



INNOVATIVE TEACHING STRATEGIES AS CORRELATE OF SECONDARY SCHOOL STUDENTS ACADEMIC PERFORMANCE IN MATHEMATICS IN OYO METROPOLIS

¹LAWRENCE ADESOLA ADEBIYI & ²ABDULJALEEL KOLA
LAWAL

¹General Studies Education Department, Emmanuel Alayande College of
Education, Oyo. ²Department of Curriculum and Instruction, Emmanuel
Alayande College of Education, Oyo.

Abstract

Over the years, traditional methods of teaching mathematics has been the usual practices in secondary schools. In this 21st century, innovative teaching through creative and blended teaching- learning processes is seen to be more effective. The study was set up to investigate the correlation between teachers' innovative teaching strategies and the Students academic performance. Seven strategic steps were considered to ease the modern teaching and learning process. Two hundred and twenty five (225) Senior Secondary School Two (SS2) Students were purposely chosen from five selected public schools in Oyo for the study. Two main instruments Mathematics Innovative Teaching Strategy and Mathematics Students Academic Performance Test were constructed and administered at (QINTS, $r = .81$) and (MATQSAP, $r = .87$) reliability coefficients with the use of KR-20/21 reliability test procedures respectively. The data collected were analyzed using percentage counts, Pearson Product-moment correlation statistic and multiple regression analysis technique. The study revealed that using innovative teaching methods have significant positive correlation on the students' academic performance. It is recommended that government should organize refresher courses for mathematics teachers frequently from which teachers can be equipped with various teaching strategies that may enhance students' better academic performance in Mathematics.

Keywords: *Teaching methods, Traditional teaching, Innovation, Innovative teaching, Mathematics performance.*

Introduction

Education is seen as the bedrock of national and human development and a weapon for acquiring skills, relevant knowledge, habits and inculcating cultural values for surviving in the changing world (Oshin & Adebisi, 2018). Mathematics education with a clear and share vision becomes imperative because Mathematics occupies a central position in the school curriculum. It cuts across all fields and virtually useful in all areas of life. Unameh (2011) in Nyamwe (2013) state that mathematics education is a bedrock and an indispensable tool for scientific and economic advancement of a person and a nation at large. It is a critical factor in the development and academic progression of any country, this is seen as one of the reasons why it is a national policy that admission into Nigerian Universities and other public tertiary institutions required a credit pass at Ordinary level.

Fawad ((2015) viewed Mathematics as the branch of human enquiry involving the study of numbers, quantities, data, shape and space and their relationships, especially their generalizations and abstractions and their application to situations in the real world. It is a science of magnitude and number that is very useful across all walks of life.

Mathematics is a fundamental subject in human life, no wonder it is a core subject at O'level examinations. Akinoso (2011) viewed mathematics as the basis for science and technology and the tool for achieving scientific and technological development. Conceptually, it means mathematics is an indispensable stake in the individual, national and international development.

In education, Hyung, (2006) observed that the proper and meaningful study of mathematics should assist the individual in ordering, organizing and investigating his or her environment. The skills developed through learning of mathematics will enable the individual to calculate easily and be involved in mental processes in reasoning so as to develop and transform the nation. Effective teaching in mathematics involves acquiring relevant knowledge about students and using that knowledge to design subject matter, classroom teaching and learning processes.

Oyeniran and Adebisi (2019) opined Teaching strategies that encourage learners participation develop academic interests and allow learners to be physically active and perceptive during a Mathematics lesson. The utmost principle of all science educators should be to bring about improvements in Teaching – learning processes using an indispensable teaching method that is a process, technique or strategy teacher employs while giving instructions to learners (National Research Council, 2000). Research findings show that greater learning occurs when children are physically involved in the lesson, they are more interested in the learning process and better able to remember the concepts they are learning (Lurea, Neacsu, Safta and Suditu, 2011). This can only be achieved through inventive and creative teaching which is adequately back up with relevant teaching innovations.

In mathematics education, only effective teaching learning process bring about desirable changes in individual learner while poor performance or achievement are seen as product of ineffective teaching resulting from inadequate teaching methods. Mathematics demands productive teaching to achieve its aims as identified by (FRN) (2004) to encourage and enable students:

- recognize that mathematics permeates the world around us
- appreciate the usefulness, power and beauty of mathematics
- enjoy mathematics and develop patience and persistence when solving problems
- understand and be able to use the language, symbols and notation of mathematics
- develop mathematical curiosity and use inductive and deductive reasoning when solving problems
- become confident in using mathematics to analyse and solve problems both in school and in real-life situations
- develop the knowledge, skills and attitudes necessary to pursue further studies in Mathematics
- develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others
- develop a critical appreciation of the use of information and communication technology in mathematics
- appreciate the international dimension of mathematics and its multicultural and historical perspectives.

