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GENDER AND PARENTAL SOCIO-ECONOMIC BACKGROUND AS DETERMINANT OF PUPILS' MULTIPLICATIVE THINKING

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ABSTRACT

The study investigated the influence of gender and socio-economic background on pupils' multiplicative thinking among basic 5 and 6 pupils' in Bayelsa State, Nigeria. A total of two thousand two hundred and forty pupils were selected form 80 basic schools using the stratified random sampling technique. Ex-post facto design was used for the study. Two instruments were used for the study. These were the Multiplicative Thinking Performance Test (MTPT) and Students Variable Questionnaire (SVQ). The instruments were constructed, validated and used for the study. Research questions were raised and answered including two hypotheses formulated and tested. Mean and standard deviation were used to answer the research questions and the hypotheses were tested using Independent t-test, One-way Analysis of Variance (ANOVA) and the Scheffe's Post Hoc Comparison. The results showed significant influence of parental socioeconomic status and non-significant influence of gender on pupils' multiplicative thinking. Conclusion from the findings led to the recommendation that Parents should provide a conducive home environment with appropriate materials such as mathematics textbooks, mathematical games and toys to enhance the development of pupils' multiplicative thinking.

KEY WORDS: Gender, Socio-economic background, multiplicative thinking

INTRODUCTION

Mathematics is generally considered as the basis for the preparation of every individual, since our everyday activities involves mathematics. It is the sure foundation of every science courses and has a vital role in science and technology, the major feature of development in the world. Thomaskutty and George (2007) emphasized the versatile nature of mathematics by identifying educational values of the subject which include aesthetic, morals and practical values. There is no doubt about the fact that functional mathematics knowledge is the only true route to entering into the modern world. An elementary knowledge of the simplest branch of mathematics, arithmetic is used by man daily to carry on his activities.

Arithmetic is the branch of mathematics that deals mainly with the four fundamental operations – addition, subtraction, multiplication and division, and their relations which are basic mathematical concepts to teach at primary education level. Acquisition of those four operations and their relations enables students to develop their understanding for numbers and calculating strategies as well as associating them with daily life problems.

A concrete understanding of the fundamentals of multiplication being one of the concepts used in arithmetic is desirable in order to be able to appreciate the sufficiency of any multiplication method together with its application restrictions. This understanding will aid in analysing how accurately the flow is mathematically described, which abridging assumptions were made, and how they influence the end result of the calculation. To help satisfy this requirement, the determination of pupils' multiplicative thinking becomes very necessary. Nunes, Bryant, Barros and Sylva (2011) investigated into mathematical reasoning and arithmetic skills as predictors of mathematical achievement and found that students' ability to reason mathematically was the stronger predictor of success. This indicates that educators must help students progress beyond memorization of arithmetic facts in order to develop mathematical reasoning. Students must be provided with opportunities to explore multiplicative thinking in a variety of contexts and in different ways in order to understand that it is more than just multiplication and division.

Multiplicative thinking refers to the ability of working easily with multiplication concepts, strategies and representations as they appear in ranges of concepts (Siemon, 2005). Hurst and Hurrell (2016) stated that multiplicative thinking is vitally important in the development of significant mathematical concepts and understandings such as algebraic reasoning, place value, proportional reasoning, rates, ratios, measurement, statistical sampling, knowledge of division, fractions and are unique predictors of later mathematical achievement. It goes beyond memorization of basic arithmetic skills and helps effectively in a variety of ways such as solving words problems, diagrams, symbolic expressions, and written algorithms.

Multiplication is viewed as difficult by primary school pupils as result of their inability to understand the operation. A majority of primary school pupils prefer the use of addition when compared to multiplication. This is because multiplication when compared to addition is a

complex operation and requires higher order thinking or reasoning which over reliance on additive thinking alone cannot provide the required solutions (Baidoo, 2015). Hurst and Hurrell (2016) citing various authors stated that pupils perform below curriculum expectations in multiplicative thinking and cannot be labelled as 'solid' multiplicative thinkers. The difficult of multiplication and being unable to think multiplicatively arises from their being taught procedurally resulting to memorisation of those procedures rather than conceptual understanding. This has resulted to most male and female pupils not developing multiplicative thinking.

