

# EFFECT OF SKIMMING ADVANCE COGNITIVE ORGANIZER ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN MATHEMATICS IN ENUGU STATE, NIGERIA

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## Abstract

*The incessant poor achievement of students in Mathematics has attracted the attention of both the government and stakeholders in education sector. Based on this, several policies have been made with respect to finding solutions to the problem. Against this background, this study investigated the effect of skimming advance cognitive organizer on senior secondary school students' achievement in Mathematics in Enugu East Local Government Area, Enugu State, Nigeria. The study has two research questions and three research hypotheses. It adopted a non-equivalent control group quasi-experimental research design. The sample size for this study was 257 which was made up 109 males and 148 females. Out of the 10 public secondary schools in Enugu East L.G.A., five are co-educational schools and two schools were randomly chosen from the five co-educational schools. In each of the two schools sampled, two intact classes were randomly selected and used for the study. The instrument used for data collection was Inequality Achievement Test (IAT). The reliability coefficient of the IAT was determined to be 0.65 using K-R 20 formula. The instrument was administered to the students before the treatment and after the treatment. The research questions were answered with mean and standard deviation while the hypotheses were tested with ANCOVA at probability level of .05. After the data analysis, the following findings were made: students taught Inequality with skimming advance cognitive organizer achieved better than the students taught with traditional method; there is no significant difference between the mean scores of male and female students with skimming advance cognitive organizer. Based on the findings, the researcher recommended that, in addition to organizing conferences for in-service Mathematics teachers; seminars and workshops should be organized by the school board for Mathematics teachers on how to use advance cognitive organizers in teaching Mathematics.*

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**Keywords:** Skimming advance cognitive organizer, Mathematics achievement, gender, Inequality

## Introduction

Mathematics, as an integral part of secondary school subject, cuts across all the sciences and other areas of human existence. Leibniz (1999) in Odili (2016), noted that without Mathematics, one will never penetrate to the depths of philosophy, without philosophy one will never penetrate to the depths of Mathematics, without both, one will never penetrate to the depths of anything. In view of the above assertion, it can be observed that science teaching, especially, Mathematics is the vehicle through which all scientific and technological advancements are made possible. The reason for this is not far-fetched. Justifying the reason, Ngugah (2013), noted that Mathematics is all embracing and all encompassing; that is, in virtually all spheres of human endeavour, Mathematics is used as an aid in commerce, farming and control of environment. It is also applied in areas of Medicine, Engineering and even administration. Nneji and Alio (2014)

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described it as not just a pre-requisite for progress through the educational system; but it is also a tool for educating the mind. According to them, Mathematics develops, in its learner, the habit of precision and logical thought.

In recognition of the importance of Mathematics in all aspects of human endeavour, the Federal Government of Nigeria (FGN, 2013), through the National Policy on Education, made the study of Mathematics compulsory in basic level of education. Again, the further education of senior secondary school students depends heavily on their performance on Mathematics and English Language. Thus, with the place of Mathematics in the life of every child, and the compulsion placed on it for every child by FGN (2013), teachers in general education must find appropriate instructional strategies to assist students with various deficiencies in their various subject areas.

On the contrary, the students' achievement in Mathematics over the years had not been encouraging. This poor achievement of students in Mathematics and other related science subjects is so evident that the credit percentage pass has not increased remarkably to meet up with the expectations of the present day technological advancement. An analysis of students' achievement in Mathematics and other subjects for five years, as shown on the table 1 below, indicates that thousands of senior secondary school students failed Mathematics. As a result, many of them would not be able to secure admission into tertiary institutions, especially, the universities or secure employments.

