

## Efficacy of Differentiated Instruction and Conventional Methods on Low Achievers' Interest in Learning and Gender

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### Abstract

The need to seek for innovative teaching methods to enhance the interest of mathematics low achievers necessitated this study. This study examined the effect of differentiated instruction on low achievers' interest in mathematics based on gender. The sample size for the study consists of 66 males and 80 females identified mathematics low achievers. The researchers used multi-stage sampling technique. Mathematics Interest Rating Scale was the instrument used in collecting data. The pre-test and post-test data were analyzed using mean, standard deviations and Analysis of Covariance. Results revealed that the use of differentiated instruction in teaching mathematics low achievers in primary school increased their interest in mathematics than conventional method. Influence of gender on interest of mathematics low achievers is significant. The interaction effect of instructional strategies and gender on mathematics interest of low achievers is not significant. The study provided empirical evidence that differentiated instruction acted as valuable tool for enhancing interest and achievement in mathematics therefore, researchers may benefit from the outcome of this article for further research. The data could serve as reference point for empirical study. Curriculum designers and text books authors may include information on the method in children's' text book.

### Keywords

Interest, Mathematics, Achievement, Low achievers, Differentiated instruction, Gender.

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## INTRODUCTION

Learners have complex learning needs with pupils of different levels of understanding. This is true where children of diverse backgrounds are found in a classroom. It has been noted through careful observation that pupils in primary school in Abuja, Nigeria have low interest in mathematics. Mathematics is the study and manipulation of numbers shapes, objects, structures, which develop through logical reasoning as in counting, measurement, and calculation to solve mathematical problems, Mathematics is a notable ingredient that organizes the abstract elements of sciences to promote

technological development of nations globally. It involves logical and rational thinking to solve mathematical problems. The level of individual reasonable and logical thinking determines individual level of achievement in mathematic. Some of these indicators are lack of eagerness and enthusiasm, lack of readiness to receive the teacher through positive words, lack of genuine smiling faces and absentmindedness resulting in inattentiveness and lack of full cooperation with the teacher. This is practically demonstrated in pupils' attitude ranging from insensibility to lack of full cooperation with the teacher are on the increase in mathematics classes. The low achievers do not answer questions correctly in classes and sometimes appear not to understand the content in mathematics classes. The above problems show lack of interest in mathematics classes. This may be linked to the type of teaching strategy (conventional strategy) adopted by mathematics teachers in primary school. Pupils' interest could determine their achievement especially in mathematics and may be associated with the gender of pupils. The study focused on the efficacy of differentiated instruction based on gender, interest in learning and academic achievement of mathematics low achievers.

Gender is a natural state of being recognized as male or female. Gender is seen as roles, and regulations, principles and community way of life designed by the cultural elements and the community for male and female in the community. The argument on which gender (male or female) performs better in mathematics remains unresolved especially in primary schools. Achor, Imoko & Ajai (2013) investigated the effect of games and simulations on gender related differences in mathematics achievement and interest of students in geometry in Benue State. Findings revealed that male and female students taught using games, and simulations did not differ significantly both in achievement and in interest. The above study is related to the present study as both studies have gender and interest as related variables. However, both studies differ because the present study examined the efficacy of differentiated instruction on primary school pupils' interest and achievement in mathematics. Another research study conducted by Kiptim, Rono, Too, Bill & Too (2013) on gender difference in Mathematics performance. The purpose of the study was to find out the gender differences in mathematics achievement of students in Keiyo South District, Kenya. It was established that majority of the students' (males and females) had a positive attitude towards learning of mathematics. However, the results showed that males were more inclined to positive attitudes than females.

Ajaii and Imoko (2015) assessed gender differences in mathematics achievement and retention by using Problem-Based Learning (PBL). The purpose of the study was to determine the extent to which Problem-Based Learning (PBL) can enhance mathematics achievement and retention. The study revealed that male and female students taught algebra using PBL did not significantly differ in achievement and retention scores, thereby revealing that male and female students are capable of competing and collaborating in mathematics. In addition, the finding showed that performance is a function of orientation, not gender. This implies that when there is no discrimination in the upbringing of pupils in relation to the choice of subject areas the tendency of female students competing with male and even performing better in science subjects is not ruled out. The present study is interested in differentiated instruction which has some of these qualities as against the normal conventional methods of teaching the pupils in Nigeria.