In line with the aims stated above, Sidhu (1995) also identified goals of teaching mathematics as to :

- i. Develop reasoning ability in thinking process of the student.
- ii. Enable students to do different kinds of calculation related to the daily life problems.
- iii. Make them creative by developing analytical and discovering abilities in them
- iv. Enable them to learn other subjects of science or general science.
- v. Prepare them for higher studies. To develop scientific approach in them to understand the realities of life on the base of logic

All these aims and goals of mathematics can only be achieved through effective teaching-learning processes and best practices in mathematics classrooms. However, researchers observed that most people find it difficult to excel in the subject with many reasons attributed to the failures or poor performances.

The table 1.1 represents the pass rate at O’level for selected subjects including mathematics:

Subject No. of Candidates	Year 2011 203	2012 234	2013 234	2014 203	2015 219
English Language	(N = 193) 91.3%	(N=205)87.8 %	(N=200)85.4 %	(N=189)78.88 %	(N=202)82.17 %
Social science	(N=190)90%	(N=179)76.7%	(N=209)89.5 %	(N=201)80.4%	(N=207)83.7 %
Religious studies	(N=176)83.3 %	(N=192)82.2 %	(N=202)86.3 %	(N=198)90.1%	(N=203)89.2 %
Mathematics	(N=123)58.3 %	(N=123)52.4 %	(N=136)58.2 %	(N=116)57.1%	(N=120)54.8%

Source: Alaafin High School, Oyo

The yearly analysis of the percentage pass rate at O’level as shown in table 1.1 revealed the performance of students from Alaafin High School, Oyo in mathematics with percentages 58.3%, 52.4%, 58.2%,57.1% and 54.8% are relatively low compare to other subjects. Okonkwo (1998) identified some causes of poor academic performance in mathematics as poor attitude of the

learner towards the subject, lack of teaching experiences on the part of the teachers, economic conditions, low teacher's motivation and the resulting attitudes, and most especially lack of appropriate teaching methods. The role of teaching methods in the act of learning mathematics cannot be over emphasized. Teaching method according according to wikipedia comprises the principles and methods used by teachers to enable student learning. For a particular teaching method to be appropriate and efficient, it has to be in relation with the characteristic of the learner and the type of learning it is supposed to bring about. Teaching strategy is a generalized plan for a lesson which includes structured or stated objectives and planned tactics sufficient to implement the strategies. Teaching strategy involves combination of different teaching methods. A review of **Pedagogy of mathematics** as highlighted by Sidhu (1995) is as follows on application of different teaching methods in mathematics.

Lecture method that is direct instruction, where knowledge is delivered through a speech. It is also the oldest and most important teaching method because it is always remained a part of all other instructional methodologies. In this method, a teacher takes part as an active participant and students are at the **receiving** end most of the time.

Inductive method, is also called scientific method in which we proceed from known to unknown, from specific to general and from example to rule.

Deductive Method here we proceed from general to specific and from a rule to an example. Already constructed formulas, rules, methods or principles are taught to the students and they apply them to solve the problems. In this teaching approach, we can also prove a theorem with the help of undefined terms, defined terms, axioms and postulates, we can derive other theorems as well.

Heuristic Method is based on child's psychology who always wants to discover something by himself or herself. It is also known as discovery method where students are encouraged to reach the solution by constructing the knowledge themselves and teacher only facilitates them by raising relevant questions. That is why it is also called inquiry method.

Analytic Method, here, we analyze the problem first by breaking up the problem in small segments and then move towards solution. It is also called descriptive method. It leads us from the unknown part of the problem to something already known or given in the problem statement. This method

emphasizes on why we are applying different kinds of operations and what is the relationship between the required solution and other portions of the problem. **Synthetic Method**, this method is completely opposite to the analytic method as we proceed from the given or known elements in the problems to the desired solution or unknown. In this method, we synthesize or put together separate elements or small portions given in the problems to draw a series of conclusions until the unknown or desired result is found Sidhu (1995).

Problem Solving Method, here, instructional methodology improve reasoning ability in the students. In this way, they become capable to find out the solutions of different kinds of problems not only during the studies but in their daily routine matters as well. Every child has the curiosity to explore the things and this psychology of the children can be utilised in a better way through problem solving method. It is the most important instructional methodology for mathematics (Collier & Lerch, 1969).