**Table 1: West African Examination Council Senior School Certificate Examination (WAEC SSCE) Results from 2013 - 2017**

Year	N0. of +candidates	Candidates with credits in 5 subjects and above including Mathematics.	Percentages of candidates with credit passes in 5 subjects and above	Percentage of candidates with less than credit passes in 5 subjects and above
2013	1 543 683	1 074 065	69.57	30.43
2014	1 692 375	529 479	31.29	68.71
2015	1 596 442	616 370	38.68	47.03
2016	1 552 758	878 040	52.97	47.03
2017	1 471 151	923 486	59.22	40.78
2018	1 571 536	756 726	48.15	51.85
2019	1 590 173	1 020 519	64.18	35.82

Source: (Yahaya 2018)

This poor achievement of the students in Mathematics have attracted the attention of many researchers (Anaeche, 2007; Azuka, 2012; Michael & Iyekekpolor 2013; Adeniji, 2014), to finding solutions to the problem. Often times, it is said that if the students have not learnt, the teacher has not taught. This statement makes it more imperative for teachers to be looking for avenues to improve the achievement of students. Researchers (Lux, 2010 and Ogbu, 2015), had blamed this poor achievement of students on the traditional method of teaching Mathematics, which is in contrast to practical-oriented Mathematics teaching methods, advocated for by present Mathematics educators.

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One of the practical-oriented methods advocated for, by modern Mathematics educators is the use of advance cognitive organizers, (Mallick & Amandeep, 2014). Advance cognitive organizers are statements, activities, or graphic organizers that help the learner anticipate and organize new information, (Instructional Strategy Lessons for Educators Secondary Education (ISLES-S), 2014). They are used at the beginning of lessons in which new information is to be learned. They often call on prior knowledge, so as to connect new learning to an existing cognitive structure. They indicate to the learners what information from a lesson will be important. They are also appropriate at the beginning of the lesson - in advance of new learning – and can be used during the focus, review, and statement of the objectives portions of the lesson. An advance organizer is like a meeting agenda in which the content is outlined. Mathematics students, especially, benefit from advance cognitive organizers, according to Gallavan & Kotter (2017:117), because “Graphic organizers or concept maps ... help students sort, simplify, show relationships, make meaning, and manage data quickly and easily”. Also, Gallavan & Kotter (2017:118) commented, “Graphic organizers can make learning of mathematical terminologies, structures, and functions meaningful and memorable”. Advance cognitive organizers originated from the Ausubelian Subsumption Theory, which allows the learner to recall and transfer prior knowledge to the new information being presented. Ausubel (1960) envisioned an advance organizer as a bridge between what the learner already knew and the knowledge needed before a task can be performed (Togo, 2002).

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Of all the advance cognitive organizers such as narrative advance organizers, demonstration advance organizers, graphic advance organizers, comparative advance organizers, expository advance organizers, skimming advance organizers, etc., the main focus of this study was skimming advance cognitive organizer (SACO). Skimming advanced cognitive organizer is a preview of readings that will occur later in the lesson, paying special attention to headings, bold print, etc. (ISLES-S, 2014). Skimming is when the teacher provides the learners with the opportunity to skim over the information that is about to be introduced, focusing on highlighted information (headings). This can be presented in form of the objective of the lesson and major areas to be covered in the course of the lesson. The Mathematics teacher allows the learners to have a preview of the lesson so as to know what to expect in the lesson and to be able to assess when and whether the expected objectives and pre-previewed contents have been covered. This is why this study focused on determining the effect of skimming advance cognitive organizer in senior secondary school two (SS2) students’ achievement in Inequalities since there is a limited research in this topic.

Gender difference, is an integral factor that affects achievement in Mathematics. Socio-linguistic literature on gender differences show that, to some extent, women and men mean and understand similar messages quite differently (Gefen & Straub 2005). Their research has shown that men tend to focus discourse on hierarchy and independence while women focus on intimacy and solidarity. This provides a solid grounding for conceptual extensions to performance in school and specifically to the study of Mathematics. Several studies (Hydea and Merzb, 2009; Ozofo, 2001; and Unodiaku, 2013) affirm that females achieve better than males in Mathematics, while some other studies, (Fennema, 2010; Muthukrishna, 2010; Asante, 2010; and Olasunde and Olaleye, 2010), reported that boys achieved better than girls in Mathematics achievement tests. These inconsistent results on the effect of gender on senior secondary school students’ achievement in Mathematics, and the limited study on the effect of skimming advance cognitive organizer on Inequality, form the major worry of this present study.