Conventional methods are content-based, chalk-talk strategy that places the pupils at the passive corner of the class and the teacher the principal actor and not facilitator. Pupils are not actively involved in the learning process and so no interactive features. According to Yew, Yap and Jay (2013), conventional methods are instructors initiate methods, which concentrate on cognitive domain with emphasis on remembering contents in the textbooks and pupils exercise books. In a related development, Chilwant (2012) carried out a study on conventional lectures project structured interactive in SAIMS Medical College in Indore, India. The purpose of the study was to determine the effect of project structured interactive lectures with conventional teaching method. The results reviewed that structured interactive lectures are better than conventional lectures as a teaching method. With conventional method, pupils receive passive information and participate passively in the classroom and memorize information and content for examination. Similarly, Ihedioha (2012) conducted a study on transmitter of knowledge and conventional teaching models on secondary school students' interest and achievement in circle

geometry and trigonometry in Nigeria. The purpose of the study was to explore the effectiveness of transmitter of knowledge model and Conventional Teaching. The results revealed that experimental group had better mean scores than the control group taught using the conventional method. Socian (2017) described conventional method of teaching as long-established customs that society traditionally used in schools and later it was realized that this method is more teacher centered and less student oriented, which, in future, can bring hurdles to their personal and professional growth. In conventional teaching, pupils have complete dependency on the teacher. Pupils do not try to seek information from other sources which can be helpful in expanding knowledge and mental boundary. Pupils learn what is being taught by the teacher. The method is less interactive. Shuchi (2017) added that conventional methods are teacher-based methods that lack healthy pupils-teacher interaction, and lead to complete dependency on the teacher. Mardianto and Wijaya (2016) carried out a study on the effect of contextual teaching and learning and conventional method on mathematics thinking ability of Islamic senior high school students in Medan. The purpose of the study was to know the differences in mathematics thinking ability of students' who were taught by using contextual teaching and learning with conventional method on the geometry material. The results indicated that there are differences in mathematics thinking ability. Students who were taught by contextual teaching and learning model had higher thinking ability than those of conventional model on the geometry material.

This implies, that conventional method of teaching does not encourage interactive activity could impede on the learner's interest. And with poor interest in mathematics, pupils might consistently perform poorly resulting in low achievement in school subjects especially in mathematics whenever taught with conventional method of teaching. Another study conducted by Nureni, Omotayo and Salaudeen (2016) worked on guided discovery, problem solving and conventional teaching methods on retention. The purpose of this study was to investigate the effect of guided discovery and problem-solving instructional strategies, in comparison to conventional teaching method, on retention of secondary school Chemistry students in Minna Metropolis, Niger State, Nigeria. The results showed that students in the experimental groups (guided discovery and problem solving) generally had higher mean retention scores in Chemistry than their counterparts taught chemistry with conventional teaching method (control group), and this indicates that guided discovery and problem-solving strategies have enhanced retention in Chemistry more than the conventional method of teaching. The conventional method limits creative thinking and has no consideration for individual differences in the learning process.

To challenge the above problems, the use of innovative teaching strategy like differentiated instruction is inevitable. Differentiated Instruction (DI) requires the use of different teaching techniques in the classrooms to improve the interest and achievement of different learners.

Differentiated instruction has the child's interest, readiness, background, achievement, problem at the center of learning. To add to this, Tomlinson (2015) described differentiated instruction as tailoring learning instruction to meet the learning needs of individuals such as boosting the interest and achievement of primary school pupils in multiplication and division of numbers in mathematics through the use of strategies like learning station, interest centers, teach-up, task board, and open-ended projects. The use of differentiated instruction yielded positive result when assessing success and challenges in the classroom in Trinidad (Thomas, Simonette, & Ramsook, 2013). This implies that differentiated instruction could enhance the interest and achievement of mathematics low achievers in Nigeria irrespective of the gender.

The use of DI present pupils with choices of teaching techniques that could assist them to learn new concepts and solve problems in relation to the concepts. DI present pupils with choices in terms of the pattern and model to learn a concept, how to use the idea in practice and solve related problems and how to get the pupils to be fully involve in the process of learning. A study conducted by Ascher, (2016) focused on poor, minority, and low ability students with reference to gender. The purpose of the study was to seek for solution for mathematics low achievement in New York. The results indicated that the most effective programs have included the following elements: individualized and small group instruction, calculator usage, laboratory work, cross-age tutoring, remedial pull out, and team games.

