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EFFECT OF THINK-SOLVE-GROUP-SHARE DIFFERENTIATED STRATEGY ONMOTIVATION, ATTITUDE AND PERFORMANCE IN MATHEMATICAL CONCEPTS AMONG SENIOR SECONDARY STUDENTS, KATSINA, NIGERIA

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Abstract

The study investigated the effect of Think-Solve-Group-Share (TSGS), differentiated strategy on motivation, attitude and performance among senior secondary students in bearing in Katsina State, Nigeria. The population for this study was 8,440 SSII students, out of which a sample of 180 senior secondary students was used for the study. A simple random sampling technique was used to arrive at the sub-group. Quasi experimental pretest posttest control group design, involving intact classes, was used. Simple random sampling method was, also, used to determine the experimental (N = 63) and control (N = 117) groups. The experimental group (EG) was exposed to Think-Solve-Group-Share while the control group (CG) was taught using Lecture method. Three instruments, MPT, MAS and MMQ were used to collect data. The reliability coefficients of MPT, MAS and MMQ were obtained as 0.77, 0.65 and 0.70 respectively. The study answered three research questions and three hypotheses. Using SPSS (23 version), hypothesis one HO_1 was analyzed using T-Test at $p \leq 0.05$, while the hypotheses two and three (HO_2 and HO_3) were analyzed using Mann-Whitney U tests also at $p \leq 0.05$. Major findings of the study showed that TSGS differentiated strategy enhance performance in Mathematics and improve students' motivation and attitude toward Mathematics positively. The study therefore, recommended that Mathematics teachers should implore the use of this strategy especially in differentiated classroom. It also recommended that student's readiness level should be identified first when teaching new concepts in Mathematics lesson.

Key Words: Differentiated strategies, performance, attitude, motivation, mathematical concepts.

Introduction

The universality of Mathematics is an issue that cannot be contended by anyone. This is because it is as old as man himself, and it is the milestone of any nation's development. Moreover, Mathematics underpins every aspect of our life; it has been used almost everywhere; in carpentry, tailoring, building, cooking, decision making, politics, choosing insurance or health plan to mention a few (National Council of Teachers of Mathematics NCTM, 2000: 4 and Hassan, 2013). To keep pace with today's technological advancement, we must prepare our younger generation to be mathematically sound, because Mathematics is a backbone of all science and technology subjects. Ebisine (2013) buttressed that Mathematics plays important role in social, economic and technological development, as such without Mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society. In effect Mathematics education is therefore *sine-qua-non* in technological development.

Despite the importance of Mathematics and the government's recognition of its importance, students in secondary schools persistently registered poor performance in

Mathematics in Senior Secondary Certificate Examination (SSCE) (WAEC & NECO Chief Examiner's report, 2012-2017 and WAEC, 2020). Some of the causes were historical (Bassey, Joshua & Asim, 2004); ill-trained teachers (Salman, 2005:27; Igbokwe, 2003; Odili, 2006:92); poor methodology (Iji and Harbor-Peters, 2005; Kolawole, 2005; Miji and Makgato, 2006) among others.

Studies have shown that the model ofinstruction especially at the secondary school levelremains overwhelmingly teacher-centered with greateremphasis on the lecture mode of instruction and the use of textbook than engaging students in critical thinking across subject area and applying the knowledge acquired to real-world situations (Peter & Olaoye, 2014). Bichi and Usman as cited in Umar (2015) buttressed that; persistence of poor performance is directly linked to over use of lecture method. In this regards, scholars like Okebukola (2005) and Wasagu (2009) observed that there is need for reforms in the way science technology and mathematic are being taught in Nigeria. This is in order to cultivate inquiring, knowing and rational mind for the conduct of a good life and democracy and also to producescientists for national development as outlined in the National Policy on Education (FME, 2013: 2).

The National Policy on Education in Nigeria (FME, 2013:2) stipulates that every Nigerian child shall have a right to equal educational opportunities to reach highest potentials in life. To achieve that Umar (2015) viewed that students require suitable assistance and guidance in accordance with their individual demand to develop their potentials optimally. The challenge is to use an appropriate framework that takes care of the diversity in our classrooms. This is necessary in order to carry every student along by treating him/her according to his/her readiness level in learning any new concept.

