

**ENHANCEMENT OF MATHEMATICAL APPLICATIONS AND SKILLS AMONG
SECONDARY SCHOOL STUDENTS IN OGUN STATE METROPOLIS**

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Abstract

Mathematical applications and skills are key issues in achieving and enhancing success among students in the country and within any sector/system. Teaching of mathematics affords one the opportunity of acquiring skills needed to boost competence in practical activities of any system. This study examined the enhancement of mathematical application and skills among students of secondary school in Ogun State. Descriptive and inferential statistics were used to analyse the data collected. The study was conducted using three hundred and sixty (360) students who were randomly selected across the three senatorial districts in Ogun State. The instrument was validated by two experts in the field. The result showed that students accepted analytic, demonstration and problem-solving method which may help in developing mathematical skills relevant for their development. Likewise, conversion, problem-solving skill, measurement and basic arithmetic skills were accepted towards mathematical application and skills relevant for students' development. More so, above half (51.4%) and few (8.3%) of the students' have credit and distinction in their academic performance, while above half (54.4%) of the study had moderate attitude towards mathematics teaching. Also, study revealed shortage of qualified mathematics teachers, parent inability of textbook, insufficient teaching aids and so on in the senior secondary schools as a major challenge facing mathematical application and skills in the study area. It is therefore recommended among others that Mathematics teachers' should be encourage the use of better teaching method that would stimulate students' positive attitude and interest towards mathematics, as well as adequate qualified and competent mathematics teachers should be recruited for schools.

Keywords; Enhancement, Mathematics, Skills, Application, Student, Secondary, School.

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1.0 Introduction

One of the major factors for the development of any nation is a good and applicative Mathematical skill. Globally, mathematics is regarded as one of the most important subjects in the school curriculum worldwide. It is seen as subject that has direct correlation with other subjects, particularly with science and technology (Federal Republic of Nigeria, 2013; Umameh, 2011). The subject cuts across primary and secondary levels of education. Mathematics remains one of the most difficult subjects in schools as perceived by students. There is general impression that mathematics is difficult by its very nature and because of this impression, majority of students have phobia for it (Ale, 2007; Ampadu, 2012; Ojimba, 2012; Onah, 2010; Ozochi, 2007; Saad, Adamu and Sadiq, 2014). According to WAEC results from 2009-2014, it revealed that secondary schools' students' performance in core subjects (mathematics inclusive) is on the decline. Specifically, in 2009, only 25.99% had five credits and above including mathematics and in 2010, there was a decline to 23.36%. Also, in 2011, the percentage of students with five credits rose to 30.9% and continued to rise to 38.81% in 2012 in mathematics performance only. Unfortunately, according to Saad, Adamu and Sadiq, (2014) who noted that in 2013 the performance of students in mathematics declined to 36.57%, and further declined to 31.28% in 2014. Students' failure in Mathematics have been credited to teachers' methods of teaching, application, students' attitudes, unavailability of learning materials among others (Karue and Amukowa, 2013; Tshabalala and Ncube, 2013). The frequent poor performance of secondary school students in core subjects has been a recurring decimal and it has made the development of secondary education to be a difficult task (National Mathematical Centre, 2009).

According to Attwood (2014) and Umameh (2011), mathematics is one of the core and essential subjects

at primary and secondary levels of education due to its importance and usefulness in everyday activities and it is seen as the gateway to future professions in variety of feeds. That is why in developed and developing countries of the world, mathematics is recognized as the subject that must be taught at all levels of education. Mathematics has a most important bearing on the intellect as such. Study of Mathematics promotes habits of accuracy and exactitude, and prevents a man from being careless and slipshod. It sharpens the reasoning powers of a man and increases his mental alertness. A major problem facing Nigerian secondary education is the poor performance of students in all the core subjects, especially mathematics and English Language as well as physics, chemistry, biology etc. Without a credit in mathematics student cannot pursue any career in science and technology courses at institutions of higher learning in Nigeria as it is, Nigeria's quest for technological advancement and economic liberation is being undermined by the continued poor level of mathematics achievement of secondary school students in Ogun State and Nigeria as a whole in external examinations. It is common knowledge that the economies of the industrialized nations are driven by science and technology development. Hence, Nigeria's vision to be among the top 20 world largest economies by the year 2020 (Vision 2020) justifies the emphasis she places on "science, technical and vocational education" (FRN, 2004). As a result students in Nigeria are being encouraged to take up science-related subjects, and one subject that cuts across all the sciences is mathematics.