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## Statement of the Problem

Over the years, the poor achievement of students in science subjects and specifically in Mathematics, has become so worrisome to both the teachers and the students themselves. This ugly situation has made many students to detest Mathematics, which in turn barred them from achieving their dreams of higher education. Many students get frustrated, ended up on the streets, and some ended up studying courses they never dreamt of. At the long run, this poor achievement in Mathematics had adversely affected the technological and scientific advancement of the nation.

Several reasons have been proffered as to why the poor achievement of students in Mathematics. Many of these reasons border on the perceived wrong methods and strategies of teaching Mathematics. These students-unfriendly strategies have discouraged many students from the study of Mathematics. This makes it imperative for more studies on the effective methods and strategies for the improvement of students' achievement in Mathematics. Meanwhile, there exists limited study on the effect of skimming advance cognitive organizer on SS 2 students' achievement in Inequality, and the disparity in the role of gender in students' achievement. Based on these gaps, this present study sought to answer to such questions as whether skimming advance cognitive organizer will improve the students' achievement in Mathematics; and whether gender actually has a role on the students' achievement in Mathematics.

## Purpose of the Study

The purpose of this study was to find out the effect of skimming advance cognitive organizer (SACO) on senior secondary school students' achievement in Inequality in Enugu East L. G. A, Enugu State. Specifically, the study sought to find out the difference in the:

1. mean achievement scores of senior secondary two (SS2) students in Inequality when taught with skimming advance cognitive organizer (SACO) and those taught with traditional method.
2. mean achievement scores of male and female SS2 students when taught Inequality with SACO and those taught with traditional method.

## Research Question

The researcher formulated the following research questions that guided the study:

1. What is the difference in the mean achievement scores of SS2 students taught Inequality using skimming advance cognitive organizers (SACO) and those taught with traditional method?
2. What is the difference in the mean achievement scores of male and female SS2 students taught Inequality with SACO?

## Hypotheses

The researcher formulated the following research hypotheses to further guide the study. The hypotheses were tested at 0.05 probability level.

1. There is no significant difference between the mean achievement scores of senior secondary two (SS2) students in Inequality when taught with skimming advance cognitive

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organizer (SACO) and those taught with traditional method as measured by Post Inequality Achievement Test (POSTIAT)

2. There is no significant difference between the mean achievement scores of male and female SS2 students when taught Inequality with SACO and those taught with traditional method as measured by POSTIAT.
3. There is no significant interaction effect of method and gender on the mean achievement scores of students as measured by POSTIAT.

### Methodology

This study adopted non-equivalent control group quasi-experimental research design. Since the subjects of this study were not randomized, this design was considered appropriate. However, intact classes used for the study were randomly assigned to treatment and control groups. Ali (1996) commented that in quasi-experimental design where non-equivalent groups will be used due to non-randomization of subjects, a pretest should be administered at the beginning of the study. The pretest was used for finding out homogeneity or otherwise of the groups. The study was carried out in public secondary schools in Enugu East L. G. A., Enugu State. Enugu East local government area has a total of one thousand seven hundred and seventy-six (1776) SS2 students which is made up of 736 males and 1040 females. The sample size for this study was 257 which was made up of 109 males and 148 females. Out of the 10 public secondary schools in Enugu East L.G.A., five are co-educational schools and two schools were randomly chosen from the five co-educational schools. In each of the two schools sampled, two intact classes were randomly selected and used for the study. Inequality Achievement Test (IAT) was used to collect data. The instrument was validated by relevant experts and was adjudged, after corrections, to be valid. The reliability coefficient of the IAT was determined to be 0.65 using K-R 20 formula. There were pretest and posttest on students using the instrument. The researcher developed skimming advance cognitive organizer for the treatment group. This was incorporated in the lesson plan prepared by the researcher for the regular Mathematics teachers who served as the research assistants. The research questions were answered using mean ( $\bar{X}$ ) score and standard deviation. The decision as high achievement was based on any mean score that was 50% and above in IAT. While low was on mean score that was below 50%. Hypotheses were tested at 0.05 probability level using analysis of covariance (ANCOVA). ANCOVA was considered appropriate since intact classes were used. It was meant to take care of the initial differences in performance of the students across the groups in the pretest, which served as the covariate to the posttest. This left only the residuals or adjusted scores so that the researcher can validly determine the significant difference in the pretest and posttest (Uzoagulu, 2017). The decision rule was to reject  $H_0$  if probability value is less than the significant level, otherwise, fail to reject.

