abstract**

*This study investigated students' perceived and actual learning difficulties in secondary school mathematics. A total of 120 secondary school students were involved in the study. This number was made up of 60 males and 60 females from four co-educational secondary schools in Etinan Local Government Area of Akwa Ibom State of Nigeria. A survey design was adopted for the study. The Students' Perception of Mathematics Difficult Concept Questionnaire (SPMDCQ) and Mathematics Achievement Test (MAT) were used as instruments for data collection. Data collected were analyzed using means and standard deviations, Spearman Rank Order Correlation and independent *t*-test. Findings showed that fourteen (14) of the topics learned were identified as difficult based on students' perceptions. Furthermore, a negative significant relationship ( $r = -0.27$ ) was found to exist between the perceived and actual learning difficulties, while significant difference existed between the male and female actual learning difficulties all at 5% level of significance. Recommendations were made that teachers try as much as possible to understand their students and their perceptions of mathematics and adopt teaching methods that would be to their benefit.*

### **Introduction**

This study focuses on students' perceived and actual learning difficulties experienced in mathematics. The way students perceive learning plays an

important role in determining the outcome of any educational endeavour and it is not in doubt that when difficulties are experienced in learning, achievement is frustrated. For this reason, one of the issues that any educational programme should address seriously is the difficult level of a course or subject. To achieve the goal of any course or subject, the difficulty level of its contents must match the developmental level of the students involved. Levels of difficulties perceived or experienced by students in mathematics have been addressed by some researchers.

Students sometimes prejudge their performance to certain activities or topics and categorize them as either easy or difficult based on their perceptions. Test results however do not always confirm these perceptions. This occurrence finds support in the poem about perception cited in the book **critical thinking and writing in a diverse world** by Rascool, Banks and McCarthy (1993). Expectations, beliefs, attitudes, self concept and understanding of the concepts, processes and applications greatly influence one's perception of a given stimulus. One perceives only what he or she wants to pay attention to and that which the person is interested in. His or her needs, motives and social situation all affect the manner by which reality is filtered.

Marton (1988) carried out a seminal work in the area of learning difficulties and found that learning difficulties are influenced significantly by students' perception of the learning environment. Ramdem (1991) reported the influence of teaching characteristics on learning difficulties which includes the teaching methods, teacher enthusiasm and commitment and the pace and level at which information is presented. Furthermore, surface learning difficulties have been reported to be influenced by factors like overload of work, students' perception of the relevance of the content, assessment processes requiring and rewarding reproduction of content, poor teaching, poor student teacher interpersonal relationship and lack of opportunity for self management (Marco, 1983; Marton,1997).

Early experience with siblings, parents and friends as well as success and failures in life help to determine the manner in which a child and eventually an adult perceives the world. Self perception results from one's experiences in growing and living, attempts to master the environment and interactions with other people. The study of Marco (1983) dealt with the perceived and actual learning difficulties. He investigated the relationship between students' perceived and actual learning difficulties in College Algebra. Results of the

Spearman Rank Difference co-relation revealed that a significant positive co-relation existed between perceived and actual learning difficulties in mathematics. Topics such as exponents, radical linear and quadratic equations, inequalities and solving verbal problems were identified to be difficult.

### **Statement of the Problem**

It is an indisputable fact that individuals are differently endowed. As a result of this, the way and manner they perceive issues are of course different. Perceptions are subjective and idiosyncratic but they can provide teachers useful information that may affect planning of lessons and decision making in the classroom. Reality is not always perceived in its exact form. Hence, will there be any relationship between students' perceived and actual learning difficulties in mathematics?

### **Purpose of the study**

This study is undertaken to determine if there exists any relationship between students' perceived and actual learning difficulties in mathematics at the secondary school level. Specifically the study will achieve the following objectives:

1. To identify topics perceived difficult by students in secondary school mathematics
2. To determine if there exists any significant relationship between the perceived and actual learning difficulties in secondary school mathematics
3. To determine if there exists any difference in students' actual learning difficulties across gender

### **Research questions**

The following questions were posed to guide the study:

1. What topics are perceived difficult by the students?
2. What is the relationship between students' perceived and actual learning difficulties?
3. What is the difference between male and female actual learning difficulties?

### **Research hypotheses**

The following hypotheses were formulated and tested at 0.05 level of significance:

Ho<sub>1</sub>: There is no significant relationship between students' perceived and actual learning difficulties in mathematics

Ho<sub>2</sub>: There is no significant difference between male and female actual learning difficulties in mathematics

### **Methodology**

The design used for the study was a survey.

A total of one hundred and twenty (120) Senior Secondary students were used for the study; and this was made up of sixty (60) males and sixty (60) females. Thirty (30) students were randomly selected from each of the four (4) co-educational secondary schools in the study area.