The planning requires enough time but (DI) is widely considered best practice as it serves to meet the needs of all students (Carlson, 2015).

The use of DI requires teachers to fashion out varieties of ways to solve individual learner's problem in a particular class. Every child has unique personal learning problem and it is an accepted fact that an effective teacher can manage any child no matter the learning problem. Complementing the above, Mulder (2014) described differentiated instruction as a strategy that varied learning needs and match them with appropriate teaching techniques using systematic process and procedures for performance monitoring and decision making. In a differentiated classroom, each learner with different learning styles is reached with different patterns to produce positive learning achievement and changes on the grounds that each learner learns differently and all necessary strategies needed to assist the learners to learn are considered. For Robb, (2015) differentiated instruction is a strategy of teaching that compel teachers to have full overview of pupil's academic progress, achievements and needs to enable them provide each one with learning experiences and techniques that could promote learning. This implies that, differentiated instruction works well when a teacher has comprehensive academic knowledge and achievement of the pupils and that will help the teacher to assist the pupils to learn better with every necessary pattern. Robb further presented some key principles that form the foundation of differentiated instruction as: formative and summative evaluation, learning needs assessments, collaborative learning, projects, and learning station.

Differentiated instruction is a teaching and learning approach that avail pupils with alternative options to learning new concepts and ideas. DI requires that learning activities and techniques should vary and be used in relation to divers learning needs in the classroom (Tomlinson, 2015). In a related development, Aluko (2008) carried out a study on cooperative instructional strategy on students' interest and performance in secondary school chemistry in Ambo University College, Ethiopia. The purpose of the study was to investigate the relative effectiveness of cooperative instructional strategy on students' performance in chemistry. The results of the analysis showed that there was a significant difference in the performance of chemistry students exposed to cooperative instructional strategy and those exposed to conventional teaching method. The cooperative instructional strategy was found to be more effective in enhancing better performance of the learners. It means teaching differently to address the diversity of pupils' needs to improve learning. Koeze (2007) posited that, DI requires partnership between pupils and teachers to use selected techniques effectively considering allotted time and lesson objectives. It has the child's, interest, readiness, background, achievement, problem, learning abilities and disabilities at the center of learning. For Knewton, (2014) it is the streaming of educational experiences to meet individual learner's needs. Differentiated instruction entails interactive activities such as collaborative, the use of learning stations and task board, encompasses varied home work; teach up, class discussion and questioning. The child is treated here as an individual.

Differentiated instruction is a strategy teacher use to meet varieties of pupils' needs taking note of each child's problem. Carlson (2015) noted that differentiated instruction is the way the teachers foresee and responds to different learning needs of pupils in the classroom. Similarly, Ganyaupfu (2013) carried out a research on teaching methods and students' academic performance. The purpose of the study was to investigate the differential effectiveness of other teaching methods on students' academic performance in South Africa. The results demonstrate that teacher-student interactive method was the most effective teaching method, followed by student-centered method while the conventional method approach was the least effective teaching method. In this way, teachers may have to modify and moderate the curriculum contents, learning process and outcome. In this study, differentiated instruction is an activity-based teaching strategy that involves the use of different techniques such as peer collaboration, guided personal study time, and activity projects to meet the learning needs of learners' capabilities in the same classroom. Differentiated instruction could have positive effect on pupils' interest and achievement in the classroom.

Interest, is a complimentary variable that determine levels of achievement in the classroom in relation to different subjects. At primary school level, interest is a determining factor with regard to achievements in mathematics. A comprehensive review by Subramaniam (2016) portrayed that

