

Effect of Maple Sketchpad Software on Gender Achievement and Retention in Algebra in Calabar Education Zone

¹ Ejaro Peter Emmanuel

Department of Curriculum and Instructional Technology
Faculty of Education University of Cross River State (UNICROSS).

² John T. Mkpanang (PhD)

Department of Science Education
Faculty of Education
University of Uyo

&

³ Stephen Ujum Odey

Department of Curriculum and Instructional Technology
Faculty of Education University of Cross River State (UNICROSS).

Odeysteve001@gmail.com

ejaropeter76@gmail.com

Abstract

The study investigated the effect of maple sketchpad software package on secondary school students' achievement and retention in Algebra in Calabar Education Zone. Two research questions guided the study and two null hypotheses were tested at 0.05 level of significance. The design of the study was quasi-experimental design. The specific design was the pretest posttest nonequivalent control group design. The study was carried out among secondary schools in Calabar Education Zone of Cross River State. The population for the study consisted of 1,553 Mathematics students in the senior secondary two in the study area. The sample size was 306 drawn from Calabar Education Zone. The instrument for data collection was Algebraic Achievement Test (AAT). AAT was face validated by three experts in the Department of Education Foundation. The reliability coefficient of the instrument was determined to be 0.83 using Kuder – Richardson Formula (K-R 20). The subjects were pretested before the treatment and the posttest was administered after the treatment, while the retention test was administered three weeks after the termination of the treatments. The data collected were analyzed using the mean, standard deviation and ANCOVA. The findings of the study showed that students who were instructed and taught using Maple sketchpad performed better and retained more than those taught using conventional method. It was also discovered that no particular gender was favored more by the treatment. Based on the findings of the student, it was recommended that secondary school Mathematics teachers should be given training on maple sketchpad so that they can use it while teaching. Also, seminars and workshops should be organized for serving teachers so as to acquaint them with the skill of maple sketchpad.

Keyword: Achievement, Gender, Mathematics, Maple Sketchpad Software, Retention

Introduction

Nigerian system of education had provided that mathematics should be taught at all levels of learning from primary to tertiary levels of education in the country. This was captured in the National Policy on Education in 2013 which made it clear on the need for the inculcation of mathematics knowledge for all children of school-going age at primary level and basic level (JSS 1-3), to ensure that they are freed from numeracy problems. Mathematics is a branch of knowledge that deals with numbers, qualities and skills, and it is the bedrock of all societal transformation and transfer of ideas into reality (Otum, Obasi & Ukpebor, 2009). It involves logical reasoning, drawing conclusion from assumed premises, systematized knowledge and or strategic reasoning based on accepted rules, laws or probabilities. It is the art which studies patterns for predictive purposes (Gilfeather & Regater, 2009).

Mathematics as a school subject is recognized as the foundation of science and technology without which a nation could never become prosperous and economically independent (Mutari, 2013). Mathematics has continued to play central role in almost all sphere of life. It is generally utilized in the areas of medicine, engineering, Bio-sciences and other parameters for national development. Thus, mathematics is defined as the science of quality and space (Tella, 2012). It remains the centre that holds all facets of life.

Due to the relevance of mathematics to National Development, the Federal Government of Nigeria made the teaching and learning of mathematics mandatory at all levels. For example, recently, the Federal Government of Nigeria presented a draft of mathematics education reform tagged “Mathematics Education for Change; Ministers Strategic Plan from 2015-2019”. This is an attempt to improve the quality of mathematics education output. Article six (6) of the draft contains welfare for mathematics teachers and scholarships offer for exceptionally precocious students in mathematics for upper and lower basic classes. This is to enable Nigeria prepare secondary school students for responsibilities of citizenship, National development and radical change in mathematics education delivery which is imperative for 21st century knowledge-driven economy.

The school mathematics is basically made up of algebra, arithmetic and geometry at the secondary and tertiary levels. Algebra with its symbolic representation is the bedrock of all branches of mathematics. Algebra is a generalization of arithmetic in simple format using letters in symbols to represent numbers (Anyor, 2011). Mathematics process is problem solving

and all problems are involved into algebraic expressions and equations for a possible solution (Smith and Okoye, 2010).

