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Improving Mathematics Achievement of Junior Secondary School Students Using Mastery Learning Instructional Strategy

Adebola S. IFAMUYIWA
Department of Science and Technology Education (STED),
Faculty of Education, Olabisi Onabanjo University, Ago-Iwoye,
Ogun State, Nigeria. Email: saji38@hotmail.com

Mrs. Iyabode E. ROSANWO
Department of Mathematics, School of Science,
Tai Solarin College of Education, Omu-Ijebu,
Ogun State, Nigeria

***Abstract* – In an effort to assist students to achieve mastery of Mathematics contents for scientific and technological advancement, this study investigated the effect of Mastery Learning Instructional Strategy (MLIS) on Junior Secondary School Students' achievement in Mathematics. The interaction effects of achievement-motivation and mathematics-anxiety were also examined. The design was pre-test, post-test, control group quasi-experiment involving 2 x 2 x 2 factorial matrix. Purposive sampling technique was used to select four Junior Secondary Schools (JSS) in Ijebu North-East Local Government Area of Ogun State. A total of one hundred and forty four (144) JSS students participated in the study. The instruments used include Mathematics Achievement Test (r = 0.87), Motivation towards Learning Mathematics Questionnaire (r = 0.89) and Mathematics Anxiety Rating Scale (r = 0.88). The four hypotheses formulated were tested using the analysis of covariance and its' multiple classification analysis, using pre-test scores as covariates. Results showed that using the MLIS resulted in higher achievement in Mathematics than the conventional method. There was significant main effect of mathematics-anxiety on the students' achievement scores in favour of the students with low mathematics-anxiety. It was thus recommended that the teachers of Mathematics should learn and use the MLIS in teaching the subject especially at the Junior Secondary School level.**

***Keywords* – Mastery Learning Instructional Strategy, Students' Achievement in Mathematics, Achievement-Motivation, Mathematics-Anxiety, Junior Secondary School.**

I. BACKGROUND AND LITERATURE

The role of Mathematics in education is to essentially improve the overall education of an individual (Akinsola and Ifamuyiwa, 2008). It describes all problems arising from most branches of Science and Technology, be it Science, Engineering, Industry, Technology and even the Arts. The knowledge of and the use of Mathematics pervades all facets of life including that of playing a vital role in the development of the nation. The knowledge of Mathematics does not only promote the habit of accuracy, logical, systematic and orderly arrangement of facts in the individual learner; it also encourages the habit of self-reliance and assists learners to think and solve their problem themselves. However, the consistent poor performance of Nigerian students in Mathematics at the secondary school level has rekindled researches in developing effective strategies capable of improving students' achievement in the subject.

The teaching learning process is an interaction among all elements of the classroom – the teacher, the students, the learning materials and the school environment. Primarily, the purpose of classroom teaching and learning is to satisfy the set objectives of instruction with the aim of attaining the goals of education. Consequently, almost all activities in the classroom are geared towards accomplishing the societal goals of education. In turn, the expectation of the society from the learner is to perform well at least to satisfy parental expectation as well as justify the huge national expenditure on education. The correct use of an appropriate teaching method is critical to successful teaching and learning (Wachanga and Mwrangi, 2004). Knowledge of how teaching methods affect students learning may help educators to select methods that can improve teaching quality, effectiveness, and accountability to learners and the public (Foster, Pinkest and Husman, 1991). Also, the question of how to motivate students in the classroom has become a leading concern for teachers of all disciplines (Okey, 2007). Motivating and engaging students in the teaching learning process are especially relevant to Mathematics education in the light of the recurring questions about how to get more students interested and involved in learning (Wong, 2003; Akinsola, 2008).

The problem of teaching and learning Mathematics in Nigerian secondary schools had been attributed to the inability of the teachers who give students less opportunity to learn at their own pace. It appears that the prevalent method of using textbook and chalkboard as instructional materials have been shown to be ineffective and have not been yielding the desired result (Akinsola, 1994).