Laboratory Method has the capacity to deal with practical work in mathematics. It is a method of “learning by doing”. That is why, different kinds of tools and equipments are used in it to perform practical work which includes drawing of different shapes, taking measurements of geometrical figures and making of charts and graphs. Students go through different experiments in laboratory or classroom and learn by observing and calculating themselves. During this process, they get opportunity to draw conclusions and generalize different laws and formulas. The role of a teacher in this method is to supervise the whole process and give proper instructions to the students at each step. He or she should keep some points in mind to make this method successful.

Project Method, this method is also based on the philosophy of “learning by doing”. the method is defined as “whole-hearted purposeful activity”. In this method, students are engaged in such kind of projects in which they get opportunity to apply their theoretical knowledge and learn practically. Combination of two or more of these methods can go a very long way in making a mathematics class interesting to the learners since they are capable of explaining basic concepts of all branches of mathematics, establish laws and formulas related to algebra, matrices and geometry.

Innovative Teaching and Learning Strategies

Another recent and learners friendly teaching method in mathematics is **Innovative teaching** where good and professional teachers are expert in

inventive and creative in teaching. Here teachers continue to discover and devise new methods and content to ensure that students always get the best learning experiences. In such situations, teaching and technology combine to support learning to enhance responsive teaching practices, student ownership of learning, high levels of engagement, application of authentic context, the development of competencies, media collaboration, and strategic use of digital technology.

Our students are growing up in a rapidly changing world in which they will face increasingly complex challenges and exciting opportunities offered by new knowledge and technologies. To prepare our students for this world, we continue to review, rethink and adapt our pedagogy, systems, spaces and use of digital technology in order to meet the needs of modern students and equip them to thrive in such a world. Innovative Teaching and Learning practices incorporates responsive teaching practice, student ownership of learning, high levels of engagement, authentic contexts, the development of competencies and the strategic use of digital technologies to connect, collaborate, create and share learning. School aim to further embed the following innovative teaching and learning practices to ensure active learning. Our students should be involved in the learning, working on activities that help them to learn, not just sitting 'receiving' wisdom. Such activities might include discussions, working collaboratively on a project, designing a presentation to share findings or performing an experiment. Students are guided and encouraged to seek feedback, learn from their mistakes, and to take responsibility for their own learning.

It is about the student being a partner in the learning instead of just receiving knowledge from the teacher. In Authentic learning, students solve challenging problems in 'real life' contexts, most especially across any learning area of mathematics and often involve students working collaboratively. In Blended learning, our students are involved in learning that occurs when at least part of the content and instruction is delivered via digital and online media. Learning will also occur in other ways, including with the teacher in person. Students have some control over time, place, path, or pace of their learning. Co-constructed curriculum. Our students work with their teachers and on occasions, parents to develop a curriculum that really engages and extends them. Collaborative Inquiry. Our students work closely together to enhance their

understanding of the world around them. They develop a question, gather and analyze evidence, determine next steps and share their findings and recommendations.

Innovative teaching as applicable to teaching of mathematics using technological based instructional materials..

1. Cross over Teaching

It is an enriching experience for the students. Here, the teacher links the educational content with the experiences that the students are having. This teaching is further enhanced and deepened by using familiar local or foreign technological based instructional materials to teach and ask questions related to the content. For example Clock, Calendars, Calculators, Computers and other objects are used to teach concepts on basic arithmetic processes..

2. Teaching through Smart Boards

Smart boards such as Interactive Wireless Whiteboard, Touch Screen Interactive White board, All-in-one interactive Whiteboard etc are devices that integrate interactive educational functions. Effective ways to bring the classroom to life while helping students experience a deeper level of engagement and understanding. This is done by making the course content interactive and visual. The smart boards transform the teaching experience into an interactive and collaborative experience as the teachers use dynamic multimedia content, to help convey the topic more effectively to the students and making it a visual, engaging experience.

3. Teaching through Flipping Classrooms

In this technique, students are made active participants of the learning process by passing the onus of learning on them, it requires the teachers to relegate to the role of resource providers and the students take the responsibility of gathering concepts information using various tools of technology such as Kidblog, Venngage, Youtube, Google Classroom etc The students are encouraged in constructing knowledge in and outside the classroom, fill in the information gaps and make inferences on their own as and when needed.