Interests have been noted as valuable motivational traits that influence pupil's involvement and achievement in learning activities. It plays a key role in influencing students' learning behaviors and intention to participate in the future (Chen, 2011). Interest is one's personal passion and curiosity generated internally that is highly sustained by the passion towards a particular object and activity until improved goal is achieved. According to Silvia (2011), interests are self-strengthening motives that prompt one into learning activities which also sustain the learning activities leading to positive achievement. It is one's emotion, mind set and determination which are linked with one's level of accomplishment in school. For Khayati and Payan (2014) interest is a stimulus that increases the activity power. Schiefele (2011) noted that interest is a persuasive variable that relates pupil's desires to learning activities and objects. Interest is the excitement and enthusiasm that is generated to accompany an activity and action that will lead to the achievement of the desired goal. According to Khayati and Payan, (2014), interest is a stimulus that originates, sustains, and increases one's desire and effort in an activity. Interest is a stimulus that increases the activity power. Interest according to Michelsen (2016) is the drive in learning and academic development; it could be seen as rational construct that exists between people, objects and learning activities. Interest could be a prevailing interaction between individuals, objects and learning activities

Chavan (2016) noted that the proper foundation in Mathematics knowledge laid at school should depend on the interest of pupils in Mathematics. If the students take interest in this subject then they can achieve better in Mathematics. That is why other areas of psychology argued that interest is a motivational variable for human development (Paul, 2011). The work of Shofoyeke (2016) focused on the impact of teaching methods on pre-primary school pupils' learning interest and achievement in protection issues in selected nursery and primary schools. The study found no significant main effect, however, pupils taught by demonstration method performed relatively better than play-way and conventional methods. Furthermore, the study found no significant main effect of gender and teaching methods on pupils' achievement scores.

In line with this, Kpolovie, Jeo and Okoto (2014) stated that interest in learning, is a powerful affective psychological trait and strong knowledge emotion as well as an overwhelming magnetic positive feeling. It encourages pupils to spend more time on school work (Lee, Hui & Chen 2011). To Frenzel, Goetz, Pekrun and Watt (2010), interest is a motivational variable that drives individuals to take up an engagement including learning activities, objects, and responsibilities. According to Lazardes and Ittel (2012), interest is a motivational instinct that is both intrinsic and extrinsic. It is a valued determinant that can lead to improved teaching and learning which in turn lead to high achievement in school. Pupils who are interested in school activities and learning activities could experience high achievement levels in all subjects.

Given this great importance of pupils' interest for their learning processes, it is highly problematic that interest may be considered to be on the declines in primary school. Interest is described as display of eagerness, concern and curiosity to get something done with positive results in mind. (Ivowi, 2011). The researchers observed that these attributes are lacking among pupils. To prove individual interest in a subject, it requires a display of effort in that area. This effort could be seen in the mode of repetition of learning activities without a feeling of tiredness but with renewed performance in relation to originality and innovation in the concern area. Interest of fulfillment becomes noticed when it has to do with problem-solving techniques. To sustain this interest, practical teaching method such as differentiated instruction becomes necessary in the sustenance of interest in school learning especially when it involves low achievers in mathematics.