Scholars like Voughn and Baker (2001) and Khamal, Shah and Koirala, (2014) believe that, teachers can address learners' needs by using a variety of teaching methods so that learners are exposed to multiple ways of learning there by ultimately giving them opportunities to excel. Students differ in their readiness level in learning a particular concept, they also differ in interest and learning profiles (Tomlinson, 2001: 45), hence their diversity. The type of instruction that accommodates learners' diversity is the Differentiated Instruction (DI). Weselby (2017: 5) asserts that; not all students require the same amount of support from the teacher, students could choose to work in pairs, small group or individually. While some students benefit from one-on-one interaction with the teacher, others may be able to progress by themselves. Teachers can enhance student learning by offering support based on individual needs.

Differentiated instruction strategies are learner centered strategies, like Think-Pair-Share, demonstrated in a differentiated classroom. Differentiated classroom is a class in which teacher gives maximum support to low achievers and at the same time engages high achievers; it is a class which creates spirit of team work among learners (Tomlinson, 2001: 17). Differentiated classroom is also characterized by formative evaluation. Hence this study investigated the effect of Think-Solve-Group-Share differentiated strategy on motivation, attitude and performance in Mathematics among senior secondary school students giving preference to students' readiness.

Think-Solve-Group-Share is a variation of Think-Pair-Share which is a strategy built upon three stages developed by Professor Frank Lyman and his colleagues at the University of Maryland in 1981. The Think-Solve-Group-Share has four stages; (i) Think

Phase, (ii) Solve Phase, (iii) Group Phase and (iv) Share Phase. The teacher posed a task to the students, time was given for the students to read the question and think of appropriate algorithm to apply, then another time was given for each student to solve the task individually, then students were allowed to discuss their solution in a group of three and finally, volunteer from a group was allowed to present (share) their solution to the entire class. Constructive criticism was allowed while the teacher acts as a moderator.

The efficacy of Think-Pair-Share, on performance, was established by many researchers such as: Hamdan (2017) in his study, "The Effect of Think – Pair – Share Strategy on the Achievement of Third Grade Student in Sciences in the Educational District of Irbid, Turkey"; Afthina, Mardiyana and Pramudya (2017) undertook a study titled; "Think-Pair-Share using Realistic Mathematics Education Approach in Geometry Learning". They used 187 students from 3 Junior High Schools in Karanganya province of Indonesia; Haakachima and Lunjebe (2019) investigated the effect of Think-Pair-Share on learners' performance in quadratic functions in Luanshya, Zambia; Akanmu (2019) in the study "effects of Think-Pair- Share on senior school students' performance in mathematics in Ilorin, Nigeria". The current study is different from the aforementioned because the strategy used in this study is a modified TPS with four stages and the previous studies were conducted in conventional classrooms while this study was demonstrated in a differentiated classroom.

Nolan, Beran and Hecker (2012) viewed that, negative attitudes are perceived to be widespread and likely to decrease students' academic performance in Mathematics, prevent them from acquiring mathematical thinking skills, and leave them uncertain about solving mathematical problems in the 'real world'. As a result, there has been much interest in assessing students' attitudes to predict academic performance in mathematical concepts and monitor attitudinal changes resulting from educational practices. Hence the importance of developing positive attitudes in students is fundamental. Research findings as reported by Odili (2006:104) established that secondary school students have negative attitude towards Mathematics. This state of art calls for combine efforts of teachers, parents and the students themselves to change this negative attitude. One way to do that is to consider the importance of motivation in the teaching and learning process. In the context of Mathematics, therefore, attitude should be viewed as a predisposition to respond in a favorable or unfavorable way to Mathematics due to the influence of certain stimuli-teaching method, environment, pears, instructional materials etc (Davadas & Lay, 2018).

Bude et al., (2007) opined that; motivation influences the scope and the quality of study behaviour of students. High–quality study behaviour involves active knowledge construction and active knowledge construction is known to enhance understanding of mathematical concepts. Therefore, in attempt to improve Mathematics education, it is important to stimulate students' motivation in the learning of mathematical concepts. The form of motivation used by most teachers is that of teacher-imposed external reinforcement which aimed at to determine what a child thinks, how he answers a question or attack a problem, this should be discouraged (Odili, 2006:105). Rather, motivation should be geared towards improving intellectual curiosity of the students. Curiosity leads him to discover answers to questions. Discovery, in turn, arouses further curiosity.