Mastery Learning Strategy (MLS) is based on the assumption that given adequate instruction, time and motivation, most students will be able to meet course objective. It provides learners with the opportunity to learn at individual level and it is a learner-cantered strategy that allows a learner to attain high level of predetermined mastery on unit of instruction before being allowed to proceed to the next unit. Mastery learning strategy is not a new concept; it was introduced into American education over seventy years ago. It was originally developed by Morrison in the 1930s but initiated and pioneered by Carroll (1963); Bloom (1974) and Keller (1993). The idea of mastery learning developed by these authors was modified by Block and Burns (1976) to reflect a fundamental change about the nature of instruction and thinking. His formula for

mastery is pre-test, teach, and test again (post-test) to the point of actual mastery of learning.

Mastery Learning Strategy is a process whereby students achieve the same level of content mastery but at different time intervals. According to Burrows and Okey (1999), the five variables upon which the theory of mastery learning depends are: quality of instructions, ability to understand instructions, perseverance, learner's aptitude and time allowed for learning. In addition, MLS is a motivator to school learning and is capable of developing in students a lasting interest in learning of all kinds.

Mastery Learning Instructional Strategy (MLIS) as used in this study refers to the instructional use of systematic corrective teaching and learning steps in which learners enjoy and participate actively in several learnable hierarchical units of content. Each student must learn and attain mastery of each unit of content at his own pace. Appropriate corrections are given at the end of each unit of task with provision of remediation to the slow learners. Mastery learning instructional strategy is a 'personalized system of instruction' modelled after Skinner's operant conditioning, a special kind of programmed instruction. It is a system of personalized instruction because each learner is expected to work at his or her own pace with assistance from the teacher and peers. This type of strategy has been acclaimed to be helpful in learning abstract thinking tasks and mathematical calculation coupled with the fact that as submitted by (Yau, 2007) successful learning of subsequent units of contents depend on mastery of preceding ones.

Literature indicates positive effects of mastery learning on students' achievement, attitudes towards learning and the retention of content. School system that implemented mastery learning have found it to be a very effective teaching and learning strategy and has proved conventional method to be ineffective in bringing learners to acceptable level of mastery (Abadon, 1993; Odulaja, 1993; Emeke, 2002; Fawole, 2006). Odulaja (1993) investigated the differential effectiveness of partial mastery and mastery learning strategies on transfer of learning in Geography and reported that mastery learning strategy enhanced better transfer of learning than the partial learning strategy. Emeke (2002) and Fawole (2006) submitted that mastery learning strategy has been found to facilitate effective learning and resulted in better achievement of students' cognitive, affective and psychomotor outcomes than other strategies. Guskey (2009) asserts that despite the modest nature of the changes to implement mastery learning, extensive research evidence gather in Asia (Wu, 1994), Europe (Postlethwaite and Haggarty, 1998; Yildiran, 2006), and the United States (Anderson, 1994) show that the careful and systematic application of mastery learning principles can lead to significant improvement in students learning. It should however be noted that review of studies on mastery learning revealed some contrary outcomes as opposed to the success of MLS alone. Kulik and Bangert-Drowns (1990b) and Akinsola (1994) reported that rather than mastery learning strategy alone, it is modified or enhanced mastery learning and mastery learning coupled with teams that significantly increase student's achievement and affective outcomes in school subjects.

Mastery learning instructional strategy is considered in this study for a number of reasons; the first being that almost all the cited authors have used the strategy in other subject discipline and foreign environment but not Mathematics as a discipline and Ogun State, Nigeria respectively. Secondly, the cited authors have used mastery learning strategy alone or with some other variables different from the moderator variables (achievement-motivation and mathematics-anxiety) examined in this study; and thirdly, the participants (Junior Secondary School II students) are not the same as the ones investigated in previous studies reviewed.

The fact that students' personality variables such as cognitive entry behaviour (Ogunkola, 2000), achievement-motivation (Amosun, 2002), gender (Ogwuzor, 1992), locus of control (Ifamuyiwa, 2003), numerical ability (Adegoke, 2003) and mathematics-anxiety (Garry, 2005) can affect students' learning outcomes, irrespective of instructional strategy used necessitated the inclusion of achievement-motivation and mathematics-anxiety as moderator variables in this study.