4. Teaching through social media collaboration

Another innovative method of teaching involves encouraging student collaboration for various learning processes using social medias such as Instagram, Whatsapp, Twitter, Facebook, Blogger, Tik Tok etc. Today, we live in a globalized world and collaboration is an essential life skill that is important

for all careers and enterprises. In recent years, the use of mobile phones among adults and youths, especially teenagers in secondary school has dramatically increased. Teachers can help foster this skill in the classroom by allowing students to learn using social medias, study and work in groups. For instance, by assigning group homework or encouraging students to work together on any mathematical skill, presentations and reports. Today, collaboration as a form of teaching is gaining acceptance as a powerful teaching tool where once again the responsibility is much on certain group of students as the educators, tutors, mentors, supervisors for other students. It also teaches students empathy, negotiation skills, teamwork, and problem-solving.

5. Teaching through 3D printing technology

3D printing is a virtual reality technology that offers students a valuable opportunity to learn in an immersive manner that creates a lasting impression on their minds. It makes learning fun and helps the students retain the material for a longer time – all the essential points when considering effective teaching methods in a classroom. 3D printing technology involves a construct that bring rich learning experience from computer screen into students hand. It encourages sharing, teamwork, planning, design, thinking and reasoning through difficult or complex ideas. In the lower level classrooms, teachers can use the 3D printers to teach content that was previously taught via textbooks, thus helping students gain a better understanding of the concept- especially STEM subjects. 3D printers are used to create prototypes and make complex concepts easy to understand.

6. Teaching through gaming technology

In respect with fast progress of science and technology, game-based learning into the mathematics classroom encourages active learning and engagement by providing students with possibilities to place problem-solving within the context of play. It encourages collaborations and interactivity. It provides educators with an interactive means of delivering knowledge. Learning acquired from game is more likely to be retained. It increases the motivation level of students as regards learning of Mathematics. This involves the use of Game boards, Computer based games, bouncing sums, straw poll, shaving equations, global probability, sweet math and so on.

7. Technology and innovative methods of teaching

The use of technology in the classroom allows educators to experiment with innovative methods of teaching. This method helps teachers to engage the students with different kinds of stimuli and creates an environment of activity-based learning. It makes the content of the classroom more interesting and makes learning fun.

For teachers, technology helps computing and save vital classroom resources such as lesson plans, notes, audio lessons, videos, and assignments details on the classroom using different aptitudes such as Google, Canvas, U-tube and cloud. These can then be accessed by the students from the comfort of their homes whenever such details are needed. (Rahmon and Adebiyi, 2019). It also ensures that students who have missed class either for illness or any other reason stay updated at all times. It eliminates the need for lugging around heavy textbooks and allows students to learn at a time, place and pace that they are comfortable with. Technology offers an endless set of resources that they can tap into depending on the need of the students.

Statement of the problem

The dismal and fluctuating performance of students in Mathematics as a core subject has triggered renewed concern among educators and has fueled much dissatisfaction among stakeholders in education. This is because mathematics remains the bedrock of science and technology education, both of which are indispensable if the country must realize its dream of technological breakthrough and development. This incidence of students' poor Mathematics achievement has assumed an alarming proportion. Many factors have been attributed to this abysmal performance in Mathematics which include the nature of the subject, the learners' factors, the teachers' factors, textbooks, curriculum, school environment and system of preparation and management of the achievement test, anxiety, motivation, reasoning and numerical ability, problem solving skill, instructional strategy among others. Among all this factors innovative instructional strategies which is a way of teaching that improves the students reasoning and learning ability remain the only factors with little empirical results on students' achievement in mathematics particularly in Oyo state and as such necessitate the need for this study.

Purpose of the study

The study purposively determines the:

- i. impacts of innovative teaching strategies on the academic performance of students in mathematics
- ii. correlation between innovative teaching strategies and students academic performance in mathematics

Hypotheses

1. What is the correlation between innovative teaching strategies and students' academic achievement in Mathematics?
2. What is the relative influence of innovative learning strategy on students' academic achievement in Mathematics?