The knowledge of mathematical application and skills is an essential tool in every individual and society; It is a tool that can be used in our daily life to overcome many difficulties being faced in life. Several studies and researches have been done in many countries to examine the factors that influence students' performance in mathematics. Among these factors, students' attitudes towards mathematics are one

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important factor that has been consistently studied. Often, the studies on relationship between students' attitudes and the students' academic performance show a positive relationship (Mohd, Mahmood, and Ismail, 2011). Students' attitudes towards mathematics are a major factor that might influence the performance of the students. Several studies have been conducted in different countries to find out students' attitudes towards mathematics (Tahar, Ismail, Zamani and Adnan, 2010; Tezer and Karasel, 2010). Data collected and analysed suggested that the low performance of students in Mathematics is influenced by attitude factors. The competence gained in the study of Mathematics is widely used in all spheres of human life. Mathematics plays a key role in shaping how individuals deal with the various spheres of private, social, and civil life (Anthony and Walshaw, 2009). This justifies the obligation of the study of the subject by all students who go through basic and secondary education in most countries Nigeria inclusive. Mathematics is therefore seen as a core subject at these levels of education in Nigeria.

1.1 The objectives of the study are to:

- i. examine the methods employed in teaching mathematics in senior secondary schools in the study area.
- ii. determine the basic mathematical application and skills relevant for the students development in the study area.
- iii. examine the academic performance of student in mathematics in the study area.
- iv. examine the students attitude to mathematics teaching in the study area.
- v. identify challenges confronting the teaching of mathematics for the student development in the study area.

1.2 The hypothesis of the study

There is no significant relationship in the student's attitude in mathematical application and skills and student's academic performance in mathematics,

2.0 Methodology

2.1 Research Design: The study employed descriptive survey design. The design was adopted because it is the best for describing the characteristics of a large population and it ensures that respondents give honest answers since anonymity is guaranteed. This is normally used to systematically gather factual quantifiable information necessary for decision-making. Such designs are efficient methods of collecting descriptive data regarding the characteristics of populations, current practices and conditions or needs.

2.2 Population of the study: The population of the study comprises students (male and female) chosen across the three (3) senatorial districts in Ogun State. The total population for the study consists of 1126 Senior Secondary School (SSS 3) students in two (2) secondary schools in each of the senatorial districts in Ogun State. (i.e $2 \times 3 = 6$).

2.3 Sampling techniques and sample size: However, three hundred and sixty (360) were considered as appropriate sample size for this study sampling table. In order to distribute the sample size of 360, researcher employed quota sampling technique to distribute sample to the six selected schools. Specifically, quota sampling technique was used as a form of proportionate of stratified sampling, where a predetermined proportion of persons are to be sampled from diverse groups but on ease basis. Total Population: 1,126, Number of strata: 6, $360/1126 = 0.319$. Therefore, the element per strata is 0.319. Lastly, we found the number of subjects in a sample and this was determined by multiplying the number of samples in each population by element per strata (i.e. 0.319). The table below shows distribution of sample

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to six selected senior secondary schools in across Ogun State.

Table 1: Showing the distribution of population and sample size in the schools selected.

S/N	School	Number of population	Element per strata	Sample
1	School A	215	0.32	69
2	School B	220	0.32	70
3	School C	150	0.32	48
4	School D	170	0.32	54
5	School E	176	0.32	56
6	School F	195	0.32	62
	Total	1126	0.32	360

2.4 Research Instrument: The instrument of data collection is a questionnaire which was validated by two experts in the field, one mathematics educator and one statistician expert.

2.5 Method of Data Analysis: The statistical parameter involved in the analysis of the data is mean rating statistics of strongly agree (SA) = 5 points, agree (A) = 4 points, undecided (U) = 3, disagree = 2 points (D) and strongly disagree (SD) = 1 point was utilized. A criteria mark of 3.0 was adopted for decision making because it's a bit higher than the mean mark, hence a calculated mean greater or equal to 3.0 is accepted while a calculated mean less than 2.5 is rejected.

