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SELF CONCEPT AND ATTITUDE TOWARDS MATHEMATICS AS DETERMINANTS OF MULTIPLICATIVE THINKING AMONG PRIMARY SCHOOL PUPILS IN 5 AND 6 IN CALABAR EDUCATION ZONE OF CROSS RIVER STATE.

***Ibok, Ekpenyong E., **Thomas, Edet S., & ***Okri, John A.**

*** ibokekpenyong@yahoo.com 08063923224**

**** edethomas16@gmail.com 08063762108**

***** okrijohn@yahoo.com 08067525992**

*&*** Department Of Science Education

****** Department of Educational Foundations, Guidance and Counselling
Faculty of Education,
University Of Calabar

ABSTRACT

Children frequently find multiplicative tasks to be a stumbling block in their Mathematics process. Many use inefficient and inaccurate counting method and encounter difficulties in memorizing tables. Pupils loose interest in multiplicative tasks because of the difficulties they experienced and these difficulties are due to pupils' self concept and attitude to mathematics. Multiplicative tasks include comparing numbers through many processes. Initially, children tend to reason additively about multiplicative situations and this additive thinking is often resistant to change. Basic multiplicative tasks are considered to be foundational for further advancement in Mathematics. They form the bases for learning, multiplication multi-digit, factions, ratios, division and decimal. It is an individual's idea reasoning ability or position taken with respect to multiplicative tasks. Its development in individuals has always been recognized and solves problem efficiently. It requires a new level of sophistication in thinking about numbers and operations. Two hypotheses were formulated based on self concept and attitude toward Mathematics that formed the main variables of the study. Survey research design was adopted for the study. There are one hundred and fifty-four (154) public primary schools and ten thousand nine hundred and seventy nine (10979) including male and female pupils. A multi-stage sampling technique involving stratified and simple random technique was adopted in selecting 625 primary five pupils out of 6238 and 475 primary six pupils out of 4741, making a total sample of (1100) pupils out of (10979) pupils using 31 schools out of 154 for the study. The multiplicative achievement test item was the main

instrument used for data collection. The reliability estimate of the instrument was established through the test re-test reliability methods. One way Analysis of Variance (ANOVA) and Independent t- test were the statistical technique adopted to test the hypotheses at .05 level of significance. The result of the analysis revealed that self-concept, attitude toward mathematics significantly influence pupils multiplicative thinking among pupils in primary 5-6 in Calabar Education Zone of Cross River State. Based on this finding, it was recommended that pupils should develop positive attitude toward mathematics in order to enhance their multiplicative ability.
Keywords: Self-concept, Attitude, multiplicative thinking

Introduction

The Primary level of education as concisely stated in section three paragraphs 15 of the National Policy on Education is very important based on the fact that primary level of education is the key to the success or failure of the entire education system (Federal Republic of Nigerian, 2013). If the Mathematics study at this level is interesting and understandable, the increasingly sophisticated Mathematical idea (multiplicative thinking) at this level can sustain pupils' engagement and enthusiasm. However, if their learning becomes a process of simple "parroting" and "memorizing", they soon begin to lose interest. Instruction at this level must be active, intellectually stimulating and must help pupils make sense of mathematics (paramjit, 2003)

Multiplication includes comparing numbers through many processes and research has shown that multiplicative thinking develops slowly in children over long periods of time (Kamii, 2009). Initially, children tend to reason additively about multiplicative situations and this additive thinking is often resistant to change (Greer, 2006). Children need practice with tasks that help develop multiplicative ability in particular tasks that help them recognize and reason about multiplicative relationship. To enable children to focus on more sophisticated tasks, such as problem solving proficiency in basic tasks and skills is an advantage. Without procedural fluency and the ability to recall basic facts from memory, children focus during problem solving will be on basic skills rather than the tasks at hand, thus drawing attention away from the learning objectives of the task. If the pupils cannot perform these multiplicative tasks without the need to use calculators or other aids, higher-order processing in problem solving will be impeded (Woolfolk, 2006). Basic multiplicative tasks are considered to be foundational for further advancement in Mathematics. They form the bases for learning, multiplication multi-digit, factions, ratios, division and decimal (Ell, Irwin & McNaughton, 2004)