It is necessary for every teacher to make sure male and female pupils are equally carried along in terms of their achievement and this would minimise the issue of gender differences. A lot of studies focused on Gender differences in mathematics. Some of these studies believed that males perform better in mathematics than girls. These beliefs may have arisen as a result of heritable differences between female and male pupils. Cultural practices effects, peer, training and experience and school influences may have been some of the reasons for their believe in gender differences. Male and female pupils are faced with effects of early experiences, cultural factors and other factors when they go for higher study in science and mathematics because of the interactions of these factors.

In spite of research evidence of boys' superiority in mathematics achievement, there are other research studies' findings that disagree with the difference between gender in mathematics achievement. For instance, one of the international studies conducted by the IEA (Third international mathematics and science study), showed that, on the average across nations, there was no significant disparity between the mathematics performance of boys and girls at either eighth or fourth grade (Mullis, Martin, Gonzalez, & Chrostowski, 2004). Findings from a gender difference longitudinal study indicated that, there was no significant disparity between the mathematics achievement of male and female students (Ding, Song, & Richardson, 2007). According to Martin, Mullis, and Foy, (2008), in a recent IEA study, there was no significant difference in the mean mathematics achievement of male and female pupils at the fourth grade, and females mean achievement was greater than that of males at the eighth grade. There are no one resolution to the big questions about gender disparity in science and mathematics. Thus, the millennium declaration of September 2000 had one of its goals, as gender equity promotion, women empowerment and gender inequality elimination in primary and secondary system by 2005 and all levels, by 2015 (United Nations, 2000).

The proponent of Pearson's gender relation theory believed that the society looks at all activities in terms of male and female social roles and interactions and this is an assumption of gender roles as dictated by the society (Pearson, 1992). According to Pearson (1992), the authority exercise by the society turns out to be biased against the women folk. Due to this bias, the performance of male and female in nearly all spheres of life are bound to vary. In reality the social, cultural and economic norms operated by the society are the factors that affect male and female pupils' achievement in schools. The social, cultural and economic

norms also embrace socioeconomic background which is one of the factors of family and it is mostly determined by parental education, occupation and income levels.

Socio-economic background (SES), according to sociologist refers to various wealth, authority and prestige levels (Woolfolk, 2006). These levels are not the same in the society. It is the measure of an individual work experience, economic position or that of the family and social position comparing to others in terms of income, education and occupation. Internationally, Socio-economic background is grouped into five classes. They are upper, upper middle, middle, lower middle and lower classes (Akhtar & Niazi, 2011). Akhtar and Niazi (2011) stated that some variations in the class structures may appear but most of the time these five class structures are used. According to them, the general view is that the students from upper classes achieve better because they are exposed to better opportunities of interacting with the learning environment. On the other hand, students from the lower classes have lesser opportunities, lesser resources therefore, lag behind in all aspect of life. They may not be more productive as compared to other groups. Theories about the classes of socio-economic background are extremely old; It started from the three-class theory of which was popular and classified as upper, middle and lower classes to six class theory (Akhtar & Niazi, 2011).

Coleman (1968) cited in Rothman (2003), stated that the relationship between socioeconomic background and pupils' achievement has been argued for years and the most influential factor that has been considered is inequality in educational opportunities. The influence of socioeconomic background on pupils' achievement is not clear-cut, many theories have tried to explain the relationship (Rothman, 2003). Rothman (2003) stated that pupils from low socioeconomic background are not privileged in schools due to the fact that they do not have an academic home situation which influences pupils' achievement at school. Another argument was what goes on in the family which is referred to as the family climate is that which predicts pupils' achievement and not the pupils' socioeconomic background (Mashile, 2001). Mashile further argued that variables such as parents' styles, support, encouragement and pupils' intellectual stimulation are the factors that play essential part in the achievement of pupils. Therefore, it becomes important to examine the contribution of socioeconomic status to pupils' multiplicative thinking. Hence, the study gender and parental socio-economic background as determinant of pupils' Multiplicative thinking.