Statement of the Problem

Students' poor performance in the Mathematics senior school certificate examination is an issue of great concern to all stakeholders. The study of Musa and Dauda (2015) revealed a worrisome condition Mathematics education is in. Previous study documented a trend analysis of May/June WASSCE Mathematics in Nasarawa state from 2004-2013. The result showed a downward pattern of performance at the credit level and the result was in agreement with the trend at the national level which is also less than 50% as confirmed by WAEC and other researchers who have reviewed trends of performance at national level. The predictor of the trend analysis has indicated that the trend could continue up to 2020 if the situation is not arrested. The situation in Katsina state is not different as 2020 WASSCE result showed that only 48.4% passed Mathematics at credit and above level (Katsina state MOE, 2020).

The aforementioned indicated persistent poor performance in school mathematics, also the poor performance was attributed to, among others, poor methodology used in teaching it. Consequently, scholars explored several methods in an attempt to improve the situation. Nonetheless, WAEC 2020 chief examiner reported, on question 9 which is on bearing, that "many candidates erred while solving the problem because of lack of knowledge of bearing …". Hence, this study investigated whether differentiated strategy Think-Solve-Group-Share have effect on attitude, motivation and performance in mathematical concepts (bearing and sequence and series) among senior secondary school students in Katsina giving preference to the students' readiness in demonstrating this strategy.

Research Questions

The following research questions were formulated to guide the conduct of this study:

i. To what extent do the mean scores in academic performance between students taught mathematical concepts using Think-solve-Group-Shares strategy differ from those taught by lecture method?
ii. What is the difference in the mean rank attitude responses towards Mathematics among students taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method?
iii. What is the difference in the mean rank motivation responses toward Mathematics among students taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method?

Research Hypotheses

The following hypotheses were tested at 0.05 level of significance:

HO_1: There is no significant difference between mean scores of students' performance taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method.
HO_2: There is no significant difference between mean ranks of students' attitude toward Mathematics, taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method.

HO_3: There is no significant difference between mean ranks of students' motivation toward learning Mathematics, taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method.

Methodology

The study used a quasi-experimental design involving pretest posttest control group. The study was carried out in Dutsinma and Daura Education Zones of Katsina state, Nigeria. The population of the study consists of all SSII students of public senior secondary schools totaling 8,440. The mathematical concepts used in the study were bearing and sequence and series as they are identified among others as difficult concepts in school Mathematics (Adegun & Adegun, 2013; Azuka, Jekayinfa, Durojaiye & Okwuoza, 2013; Chalse-Ogan & Geoge, 2015; Olubukola, 2015 and WAEC, 2020).

A sample of 180 students from two intact classes, drawn from the two zones, was used for the study. The sub-group was arrived at by sampling one school from each zone and one intact class from each sampled school using simple random sampling. One class was randomly assigned to experimental group while the other was assigned to control group.