3.0 Result and discussion

3.1 Methods employed in teaching mathematics in senior secondary schools.

Result in Table 2 reveals that out of five method employed in teaching mathematics in senior secondary school sampled, three (3) methods showed that the methods have mean value greater than 3.0 which is the mean value of the five point Likert scale used in the

study meaning that all the students agree that the methods are innovative teaching method that can enhance their academic performance in mathematics. Analytical method has a mean value of 3.86 and is general accepted by the student, while demonstration method has a mean value of 3.81 and is accepted by the student and problem-solving method has a mean value of 3.78 which is also been accepted by the generalization of student sampled. Laboratory and project-method were rejected by the student with the mean value of 2.66 and 2.68 respectively. The building of problem solving competences in Mathematics is hindered by attitudes. Attitude is concerned with an individual's way of thinking, acting and behaving. Negative and positive attitudes are formed throughout the learning experiences students undergo (Yara, 1999). The factors that is associated with the school, teacher and teaching of mathematics are teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other student's opinions about mathematics courses (Yilmaz, Altun and Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2000), receiving private tuition (Köğçe et al, 2009), teachers' beliefs towards mathematics (Cater and Norwood, 1997) and teachers' attitude toward mathematics.

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Table 2: Methods employed in teaching mathematics in senior secondary schools.

Teaching Method	SA(%)	A(%)	U(%)	D(%)	SD(%)	Mean	Decision
Analytic	39(43.3)	25(27.8)	9(10.0)	8(8.9)	9(10.0)	3.86	Accepted
Laboratory	13(14.4)	15(16.7)	10(11.1)	32(35.6)	20(22.2)	2.66	Rejected
Demonstration	37(41.1)	26(28.9)	9(10.0)	9(10.0)	9(10.0)	3.81	Accepted
Problem-Solving	28(31.1)	33(36.7)	15(16.7)	9(10.0)	5(5.6)	3.78	Accepted
Project-Method	15(16.7)	13(14.4)	10(11.1)	32(35.6)	20(22.2)	2.68	Rejected

3.2 Basic mathematical application and skills relevant for the students' development.

Result in Table 3 shows that conversion skills was with the mean value of 4.06 and ranked first among the mathematics application and skills relevant for student development in the area sampled, while problem-solving skills was with the mean value of 4.00 and ranked second among the mathematics application and skills relevant for student development, measurement skills was with the mean value of 3.98 and ranked third among the mathematics application and skills relevant for student development and basic arithmetic skills was with the mean value of 3.84 among the mathematics application and skills relevant for student development in the study area. It was noted that among the variables used for the mathematics application and skills relevant for student development conversion skills, problem-solving skills, measurement skills and basic arithmetic skills were generally accepted by the student sampled, while manipulation skills was with the mean value of 2.52

and was rejected by the students'. Skills are the required characteristics or ingredients for effective teaching in mathematics while methods can be compared to pattern to be followed in teaching. There are many teaching methods as there are teachers in the world. In teaching seven steps and the required skills may be suggested for effective teaching as follows: Preparation for instruction (Organizational skills); Motivation (Communication skills); Presentation of the learning task (Focus skill); Inducement of the trial response (Feedback skill); Correction of the trial response (Questioning skill); Fixation of response (Closure skill); and Test response (Evaluation skill) Even though the enumerated skills are interdependent; one is as effective alone as it is when combined with others. Eggen and Kauchak (2002) claimed that the interaction and integration of those skills are crucial to teaching and learning.

Table 3: Basic mathematical application and skills relevant for the students' development.

Mathematics application and skills	SA(%)	A(%)	U(%)	D(%)	SD(%)	Mean	Decision
Measurement skills	28(31.1)	45(50.0)	6(6.7)	9(10.0)	2(2.2)	3.98	Accepted
Problem – solving skills	29(32.2)	45(50.0)	5(5.6)	9(10.0)	2(2.2)	4.00	Accepted
Conversion skills	34(37.8)	40(44.4)	5(5.6)	9(10.0)	2(2.2)	4.06	Accepted
Manipulation skills	13(14.4)	15(16.7)	10(11.1)	20(22.2)	32(35.6)	2.52	Rejected
Basic arithmetic skills	33(36.7)	28(31.1)	15(16.7)	9(10.0)	5(5.6)	3.84	Accepted

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3.3 Academic performance of student in mathematics.