STATEMENT OF THE PROBLEM

The understanding of multiplication has been seen as very difficult for children at the primary level. This has been as a result of pupils, procedural understanding instead of their conceptual understanding which has resulted to the problem of pupils' multiplicative thinking not being developed. The non-development of pupils' multiplicative thinking to a large extent has affected pupil understanding of mathematics. This is because multiplicative thinking greatly assists the conceptual understanding and complete comprehension of the procedures in

mathematics. The question therefore does gender and pupils' parental socio-economic factors responsible for this non development of pupils' multiplicative thinking?

PURPOSE OF THE STUDY

The study is aimed at investigating gender and parental socio-economic background as determinant of pupils' multiplicative thinking in Bayelsa State. The study sought to achieve the following.

1. Investigate the influence of pupils' gender on their multiplicative thinking
2. Assess the influence of pupils' parental socio-economic background on their multiplicative thinking.

RESEARCH QUESTIONS

In order to guide this study, the following research questions were posed.

1. What influence does pupils' gender have on their multiplicative thinking?
2. What is the influence of pupils' parental socio-economic background (high, average, low) on their multiplicative thinking?

HYPOTHESES

The study specifically tested the following hypotheses at .05 level of significance.

1. Pupils' gender does not significantly influence their multiplicative thinking.
2. There is no significant influence of pupils' parental socio-economic background on their multiplicative thinking when classified as high, average and low.

RESEARCH METHOD

The research design used for this study was the ex-post facto design. According to Kpolovie (2010), ex-post facto research is a methodological approach for eliciting possible or probable antecedent of events that have occurred already and which cannot be subjected to the direct rigorous manipulation and control by the researcher. The researcher used this design because the independent variables gender of pupils and pupils' parental socio-economic background have occurred already and the researcher had no direct control over them.

The population for the study consisted of all basic five and six pupils in the 537 public primary schools in Bayelsa State in 2012/2013 session. They were 108, 741 pupils of which 54,037 were males and 54,704 were females (Bayelsa State Universal Basic Education Board (BSEBU), 2012). The focus on basic five and six pupils were because they must have gone through the concept of multiplication considering the primary school curriculum in mathematics. The disproportional stratified random sampling technique was used for the study. The strata were based on the eight educational zones. The subsample fractional selection resulted to Ten (10) public schools randomly selected from each educational zone.

Fourteen (14) pupils were selected using simple random technique (hat and draw) from each class of basic 5 and 6, making a total number of 28 pupils from each school. This resulted to a total of 2,240 pupils from the eighty (80) schools since the educational zones were eight (8). This constitutes 2% of the population. According to Isangedighi, Joshua, Asim and Ekuri (2004), a proportion of 2% may be adequate for a population of about 200,000 pupils considering the cost of producing and distributing copies of questionnaire to everyone in the population.

The instruments used for this study were Multiplicative thinking performance test (MTPT) for basic 5 and 6 pupils and Students' variable questionnaire (SVQ). The multiplicative thinking performance test (MTPT) was used to measure pupils' multiplicative thinking level. According to Ell, Irwin and McNaughton (2004), the gathering of data in regard to how pupils think of multiplication generally comes from checking and categorizing pupils' answers to problem situation. The methods pupils use in solving problems is considered a hint of their reasoning about the problem. The problems could be word problems or multiplication task structure (Jacob & Wills, 2001). Mulligan and Mitchelmore (1997) cited by Ell, Irwin & McNaughton (2004) showed that pupils' method of solving the problem determine the strategy they use, thus gives information about their thinking. The content of the test covered multiplication and division in primary mathematics. The researcher-constructed instrument comprised of demographic variables of the respondents in section A, that is, name of school, sex; section B comprised of 20 questions. In order to ascertain the multiplicative thinking of the pupils, they were asked to show proper working in each of the given problems. The direction of their thinking was obtained from the strategy applied in arriving at the solution. 1 mark was scored for calculations using multiplicative thinking and 0 mark for additive thinking and neither additive nor multiplicative thinking.

The Students Variable Questionnaire comprised of two parts: Section A and B. Secvtion A was to obtain information on students' personal data, which comprised of name of school, name of pupil, class and sex. Section B comprised of pupils' parental socio-economic background. The kupuswamy scale was adapted for the socio-economic background section. It contained three items of education, occupation and income. On the pupils' parental socioeconomic background variable, pupils were classified into three groups of high, average and low after scoring the questionnaire for each pupil.