Algebra curriculum in secondary schools include (i) open sentences, (ii) simple equations in one variables, (iii) expansion of algebraic expression (iv) factorization (v) algebraic fractions (vi) word problems (vii) linear inequalities in one variable (viii) coordinate axis (ix) linear equations in two variables (x) linear graphs (xi) simultaneous linear equations (xii) change of subject (xiii) variation (Ogbu, 2011). Adeoye (2012) enumerated the objectives of algebraic expressions for teaching and learning to include (i) Hierarchy orderly approach (ii) creative imagination (tessellation) (iii) deductive thinking (extrapolation) and extension) (iv) problem solving (involving) (v) everyday arithmetic (existing).

In general, the objectives of algebra in secondary schools are to: (i) introduce students to mathematical structure (orderly approach) (ii) introduce students to the understanding of the basic concepts (iii) evaluation of formulae and the solution of simple equations (involving) (iv) introduce students to the meaning of useful basic algebraic concepts such as literal numbers, formulas and symbolic language of algebra (tessellation) existing and extrapolation (Basic Education in Mathematics, 2012).

Despite the importance of algebra in mathematics and other sciences like engineering, physics, medicine and National Development (Tella, 2012), secondary School students have continued to perform poorly in mathematics in general and algebra in particular. Sulieman and Hammed (2019) stated that one of the major problems facing the educational system in Nigeria is the abysmal failure of students in public examination; particularly at the secondary level of education. The situation is so pathetic that stakeholders keep on wondering why this level of education has persistently failed to meet the yearnings and aspirations of the society. Some researchers viewed strategy of teaching algebra as the problem of poor performance of algebra.

Other researchers like Okabiah (2006), Obioma (2006), Mutari (2013) and Azubike (2014) pointed to the fact that teachers use mostly conventional methods of teaching which is outdated and may invariably responsible for mass failure (Azubike in Ogunyemi, 2010). Many researchers like Suleiman and Hammed (2019); and Tshabalala and Ncube (2013) indicated inappropriate teaching and learning methods in secondary schools. Other factors include teachers' inability to help students learn algebra effectively, unqualified teachers teaching algebra and in adequate teaching aids (Popoola and Olarewaju, 2010).

A report from Ogunyemi and Adeoye in Okoro (2011) indicated that the four operations of addition, multiplication, subtraction and division and the failure to observe the rubrics, symbols, notations measurement units and inability to model mathematical word problems into algebraic expressions and equations for easy solution pose a problem to students' achievement in algebra.

Challenged by the problem of improving students' achievement and retention in algebra by ensuring sustainable scientific and technological development of the nation, mathematics educators have suggested various ways of improving the teaching and learning of algebra. Some of these researchers include Udeinya and Okabiach (2007) and Ekoya (2010). For example Johnson and Johnson in Anyor (2011) suggested cooperative and individualistic learning; Ogunyemi, (2012), algebra modeling. A comprehensive introduction Prentice Hall, Ibadan University Press in Popoola and Olarewaju (2010) suggested problem solving model as effective teaching and learning strategies. Odili in Smith (2014) stated that for mathematics students to perform well, he/she must be guided by psychological characteristics of how human beings learn.

These characteristics include cooperative attitudes, interest, hard work and commitment autonomous learning or independence and problem solving for students' achievement. Since the current paradigm shift is moving from teacher to learner-centered strategies, the above characteristics should guide the choice of teaching approach that will make success in algebra reach all students in Nigerian schools. Other researchers also noted that it is not certain whether mathematics teachers use effective teaching materials and instructional aids in the teaching of algebra in secondary schools.

It is noted however that audio-visual aids may inspire students to exert maximal efforts toward achieving their goals (Egbo, Checko and Nwoke, 2011). This is because students learn more if they are engaged in significant and appealing activities (Joash, 2014). Regular instruction plus audio-visual aids resulted in more factual learning than those without audio-visual aids in mathematics (algebra) in secondary schools (Ogunyemi, 2012). Ogunyemi further stated that it is also noted that mathematics teachers who made use of appropriate instructional materials obtained higher mathematics scores.

Instructional tools and materials are of immense importance to algebra achievement and retention. The issue of motivation of students in the learning of algebra using tools like

Geogebra software, Laser Scan and Maple Sketch pad has dominated many researchers. For instance, Abimbode (2017) opined that instructional tools like geogebra and Maple sketch pad in teaching and learning of algebra promotes and sustains student's interest and helps the students to discover themselves and their abilities, and thus suggest the maple sketchpad for the teaching and learning of algebra.