Two instruments, the Students' Perception of Mathematics Difficult Concept Questionnaire (SPMDCQ) and the Mathematics Achievement Test (MAT) were used for collecting data.

### **Students' perception of mathematics difficult concept questionnaire (SPMDCQ)**

SPMDCQ was a 22- item questionnaire measured on a 4- rating scale of very difficult (VD), difficult (D), simple (S) and very simple (VS). This was structured to determine the topics perceived to be either simple or difficult by students.

### **Mathematics achievement test (MAT)**

MAT was the twenty five (25) multiple choice questions constructed from the twenty two items in the questionnaire. This was used to determine the actual learning difficult topics by students.

The reliability of SPMDCQ and MAT was determined using the test-retest method. The two instruments were administered twice to a group of students that were not part of the study sample within three weeks interval. Using the Pearson's Product Moments Correlation (PPMC), 0.67 and 0.73 were obtained for SPMDC and MAT respectively.

SPMDC was scored using a score range of four (4) for very difficult, three (3) for difficult, two (2) for simple and one (1) for very simple. Items with mean difficult level below 2.5 are grouped as simple and items with mean difficult level greater than 2.5 are grouped as difficult.

MAT consisted of twenty five multiple choice questions with three distracters and one correct option lettered A – D. Each correct answer attracted four (4) marks.

The instruments were administered from school to school with the assistance of the subject teachers in each of the schools.

The data generated was analyzed using means, percentages and standard deviation.

Spearman Rank Order Correlation and t-test were used to test the hypotheses.

The results are presented in line with the research questions/hypotheses posed.

**Research question 1:** *What topics are perceived difficult by the students?*

The answer to this question is presented in Table 1.

As shown in Table 1, topics like household arithmetic and commercial arithmetic, approximation, expansion and factorization of algebraic expressions, word problems on algebraic fractions, plane figures and shapes, probability, sets, mensuration, trigonometry, sequence/arithmetic and geometric progression, quadratic equations, statistics, surds and geometrical constructions with difficult level above 2.50 are perceived difficult by students. Whereas topics like whole numbers and standard form, fractions simple equations, angles, data presentation, indices, logarithms, and variation with difficulty level below 2.50 are perceived simple by the students.

This answers research question one.

**Hypotheses testing**

**Ho<sub>1</sub>:** *There is no significant relationship between students' perceived and actual learning difficulties in mathematics*

This hypothesis is tested using Table 2.

The following abbreviations are used in the table:

- X = Perceived scores
- Y = Actual scores
- RX = Rank of perceived scores
- RY = Rank of actual scores

D	=	Difference between paired ranks
D <sup>2</sup>	=	Squares of differences between paired ranks
r	=	rank difference correlation coefficient
r	=	$\frac{1 - 6\sum D^2}{N(N^2 - 1)}$

The computations in Table 2 shows that there is a negative correlation ( $r = -0.27$ ) between the

perceived and the actual difficulty scores. This means that as the level of perception of learning difficulties increases, the performance in actual learning decreases and vice versa.

**Ho<sub>2</sub>:** *There is no significant difference between male and female actual learning difficulties in mathematics*

This hypothesis is tested using Table 3.

Table 3 shows that the calculated t- value of 2.39 is greater than the critical value of 1.96 at .05 significant level. This implies that there is a significant difference between the male and female actual learning difficulties in mathematics.

### **Discussion of results**

Considering all the respondents of the study in Students' Perception of Mathematics Difficult Concept Questionnaire, it was found that fourteen (14) out of twenty-two (22) or 64% of the learning topics were perceived by the respondents as difficult to achieve. This shows clearly that the students lack confidence in their mathematical ability in achieving most of the topics learnt in secondary school mathematics. If, as it is seen in this study, students believe they are unable to tackle 64% of the topics learnt, it is obvious that 36% cannot earn them a pass talk less of a credit in mathematics. Their negative beliefs about themselves as learners of mathematics prevent them from improving their mathematics performance, since they believe that it is beyond their ability to perform well (Chapman, 1988) Hence the poor results recorded in our internal and external examinations year in year out.

Also, there was a negative significant relationship between the perceived and actual learning difficulties of students. Students' with mathematics learning difficulties due to their repeated experience of failure are those who present

the most maladapted attribution patterns because the type of attributions that the students make will have repercussion at both the cognitive (expectation) and the affective domain (self concept). It is the self concept level that that determines their motivation and degree of involvement in classroom activities. Doubting their own abilities, they exaggerate the magnitude of their deficiencies, and tend to attribute their failure to lack of ability. The more they magnify their deficiencies, the less they perform. These set of students show low expectations of success, and give up easily in the face of difficulties. The finding of negative relationship is at variance with earlier finding of Marco (1983) who found a positive relationship between the perceived and actual learning difficulties of mathematics students.