The face validity of SVQ and MTPT was assessed by two measurement and evaluation experts in the University of Uyo and the two experts in Mathematics Education. They assessed the relevance of each item in relation to the purpose of the study, if items were stated in an ambiguous form, if items were precise as possible, if items were free from grammatical errors, relevance of each item in relation to the construct under measurement and all the corrections and comments of the validators were effected and incorporated into the final form of the instrument. The content validity of MTPT was ascertained by the use of the test blueprint as shown in Table 1 where the questions were 15% on number and numeration, 30%

on basic operation and 55% on measurement. Knowledge constituted 25%, Comprehension 20% and Application 55% of the total questions. Application constituted 55% because more of the application problems dealt with thinking. The table of specification was considered on three levels due to the level of the students. This was because setting questions on the higher order of the table of test blueprint will result to higher mathematics concepts which will be above the level of primary school pupils. The content validity of the instruments was ascertained by the use of the test blue print and two experts in mathematics education. The experts assessed the relevance of the item in relation to the cognitive level and measure of ability, the adequacy of the items to measure the areas of primary mathematics they purport to measure and all the corrections and comments of the validators were effected and incorporated into the final form of the instrument.

Table 1: Specification for multiplicative thinking performance test

Content Unit		Knowledge 25%	Comprehension 20%	Application 55%	Total Items
Number & Numera	15%	1	1	1	3
Basic Operations	30%	1	1	4	6
Measurement	55%	3	2	6	11
Total	100%	5	4	11	20

The reliability of Multiplicative Thinking Performance Test (MTPT) was determined using the Kuder-Richardson formula 20 (K-R20) after subjecting the instruments to a trial test of 40 pupils (20 basic 5 and 20 basic 6). The instrument was presented to a sample of pupils who were not part of the study but had relevant qualities as those in the study. Reliability coefficients of .80 obtained for MTPT. The reliability of Students' Variable Question (SVQ) was determined using the Cronbach coefficient alpha formula after administering the instrument to the trial group and a reliability coefficient of .82 for pupils' parental socio-economic background was obtained. The reliability coefficients of the instruments obtained were considered high enough, showing that, the instruments were reliable. According to PsyAsia International (2006), most psychological societies (British Psychological Society) and academics (Devellis) proposed that a suitable level of reliability for psychometric tests is:

Ability/Aptitude Tests: .80

Personality Tests: .70

Table 2; Acceptable and unacceptable levels of the Cronbach's alpha coefficient

Alpha coefficient	implied reliability
beneath .60	intolerable
amid .60 and .65	unwanted
amid .65 and .70	minimally tolerable
amid .70 and .80	good
amid .80 and .90	very good
a lot over .90	think of reducing the scale

Source: PsyAsia International (2006)

The instruments for this study were administered by the researcher and research assistants. Permission from the respective primary school headmaster were sought. The instruments were administered to the pupils in their different schools. The relevant instructions were given to the pupils. The pupils were allowed to fully complete the SVQ while the MTPT was timed forty minutes. In order to match the questionnaire and test, pupils were assigned some numbers for identification purposes. The instruments were fully retrieved from the pupils, one after the other by either the researcher or research assistants to ensure 100% recovery.

RESULTS

The data collected for the study are presented based on the research questions and hypotheses of the study.

RESEARCH QUESTION

Research questions are analysed using mean and standard deviation.

Research Question One: What influence does pupils' gender have on their multiplicative thinking?

Table 3: Mean Score and Standard Deviation of Pupils' Multiplicative Thinking Based on Gender

Gender	N	$\dot{X}$	SD
Male	1104	11.39	3.01
Female	1136	11.55	3.00

As shown in Table 3, the mean scores of male and female pupils are 11.39 and 11.55 respectively. This indicates that female pupils achieved better than their male counterparts. Table 3 also showed that the standard deviations of male and female students are 3.01 and 3.00 respectively. The standard deviation of female pupils is lower than that of their male counterparts indicating that majority of females were closer to their mean score when compared to that of males.