Multiplicative thinking is indicated by a capacity to work flexibly with concepts, strategies and representations of multiplication as they occur in a wide range of contexts (Siemo, 2005). It is an individual's idea reasoning ability or position taken with respect to multiplicative tasks and its development in individuals has always been recognized and solves problem efficiently. It requires a new level of sophistication in thinking about numbers and operations. This sophistication is inherent in the nature of multiplication (Jacob & Wills, 2001). Multiplicative thinking cannot be generalized in any simple way from additive thinking, unless teachers consciously help children develop multiplicative ability which goes well beyond repeated addition (Jacob & Wills, 2001).

However, multiplicative thinking is followed directly from experiences in additive thinking. Children need to reason and communicate about interesting tasks that can be solved in various ways and that lead to multiplicative situations (Odo,2014).

Multiplication has posed a lot of problems to children at upper and lower levels of primary school (Siemo, 2005). Children frequently find multiplicative tasks to be a stumbling block in their Mathematics process. Many use inefficient and inaccurate counting method and encounter difficulties in memorizing tables (Greer,2006). Pupils loose interest in multiplicative tasks because of the difficulties they experienced, and these difficulties are in the language used in the teaching, the calculators involved, the symbols associated with it, fear and teachers' poor attitude to work (Adebayo, 2006). Seah (2004) in his research found that pupils demonstrate very limited understanding of the multiplication concepts, with their knowledge restricted to procedural rather than conceptual understanding. Odo (2014) citing Clark & Kamu (1996) in their study found that pupils have trouble in gaining the knowledge of multiplication meaningfully, throughout primary school. Children having troubles in ginning that knowledge of multiplication meaningfully is not necessarily because of its mathematical content, but due to a lot of other factors (Siemo, 2005). Siemo further stated that these factors could be teacher related, student related, school or home environment related. It also appears that subconscious mind of the pupils, a wrong impression has been made, that at the stage where they are, it seems virtually too late or impossible to study mathematics concepts including multiplicative tasks and understanding in order to succeed in the subject. If basic multiplicative tasks are not acquired during the primary school years, it is highly unlikely that deficit may occur in secondary school performance (Steel & Funnell,2007)

The research therefore reviewed self-concept and attitude toward Mathematics as determinants of multiplicative thinking and deemed it necessary to use pupils in primary 5 and 6 because they are likely to be more multiplicative thinkers than additive thinkers. Self-concept is an important construct in education because of its linkage to academic achievement (Valentine, Dubois & Cooper, 2004). Nonetheless, a general self-concept might not be solely confined in the academic orientation (Skaalvik, 2006). To facilitate research in education, Shauelson, Hubner & Stanton (1976) proposed a hierarchical model that divided the general self-concept into academic and non-academic components. Marsh & Cravel (2007) maintain that, "enhancing a child's academic self-concept is not only a desirable goal but is likely to result in improved academic achievement as well".

The anticipated improvement of pupils' performance is based on the existence of a reciprocal relationship between self-concept and academic achievement (Marsh & Baumert, 2005). According to woolfolk (2006), self-concept generally refers to the composition of ideas and feelings people have about themselves. Ifamuyiwa (2004) viewed self-concept as the extent to which such an individual believes in himself to be capable, significant, successful and worthy. He also stated that, self concept entails all the beliefs about the individual's self-judgment of his own abilities, influence and popularity. Harter (1999) described it as an organized and consistent way in which an individual thinks, feels and react to issues concerning himself. Jagprea and Kaur (2009) examined academic achievement as correlates of self-concept among adolescents. The

study investigated self-concept among adolescents in relation to academic achievement and home environment. The study was conducted on a representative sample of 300 adolescents of ninth class selected on the basis of randomized technique of sampling from different government and private schools of particular district of Punjab, India. The coefficients of cancelation of self-concept with academic dimensions were computed for the sample. The results revealed self-concept to be positively correlated with academic achievement.