From Table 4, the level of academic performance of students sampled across the study area shows that students performance is low (00 - 39) with 85 students has 23.6% which shows many failure rate giving that only few (30) of the students sampled representing 8.3% got excellent marks between 70 - 100. This implies that students with high mathematics self-concept will generally have high attitude towards mathematics in the area sampled for study. This implies that despite the effort of teachers in mathematics teaching to student the situation at least need further intervention to remedy it. However, high (51.4%) of the students score between 50 – 69 accounted to 185 students has high credit and few (16.7%) of the student score between 40 – 49 accounted for 60 students in the study area. According to Oginni and Owolabi (2012) who demonstrated that programmed instruction, a new strategy, assisted a lot of students to learn, understand and achieve the mastery of mathematics concepts with significant improvement in their achievement, Bot (2013) who discovered that mathematical modelling, a new strategy, is effective in teaching the applications of mathematics, and also Bot and Davou (2016) who found out that back-to-back instructional strategy is effective in helping students to increase their achievement in algebra significantly. Many researchers, psychologist and educators alike, have identified some of the variables that have effects on students’ academic performances. Academic performance is an individual’s inherent potentials in terms of intelligence combined with other sociological factors. Ojerinde (2009) in his study identified personality factors such as anxiety, achievement, motivation and level of interest as factors that affect academic performance. The consistence of these claims was asserted by Ford (2010), which claimed that student with high self-efficacy received higher grades than those with low self-efficacy and that

students with negative self-concept have poor academic performance.

Table 4: Academic performance of student in mathematics.

Academic performance	Mark range	Freq	Percentage (%)	Remark	Decision
Low	00 – 39	85	23.6	Many(Failure)	Fail
Moderate	40 – 49	60	16.7	Few (Passes)	Pass
High	50 – 69	185	51.4	High (Credit)	Pass
Excellent	70 - 100	30	8.3	Few(Distinction)	Pass

3.4 Students’ attitude towards mathematics teaching.

Table 5 revealed the overall attitude of students towards mathematics teaching in the study area. It was noted that above half (54.4%) of the students accounting for 196 has moderate attitude towards mathematics teaching, while 27.5% of the students has high attitude and 18.1% of the student developed low attitude towards the teaching of mathematics in the study area. This finding is also in agreement with Yang (2013) who observed that mathematics teachers do not offer sufficient support for effective mathematics learning among the students. The submission of this finding is in agreement with Ajai and Iyekekpolor (2016) who stated that mathematics teachers are not interested in the subject and do not help their students by way of catering for their individual differences and needs. Rawnsley (2010) had early posited students develop a more positive attitude toward their mathematics lessons where the teacher is perceived to be highly supportive, equitable and gives the students the chance to play an integral role in the teaching-learning process. The situation would be however different, going by the finding of this study. This is because students perceived their teachers as not supportive but rather discouraging them from learning mathematics.

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Table 5: Students' attitude towards mathematics teaching.

Attitude towards mathematics teaching	Frequency	Percentage (%)	Decision
12 – 28	65	18.1	Low
29 – 44	196	54.4	Moderate
45 – 60	99	27.5	High
Total	360	100.0	

3.5 Challenges confronting the teaching of mathematics for the student development.

Result in Table 6 shows that majority (78.9%) of the students agreed that shortage of qualified mathematics teachers is a major challenges facing students development in mathematics in the study area, while 21.1% of the respondents disagreed over shortage of qualified mathematics teachers in the area sampled. Also, majority (71.1%) of the students agreed that insufficient provision of teaching material or teaching aids to schools by the Government and parent inability to provide textbook for their children respectively causes mass failure in secondary schools particular in mathematics as a subject, while 28.9% shows that teaching aids is not that useful in the teaching of mathematics. This implies that parent inability and government role in schools were the major challenges facing teaching of mathematics for students' development. Majority (70.0%) of the respondents reveals that poor content of teaching is another challenges confronting teaching of mathematics for the student development. The foregoing findings is in congruent with the studies of Satish (2013) and Saad, Adamu and Sadiq (2014) who found that non-availability of qualified mathematics teachers often responsible for students' hatred, as well as failure in mathematics. Also, as perceived by students, the frequent use of instructional material in teaching mathematics in school helps their mathematics teachers to enrich their mathematics. The findings are also in line with the studies conducted by Maruff and