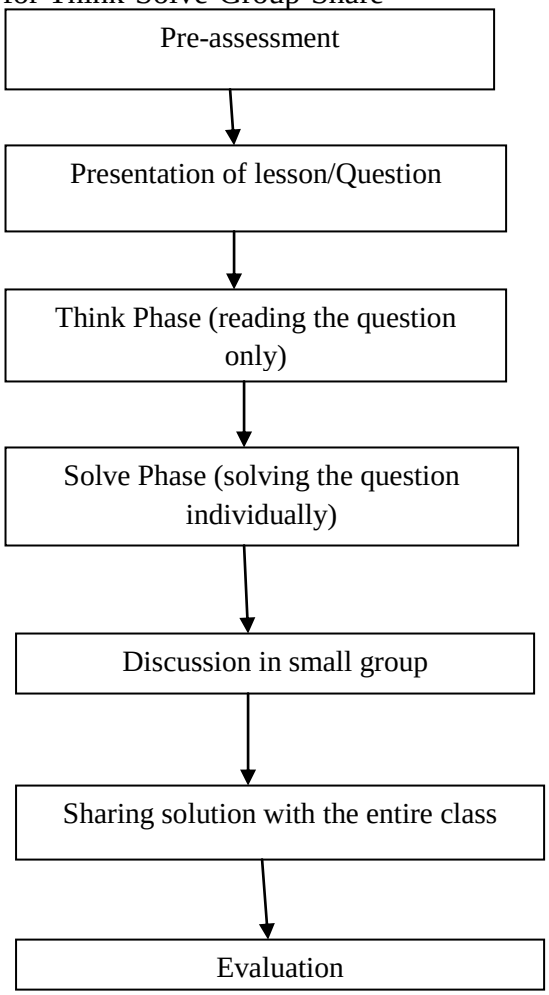
Three instruments were used to collect data for the study. They are Mathematics Performance Test (MPT), Mathematics Attitudinal Scale (MAS) and Mathematics Motivation Questionnaire (MMQ). MPT was validated by two experts in Mathematics Education; its reliability coefficient obtained by test retest method was 0.77. Both MAS and MMQ were validated, also, by two educational psychologists; their reliability coefficients obtained by split half method, and corrected using Spearman Brown Prophecy formula, were 0.65 and 0.70 respectively. These values were considered high enough for the study.

Before the commencement of the treatment, the three instruments were administered as a pretest. This was followed by the treatment which lasted for six (6) weeks. The experimental group was taught using Think-Solve-Group-Share (TSGS) as shown in figure 1 while the control group was taught using lecture method.

The pre-assessment was administered to determine the readiness level of the subjects. In a situation where the result of the pre-assessment is poor; a preparatory lesson was given to ensure the subject are ready for the concept to be taught. After the treatment, the same instruments were administered as posttest. Results obtained were used as data for the study.

Hypothesis One was analysed using mean and t-test for independent samples while hypotheses two and three were analysed using sum of mean ranks and Mann-Whitney U test.

Figure 1: Flow Chart for Think-Solve-Group-Share



Results

Research Question One: To what extent do the mean scores in academic performance between students taught mathematical concepts using Think-Solve-Group-Shares strategy differ from those taught by lecture method?

Table 1: Means and Standard Deviations of Mathematics Performance Posttest Scores for Think-Solve-Group-Share (TSGS) Strategy and Lecture Method

Group	N	Mean	Mean Diff.	Std. Dev.
TSGS	63	57.63		10.242
			24.13	
Lecture	117	33.50		5.784
TOTAL	180			

Table 1 showed that the mean scores of the EG1 (TSGS) and that of CG (Lecture) were 57.63 and 33.50 respectively with a mean difference of 24.13. Add to find out if the treatment has effect, the result is further subjected to t-test statistical analysis.

Analysis of Hypothesis One (HO_1): HO_1 was tested using t-test for independent samples and the summary of the analysis is shown in Table 2.

Table 2: t-test Result on Performance in Mathematics between Experimental Group and Control Group

Group	N	Mean	SD	Df	$t-value$	$p-value$	Remark
EG	63	57.63	10.242				
				178	20.21*	0.001	Significant
CG	117	33.50	5.784				
TOTAL	180						

*Significant at $p \leq 0.05$

Result in Table 2 showed that p-value (observed) = 0.001 is less than p-value of 0.05 at df = 178. Since the observed p-value = 0.001 < 0.05 then the null hypothesis (HO1) which states that: "There is no significant difference between mean scores of students' performance taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method" is rejected. This means there exist statistically significant difference between EG (TSGS) and the CG (Lecture) in favour of TSGS. Hence, the students taught mathematical concepts using TSGS differentiated strategy performed better than those taught same content using Lecture Method.

Research Question Two: What is the difference in the mean rank attitude responses towards Mathematics among students taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method?

Table 3: Mean Ranks of Attitude toward Mathematics between the Experimental Group and Control Group.

Group	N	Mean Rank	Sum of M. R	M. R Diff.
EG	63	128.99	8126.50	
				61.22
CG	117	67.77	8163.50	
Total	180			

Table 3 showed that there is difference between the mean ranks between the EG (TSGS) and the CG (Lecture) with mean rank difference of 61.22. Add to find out if the treatment has effect, the result is further subjected to Mann-Whitney U test.