### Results

**Research question 1:** What is the difference in the mean achievement scores of SS2 students taught Inequality using skimming advance cognitive organizer (SACO) and those taught with traditional method?

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**Table 2:** Mean and S.D Score of treatment and control groups in pretest and posttest

Group	Pre-test		Post test		Mean $(\bar{X})$ difference within the groups
	Mean $(\bar{X})$	S.D.	Mean $(\bar{X})$	S.D.	
Treatm. (n= 128)	28.31	7.52	64.22	12.82	35.91
Control (n= 129)	28.02	7.59	30.52	8.18	2.50
Mean $(\bar{X})$ difference b/w the groups.	0.29		33.70		

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Table 2 revealed the results of IAT administered on the students. It could be observed from the table that the treatment group, taught Inequality with skimming advance cognitive organizers, had a mean score of 28.3125 with a S.D. of 7.52 in the pretest, while the control group taught with traditional method had a mean score of 28.02 with a S.D. of 7.59. Similarly, in the posttest, treatment group had a mean of 64.22 with a S.D. of 12.82 while the control group taught with traditional approach had a mean of 30.52 with a S.D. of 8.19. The mean difference between the groups in pretest is 0.29. However, the difference within the pretest and posttest groups for the treatment group is 35.91 and 2.50 for the control. Therefore, the students taught Inequality using skimming advance cognitive organizers, performed better than those taught using traditional approach.

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**Research Question 2:** What is the difference in the mean achievement scores of male and female SS2 students taught Inequality with SACO?

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**Table 3:** Mean  $(\bar{X})$  achievement scores and S.D. of Males and Females in Treatment group

Gender	No	Pretest		Posttest	
		Mean $(\bar{X})$	S.D	Mean $(\bar{X})$	S.D
Male	55	28.93	7.67	62.78	12.62
Female	73	28.59	7.72	65.30	12.96
Total	128	28.87	7.89	64.23	12.82
Difference in mean		0.34		2.52	

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Table 3 revealed achievement scores of males and females in treatment group. The male students taught Inequality using skimming advance cognitive organizer have a mean of 62.78 with a S.D. of 12.62 while their female counterpart had a mean score of 65.3014 with a S.D. of 12.96. The mean difference between the male and female students is 2.52 in favour of the females.

**Table 4:** Analysis of covariance (ANCOVA) for hypotheses 1, 2 and 3 on students Achievement

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Source	Type III Sum of			F	Sig.	Decision
	Squares	df	Mean Square			
Corrected Model	1961.396 <sup>a</sup>	2	980.698	5.922	.000	
Intercept	795348.440	1	795348.440	4802.352	.003	
Method	30.340	1	30.340	.183	.000	<b>S*</b>
Gender	308.521	1	308.521	1.863	.669	<b>NS*</b>
Method * Gender	1.905	1	1.905	.280	.174	<b>NS*</b>
Error	42066.573	254	165.616			
Total	1015021.000	257				
Corrected Total	44027.969	256				

S\* = significant at  $p \leq .05$  level of sig.; NS\* = not significant at  $P \leq .05$  level of sig.

Table 4 revealed the ANCOVA results of students who were taught Inequality with skimming advance cognitive organizer instructional method and traditional method. In the table, method has F value of .183 and significant at .000. This significant value of .000 is less than .05. Therefore, F is significant at .05. Hence, the hypothesis one is rejected. This means that there is significant difference between the mean achievement scores of students taught Inequality with skimming advance cognitive organizer and those taught with traditional method. More so, gender has F value of 1.863 and significant at .669. This significant value of .669 is greater than .05. Therefore, F is not significant at .05. Hence, the hypothesis two is not rejected but retained. That is, there is no significant difference between the mean achievement test scores of male and female students taught Inequality with skimming advance cognitive organizer instructional method. Similarly, method and gender have F value of .280 and significant at .174. This significant value of .174 is greater than .05. Therefore, F is not significant at .05. Hence, the hypothesis three is not rejected. That is, there is no interaction effect of method and gender on the mean achievement scores of students as measured by POSTIAT.