Amos (2011) who found that the use of appropriate instructional materials in school united learning and learners' mind and help them recall things that would have been easily fail to recall.

Table 6: Challenges confronting the teaching of mathematics for the student development.

Challenges	Yes (%)	No (%)
Poor attitude of teacher towards teaching of mathematics	244 (67.8)	118 (32.2)
Parent inability to provide textbook for their children	256 (71.1)	104 (28.9)
Insufficient teaching aids/textbooks by the government	256 (71.1)	104 (28.9)
Rush to finish the syllabus	216 (63.3)	132 (36.7)
Over population of students in classroom	216(36.3)	132 (36.7)
Lack of interest in mathematics		
Poor content of teaching	252(70.0)	108 (30.0)
Transfer of teachers		
Shortage of qualified mathematics teachers	284 (78.9)	76 (21.1)

3.6 Hypothesis of the study

There is no significant relationship in the student's attitude to mathematical application and skills and student's academic performance in mathematics.

The result in Table 7 showed that 'r' value, r-cal (0.567) with a P value < 0.05 alpha level is greater than the critical r-tab (0.254). The null hypothesis is therefore rejected, which means that there is significant relationship in the students' attitude to mathematics application and skills and students' academic performance in mathematics. The study also revealed that students' attitude to mathematics (X = 12.55) have higher disposition towards academic performance in mathematics in the sampled area. The findings agreed with that of (O'Connell, 2000) who stated that students' attitude towards science is more likely to influence achievement in science courses than

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achievement influencing attitude. It also agreed with the finding of (Akinyemi, 2009) that improved students' attitude toward subject in school will enhance students' performance in the subject.

predict students' attitude towards mathematics. The findings revealed that there was statistical significant relationship in the students' attitude to mathematics and students' academic performance in mathematics.

Table 7: Pearson Product Moment Correlation of Students' Attitude to mathematics application and skills and Students' Academic Performance in mathematics.

Variable	N	X	SD	df	r-cal	r-tab	Remark
Students' attitude to mathematics	360	18.45	0.462	358	0.567	0.254	S
Students' academic performance	360		0.513				

4.0 Conclusion and Recommendation

4.1 Conclusion

Based on the findings of the study, it can be deduced that several factors caused students' failure in mathematics which include insufficient number of qualified teachers, parent factors, inadequate textbooks, lack of interest in mathematics, in conducive classroom, frequent transfer of mathematics teachers, lack of constant study of mathematics and too many students in mathematics classes, Findings from this study suggest that students with moderate and high attitude towards mathematics perform better than those with low attitude on the subject. Mathematics teachers' competencies are helpful and relevant for understanding mathematics application and principles because it significantly

4.2 Recommendation

Based on the implications of the findings, the researchers have made the following recommendations.

1. Special teaching methods for students with low attitudes toward Mathematics which are in harmony with the basic principles of education, to be developed to ensure their capacities are developed.
2. Mathematics teachers' should be encourage the use of better teaching method that would stimulate students' positive attitude and interest towards mathematics.
3. Government at all levels (Federal, State and Local) should ensure that basic educational facilities such as learning materials, libraries, standard classroom blocks and laboratories are provided for schools so as to enhance teaching and learning.
4. Adequate qualified and competent mathematics teachers should be recruited for schools.
5. Students should try to develop and maintain a positive self-concept and self-efficacy towards learning of mathematics.
6. Mathematics teachers should continue to practice the use of different approaches and techniques in the teaching of mathematics concepts and principles.
7. Government and all educational stakeholders should ensure that teachers are constantly send to workshops, seminars, and conferences in order to enhance new innovations in mathematics teaching.

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