Achievement-motivation is an inner state or moves that energizes, activates and directs or channels behaviour towards goals. It influences how and why people learn as well as how they perform and have been shown to be a strong predictor of student's achievement (Amosun, 2002). It is a general term applying to the entire class of drives, desires, needs, wishes and similar forces that stimulates students to act in a better way to achieve stated objectives. Achievement-motivation, according to (Weiner, 1990), is a pivotal concept in most theory of learning and is closely related to arousal, attention and feedback/reinforcement. For example, a person needs to be motivated enough to pay attention while learning. Receiving a reward or feedback for an action usually increases the likelihood that the action will be repeated (Weiner, 1990). Achievement-motivation is a variable identified by educational psychologists and Mathematics educators as both personal and environment variable that could be manipulated in favour of academic gain; and according to Tella (2003), it is a popular and leading moderating variable. Gesinde (2000) posits that the urge to achieve varies from one individual to the other; while for some individuals, the need for achievement is very high, for others it may be very low. He asserts further that, those who have high achievers as their role models would develop high need to achieve, while those who have low achievers as their models hardly develop the need to achieve. Aremu (1998) explained that, when pupils express lack of interest in a subject, it affects the way they listen to the teacher and consequently their performance in the subject.

Mathematics-anxiety has been described as an inhibiting factor in the learning of Mathematics which results in an inconceivable dread of Mathematics that can interfere with manipulating numbers and solving mathematical problems within a variety of everyday life and academic situations

(Furners and Duffy, 2002). The physical symptoms accompanying this dread include dry mouth, sweaty palms, upset stomach or headache. Without any doubt, all the symptoms above lead to poor achievement in Mathematics. In the context of Mathematics learning, each student has a unique level of mathematics-anxiety at which they perform best. Umoinyang (1999) submitted that an individual would need to experience a moderate amount of anxiety in order to achieve well. However, excessive amounts of mathematics-anxiety about Mathematics or the complete lack of that anxiety usually produce low achievement. Factors such as previous negative experiences, parental dissociation, low confidence, classroom atmosphere and negative subject-matter-attitude combined to cause the anxiety reaction which reveals itself physiologically in what is known as mathematics-anxiety (Fotoples, 2000). For the purpose of this study, mathematics-anxiety refers to the frustration and helplessness felt by the learner when faced with a situation in which mathematical procedures are necessary. Students experiencing mathematics-anxiety are less able to perform basic computational operations and therefore their achievement in Mathematics suffers (Furner & Duffy, 2002).

In recent years, some research studies have shown that anxiety has impaired achievement in a wide range of cognitive functions including attention, memory concept formation and problem-solving (Spielberger, 2006). Zengru & Xinbing (2009) investigated the impact of mathematics-anxiety on students' achievement in Mathematics and concluded that excessive amount of anxiety about Mathematics or the complete lack of it resulted in low achievement in Mathematics.

Consequent upon the fact that the conventional method of learning Mathematics in most Nigerian secondary schools does not give learners the opportunity to learn at their own pace and has not been yielding the desired learning outcomes in the subject, and coupled with the established fact that the mastery learning strategy could be influenced by some learners' personality variables, the present study investigated the effect of mastery learning instructional strategy and the moderating effects of achievement-motivation and mathematics-anxiety on junior secondary school students' achievement in Mathematics. The study is guided by the following null hypotheses.

Hypotheses

Ho_1: There is no significant main effect of instructional strategy (treatment) on the students' achievement in Mathematics

Ho_2: There is no significant main effect of achievement-motivation on the students' achievement in Mathematics

Ho_3: There is no significant main effect of mathematics-anxiety on the students' achievement in Mathematics

Ho_4: There is no significant interaction effect of instructional strategy, mathematics-anxiety and achievement-motivation on the students' achievement in Mathematics.

II. METHODOLOGY

The pre-test, post-test, control group quasi-experimental design involving 2 x 2 x 2 factorial matrix was employed in the conduct of this study. The independent variable, instructional strategy, was manipulated at two levels namely: Mastery Learning Instructional Strategy (MLIS) and Conventional Method (CM). The two moderator variables, achievement-motivation and mathematics-anxiety, both occurred at two levels: High and Low.

The target population comprised all the public Junior Secondary School year two students (JSS2) in Ijebu North East Local Government Area, Ogun State.