Methodology

The design of this study is a descriptive survey research of correlation type. The design is appropriate as the researcher administer standardized questions on a sampled group of people for the purpose of describing respondents' opinions and views regarding the subject of investigation. The population for this study comprises of all public senior secondary school II students in all public secondary schools in Oyo metropolis. While five public senior secondary schools and 225 SS2 students were randomly selected from four local government areas in Oyo metropolis as study sample. One school was randomly selected from Oyo East, Oyo West and Afijio Local Government. Two schools were randomly selected from Atiba Local Government because it covers the larger area and comprises more secondary schools than others. Two instruments were designed and used for data collection. One was self-constructed questionnaire on innovative teaching strategy (QINTS) of Likert type rating scale to extract information on instructional methodology. The questionnaire consist of seven (7) sections and each section measuring a specific teaching innovative strategy. The seven sections yielded a total of twenty one (21) items. Cronbach Alpha statistics was adopted to determine the reliability coefficient of QINTS which yielded 0.81. The second instrument (MATQSAP) comprised ten 50 multiple-choice items which was designed to measure students performance in mathematics. Kuder-richardson-20 techniques were adopted to obtained a reliability estimates of 0.87. The instrument was administered to one

225 sampled students which was done with the permission of the principals of the schools used for the study. Pearson product Moment Correlation (PPMC) and linear regression were adopted to analyze the data collected in order to provide answer to the research hypotheses formulated at 0.05 alpha level of significant.

Results

The results of the study were presented in line with the hypotheses stated for the study.

Research Question One: What is correlation between innovative teaching strategies and students’ academic achievement in Mathematics?

Correlation matrix in table below was used to answer research question one as follows:

Table 1: Correlation Matrix

		innovative teaching strategies	MATSCORE
innovative teaching strategies	Pearson Correlation	1	.582**
	Sig. (2-tailed)		.000
	N	225	225
MATSCORE	Pearson Correlation	.582**	1
	Sig. (2-tailed)	.000	
	N	225	225
**. Correlation is significant at the 0.05 level (2-tailed).			

Table 1 shows the relationship between innovative teaching strategies and the student achievement in mathematics. The result revealed that innovative teaching strategies have a positive and significant relationship on students’ academic achievement in mathematics. It has a positive correlation of .582**. Correlation is significant at the 0.05 level (2-tailed). This finding of this study is in agreement with that of Sadavel etal (2017), Lurea etal (2011) and Fawad (2015).

Research Question Two: What is the relative influence of innovative learning strategy on students' academic achievement in Mathematics?

The research question two was answered using table 2 (a) and (b).

Table 2(a): Regression Analysis on Mathematics Academic Performance using innovative teaching strategies Data.

Table 2(a)

Multiple R	.256
R Square (R²)	.067
Adjusted R²	.036
Standard error of estimate	6.018

Table(2b)

Sources of Variation	df	Sum of Squares (SS)	Mean Square (MS)	F	Sig.	Remark
Regression	7	523.538	74.791	2.082	.049	S
Residual	217	7273.882	37.908			
Total	224	7797.420				

*S = Significant

Table 2(b) shows the seven identified strategies of the independent variable had significant multiple correlation on the students' academic performance in mathematics when combined ($R = .256$; R^2 square = .067). The result further showed that 3.6% of the variation in performance of the students was accounted for by the independent variables. The F-value of 2.082 at $P < .05$ which was significant. However, the multiple correlation which is positive in the mathematics performance test is due to the seven factors taken together. Concerning the relative influence of the Innovative teaching strategies on students academic performance, the correlation coefficients of the individual scores indicated significant results. This means that relationship exists between innovative teaching strategies and students academic performance. With adjusted multiple regression coefficient R of .256, there is significant multiple relationship between the strategies and students performance in mathematics.

Discussion

The students' performance in mathematics is of great concern. The value of Mathematics as a bedrock of science and technology for sustainable goal and development cannot be overemphasized. The findings of this study showed that students performed better when teaching and learning of mathematics are responsive, students centered, engaged and practically involved in terms of application, using authentic mathematics context through quality teaching, development of competency by making sure students understand mathematical concepts clearly, involvement of media collaboration and the use of digital technology in teaching/learning process influencing students academic performance in mathematics with ($P < .05$). The independent variables were effective in predicting students performance. The study also shows that independent variables had significant positive multiple correlation on students' performance in mathematics when combined ($R = .256$, $R^2 = .067$). The observed F-ratio is significant at $P < .05$. This is an indication that the effectiveness of combination of the independent variables in predicting students performance in mathematics. Therefore, variability in students' performance in mathematics is accounted for by a linear combination of the seven steps considered for innovative teaching strategies. The finding is supported by earlier reports of Sidhu (1995) which confirmed that instructional strategies had impacts and made significant contributions to the prediction of variation to students academic performance in mathematics.