Testing Hypothesis Two (HO_2): HO_2 was analyzed using Mann-Whitney U test and the summary of the analysis is shown in Table 4.

Table 4: Mann-Whitney U Test for Comparison of Mean Ranks of Attitude toward Mathematics Posttest Scores for Experimental Group and Control Group.

Group	N	Mean Ranks	Sum of M. R	M.R Diff.	U	p-value	Remark
EG	63	128.99	8126.50	61.22	Z= -7.278*	0.001	Sig.
CG	117	67.77	8163.50				
Total	180						

*Significant at $\alpha = 0.05$

Result in Table 4 showed that there exists a statistically significant difference in the mean ranks between the EG and CG with Mann-Whitney U test (Z = -7.278) and mean rank difference of 61.22. since the p-value = 0.001 < 0.05 significant level, the HO_2 which states that: "There is no significant difference between mean ranks of students' attitude toward learning Mathematics, taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method" is not accepted. Meaning that, Think-Solve-Group-Share differentiated strategy improved students' attitude toward Mathematics more than the lecture method.

Research Question Three: What is the difference in the mean rank motivation responses toward Mathematics among students taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method?

Table 5: Mean Ranks of Motivation toward Mathematics between the Experimental Group and Control Group.

Group	N	Mean Rank	Sum of M. R	M. R Diff.
EG	63	128.83	8116.50	58.97
CG	117	69.86	8173.50	
Total	180			

Table 5 showed that there is difference between the mean ranks between the EG (TSGS) and the CG (Lecture) with mean rank difference of 58.97. Add to find out if the treatment has effect, the result is further subjected to Mann-Whitney U test.

Testing Hypothesis Three (HO_3): HO_3 was analyzed using Mann-Whitney U test and the summary of the analysis is shown in Table 6.

Table 6: Mann-Whitney U Test for Comparison of Mean Ranks of Motivation toward Mathematics Posttest Scores for Experimental Group and Control Group.

Group	N	Mean Ranks	Sum of M. R	M.R Diff.	U	p-value	Remark
EG	63	128.83	8116.50	58.97	Z= -7.246*	0.001	Sig.
CG	117	69.86	8173.50				
Total	180						

*Significant at $\alpha = 0.05$

Result in Table 6 showed that there exists a statistically significant difference in the mean ranks between the EG and CG with Mann-Whitney U test (Z = -7.246) and mean rank difference of 58.97. Since the p-value = 0.001 < 0.05 significant level, the HO_3 which states that: "There is no significant difference between mean ranks of students' motivation toward Mathematics, taught mathematical concepts using Think-Solve-Group-Share strategy and those taught by lecture method" is rejected. Thus, Think-Solve-Group-Share differentiated strategy improved students' attitude toward Mathematics more than the lecture method.

Discussion

The result of this study established that students taught mathematical concepts (bearing and sequence and series) using Think-Solve-Group-Share differentiated strategy performed significantly higher than their counterparts taught using lecture method. This gave support to the following studies: Hamdan (2017) who reported significant improvement in the performance of Third Grade Student in Sciences in the Educational District of Irbid, Turkey, following exposing them to Think-Pair-Share strategy; Afthina, Mardiyana and Pramudya (2017) investigated the use of Think-Pair-Share on students' Geometry Learning in Karanganya province of Indonesia and found that TPS learning model using RME gives better effect in Mathematics achievement; Haakachima and Lunjebe (2019) investigated the effect of Think-Pair-Share on learners' performance in quadratic functions in Luanshya, Zambia and found that a significant difference exist between the posttest scores of the experimental and control group on performance in quadratic functions in favour of the experimental group; Akanmu (2019) in his study "effects of Think-Pair- Share on senior school students' performance in mathematics in Ilorin, Nigeria" found that the use of Think-Pair-Share improved students' performance in Mathematics, gender of a student does not affect his or her performance in Mathematics, and the use of think-pair-share improved the retention ability of the students. The similarity of the current study and the previous studies point to the fact that Think-Solve-Group-Share, which is a variation of Think-Pair-Share, is effective in promoting students' performance irrespective of where it is used.