Participants in the study were drawn from four public Junior Secondary Schools in the selected Local Government Area using purposive sampling technique. The schools were chosen based on availability of qualified Mathematics teachers for the quasi-experiment. The willingness of the principals and Mathematics teachers to participate in the study was considered in the selection of schools. JSS 2 class was considered appropriate for the study first because it is neither a certificate class (JSS 3) nor a transformation class (JSS 1) and secondly because JSS 2 class exists in all the public secondary schools in the selected local government area and the students are matured to the extent of being exposed to individualized mastery learning strategy. One intact class (an arm of JSS2) was randomly selected and assigned to the experimental and control group. All the students in each chosen class participated in the study. The participants were assigned to control and experimental group by simple random sampling technique. In all, one hundred and forty-four (144) JSS students (mean age is 12.2 years) took part in the study.

Two procedural instruments, one measurement instrument and two classification instruments provided the needed framework for the collection of valid and reliable data for the study. These are:

i. Mastery Learning Instructional Strategy Guide (MLISG)
ii. Conventional Method Guide (CMG)
iii. Mathematics Achievement Test (MAT)
iv. Motivation to Learning Mathematics Questionnaire (MTLMQ)
v. Mathematics Anxiety Rating Scale (MARS)

(i) *Mastery Learning Instructional Strategy Guide (MLISG)*

The MLISG is researchers designed procedural instrument which describes the step by step approach to instruction in the mastery learning strategy class. It is a seven step guide for participants in the experimental group.

(ii) *Conventional Method Guide (CMG)*

The CMG is also researchers developed guide for instruction in the conventional method class. It is a five step guide for participants in the control group.

(iii) *Mathematics Achievement Test (MAT)*

The MAT is a 50-item multiple choice objective test with five options per item developed and validated by the

researchers to measure students' achievement in the Mathematics topics covered in the study. The major topics covered were taken from the Junior Secondary School (JSS2) Mathematics Curriculum. These are: Angles (sum of angles of a convex polygon, angles of elevation and depression); Data presentation (ordered presentation of data or frequency table, pie-charts) and Probability (occurrence of chance events in everyday, probability of chance events).

An initial pool of 150 multiple choice objective test items was developed from a table of specification drawn to reflect knowledge, comprehensive and application tasks using past questions (standardized test items) of Junior Secondary School Certificate Examination (JSSCE) in Mathematics, and covering the six content areas covered in the study. The 50 items that survived the item analysis procedure constituted the MAT. The 50-item MAT was administered on a sample of 80 JSS 2 students (40 males and 40 females) randomly selected from one school outside the area of study to test its reliability. The test-re-test method was used, with the first and second administration done within two weeks interval. The Pearson Product Moment Correlation coefficient obtained was 0.87, thus affirming that it is a reliable instrument for the study.

(iv) *Motivation to Learning Mathematics Questionnaire (MTLMQ)*

MTLMQ is a thirty-five (35)-item questionnaire adapted from Motivation for Academic Study Scale (MASS) (r = 0.82) by Osiki (2001). The MTLMQ was used as a classification instrument to measure the extent to which students' achievement in Mathematics is influenced by their motivation to learning Mathematics. MTLMQ is a five point Likert type scale to with responses ranging from 1 to 5, where 1 stands for less motivated and 5 for highly motivated. The instrument had two sections. The first section sought demographic data on the respondents' age, sex, class, name of school etc. while the second section had 35 items to which the participants were expected to respond by indicating how high they think, react or believe in each item.

The revised MTLMQ was presented to experts in Mathematics education for scrutiny, comments and criticism to ascertain its suitability for the present study involving JSS students. The comments and suggestions of the experts were incorporated into the final draft used for data collection. In ascertaining the reliability of the instrument, it was administered on the same set of 80 JSS2 students used for MAT validation. A correlation coefficient of 0.89 was obtained at the end of the administration using test re-test reliability method within two weeks interval.

(v) *Mathematics Anxiety Rating Scale (MARS)*

MARS is a twenty-four (24) items questionnaire adapted from Mathematics Anxiety Rating Scale (MARS) by Plake and Parker (1982). Five items from the initial instrument were modified to suit the purpose, level and social understanding of the participants. A reliability coefficient of 0.84 was reported for the initial instrument. The MARS was used as a classification instrument to measure the students' level of mathematics-anxiety. It is a 5-point Likert type scale with responses ranging from 1 to 5, where 1 indicates low mathematics-anxiety and 5 indicates high mathematics-anxiety.