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### Discussion

In line with the findings of this study, there are obvious reasons and enough evidence to establish that the poor achievement of students in Mathematics can be eradicated and/or reduced with effective methods of instruction. This implies that student-centered methods such as skimming advance cognitive organizer, should frequently be used by Mathematics teachers. The mean score of 64.22 of students taught with skimming advance cognitive organizer and mean score of 30.52 of students taught with traditional method, are clear cut evidence. This upholds the finding of Onah (2012) that students taught with the use of Computer Assisted Instruction (CAI), which is an activity-based strategy, achieved better than those taught with conventional method. Similarly, this result confirms the result of Ogoke (2018) on the efficacy of immediate reinforcement learning strategy on academic achievement of the senior secondary school students in Okigwe education zone. This implies that any student-oriented method has the high probability of increasing students' academic achievement.

Furthermore, the findings of this study revealed a slight mean difference of 2.52 between the mean achievement scores of male and females taught with SACO and those taught with traditional method, in favour of females. However, this mean difference is not significant at .05. This fact was shown by the result of the hypothesis 2, which has it that there is no significant difference between the mean achievement scores of male and female SS2 students when taught Inequality with SACO and those taught with traditional method as measured by POSTIAT. This result confirms the findings of Onoh (2005) which states that female students achieved better than their male counterpart in their experimental and control groups but this difference in achievement was not statistically significant. On the other hand, the result of this study, contradicts the findings of previous researchers (Hydea and Merzb, 2009; Ozofor, 2001; and Unodiaku, 2013), that females achieved better than males in Mathematics achievement.

### **Conclusion**

From the findings of this study, it can be concluded that the use of skimming advance cognitive organizer in Mathematics teaching and learning exercise improves the achievement of senior secondary school students in Mathematics, especially in Inequality. Again, this instructional approach, that is, SACO, is more favourable to female students than the males. However, the study revealed that the noticeable mean difference is not significant. This implies that the use of skimming advance cognitive organizer can give an equal learning opportunities to male and female students, in comparison to their achievement in Mathematics tests.

### **Recommendation**

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

- The use of advance cognitive organizers in secondary school Mathematics instruction should be made compulsory by curriculum planners. With this in place, the unnecessary anxiety and apprehension that usually grip students will be reduced and/or eradicated.
- Experts and experienced teachers on the use of skimming advance organizers should be engaged by school principals, post primary school management authorities, and other stake holders in education, through conferences, seminars and workshops, in order to educate teachers on how to use advance cognitive organizers in classroom instruction.
- Emphasis should be laid on innovative teaching methods, such as, use of advance cognitive organizers, in Colleges of Education and other teacher training institutions. This will help the would-be teachers to master its use before graduation.

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## References

- Adeniji, K. A. (2014). Motivational teaching strategies towards improving learning of mathematics at primary & secondary school level. *Abacus – The Journal of the Mathematical Association of Nigeria*. 39(1), 44-354
- Ali, A. (1996). *Fundamentals of research in education*. Awka: Meks publishers (Nig.).
- Anaechie, K. C. (2007). Roles of Mathematics games in teaching and learning of Mathematics in junior secondary schools in Ideato North local government Area, Imo State. *Unpublished B.Sc. Project*. ESUT
- Asante, K.O. (2010). Sex differences in Mathematics in Ghana. Retrieved from <http://www.tags.org/periodical=201012/2187713381.html> in 2017.
- Ausubel, D.P. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology* 51, 267-72.
- Anaduaka I. & Okafor, J. N. (2013). Impact of computer based-instruction on students' performance and retention in algebraic word problems, Kaduna State, Nigeria. *ABACUS, Journal of Mathematical Association of Nigeria (MAN)*. 43(1), 7 - 13
- Azuka, B. F. (2012). Improving the memory of students in Mathematics classroom towards better performance. *Abacus – The Journal of the Mathematical Association of Nigeria*. 37(1): 65-72.
- Federal Republic of Nigeria. (2013). *National Policy on Education* Lagos: NERDC press.
- Fennema, E. (2010). Gender and Mathematics. What is known and what I wish was known? (*Unpublished manuscript*). Madison, Wisconsin Centre for culture and mathematics performance.
- Gallavan, N. P., & Kotter, E. (2017). Eight types of graphic organizers for empowering social studies students and teachers. *Social Studies*, 98(3), 117-128.
- Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-graph: Tutorial and annotated example. *Communications of the Association for Information Systems* 16(1) 91-109.
- Hyde, J.S. & Merzb, J.E. (2009). Gender, culture and Mathematics performance. Retrieved from <http://tetvideo.madson.com/uw/gender> in 2016.
- ISLES-S, (2014). *Instructional Strategy Lessons for Educators Secondary Education East Carolina University*, USA.
- Lux. N. (2010). Assessing Technological Pedagogical Content Knowledge. *M.Sc.Dissertation, Boston University*, 2010. Retrieved <http://proquest.umi.com/pqdweb> in 2013.
- Mallick M. K. & Amandeep (2014). Effect of advance organizer model of teaching on academic achievement of secondary school students in social science. *Learning Community: 5(1)*, 17-22.