Research Question Two: What is the influence of pupils' parental socio-economic background (high, average, low) on their multiplicative thinking?

Table 4: Mean Score and Standard Deviation of Pupils' Multiplicative Thinking Based on Pupils' Parental Socio-economic Background.

Pupils' Parental Socio-economic Background	N	$\dot{X}$	SD
High	635	12.20	2.87
Average	792	11.77	2.94
Low	613	10.60	2.98

As shown in Table 4, the mean score of pupils from high, average and low parental socio-economic background are 12.20, 11.77 and 10.60 respectively. This indicates that pupils from high parental socio-economic background achieved better than their counterparts from average and low parental socio-economic background while those from average socio-economic background achieved better than those from low parental socio-economic background. Table 4 also showed that the standard deviations of pupils from high, average and low parental socio-economic background are 2.87, 2.94 and 2.98 respectively. The standard deviation of pupils from high economic background is lower than those from average and low parental socio-economic background while from average socio-economic background is lower than those from low parental socio-economic background indicating that majority of pupils from high parental socio-economic background were closer to their mean score when compared to their counterparts from average and low parental socio-economic background while majority of those from average socio-economic background were closer to their mean score than those from low parental socio-economic background.

HYPOTHESES TESTING

The hypotheses were tested using independent t-test and analysis of variance.

Hypothesis One: Gender does not significantly influence pupils' multiplicative thinking.

Table 5: Independent t-test analysis of pupils' multiplicative thinking test performance classified by pupils' gender

Gender	N	$\dot{X}$	SD	df	t_{cal}	P-value$_{cal}$
Male	1104	11.39	3.01	22381	1,26	.52 ^{NS}
Female	1136	11.55	3.00			

NS = Not significant at .05 level of significance

Table 5 showed that the calculated p-value (.52) is greater than the significant level (.05). Therefore, the null hypothesis is retained. This implies that gender does not significantly influence pupils' multiplicative thinking

Hypothesis Two: There is no significant influence of pupils' parental socio-economic background on their multiplicative thinking when classified as high, average and low.

Table 6: Analysis of variance of pupils' multiplicative thinking test performance classified by socioeconomic background

Socio-economic Background		SD	df	t_{cal}	P-value$_{cal}$
Between Groups	1027.37	2	513.68	59.68	.00*
Within Groups	19254.25	2237	8.61		
Total	20281.62	2299			

***Significant at .05 level of significance**

As revealed in Table 6, the calculated p-value (.00) is less than the significant level (,05). Therefore, the null hypothesis is rejected. This implies that there exists a significant influence of parents' socio-economic background on pupils' multiplicative thinking when classified as high, average and low. In order to determine the direction of significance, a Scheffe' posthoc pairwise comparison test was done and the results are summarized in Table 7.

Table 7: Summary of Scheffe' posthoc comparison of pupils' multiplicative thinking test performance classified by pupils' parental socio-economic background

(I) Socio-economic Background	(J) Socio-economic Background	Mean Difference (I-J)	Std Error	Sign at P < .05
High	Average	0.44*	0.16	.00
	Low	1.60*	0.16	.00
Average	High	-0.44*	0.16	.00
	Low	1.77*	0.15	.00
Low	High	-1.60*	0.16	.00
	Average	-1.17*	0.15	.00

*Significant at .05 level of significance

Table 7 showed that the mean score (12.20) of pupils who were from high socioeconomic background is greater than the mean score (11.77) of pupils who were from average socioeconomic background and the mean score (10.60) of those who were from low

socioeconomic background. The mean score of those who were from average socioeconomic background is greater than those who had low socioeconomic background.

The mean differences shown in Table 7 are 0.44 for high and average socioeconomic status; 1.60 for high and low socioeconomic status, and 1.17 for average and low socioeconomic status. The levels of significance displayed in Table 7 indicated that pupils from high socioeconomic status performed significantly better than their counterparts from average and low socioeconomic status. Also, pupils from average socioeconomic status performed significantly better than those from low socioeconomic status.