Maple sketch pad is a mathematics and research software that combines powerful mathematics engine with an interface that makes it extremely easy to analyze, explore, visualize and solve mathematical (algebra) problems (Joash, 2014). Maple sketch pad is mathematical software that can function as an enhanced calculator, a programming language or as a tool to produce diagrams and graphs. Maple sketchpad is designed to release the students from routine work to allow them to focus on the essence of the student material at the moment consider more task to facilitate the understanding of algebra by other method of presentation. Maple sketchpad can facilitate the mathematical environment as it helps to relieve boredom and establish a friendly atmosphere which allows for growth of skills and knowledge (Joash, 2014).

Drier (2010). Maple sketchpad in the teaching and learning of algebra will help to eliminate the major sources of frustration by students who do poorly because the subject requires a great deal of memorization regarding logical steps, sequences and number orders, those with bad memories often find themselves a loss when it comes to completing even the simplest algebra function. Maple sketchpad is important in the teaching of algebra to secondary schools' students and it helps both boys and girls who have phobia for algebra. Educators and researchers vary in their opinions as to whether gender affects students' achievement in secondary school mathematics (Algebra), or not. Gender is a cultural construct that distinguishes the roles, behaviors, mental and emotional characteristics between male and female developed by a society (Udousoro, 2011). Umoh (2003) defined gender as psychological term used in describing behaviours and attributes expected of individual. According to Nneji (2012), gender issues in sciences generally and mathematics in particular is indeed very vital. This becomes more obvious in societies such as ours where science is erroneously viewed as masculine and arts subject viewed as feminine.

Abiam and Odok (2006) found no significant relationship between gender and teaching method on students' achievement in number and numeration, algebraic processes and statistics. Albert (2015) found that female students achieved higher than their male counterparts in

mathematics. In view of these contradicting results, this study investigated the effect of Maple Sketchpad software package on secondary school students' achievement and retention in algebra. This study seeks to find which of the gender male or female benefitted more than the other in achievement and retention.

Educators and researchers vary in their findings opinions as to whether location affects students' achievement and retention in secondary school mathematics or not. Location of schools in this context could be categorized into two viz: urban and rural. Undoubtedly urbanization and rural development still pose great challenges to the government of the third world countries such as Nigeria. In the urban areas, basic infrastructures are inadequate in supply, hence the struggle for and consequent over stretching of the available few. Therefore, in school system, the story has remained that of over- crowded classrooms. The emergence of urban congestions has worsened things and created more unmanageable social problems. The problems of urbanization are many and they constitute a big threat to teaching and learning in the school. This is because learning must take place in very conducive environments (Audu, 2006).

On the other hand, the situation in the rural areas is not in any way better. Although the rural location may never be known for over population, they have definitely suffered neglect and abandonment. Hence, schools in the rural areas are marked by dilapidated buildings, where they even exist at all and lack of necessary equipment to enhance teaching and learning. Many rural schools have been deserted by teachers who usually seek transfer to urban areas. This has affected the academic achievement of students in both internal and external examinations.

Research Questions

The following research questions guided the study:

- i. What are the mean algebra achievement scores of male and female students in the experimental group?
- ii. What are the mean algebra retention scores of male and female students in the experimental group?

Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

H₀₁: There is no significant difference between the mean algebra achievement scores of male and female students in the experimental group.

H₀₂: There is no significant difference between the mean algebra retention scores of male and female students in the experimental group.

Methodology

This study adopted a quasi-experimental research design. Quasi experimental design specifically pretest-posttest non-equivalent control design was utilized. Nworgu (2015) defined quasi-experimental research design as one which 'random assignment of subjects to experiment and control groups is not possible. The choice of the design according to Nwogbo (2007) is because there was no randomization of research subject into groups. This was to avoid disorganization of the school arrangement. Thus, intact classes were used for the study. However, the intact classes were randomly assigned to either experimental or control groups. According to Nworgu in Okoro (2015), an essential and indispensable feature of quasi experimental design is the use of control group. He opined that a control group is one to which experimental treatment was not administered.