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- Michael, A &Iyekekpolo, S. A. O. (2013). Exposition of selected indigenous mathematical games in Taraba state of Nigeria: implication on ethno mathematics for national development. *Proceedings of Sept. 2013, Annual National Conference of MAN* 479-494.
- Muthukrishna, L. (2010). Gender equality in reading and Mathematics achievement. Reflecting on ETA goal 6, *HEP Newsletter*, April, 8-9.
- Ngugah, C.O. (2013). Problems and prospects of teaching and learning of mathematics in secondary schools in Ebonyi. *Journal of Studies in Education*.8 (1), 91-97.
- Nneji, S.O. & Alio, B.C. (2014). Role of Mathematics in EntrepreneurshipDevelopment in Nigeria. *Journal of Science and Computer Education (JOSCED)* 2(2), 153-167.
- Odili, A. O. (2016). *Mathematics in Nigerian Secondary Schools. A teaching Perspective*. Port-Harcourt: Rex Charles and Patrick Limited
- Ogbu, S. (2015). Effect of Microsoft excel on secondary school students' achievement, interest and retention in statistics in Enugu educational zone. *An unpublished Ph. D. Thesis, ESUT*
- Ogoke, C. J., Anyanwu A., Osuji, N. C and Nwaneri, M. O. (2018). Effect of immediate reinforcement learning strategy on the senior secondary school students' achievement in Mathematics. *Abacus, Journal of Mathematical Association*. 43(1), 202 - 209
- Olasunde, G.R. and Olaleye, O.O. (2010). Effect of concrete mapping strategy on senior secondary school students' performance in Mathematics. *Journal of Mathematics Science Education*, 1(1), 34 – 46.
- Onah, J. U. (2012). Effect of computer assisted instruction (CAI) on secondary school students' achievement. *African Journal of Mathematics and Computer Science Research*. 3(7), 113-123,
- Onoh, D.O. (2005), Effect of advance organizer on students' achievement, interest and retention in. *An unpublished Ph.D. Thesis*, Enugu State University of Science and Technology (ESUT). Enugu.
- Ozofor, N.M. (2001). Effect of two modes of computer aided instruction on students' achievement, and interest in statistics and probability, *Unpublished Ph.D. Thesis, UNN*.
- Togo, D. F. (2002). Topical sequencing of questions and advance organizers impacting students' examination performance. *Accounting Education*, 11(3), 203-216.
- Unodiaku, S.S. (2013). Effect of game-based instructional model on the pupils' achievement in arithmetic at upper primary school level in Igbo-Etiti LG.A., Enugu state. *International Journal of Education, Michael Okpara University of Agriculture, Umudike, Abia State*.
- Uzoagulu, A. E. (2017). *Practical Guide to Writing Research Project Reports in Tertiary Institutions*. Enugu: Jacobs classic publishers
- Yahaya, L. A. (2018). Strategies of Reducing Maths-phobia among Students: A counsellor's Perspective. *Enhancing Mathematics Education in Nigeria. A Research in Honour of Prof. Michael Olubusiyi Fajemidagba*. Unilorin Maths Edu Group. 79 - 84