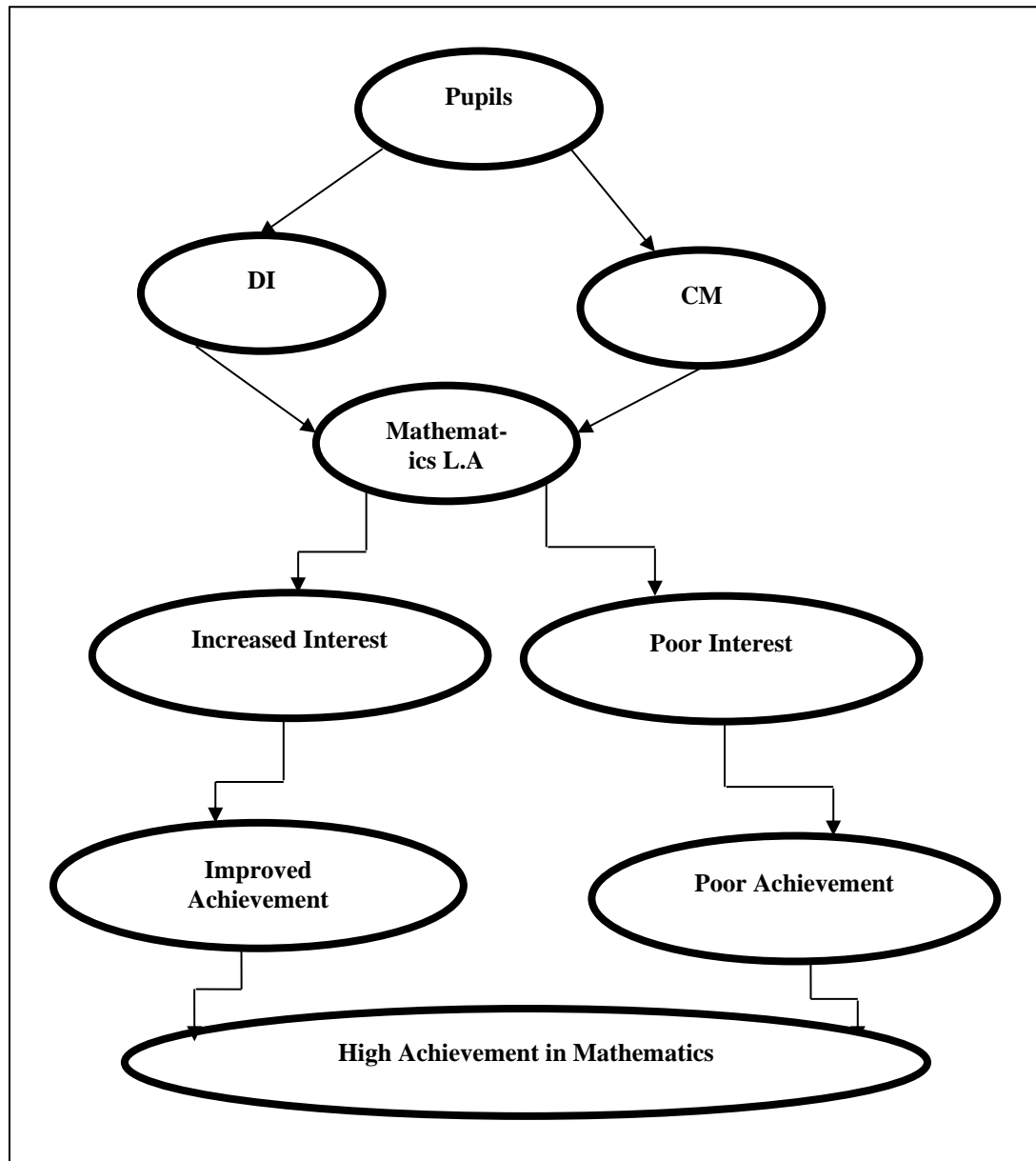
Lazardes and Ittel (2012) noted that interest in learning activities, projects and knowledge could determine high achievement in schools. Pupils who engage in learning activities with joy and intense feeling for knowledge may achieve high marks especially in mathematics. Given this great importance of pupils' interest in their learning processes, it is highly problematic that interest in mathematics substantially declines during primary school. In this study, interest is consistent exciting curiosity to absorb, retain instruction and apply the instruction to perform mathematical tasks and activities and to

learn new things in addition, subtraction, multiplication and division of numbers for better academic achievement.

Academic achievement is the outcome of the measurement of academic learning activities with academic instrument in the form of continuous assessment and examination. This means that school achievement is the measurement of knowledge attained in between and at the end of school term. It is the output of learning activities as measures by assessment and examination. It is the goal level the pupils, teachers and the school can be rated to have attained after a comprehensive learning process and evaluated using the school continuous assessment and examination. It is vital to note that achievement is the outcome of the pupils' academic effort; including investment of time, energy and cognitive work at home and in school. In this study, academic achievement in mathematics is the accomplishment in learning content as measured by continuous assessment and examinations after teaching. The level of pupils' academic achievement determines whether one can be classified as low achievers in mathematics.