The revised MARS was presented to experts in Mathematics education and a psychologist for scrutiny, comments and criticisms to ascertain its content validity and suitability for the present study involving JSS students. The comments and suggestions of the experts were incorporated into the final draft used for data collection. In ascertaining the reliability of the instrument, it was administered on the same set of 80 JSS2 students used for MAT validation. A correlation coefficient of 0.88 was obtained at the end of the administration using test re-test reliability method within two weeks interval.

III. PROCEDURE

After due permission of the principals of the chosen schools, the researchers had close rapport with the participating Mathematics teachers and students to obtain their maximum co-operation, motivate and encourage them for the conduct of the study. The training programme for the participating teachers lasted for a day using the instructional guides for the experimental and control groups. The students that were assigned to the experimental group were exposed to orientation activities on Mastery Learning Strategy. The students were taught the social skills and rules guiding the principles and use of mastery learning strategy. The students assigned to the control group were addressed by the researchers on the objectives and importance of the study. The experiment which took eight weeks was done in three stages namely pre-test (one week), actual teaching (six weeks) and post-test (one week). There was no alteration on the time table allocated for Mathematics in the selected schools. Four (4) periods of 40 minutes each was spent each week for the eight weeks.

Pre-test (one week): During this week, all the participating students responded to the two classification instruments, MTLMQ and MARS. They thereafter took the MAT. This took place in each of the participating schools separately to avoid unnecessary mix-up and possible interaction of the participating students.

Actual teaching (six weeks): During this period, the experimental group was exposed to mastery learning strategy while the control group was exposed to conventional method.

Post-test (one week): During this week, the MAT was re-administered on the students as post-test. The items on the MAT were however rearranged before its final administration on the students.

Inferential statistics involving analysis of covariance (ANCOVA) test and its accompanying multiple classification analysis (MCA), with pre-test scores as covariates, was used to test the seven hypotheses raised in this study. The test was done at the .05 level of significance.

IV. RESULTS

Ho_1: There is no significant main effect of instructional strategy on the students' achievement in Mathematics

Table 1. Summary of analysis of covariance of students' achievement scores according to instructional strategy, achievement-motivation and mathematics-anxiety

Source of Variation	Sum of Square	Df	Mean Square	F	Sig.
Covariate (Pre-test)	18937.831	1	18937.831	1288.232	.000
Intercept	197.649	1	197.649	13.445	.000
Main Effects					
Treatment	99.817	1	99.817	6.790	.010*
Motivation (AM)	5.880	1	5.880	.400	.528
Mathematics Anxiety (MA)	85.713	1	85.713	5.831	.017*
2 Way Interaction					
Treatment x Motivation	53.800	1	53.800	3.660	.058
Treatment x M. Anxiety	5.652	1	5.652	.384	.536
Motivation x M. Anxiety	23.203	1	23.203	1.578	.211
3 way Interaction					
Treatment x AM x MA	6.826	1	6.826	.464	.497
Explained	45055.386	8	5631.923	383.107	.000
Residual	1984.586	135	14.701		
Total	47039.972	143			

* denote significant F at $P < 0.05$ R Squared = .958 (Adjusted R^2 = .955)

The result in table 1 revealed significant outcome ($F_{(1, 135)} = 6.790$, $P < 0.05$) for the main effect of treatment (instructional strategy) on achievement scores in Mathematics. This outcome implied that the post-test mean achievement scores of the students exposed to Mastery Learning Instructional Strategy and the Conventional Method are significantly different. Hence, the null hypothesis one is rejected.

The result of the Multiple Classification Analysis (MCA) presented in table 2 below revealed the magnitudes of the post-test mean achievement scores of the students in the experimental and control group. This is to expose the better of the two groups in terms of post-test achievement scores.

Table 2. Multiple classification analysis of the students' achievement scores according to treatment, achievement-motivation and mathematics-anxiety

Grand Mean = 41.270					
Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independents + Covariates	Beta
Instructional Strategy					
1. Mastery Learning	69	- 0.164		2.543	
2. Conventional	75	- 2.274	.048	- 0.106	.22
Achievement Motivation					
1. Low	60	- 1.431		0.891	
2. High	84	- 0.934	.003	1.473	.05
Mathematics Anxiety					
1. Low	77	- 0.019		2.170	
2. High	67	- 2.392	.040	0.239	.20
Multiple R squared					**.958**
Multiple R					**.978**

The result in table 2 revealed the magnitudes of the adjusted post-test mean achievement scores of the students exposed to the two instructional strategies. With a grand mean of 41.270, the students exposed to mastery learning instructional strategy recorded better post-test mean achievement score of 43.813 (41.270 + 2.543) than the students taught using the conventional method who recorded post-test mean achievement score of 41.164 (41.270 – 0.106). This outcome revealed that MLIS, with the better post-test mean achievement score, had the greater potency at effecting students' achievement in JSS Mathematics. Thus, the obtained significant difference in instructional strategy is in favour of mastery learning instructional strategy.