DISCUSSION OF RESULTS

The influence of gender on pupils' multiplicative thinking as found in this study indicated that gender does not significantly influence pupils' multiplicative thinking. The absence of a significant difference might be due to both male and female pupils freely interacting in class at this level with each other which resulted to a better understanding, motivation, development of problem-solving technique and generation of a greater participation of male and female pupils in mathematics. It may also not be unconnected with the scientific awareness and literacy in the society which has gone a long way in changing some societal expectations as well as the attitude of the female pupils.

The result of the study is in line with Samuelsson (2010), whofound that there was no essential disparity in the performance of boys and girls in both the traditional and problem-solving group. The study was contrary to the findings of Bharadwaj, Giorgi, Hansen and Neilson (2012) who found that gender gap appeared to increase with age and that boys and girls differ considerably in perception about their own capabilities in mathematics with regards to mathematics test scores.

The study also investigated the influence of socio-economic background on pupils' multiplicative thinking. The findings indicated that pupils from high parental socioeconomic background mean score in the multiplicative thinking test was significantly better than their counterparts from average and low parental socioeconomic background. Also, pupils from average parental socioeconomic background mean score in the multiplicative thinking test was significantly better than those from low parental socioeconomic background.

The findings could be ascribed to pupils' early years of quantitative inclination in life from the home. It affirms Woolfolk (2006), who stated that the individual's quantitative potentials are determined by his home status. This is because parents are really concerned with their pupils' education and offer them surroundings that can affect learning. They serve as a model of learning, provide educational resources in the home and hold positive attitudes and values towards education. According to Fakuade (1983), pupils of different socioeconomic backgrounds pose differing access to books and school related input and this may affect their achievement.

The result is consistent with the research findings of Nunes, Bryant, Sylva, and Barros (2009), who found that pupils from upper socio-economic background were superior to their counterparts in average and low socio-economic background in terms of their mathematical way of thinking. The findings also agreed with Trani (2009) that the high correlation coefficient provided evidence that as students' parental socioeconomic status decreases so does students' achievement. However, the result contradicts the findings of Millones, Van-Leeuwen and Ghesquiere (2011), who found that an insignificant difference existed in the achievement of pupils from different socio-economic backgrounds.

CONCLUSION

Based on the findings of this study, it could be concluded that parental socio-economic background is very significant in pupils' attainment of multiplicative thinking. Parental socio-economic background affords them the opportunity to provide necessary educational resources that can boost the multiplicative thinking of pupils when used effectively. Gender was insignificant in the development of multiplicative thinking of pupils.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

(1) Parents should provide a conducive home environment with appropriate materials such as mathematics textbooks, mathematical games and toys to enhance the development of pupils' multiplicative thinking.

(2) Teachers should give both male and female equal opportunity in teaching and learning. This would enhance the multiplicative ability of both male and female students thereby making them think multiplicatively.

(3) Heads of schools should arrange for extra classes and discussion in school for pupils having problems in multiplication so that such pupils can be attended to through the combined efforts of the school and the home.

(4) The government, ministry of education and head of schools should through the Parent Teachers Association (PTA) ensure that counselling services are provided for parents on how they could help in the development of the multiplicative thinking of their wards.

REFERENCES

Akhtar, Z. & Niazi, H. K. (2011). The relationship between socio-economic status and learning achievement of students at secondary level. *International Journal of Academic Research, 3* (2), 956 – 962.

Hurst, C. & Hurrell, D. (2016) Investigating children's multiplicative thinking: Implications for *teaching. European Journal of STEM Education, 1*(3), 1 – 11.

Baidoo, S. R. (2015). Multiplicative thinking ability among primary school pupils. International *Journal of Mathematics Trends and Technology, 24*(1), 17 – 23.

Bayelsa State Universal Basic Education Board (BSUBEB) (2012). *Pupils' Distribution Report 2012.* Yenagoa:Department of Statistics BSUBEB.

Bharadwaj, P., Giorgi, G. D., Hansen, D. & Neilson, C. (2012). *The gender gap in mathematics: evidence from low–and-middle income countries.* Retrieved from www.standford-edu/~degiogi/Test%20score%20Paper-web/pdf.

Ding, C. S., Song, K. & Richardson, L. I. (2007). Do mathematical gender differences continue? *Journal of the American Educational Study Association, 40*(3), 279 - 295.