Mathematics low achievers are pupils who are consistently failing mathematics homework, class work, continuous assessment tests and examinations for a period of time. According to Okpale (2016), Mathematics low achievers are pupils who constantly score low marks in their mathematics continuous assessment tests and examination. These are pupils who consistently score below 40 out of 100 which is below class average in mathematics class activities and examinations. Mathematics low achievers are pupils who do not perform well consistently in mathematics class. Mathematics low achievers are children whose previous records in mathematics from their previous classes for six terms portray low performance (below 40%). Pupils who could be considered as low achievers consistently achieve below average marks of calculated class average and are challenged with solving mathematics problems that pupils of their age can solve. Yew, Yap and Tay (2013) described mathematics low achievers as pupils who have not done well in mathematics in the past terms and consistently scored below 40% in summative and formative assessment in primary school. In this study, Mathematics low achievers are pupils who are assessed as constantly achieving low scores in mathematics activities ranging from class work, homework, class exercises and performances among classmates in mathematics. Mathematics low achievers are pupils who find it difficult to understand mathematic contents, solve mathematical problems correctly and score below class average consistently in continuous assessment, test and examination. Mathematics low achievers are pupils who are scoring low marks consistently in homework, class work, test and examination and struggle with mathematics in the classroom. These pupils tend to struggle with using a conventional approach of learning to accomplishing assignments. According to Alavinia and Farhady (2012), mathematics low achievers are pupils who are struggling with mathematics exercises and characterized as pupils with special learning needs. The following also contains attributes of mathematics low achievers; learning difficulties, disorganized, inattentiveness, academic laziness, lack of attentions, low self-esteem, absenteeism, peer dependence, indiscipline, narrow interest range, lack of social traits, inability to face pressure and lack of motivation.

As shown in the schematic relationship, the study examined the effect of differentiated instruction on interest of mathematics low achievers based on gender. Specifically, the study determined: (i) the influence of gender on interest of mathematics low achievers in primary school. (ii) The influence of gender on interest of mathematics low achievers in primary school. (iii) Interaction effect of instructional strategies and gender on interest of mathematics low achievers in primary school. The following research questions and null hypotheses guided the study: What is the effect of differentiated instruction on the interest of mathematics low achievers in primary school? What is the influence of gender on interest of mathematics low achievers in primary school? What is the interaction effect of instructional strategies and gender on interest of mathematics low achievers in primary school? There is no significant difference in the interest of primary school mathematics low achievers exposed to differentiated instruction and those exposed to conventional methods. The influence of gender on interest of mathematics low achievers in primary school is not significant. The interaction effect of instructional strategies and gender on interest of mathematics low achievers in primary school is not significant.



**Figure 1:** Schematic Relationship among Differentiated Instruction, Achievement and Interest of Mathematics Low Achievers in Primary School

## RESEARCH METHOD

Quasi-experimental research design was applied to determine the effect of differentiated instruction on primary school mathematics low achievers' interest in learning. It is non-randomized pre-test, post-test, non-equivalent experimental and control group design with experimental group receiving treatment. Quasi-experimental design establishes cause and effect relationship. It is a design that can be used for cause and effect study (Ramalingam, 2006).

This study was carried out in Nigeria. This was because of pupils' poor persistent achievement in mathematics. Public primary schools were used because of the pupils' persistent poor achievement in mathematics. Sample size for the study was 146 (66 males and 80 females) identified mathematics low achievers drawn from six intact classes in the Area Council of the study. Multi-stage sampling technique was applied. Firstly, the researchers used simple random sampling to draw six Area Councils in the

Federal Capital Territory. Second, the researchers applied purposive sampling technique to selected six public primary schools. Third, primary 4 classes with high records of mathematics poor achievement were selected. Fourth, simple balloting was used to assign the six primary 4 intact classes to experimental and control groups.

## INSTRUMENTATION

Mathematics Interest Rating Scale (MIRS) were used in collecting the data for the study. Mathematics Interest Rating Scale (MIRS) is a four-point rating scale adopted from Ali & Waleed (2014). The authors used an attitude scale which is sub-divided into four sub-sections as follows: self-efficacy (SE) with eight items, Enjoyment (E) column with eight items, anxiety (A) column with seven items and Relevance (R) column with eleven items. Enjoyment was adapted and reframed to form the present Mathematics Interest Rating Scale (MIRS). MIRS were used to measure the interest of pupils in mathematics before the training and after the training session. The 20 item MIRS was designed and administered on both the treatment and the control groups before and after the study. The scale ranges from Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1), the items of the instrument were reshuffled and administered for post-test. The pre-test and post-test data obtained from the administration of Mathematics Interest Rating Scale were analyzed using mean and standard deviations for research questions and Analysis of Covariance (ANCOVA) for testing the hypotheses. The choice of analysis of covariance is because pre-test and post-test were involved and therefore determine whether there is any significant difference between groups based on the mean scores. Mathematics Interest Rating Scale (MIRS) was subjected to face validation by three experts in Faculty of Education in University of Nigeria Nsukka, two in Educational Psychology Unit of Educational Foundations Department and one in Mathematics Education of Science Education Department. A trial test was conducted to determine the internal consistency reliability of the instruments. Cronbach Alpha was used to measure the internal consistency of MIRS. Cronbach Alpha method was used due to the fact that the items had no right and wrong answers as they were not dichotomously scored. Mathematics Interest Rating Scale (MIRS) yielded a reliability estimate of .92.