Sanchez and Roda (2003) investigated the relationship between self-concept and academic achievement in primary schools, their objective was to verify the degree of association and performance, as well as determining the psychometric properties. The SDQ questionnaire was used. A sample of 245 primary school students studying in the public or subsidized schools in America and Spain. Data regarding the subjects' self-concept were obtained through the use of adapted academic self-concept and non-academic self-concept scale (SDQ) by Elexpuru (1992). The Scholastic performance was through marks assigned by students' teachers. Results indicated that close relation exists between academic self-concept and measures of academic performance and total self-concept together with academic self-concept are good predictors of general performance.

Chanal, Sarrazin, Guay and Boiche (2009) found that pupils' performance in mathematics depend on what they thought of or believe about themselves, with references to Mathematics as a subject. Hence, it is thought worthwhile to understand the complete abilities and potentials of the child before giving him education. Yara (2010). For better understanding, the teacher needs to first know the self-concept of the pupils and how it influences their multiplicative task. Therefore, inquiry needs to be found about self-concept and how it influences the multiplicative task of pupils. Bong (2010) investigated the relationship between self concept and academic performance in science subjects. He used a sample of 120 pupils in public school schools in Uyo. The pupils were also required to complete academic self-concept questionnaire. The hypotheses were stated and tested using one way analysis of variance (ANOVA). The study revealed that amongst other variables, self concept significantly influenced the academic performance in mathematics.

Obo (2010) conducted a study to find out the influence of self concept on the academic performance of senior secondary schools mathematics in Cross River State. A sample size of 600 SS II students was used. The data were analyzed using one way analysis of variance (ANOVA). The research design used was survey method,using questionnaire. The result of the analysis showed that there was a significant influence of self concept on students' academic performance in mathematics.

Pupils' attitude to mathematics and interest could play a substantial role in their studying mathematics. Attitude towards mathematics is individual thinking, feeling, interest, opinion or position, taking with respect to mathematics. Some Nigerian primary school pupils developed negative attitude towards science and mathematics which affect multiplicative tasks Odunusi, 2007). A positive attitude towards mathematics reflects a positive emotional disposition in relation to a subject and in a similar way a negative attitude towards mathematics relate to a negative

emotional disposition (Eshon, 2013). These emotional dispositions have an impact on the individual behaviour as one is likely to achieve better in the subject. (Zan & Martins, 2008).

Okon and Agba (2006) investigated primary school pupil's attitudes to mathematics. Their result shows that pupils had negative attitude towards mathematics which attributed to the people misconception in mathematics. Adebayo (2006) cited in Udo (1996) shared the view that students have negative attitude towards mathematics but attributed this to teachers poor attitude and inability to teach that, which is transmitted to students to affect pupils multiplicative abilities.

Ottoway (2012) investigated the factors influencing the academic performance in Mathematics in Sokoto State. He used two instruments, one measure the factors and the other measure the academic performance (i.e achievement test). In this study the total sample of 180 junior secondary three students were randomly selected. Independent t-test statistical analysis was used. The result of the analysis shows that a significant influence exists between students' attitude towards mathematics (science) and academic performance in mathematics.

Theoretical framework

The constructivist theory of learning by Jean Piaget (1975) was adopted for better understanding of the study. The studies by Piaget have led to the constructivist philosophy, which focused on the framework that students carry into learning situations. According to the theory, learners bring their personal experiences into the classroom and these experiences have a tremendous impact on students' views of how the world works. Students come to learning situations with a variety of knowledge, feelings, attitude and skills, and this is where learning should begin. These exist within the students and is developed as individuals interact with their peers, teachers, and the environment. Learner's construct understanding or meaning by making sense of their experiences and fitting their own ideas into reality.

According to Woolfolk (2006), Piaget stated that our thinking processes change radically, though slowly, from birth to maturity because we constantly strive to make sense of the world we live. Thus, it is done through biological maturation, activity, social experience, socio status and equilibrium and interaction to influence changes in thinking.