Furthermore, a significant difference was found to exist in the actual learning difficulties across gender in favour of the males. This finding supports earlier studies of Leiuhardt, et al (1997), who found that males do better in mathematics than females while females perform better in reading tests. The finding agrees also with Udousoro (2000) which reports a significant difference in mathematics learning outcomes in favour of the males.

### **Conclusion**

The finding of this study has shown that one's perception of the difficulty of an item is not parallel with the outcome when one is exposed to reality. Some biases and personal prejudices, basically the offshoot of one's perceptions, may have affected the results. Students who perceived some topics simple failed to perform well in the actual situation. Furthermore, the results of the study indicate that the students' actual performance is gender sensitive.

### **Recommendations**

The following recommendations are made based on the findings of the study:

Mathematics teachers should understand the perceptions of their students and try to adopt instructional strategies that whatever students perceive as easy would really turn out to be easy and whatever is difficult may be properly addressed to improve students' achievement.

School administrators should provide proper counseling of students on matters related to them to realize that perceptions are not always real.

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**Table 1: Percentage analysis of responses of students towards perceived difficult topics**

TOPIC	NO. OF RESPONDENTS				N	WEIGHTED MEAN	DECISION
	VD	D	S	VS			
Whole numbers and standard Form	18	16	43	43	120	2.08	Simple
Fractions	9	39	35	37	120	2.17	Simple
Household and commercial arithmetic	34	51	27	8	120	2.93	Difficult
Approximation	29	29	45	17	120	2.59	Difficult
Expansion and factorization of algebraic expressions	28	40	38	14	120	2.69	Difficult
Simple equations	13	31	57	19	120	2.48	Simple
Word problem on algebraic fractions	28	37	30	25	120	2.82	Difficult
Plane figures and shapes	20	43	34	23	120	2.50	Difficult
Angles	13	30	44	33	120	2.19	Simple
Data presentation	25	33	37	25	120	2.49	Simple
Probability	36	36	26	22	120	2.72	Difficult
Indices	27	27	30	36	120	2.38	Simple
Logarithm	19	22	41	38	120	2.18	Simple
Sets	22	38	38	22	120	2.50	Difficult
Mensuration	34	36	30	20	120	2.70	Difficult
Trigonometry	44	38	23	15	120	2.93	Difficult
Sequence/Arithmetic and Geometric Progression	45	27	32	16	120	2.84	Difficult
Quadratic Equation	23	39	36	24	120	2.54	Difficult
Statistics	35	32	29	24	120	2.72	Difficult
Variation	24	32	36	28	120	2.43	Simple
Surds	44	35	20	20	120	2.84	Difficult
Geometrical construction	43	31	30	15	120	2.83	Difficult

**Table 2: Computation of relationship between Perceived and Actual learning difficulties scores of students using Spearman rho-tied Ranks**

VARIABLES	X	Y	RX	RY	D	D <sup>2</sup>
Whole numbers and standard Form	2.08	0.41	22	12	10	100
Fractions	2.17	0.23	21	19.5	1.5	2.25
Household and commercial arithmetic	2.93	0.50	1.5	5	3.5	12.25
Approximation	2.59	0.23	11	18	-7	49
Expansion and factorization of algebraic expressions	2.69	0.36	10	14	-4	16
Simple equations	2.48	0.44	16	8	8	64
Word problem on algebraic fractions	2.82	0.53	6	4	2	4
Plane figures and shapes	2.50	0.30	13.5	16.5	-3	9
Angles	2.19	0.23	19	19.5	-0.5	0.25
Data presentation	2.49	0.32	15	16	-1	1
Probability	2.72	0.46	7.5	6.5	1	1
Indices	2.38	0.38	18	13	5	25
Logarithm	2.18	0.33	20	15	5	25
Sets	2.50	0.22	13.5	20	6.5	42.25
Mensuration	2.70	0.43	9	10	-1	1
Trigonometry	2.93	0.45	1.5	7	-5.5	30.25
Sequence/Arithmetic and Geometric Progression	2.84	0.47	3.5	6	-2.5	6.25
Quadratic Equation	2.54	0.42	12	11.5	0.5	0.25
Statistics	2.72	0.42	7.5	11.5	-4	16
Variation	2.43	0.43	17	10	7	49
Surds	2.84	0.44	3.5	8	-4.5	20.3
Geometrical construction	2.83	0.60	5	3	2	4
						$\Sigma D^2 = 478.05$

**Table 3:t-test analysis of male and female actual scores in mathematics**

GENDER	N	X	SD	DF	t-cal	t-crit	Decision at P < '05
Male	60	41.32	10.90	118	2.39	1.96	Significant
Female	60	36.27	12.53				