Elems, P. K. (2007). *Effect of pre-primary education on the development of cognitive skills of pupils in primary schools* (Unpublished master thesis). University of Jos, Nigeria.

Ell, F., Irwin, K. & McNaughton, S. (2004). Two Pathways to Multiplicative Thinking. In I. Putt, R. Faragher & M. Mclean 9eds), *Mathematics Education for the Third Millennium towards 2010* (pp 199 – 206). Sydney: Merga. Retrieved from www.merga.net.au/publications/counter-php.

Fakuade, F. A. (1983). *An investigation of the problems involved in teaching and learning of mathematics in Nigeria secondary schools* (Unpublished doctoral thesis). University of Wales, Cardiff.

Hurst, C. & Hurrell, D. (2016). Investigating Children's Multiplicative Thinking: Implications for Teaching. *European Journal of STEM Education, 1*(3), 1 – 11.

Jacob, L. & Wills, S. (2001). Recognizing the difference between additive and multiplicative thinking in young children. In J. Robis, B. Perry Mitchelmore (Eds.), *Proceeding of the 24th conference of the mathematics education research group of* Australasia (pp. 306 – 311). Sydney: Mathematics Education Research Group of Australasia.

Kpolovie, P. J. (2010). *Advance research methods*. Owerri: Springfield Publishers Ltd.

Martin, M. O., Mullis, I. V. S. & Foy, P. (2008). *TIMSS 2007 international mathematics report: Findings from IEA's trends in international mathematics and science study at the fourth and eighth grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mashile. E. O. (2001). Science achievement determinants: Factorial structure of family variables. *South African Journal of Education, 21*(4), 336 - 339.

Milliones, M. D. L., Van-Leeuwen, K. & Ghesguiere (2011). Academic performance of peruvian elementary school children: The case of schools in Lima at the 6th grade. *Interdisciplinaria*, *28*(2), 323 – 343.

Mullis, I. V. S., Martin, M. O., Gonzalez, E. J. & Chrostowski, S. J. (2004). *TIMSS 2003 international mathematics report: Findings from IEA 's trends in international mathematics and science study at the fourth and eighth grades.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Nunes, T., Bryant, P., Sylva, K. & Barros, R. (2009). *development of mathematics capabilities and confidence in primary school*. Retrieved from www.dcst.gov.uk/research.

Pearson, R. (1992). Gender matters in development. In Allan, J. & F. Thomas (Eds.*) Poverty and Development in the 1990s*. England: Oxford University Press

PsyAsia International (2006).*What is an acceptable level of reliability for a psychometric test?* Retrieved from http://www.psyasia.com/supportsuite/index.php?_m=knowledgebase&_a=viewarticle&kbarticleid=82#ixzz2CdRE0BGX

Rothman, S. (2003). *the changing influence of socioeconomic status on students' achievement: Recent evidence from Australia* paper presented at the annual meeting of the American Educational Research Association, Chicago, 21-25 April 2003. Retrieved from http.7/www.acer.edu.au/documents/LSAY_CP_AERA2003Rothman.pdf.

Samuelsson, J. (2010). The impact of teaching approaches on students' mathematical proficiency in Sweden. *International Electronic Journal of Mathematics education (IEJME), 5* (2), 61 – 78.

Siemon, D. (2005). *Multiplicative thinking.* Retrieved from www.eduweb.vic.gov.au/edulibrary/public/teachlearn/ppmultithinking.pdf.

Thomaskutty, P. G. & George, M. (2007). Mathematics and civil society. Retrieved from http://math.arizona.edu/~atpmena/conference/proceedings/Thomaskutty_Math_Civil_Society.doc

Trani, R. (2009). *The relationship between students' achievement, school disrict economies of scale, school district size, and student socioeconomic status* (Unpublished doctoral dissertation). George Fox University, Oregon, USA.

United Nations (2000). U. N. *millennium declaration 55/2 resolution adapted by the general assembly, september 18, 2000*. Retrieved http://www.un.org/milleniumgoals/.

Woolfolk, A. (2006). *Educational psychology.* New Delhi: Dorling Kin-Dersley.