A control group therefore usually provides the baseline against which to compare the effect of the experimental treatment on the experimental group. Expository method was used on the control group because it is traditional method used in all schools. The study was conducted in Calabar Education Zone of Cross River State. Calabar Education Zone is one of the four education zones in Cross River State. was chosen because of the persistent poor performance of students in external examinations in science subjects, especially mathematics as observed by the researcher. Also, Calabar education zone comprises of male and female students from different locations (urban or rural).

The population for the study consisted of 1,553 SS 2 Mathematics students in the secondary schools in Calabar Education zone of Cross River State. The sample size was 312 SS II mathematics students. Purposive sampling was adopted to identify four out of the 39 public secondary schools in the study area. The four schools drawn operate co-education and were considered to be better equipped for the study. This study also considered gender and location as the variables so as to have a basis for comparison in co-education schools.

The four schools purposively drawn had up to three or more SS II classes. There were two intact classes in each sampled school. Consequently, the total number of SS II students in the four sampled intact classes constituted the sample size for the study. This comprised 174 SS 2 students in the experimental group (73 male and 101 female) (108 urban and 66 rural) and 132 SS 2 students in the control group. The instrument for data collection was Algebraic Achievement Test (AAT). The AAT was formulated by the researcher and the items covered the content (algebraic process to be taught based on the period of task coverage). The achievement and retention test in algebra with the marking scheme were scrutinized by experts. The reliability of the instrument (AAT) was established through a pilot study on 50 students to obtained the internal consistency of 0.83 for the instrument (AAT) using Kuder-Richardson 20, (K-R (20)).

Results

Research Question 1: What are the mean algebra achievement scores of male and female students in the experimental group?

Table 1: Mean Algebra Achievement Scores and Standard Deviations of male and female students in the experimental group

Groups	n	Pre-test		Post-test	
		($\bar{x}$)	(s)	($\bar{x}$)	(s)
Experimental (Male)	73	26.45	4.77	39.55	6.02
Experimental (Female)	101	26.09	4.97	38.25	5.31

Data on Table 1 revealed that at pre-test, the mean achievement score for male students was 26.45 with a corresponding standard deviation of 4.77. Also, the female students mean score at pre-test was 26.09 and a standard deviation of 4.97 respectively. After post-test, it was observed that the male students' mean achievement score was 39.55 with a standard deviation of 6.02 respectively. For the female students at post-test, their mean achievement score was 38.25 with a corresponding standard deviation of 5.31 respectively. Similarly, the standard deviations for the male and female students after post-test are 6.02 and 5.31, indicating that the individual scores of the female students are more clustered around the mean than those of their male counterparts that had more extreme scores. This implied that the male students in the experimental group achieved higher than their female counterparts considering their higher mean achievement score at post-test.

Research Question 2: What are the mean algebra retention scores of male and female students in the experimental group?

Table 2: Summary of Mean Algebra Retention Scores and Standard Deviations of male and female students in the experimental group

Groups	n	Post-test		Retention	
		($\bar{x}$)	(s)	($\bar{x}$)	(s)
Experimental (Male)	73	39.55	6.02	43.99	6.39
Experimental (Female)	101	38.25	5.31	43.88	5.57

Data on Table 2 revealed that at post-test, the mean achievement score for male students was 39.55 with a corresponding standard deviation of 6.02. Also, the female students mean achievement score at post-test was 38.25 and a standard deviation of 5.31 respectively. After post-test, it was observed that the male students' mean retention score was 43.99. For the female students, their mean retention score was 43.88. Similarly, the standard deviations for the male and female students after post-test are 6.39 and 5.57, indicating that the individual scores of the female students are more clustered around the mean than those of their male counterparts that had more extreme scores. This implied that the male students in the experimental group retained higher than their female counterparts considering their higher mean retention score.

Null Hypotheses 1: There is no significant difference between the mean algebra achievement scores of male and female students in the experimental group.

Table 3: ANCOVA mean achievement scores of male and female students in experimental group

Tests of Between-Subjects Effects					
Dependent Variable: ACHIEVEMENT					
Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.824 ^a	1	3.824	.121	.728
Intercept	249899.962	1	249899.962	7914.497	.000
GENDER	3.824	1	3.824	.121	.728
Error	5430.894	172	31.575		
Total	261655.000	174			
Corrected Total	5434.718	173			

a. R Squared = .001 (Adjusted R Squared = -.005)

Table 3 shows that the calculated F-value for the effect of treatment (method) on gender in AAT is .121 significant at .728 level of significance, which is more than 0.05 set for the study. The null hypothesis is therefore not rejected. This means that a significant difference does not exist in the mean achievement scores of mathematics male and female students taught with maple sketchpad.