Piaget, according to Woolfolk (2006) stated that all species inherit the basic tendencies for adaptation or adjustment of the environments. She opined that Piaget stated that people are born with a tendency to organize the thinking into Psychological structure. These Psychological structures are our systems for understanding and interacting with the world. Simple structures are continually combined and co-ordinated/constructs to become more sophisticated and thus more effected

The beginning of children's understanding of multiplication is in the construction of a unit that is repeatedly added, it is what goes on in the mind of the pupils before the repeated addition of the unit that is crucial for conception understanding of multiplicative thinking. How the pupil understands the quantities within a problem is labelled as "scheme". Schemes are basic building block of thinking. They are organized systems of action or thought that allows us to mentally represent or "think about" the objects and events in our world (Woolfolk 2006). It is assumed that multiplicative thinking takes place in an active process of sense making which can be developed

by constructive activities and influenced by factors including prior knowledge, belief, self concept, attitude, expectation, perceptions and motivation.

Statement of hypotheses

The following null hypotheses were formulated to guide the study.

1. There is no significant influence of self-concept on pupils' multiplicative thinking among pupils in primary 5 and 6 in Calabar Education Zone of cross river state.

2. There is no significant influence of attitude towards mathematics on pupils' multiplicative thinking among pupils in primary 5 and 6 in Calabar Education zone of Cross River State.

Methodology

The study area was Calabar Education Zone of Cross River State. The research designed adopted is survey design. This design method was preferred because it is concerned with finding, describing and interpreting data collected from samples of population.

The population for the study consisted of all pupils in primary 5 and 6 in Calabar Education Zone which comprises of Biase, Akamkpa, Odukpani, Akpabuyo, Calabar south, Bakassi, and Calabar municipality. There are one hundred and fifty-four (154) public primary schools and ten thousand nine hundred and seventy nine (10979) including male and female pupils.

A multi-stage sampling technique involving stratified and simple random technique was adopted in selecting 625 primary five pupils out of 6238 and 475 primary six pupils out of 4741, making a total sample of (1100) pupils out of (10979) pupils for the study. The schools were stratified based on gender and local government area but out of a total of 154 public primary schools, 31 (20%) schools were randomly selected for the study, from the selected schools in each local government area, 1100 pupils (approximately 10%) of the total number of pupils were randomly selected for the study.

Two instruments were used, a questionnaire on some determinants of multiplicative thinking and multiplicative achievement test items. The questionnaire consisted of two sections (A and B). Section A described the bio data of the respondents while section B developed on the main variables which include self-concept and attitude toward mathematics. The questionnaire was based on four point scale used in measuring responding opinion level of agreement or disagreement. The instrument was face-validated by two experts in measurement and evaluation from the University of Calabar. Correction were pointed out by the expert and adjusted by the researchers and the document was considered valid.

RESULTS

The statistics package for social sciences (SPSS) computer programme was used to analyze the data collected. The data for the hypotheses were analyzed using one ways analysis of variance (ANOVA) for hypothesis one and Independent t-test for hypothesis two. The result of the analysis is presented in the table 1 and 2. The hypotheses were tested at .05 significance level

Hypothesis One

There is no significant influence of self-concept on pupils' multiplicative thinking among primary 5 and 6 pupils in Calabar Education Zone of cross river state. In testing this hypothesis, the pupils in the sample were categorized into three groups based on their scores. Pupils that scores from 70 percent and above were categorised as high self concept, 45 – 69 percent were categorised as moderate self concept while those with 44percent and below were categorised as low self concept.

Table 1: Result of one way analysis of variance (ANOVA) on influence of self-concept on pupils' multiplicative task.

Self-concept	N	$\overline{x}$	SD
Low	300	17.36	9.84
Moderate	480	21.73	10.05
High	320	18.17	9.62
Total	1100	22.67	11.72

Sources of variation	SS	df	MS	F
Between group	2706	2	1383	10.25
Within group	145,179.174	1097	132.342	
Total	147,885.174	1099		

* $p>0.05$ (critical $F_{21097}=3.00$)

From the table above, it could be observed that the calculated F- value of (10.25) is greater than critical F-value of (3.00) at .05 level of significance with 2 and 1097 degree of freedom with this result, the null hypothesis is rejected.

The pattern of this significant influence of self-concept on pupils' multiplicative thinking is explored using Fishers least significant difference (LSD) multiple pair wise comparison analysis.