Conclusion

This research study reveals that performance of students in mathematics depends on the use of innovative teaching strategies. The strategies involves the use of Cross over teaching to encourage responsive teaching practices, teaching through Smart board to aid students ownership of learning, high-levels learning engagements through flipping classroom experience, Social Media collaboration for global mathematical activities and, 3D Printing Technology for Authentic mathematical context, Gaming Technology and strategic use of digital-technology to make teaching and learning of mathematics more interactive were positively related to students performance in mathematics, while Flipping Classroom and 3D teaching strategy have negative relationship with students performance in mathematics.

Recommendation

The result of this study indicates clearly that most variables under Innovative teaching strategy in the study were positively related to students performance in Mathematics. In line with the findings, the following recommendations are therefore stated for attention.

1. It is recommended that government should organize refresher courses for Mathematics teachers frequently from which teachers can be equipped with various teaching strategies that may enhance students better academic performance in Mathematics.
2. Social networking services can help young people develop their interests in Mathematics and find other people who share the same interest, therefore, parents should encourage their wards toward positive use, visit sites that can improve their mathematical skills.
3. Stake holders in Mathematics education should bear responsibility of preparing our teachers and students towards any paradigm pedagogy shift in teaching and learning of Mathematics.

References

- Ade, S.O. (2000). Difficulties Facing Mathematics Teachers in Developing Countries. *Educational Studies in Mathematics* 12(4): 21-27.
- Akinoso, S.O. (2011). Correlates of some factors affecting students' achievement in secondary school mathematics and environmental studies (*1 JESMES*), *University of Abuja* 3. 10(83-95).
- Barrado, J.N. (2016), Innovative Methods to improve the Learning, Norwegian University of Science and Technology, (2019), http://brage.bibsys.no/xmlui/bitstream/handle/11250/2402571/15855_FULLTEXT.pdf?sequence=1
- Fawad Baig. (2015). Application of Teaching Methods in Mathematics at Secondary Level in Pakistan. *Pakistan Journal of Social Sciences* 35: 2.
- Federal Republic of Nigeria (FRN) (2004). *National Policy on Education (4th ed.)* Lagos: NERD Press, 13-14.
- Hyoungh, S.P, (2006). Development of a mathematics, science, and technology education integrated program for a maglev. *Eurasia Journal of Mathematics, Science and Technology Education*, 2(3), 89-101. Retrieved from www.ejmste.com.
- Lurea, C., Neacsu, I., Safta, C. G., & Suditu, M. (2011). The Study of the Relation between the Teaching Methods and the Learning Styles. The Impact upon Students' Academic Conduct. *Procedia-Social and Behavioural Sciences*, 11, 256-260.
- Nyaumwe, L.J & Mtetwa, D.K. (2013), Developing a cognitive theory from student teachers' post-lesson reflective dialogues on secondary school mathematics. *South African Journal of Education*. 31(145-159).

- Okonkwo, S. C. (1998). Development and Validation of Mathematics Interest Test for Junior Secondary School Students. Unpublished Ph.D Thesis , University of Nigeria Nsukka.
- Oshin, O.O. and Adebisi, L.A. (2018). Corruption as Hindrance to the Implementation of Mathematics Education Policy For National Development. *The Moulder*. 6(334-348).
- Oyeniran, J.O. and Adebisi, L.A. (2019). Relevance of Mathematics Teachers' Pedagogy and Students' Interest on Senior Secondary School Students' Achievement in Mathematics. *Coeasu Journal of Contemporary Issues*. 5(256-262).
- Rahman. S.O. and Adebisi, L.A. (2019). Investigating the Impacts of Students' Mathematics Proficiency on Academic Performance in Computer Science Education. *Journal of Science Education*. 14, 2(1-10).
- Sadavel, K., Joseph. J.G., Ragam, P., & Narayan, V.L (2017). Innovation in Classroom Teaching and Learning. International Journal of Recent Innovation in Engineering and Research, 2(6), 33-35.
- Sidhu (1995). Teaching of Mathematics (4th edition). K.S, India; Sterling Publisher Private Limited.
- Umameh, M.A. (2011). A Survey of Factors Responsible for Students' Poor Performance in Mathematics in Senior Secondary School Certificate Examination (SSCE) in Idah Local Government Area of Kogi State, Nigeria. *Received from* <http://www.academia.edu/7671293/A>.
- Usman, K.O. and Nwoye , M.N. (2010). Effect of Graphical symbol approach on the pupils' achievement in Ratio at upper Primary school level in Nsukka central L.G.A. *Journal of Mathematical center, Abuja*, 1(1), 123-132