H₀₂: There is no significant difference between the mean algebra retention scores of male and female students in the experimental group.

Null Hypothesis 2: There is no significant difference between the mean algebra retention scores of male and female students in the experimental group.

Table 4: ANCOVA on the mean retention scores of male and female students in experimental group

Tests of Between-Subjects Effects					
Dependent Variable: RETENTION					
Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.468 ^a	1	.468	.013	.908
Intercept	327153.388	1	327153.388	9316.966	.000
GENDER	.468	1	.468	.013	.908
Error	6039.561	172	35.114		
Total	341761.000	174			
Corrected Total	6040.029	173			

a. R Squared = .000 (Adjusted R Squared = -.006)

Table 4 shows that the calculated F-value for the effect of treatment (method) on gender in AAT is .013 significant at .908 level of significance, which is more than .05 set for the study. The null hypothesis is therefore not rejected. This means that a significant difference does not exist in the mean retention scores of mathematics male and female students taught with maple sketchpad.

Discussion of Findings

The discussion is presented as shown:

The findings of the study revealed that students in the experimental group achieved higher than those in the control group considering their higher mean achievement scores at posttest. Also, the students' individual scores were more clustered around the mean with expository method than with the Maple Sketchpad. The use of maple sketchpad in the classroom as a teaching method has a significant effect on student' achievement in the subject. The hypothesis revealed that there was a significant difference between the mean achievement scores of students in experimental group and those in control group. There was a difference between the post-test and pre-test scores for experimental and control groups respectively.

Furthermore, students in the experimental group retained knowledge more than those in the control group considering their higher mean retention scores. Also, a significant difference exists in the mean retention scores of mathematics students taught with maple sketchpad and those taught with expository method. The finding of the study is in agreement with earlier findings by Okoye (2014) who opined that maple sketchpad in the teaching and learning of algebra makes students to learn more and retain better what they have been taught. Okoye (2014) also reported that the group they trained with maple sketchpad outperformed other groups trained with conventional methods. Also, Jucas (2012); Ruddak (2021) and Olaniyi (2015) sufficiently emphasized the fact that students learn more if they are engaged in significant and appealing activities.

The findings of the study showed that male students achieved higher than their female counterparts when given maple sketchpads instrumental technology. There was slight difference between the male and female students in their mean achievement. In the hypothesis tested, a significant difference does not exist in the mean achievement scores of mathematics male and female students taught with maple sketchpad.

Furthermore, male students in the experimental group retained higher than their female counterparts considering their higher mean retention score. In the hypotheses tested, a significant difference does not exist in the mean retention scores of mathematics male and female students taught with maple sketchpad. These findings agree with Eya and Mogboh in Mado (2012) who observed no significant gender difference in achievement of male and female students. It however contrasted with Brien and potter (2006) who observed a significant gender difference in favor male algebra.

The finding of the study revealed that there is no significant interaction effect of gender and method on students mean scores in the Algebraic achievement and retention tests. The finding of this study is in agreement with Neboh (2009) who found no interaction effect between gender and instructional model. The achievement of male and female students may not vary due to variation in the instructional model, especially with the maple sketchpad.

Conclusion

The study has revealed that the use of maple sketchpad has enhanced student's achievement and retention in algebra. Students who were taught algebra using maple sketchpad achieved significantly higher than those who were taught algebra with conventional method. It tends to imply that the use of maple sketchpad enables the students to understand better the concepts and principle taught. Again male students in the experimental group taught with maple sketchpad performed better than their female counterparts.

Recommendations

Based on the result of the study, the following recommendations were made.

1. Since this study has established the imperativeness of maple sketchpad in enhancing achievement and retention in algebra among student, the use of instructional technology should be incorporated in Nigerian school curriculum by the government.
2. Seminars and workshops should be organized by educator's federal and state ministries of education and related professional association and agencies who are charged of education, especially at the secondary level, to enable serving teachers to familiarize themselves with the use of maple sketchpad. Presently, many of the serving teachers are not familiar with this instructional technology.

3. Government and other professional associations should sponsor further research on the use of maple sketchpad in the teaching and learning on other subject area like physics, chemistry, biology among others.