Table 2: Result of Fisher's (LSD) significant multiple pair-wise comparison analysis of one influence of self-concept on pupils' multiplicative task.

Self-concept	LowN=300	ModerateN=48O	High=320
Low	17.36	-4.37	-0.81
Moderate	-5.16	21.73	3.56
High	-0.88	4.29	18.17
	MSw =	132.342	

The significant Fisher's t-value of (5.16) indicates that the multiplicative thinking of pupils with moderate self concept(x=21.73) is higher than those with low level self concept(x=17.36). Similarly, the significant Fisher's t-value of (4.29) indicates that the multiplicative thinking of pupils with moderate self concept (x=21.73) is higher than those with high level of self concept(x=18.17). The non significant of Fisher's t -value of (0.88) indicates that those with low and high level of self concept are not significantly difference in their multiplicative ability.

Hypothesis two

There is no significant influence of attitude towards mathematics on pupils' multiplicative thinking among primary 5 and 6 in Calabar Education zone of Cross River State.

In testing this hypothesis, the pupils in the sample were categorized into two groups based on their scores. The mean scores of pupils with 50 percent and above were categorised as pupils with positive attitude while pupils that scored below 50 percent were categorised with those with negative attitude.

Table 3: Independent t-test analysis of influence of pupils' attitude toward Mathematics on Multiplicative thinking.

Variables	N	Mean	SD	t-value
Positive attitude	653	18.35	7.12	5.605*
Negative attitude	447	16.10	6.11	

*P > 0.05; Critical t-value = 1.96

From table 3, the calculated t-value of (5.605) was greater than the critical t-value of (1.96). Since the calculated t-value is greater than the critical t-value of 1.96, the null hypothesis is rejected. This means that there is a significant influence of pupils' attitude toward mathematics on multiplicative thinking among pupils in primary 5-6 in Calabar Education zone of Cross River State.

DISCUSSION

The result of the study shows that there is significant influence of self-concept and attitude toward mathematics on pupils' multiplicative thinking.

From table 1, the mean scores of pupils with moderate self concept were higher than those of high self concept. This implies that pupils with moderate self concept had higher multiplicative ability than high self concept. Ifamuyiwa (2004) view self-concept as the extent to which an individual believes himself to be capable, successfully and worthy. He stated that, self concept entails all the beliefs about the individuals and is essentially an individual's self-judgment of his own abilities, attitude, influence and popularity. The study is in support of Othman & Leng (2011) who studied the relationship between self-concept, intrinsic motivation, self-determination and academic achievement among Chinese primary school pupils and found that, positive relationship exists between self-concept and student academic performance among Chinese primary school pupils.

Isangedighi (2007) cited Roger (1951) stated that self-concept occupies the central place in one's personality and serve to shape and direct behaviour.. Isangedighi further stated that self-concept involves being able to shape direct behaviour that has relevance for learning and achievement concept.

The result in table 2 showed that, the mean scores of pupils with positive attitude is higher than those with negative attitude. This implies that, pupils with positive attitude had higher multiplicative thinking than those with negative attitude. The finding is in support of Rabideau (2005) affective and cognitive theory which stateed that favourable attitudes are accompanied by beliefs, consistent with that attitude. This implies that the more positive pupils' attitude is toward learning a particular subject, say mathematics, the more likely he/she is to succeed in that subject.

In essence, increase in attitude brings about an increase in the level of achievement in multiplicative tasks.

CONCLUSION/ RECOMMENDATION

Based on the results of the study, it was concluded that self-concept and attitude to mathematics significantly influence pupils' multiplicative thinking.

On the basis of finding, the following recommendations were made:

Pupils' should develop positive attitude towards mathematics in order to enhance their multiplicative ability

Pupils should be involved in activities like singles and short poems so as to understand the importance and applications of Mathematics in everyday life, this may help in developing pupils' interest in the subject.

Since self concept influence pupils' multiplicative ability, pupils should be encouraged to develop positive feelings towards Mathematics, this will enhance their multiplicative ability.

Since, pupils' performance in Mathematics depend on what they thought of or believe about themselves, with references to Mathematics as a subject, hence, it is thought worthwhile to understand the complete abilities and potentials of the child before giving him education.

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