The result in table 2 further revealed that while instructional strategy alone accounted for 4.84% (R^2 = 0.0484) of the variance in the students' achievement scores, the independent and moderator variables jointly accounted for 95.8% (R^2 = 0.958) of the variance in the students' post-test achievement scores in JSS Mathematics.

Ho_2: There is no significant main effect of achievement-motivation on the students' achievement in Mathematics

The result in table 1 revealed no significant main effect of achievement-motivation on the students' achievement scores in Mathematics ($F_{(1, 135)} = 0.400$, $P > 0.05$). This outcome implied that the post-test mean achievement scores of the students having low and high achievement-motivation are not significantly different at the .05 level of significance. As a result, the null hypothesis two cannot be rejected.

However, the result of the MCA in table 2 showed that the students having high achievement-motivation recorded higher adjusted post-test mean achievement score of 42.743 (41.270 + 1.473) than the students with low achievement-motivation that recorded adjusted post-test mean achievement score of 42.161 (41.270 + 0.891). The difference in the obtained mean achievement scores is not statistically significant. The result in table 2 further revealed that achievement-motivation alone accounted for 0.3% (R^2 = 0.003), less than 1%, of the variance in the students' achievement scores in JSS Mathematics.

Ho_3: There is no significant main effect of mathematics-anxiety on the students' achievement in mathematics

The result in table 1 revealed significant outcome ($F_{(1, 135)} = 5.831$, $P < 0.05$) for the main effect of mathematics-anxiety on the students' achievement scores in Mathematics. This outcome implied that the post-test mean achievement scores of the students having low and

high mathematics-anxiety are significantly different. Hence, the null hypothesis three is rejected.

The result of the MCA in table 2 however revealed that the students having low mathematics-anxiety recorded better adjusted post-test mean achievement score of 43.440 (41.270 + 2.170) than the students with high mathematics-anxiety that recorded adjusted post-test mean achievement score of 41.509 (41.270 + 0.239). The difference in the obtained mean achievement scores is statistically significant. Thus, the obtained significant difference in mathematics-anxiety is in favour of the students having low mathematics-anxiety. The result in table 2 also revealed that mathematics-anxiety alone accounted for 4% (R^2 = 0.04) of the variance in the students' achievement scores in JSS Mathematics.

Ho_4: There is no significant interaction effect of instructional strategy, achievement-motivation and mathematics-anxiety on the students' achievement in Mathematics

The result of the 3-way interaction effect of treatment, achievement-motivation and mathematics-anxiety revealed no significant outcome ($F_{(1,135)} = 0.464$, $P > 0.05$).

This implied that the students' achievement scores in Mathematics after exposure to MLIS and CM do not vary significantly among students having different levels of achievement-motivation and mathematics-anxiety combinations (i.e. low AM-low MA, low AM-high MA, high AM-low MA and high AM-high MA). Hence, the null hypothesis seven is not rejected. That is, there is no significant interaction effect of treatment, achievement-motivation and mathematics-anxiety on the students' achievement scores in JSS Mathematics.

V. Discussion of Findings

The major finding in this study revealed that mastery learning instructional strategy is better than the conventional method in enhancing the students' achievement in JSS Mathematics. It also found that mathematics-anxiety is an important factor in explaining JSS students' achievement in Mathematics. However, mastery learning instructional strategy does not interact with mathematics-anxiety and achievement-motivation to significantly affect the students' achievement in JSS Mathematics. These findings have some educational implications for Mathematics teaching and learning at the JSS level.

The finding that mastery learning instructional strategy is superior to the conventional method is not surprising because the MLIS is not just learner-centred which allows learners to actively participate in the teaching learning process, it also provides students with the opportunity to learn at the individual level thus enabling them to attain significant level of mastery of one content before proceeding to the next. This outcome is not new in literature as it corroborates earlier findings by Arlin and Webster (2003), Fawole (2006), Watkins (2009) and Chauhan (2010) that reported significant outcomes in favour of mastery learning instructional strategy in the teaching and learning of Mathematics. This finding has thus further confirmed the superiority of child-cantered approach to learning over teacher-cantered approach in teaching Mathematics topics or contents.