Conclusion

The findings of this study established that Think-Solve-Group-Share demonstrated in a differentiated classroom improved, significantly, the performance of senior secondary students in mathematical concepts.
The findings of the study also indicated that Think-Solve-Group-Share strategy improved, positively, the attitude and motivation of senior secondary students toward Mathematics.

Recommendations

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

1. Mathematics teachers should implore the use of Think-Solve-Group-Share strategy in Mathematics classes.
2. Mathematics teachers should identify the readiness level of their students at the beginning of every lesson; most importantly when introducing a new or difficult concept.
3. Mathematics teachers should implore the use of Think-Solve-Group-Share strategy in Mathematics classes in order to improve students' attitude and motivation toward Mathematics.
4. Katsina state Ministry of Education and relevant authorities should organize a workshop to educate teachers on the principles and use of differentiated instruction in mathematics classes

References

Adegun, I. K. & Adegun, B. O. (2013). Students and Teachers' Views of Difficult Areas in Mathematics Syllabus: Basic Requirement for Science and Engineering Education. *Journal of Education and Practice,* **4** (12): 235-243.

Afthina, H., Mardiyana, M., & Pramudya, I. (2017). Think-Pair-Share Using Realistic Mathematics Edducation Approach in Geometry Learning. *Journal of Physics*, **895** (1): 1-6. DOI: 10.1088/1742-6596/895/1/012025

Akanmu, M. A. (2019). Effect of Think-Pair-Share on Senior Secondary Students' Performance in Mathematics in Ilorin, Nigeria. *African Journal of Educational Studies in Mathematics and Science.* **15** (2): 109-118

Bassey,S. W., Joshua, M. T. & Asim, A. E. (2004). Performance of Seconadry School Science Students in Aptitude. Retrieved December 6th. 2010 from http//www.jeteraps.scholarlink.org

Berg, C. A. (2005). Factors Relating to Observed Attitude Change towards Learning Chemistry among University Students. *Education Research*, **6** (1): 1-18

Bude, L., Van-De-Well, M. W. J., Imbos, T., Candel, M. J. J. M., Broers, N. J. & Berger, M. P. F. (2007). Students' Achievements in a Statistics Course in Relation to Motivational Aspects and Study Behaviour. *Statistics Education Research Journal,* **6** (1): 5-21

Charles-Ogan, G. & George, N. R. (2015). Investigating Difficult Concepts in Senior Secondary School Mathematics Curriculum as Perceived by Students. *International Journal of Academic Research and Reflection,* **3** (6): 67-74.

Davadas, S. D. & Lay, Y. F. (2018). Factors Affecting Students' Attitude Toward Mathematics: A Structural Equation Modelling Approach. *EURASIA Journal of Mathematics, Science and Technology Education.* **14** (1): 517-529 DOI:10.12973/ejmste/80356

Ebisine, S. S. (2013). Re-engineering Mathematics Education for Technological Development in Nigeria. *The Journal of Mathematical Association of Nigeria*. **38** (1): 196-204.

Federal Ministry of Education (2013). *National Policy on Education (6th Ed).* Lagos, NERDC.

Haakachima, B. & Lunjebe, A. (2019). The Effect of Think-Pair-Share Cooperative Learning Model on Grade Twelve (12) Learners' Performance in Quadratic Functions: A Case of Twashuka Secondary School in Luanshya. *International Journal of Research and Innovation in Social Science (IJRISS).* **3** (10): 216-223

Hamdan, R. K. A. (2017). The Effect of Think-Pair-Share Strategy on the Achievement of Third Grade Student in Science in the Educational District of Irbid. *Journal of Education and Practice,* **8** (9): 88-95

Hassan, S. D. (2013). Effects of Three Instructional Methods of Teaching Volumes on Junior Secondary School Students' Performance in Katsina State, Nigeria. M. ED Dissertation Submitted to the Faculty of Education, Usmanu Danfodiyo University, Sokoto, Nigeria.

Igbokwe, D.I. (2003) An Assessment of the Foundation for a Sustainable Scientific and Technological Development in Nigeria, *STAN Journal of Issues on Mathematics,* **6** (1): 1-15.