References

- Abaim, P.O. & Odok, J.K. (2006). Factors in student's achievement in different branches of secondary school mathematics. *Journal of Education and Technology*; 1(1), 161-168.
- Abimbode, F.N. (2017). Changes in Mathematics since 1950s-Idea and Renaissance Nigeria in Educational Studies in mathematics. *Journal of Education*; 10(2).
- Adeoye, A.A. (2012). Effective Learning of Algebra for Economics. Retrieved on May 16, 2012 from <http://www.google.com>.
- Albert, L.N. (2015). Effect of computer Aided instruction in teaching set theory and probability. *International Journal of Studies in Education (IJOSE)*; 10(1) 10-14.
- Anyor, J.W. (2011). Using Algebra for Economic Investment Appraisal: Implication for Sustainable Development. Mathematics Association of Nigeria. 223-229.
- Audu, N.F. (2006). Algebra made Easy. *Tarzan Journal of mathematics* 2. (1) 139-154.
- Azubuike, M.A. (2014). Algebra Experience-Based Approach introduction. *Journal of Science and Technology. University of Nsukka*. Nsukka. 13 (6) 224-243.
- Drier, L. (2010). Knowledge and teaching foundations of the new reform. *Harvard: Educational Review*, 51, 1 – 22.
- Egbo, P. Checko, V. & Nwoye, W. (2011). Application of Computer Aid instruction to the teaching of Mole concept in Chemistry in Senior Secondary School Syllabus. *Journal of Educational studies, University of Jos*; 12 (1), 169-174.

- Gilfeather, M. & Regater, L. (2009). An analysis of sixth-grade pupils' errors on written mathematical tasks. *Victorian Institute for Educational Research Bulletin*, 39, 31-43.
- Joash, M.V. (2014). *Teaching Algebra for understanding*. Maidson: University of Wisconsin.
- Mutari, P.A. (2013). Effect of Reciprocal Peer tutoring on the Academic Achievement of Students in Mathematics. *Journal of Education, University of Jos*.
- Nneji, S.O. (2012) improving secondary school students' achievement interest in trigonometry through a constructivism based teaching strategy. *Journal of science and computer Education (JOSCED)*; 2(1); 55-79.
- Obioma, G.O. (2006). Mathematics Education for dynamic economy in Nigeria in the 21st Century. *Journal of Social Sciences* J.5(3); 293-296.
- Odili, A.O. (2006). *Algebra in Hymenia Secondary Schools; a teaching Perspective*. Port Harcourt anathema Education books.
- Ogbu, S.B. (2011). Effect of Simultaneous games on Students' Achievement and Interest in Mathematics. *Unpublished M.Sc. (Ed) project*. Enugu State University of Science and Technology.
- Ogunyemi, K.V. (2012). Problem solving model as effective teaching learning strategies. *Science Teachers Association*; 3(64); 122-125.
- Okabiah, P.A. (2006). *Curriculum Development for Africa*. Onitcha; Afruana Press.
- Otum, P. Obasi, R.T. & Ukpor, F. (2009). The mathematics teacher factors in the achievement of the goals of the Universal Basic Education (UBE) Abacus: *The Journal of mathematics Association of Nigeria (MAN)*, 27 (1), 72-79.

- Popoola, F.R. & Olarewaju, R.R. (2010). Factors responsible for poor performance of students in mathematics in Nigerian secondary schools. *Journal of Research in Education and Society*, 1(2 & 3); 1-10.
- Suleiman, Y. & Hammed, A. (2019). Perceived causes of students' failure in mathematics in Kwara State junior secondary schools: Implication for Educational Managers. *International Journal of Educational Studies in Mathematics*, 6(1), 19-33
- Tella, J.B. (2012). A Universal history of numbers: from Pre-history to the invention of the Computer, London.
- Tshabalala, T. & Ncube, A. C. (2013). Causes of poor performance of ordinary level pupils in mathematics in rural secondary schools in Nkayi District: Learner's Attritions. Retrieved on 26th March, 2018. From <http://novaexplore.com/NJMBS/wp>
- Udousoro, U. J. (2011). The effect of gender and mathematics ability on academic performance of students in chemistry. African Research Review. *An international Multidisciplinary Journal, Ethiopia*; 5(4)201-213.