The study also reported significant main effect of mathematics-anxiety on the students' achievement in JSS Mathematics. This finding revealed that when mathematics-anxiety is low or kept low, the students are likely to perform better in Mathematics. The finding that the students having low mathematics-anxiety performed better in Mathematics than their counterparts with high mathematics-anxiety is probably due to the fact that anxiety as a psychological construct is an emotional condition which has to do with fear and the feeling of uncertainty about the future. Hence, the less the students have such anxiety, the more they settle down and face the tasks before them and the better outcome they record in such tasks including learning Mathematics contents. This finding confirms the findings of Pitney (2005) and Zengru & Xinbing (2009) who reported that low mathematics-anxiety leads to students high achievement in Mathematics while high mathematics-anxiety or non-anxiety result in student's low achievement in Mathematics. This finding is however at variance with the submission of Perry (2004) that secondary school students' achievement in Mathematics have nothing to do with mathematics-anxiety.

The finding that achievement-motivation does not significantly influence students' achievement in Junior Secondary School Mathematics is in conflict with the finding of Rogers (2008) who submitted that students with high need to achieve obtain better grades in courses and that all individual have a drive that motivates learning. The non-significant outcome of achievement-motivation in this study is not unconnected with the age and level of the participants which places less importance on arousing interests, creating relevance, developing an expectancy of success and producing satisfaction through intrinsic/extrinsic rewards that are all indices of achievement-motivation.

VI. Conclusion and Recommendation

The process of teaching and learning Mathematics can be viewed most aptly as a highly complex human interaction in an institutionalized setting, that is, an interaction which forms a distinctive part of students' life. It is a kind of mutual influence, an inter-dependence of actions of both teacher and students on many levels. It would be important, therefore to incorporate some elements of interaction between the teacher and student on one hand and between student and student on the other in the teaching learning process.

The ineffectiveness of the conventional method of teaching Mathematics in the secondary schools in Nigeria led to the use of mastery learning instructional strategy in this study. The result revealed that Mathematics contents could be taught in more meaningful ways to learners when MLIS is used. That is, the present study has shown that mastery learning instructional strategy is more effective than the conventional method, and that mathematics-

anxiety is a student personal variable that should not be ignored if improved achievement is the expectation of stake holders in Mathematics teaching and learning.

In the light of the findings in this study, the following recommendations are suggested:

- There is need to popularise mastery learning instructional models through training and re-training workshops, seminars and in-service training programmes.
- Mathematics teachers at the junior secondary school classes should be encouraged to learn and use MLIS for the purpose of instructing learners on a regular basis.
- Mathematics teachers at the JSS level should develop strategies that would help reduce the mathematics-anxieties of learners for the purpose of reducing learners' fears during Mathematics instruction.
- Appropriate feedback and reward system should be built into the teaching learning process by Mathematics teachers to improve learner's achievement-motivation.
- Furthermore, authors and curriculum developers should formulate specific behavioural objectives for each topic. Mathematics textbooks should also be developed to include appropriate diagnostic tests and evaluation questions based on the behavioural objectives at the beginning and the end of each topic.
- In addition, textbooks in form of programmed instruction that will encourage learners to think for themselves and work individually on their own to the point of mastery of pre-requisite contents should be developed by authors and publishers of Mathematics texts.

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AUTHOR'S PROFILE

Dr. Adebola S. Ifamuyiwa is an Associate Professor of Mathematics Education in the Department of Science and Technology Education (STED), Faculty of Education of Olabisi Onabanjo University, Ago-Iwoye, Ogun State, Nigeria. He is a Fellow of the Science Teachers Association of Nigeria (STAN) and the present head of department of Science and Technology Education.

Mrs. Iyabode E. Rosanwo is a Principal Lecturer in the Department of Mathematics, School of Science of Tai Solarin College of Education, Omu-Ijebu, Ogun State, Nigeria. She is active member of the Science Teachers Association of Nigeria and the Mathematical Association of Nigeria. She was the immediate past head of department of Mathematics in the college.