Iji, C. O. & Harbor-Peters, V. F. A. (2005). Effects of Logo and Basic Programs on the Achievement in Geometry of Junior Secondary School Students. *The Journal of Mathematical Association of Nigeria*, **30** (1): 67-77

Katsina State Ministry of Education (2019). Senior Secondary School Students Enrolment 2018/2019 Session

Khamal, L.Shah, S.&Koirala,S. (2014) Exploration of Preferred Learning Styles in Medical Education Using VARK modal. *Russian Open Medical Journal*, (3): 0305 DOI: 10.15275/rusomj.2014.0305

Kolawole, E. B. (2005) Comparative Analysis of Three Methods of Solving Quadratic Equations. *ABACUS, The Journal of Mathematical Association of Nigeria,* **30** (1): 78-85.

Miji, A. & Makgato, M. (2006) Factors Associated with High School Learners' Poor Performance: A Spotlight on Mathematics and Physical Science. Retrieved May 10th, 2010, from hhtp://ajol.info/indexphp/saje/article/viewfile/25068/20738

Musa, M. & Dauda, E. S. (2014). Trends Analyses of Students' Mathematics Performance in West African Senior Secondary Certificate Examination from 2004 to 2013: Implication for Nigeria's Vision 20:2020. *British Journal of Education*. **2** (7): 50-64

NCTM (2000). *Principles and Standards for School Mathematics*. Reston, The National Council of Teachers of Mathematics, Inc.

Nolan, M. M., Beran, T., & Hecker, K. G. (2012). Surveys Assessing Students' Attitudes Toward Statistics: A Systematic Review of Validity and Reliability. *Statistics Education Journal*, **11** (2): 103-123

Odili, G. A. (2006). *Mathematics in Nigeria Secondary Schools: A Teaching Perspective.*Nimo: Rex Charles & Patrick Limited. Nigeria.

Okebukola, P. A. (2005). Quality Assurance in Teacher Education in Nigeria: The Role of Faculties of Education, A paper at Committee of Deans of Education in Nigerian Universities 2005 Meeting, Ilorin.

Olubukola, A. (2015). An Investigation of Difficult Topics in the Senior Secondary School Mathematics Curriculum as Perceived by Student Teachers. *American Journal of Educational Research*, **3** (7): 844-848 DOI: 10.12691/education-3-7-7

Peter, E. & Olaoye, A. A. (2014). Enhancing Quality of Mathematics Offered in the Nigerian School System; through Effective Mathematics Professional Development. *International Journal of Academic Research in Education and Review*, **2** (4): 64-71. DOI:10.14662/IJARER2014.013

Salman, M.F. (2005) Teachers' Identification of the Difficulty Levels of Topics in the Primary School Mathematics Curriculum in Kwara State. *The Journal of Mathematical Association of Nigeria*.

Tomlinson, C. A. (2001). *How to Differentiate Instruction in a Mixed Ability Classrooms (2nd Ed)*. Alexandria, Association for Supervision and Curriculum Development (ASCD).

Umar, Y. A. (2015). Effects of Visual, Audio, Kinesthetic Learning on Emotional Intelligence, Attitude and Performance in Ecology among Colleges of Education Students, North-West, Nigeria. A Thesis Submitted to the Faculty of Education, Ahmadu Bello University, Zaria in Partial Fulfilment of the Requirements for the Award of Doctor of Philosophy in Science Education.

Voughn, L. & Baker, R. (2001). Teaching in the Medical Setting: Balancing Teaching Style, Learning Styles, and Teaching Methods. *Medical Teacher*, **23** (6): 610-612 DOI:10.1080101421590120091000

Wasagu, M A. (2009). *Rethinking Science Education for changing Times: The writing on the Wall:* Nigeria. Trans-Akab Publishers, the 8th Inaugural lecture in Usmanu Danfodiyo University, Sokoto.

Weselby, C. (2017). What is Differentiated Instruction? Examples of How to Differentiate Instruction in the Classroom. Retrieved from http://education.cu-portland.edu/blog/teaching-strategies/examples-of-differentiated-instruction, on July 27th, 2017.