## EXPERIMENTAL PROCEDURE

In carrying out the experiment, the pupils' in the treatment and control groups were pre-tested with MIRS instrument before carrying out the treatment. The treatment involves teaching the experimental group using Differentiated Instruction (DI) as stated below.

Week 1	There was interaction led by the researchers with the pupils and social and academic background information were obtained. Then administration of pre-test using Mathematics Interest Rating Scale (MIRS) was done.
Week 2	The researchers administered differentiated instruction in teaching multiplication of two-digit numbers by 1-digit numbers and in teaching 3 by 1-digit numbers to the experimental group.
Week 3	Individualized coaching strategies was used in teaching multiplication of 2 by 2-digit and 3 by 3-digit numbers to the experimental group.
Week 4	The researchers applied the use of collaborative, questioning and varied homework strategies in teaching multiplication of factors of numbers and collaborative, task board, and teach-up in teaching word problems.
Week 5	Class discussion, collaborative, questioning and individualized coaching strategies were used in teaching division of 2-digit numbers and 3-digit numbers without remainder.
Week 6	The researchers applied collaborative, independent work, and individualized feedback strategies in division of 3-digit numbers with remainder to the experimental group.
Week 7	Mathematics Interest Rating Scale was reshuffled and administered to the experimental group. For the control group was done using directed conventional teaching strategy and each lesson lasted for 40 minutes. By the



end of the experiment, the reshuffled Mathematics Interest Rating Scale was used for post-test in both the experimental and control groups.

## RESULTS

Variable	N	Pretest		Posttest		Mean gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Teaching Strategies						
Differentiate instruction	74	2.34	0.23	3.53	0.29	1.19
Conventional Method.	72	2.29	0.21	2.96	0.28	0.67

**Table 1:** *Pretest and posttest mean interest scores of mathematics low achievers in primary school taught using differentiated instruction (DI) and those taught with the conventional strategy*

The result presented in Table 1 shows the pretest and posttest mean interest scores of mathematics low achievers in primary school taught using differentiated instruction (DI) and those taught with the directed and dictated strategy (control group). The result indicates that the pretest mean interest score of mathematics low achievers taught using differentiated instruction- DI (experimental group) was 2.34 with a standard deviation of 0.23 and a posttest mean interest score of 3.53 with a standard deviation of 0.29. The mean gain between the pretest and posttest mean interest scores of mathematics low achievers taught using differentiated instruction-DI (experimental group) was 1.19. The results also show that the control group had a pretest mean interest score of 2.19 with a standard deviation of 0.21 and a posttest mean of 2.96 with a standard deviation of 0.28. The mean gain between the pretest and posttest mean interest scores of mathematics low achievers in the control group was 0.67. For both experimental and control groups, the posttest mean interest scores obtained were greater than the pretest mean interest scores, with mathematics low achievers taught using differentiated instruction-DI (experimental group) having a higher mean gain. This implies that differentiated instruction (DI) increased the interest of mathematics low achievers than the directed and dictated strategy.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	13.773 <sup>a</sup>	4	3.443	47.388	.000
Intercept	20.620	1	2.0620	283.792	.000
preInt	1.147	1	1.147	15.788	.000
Strategies	13.055	1	13.055	179.677	.000
Gender	.599	1	.599	8.250	.005
Strategies*Gender	.015	1	.015	.205	.651
Error	10.245	141	.073		
Total	1566.467	146			
Corrected Total	24.017	145			

**Table 2:** *Analysis of Covariance (ANCOVA) of the difference in the interest of mathematics low achievers in primary school exposed to differentiated instruction (experimental group and those exposed to conventional strategy (control group)*

The result in table 2 shows that an F-ratio of 179.677 with associated probability value of 0.000 was obtained with respect to the difference in the interest of mathematics low achievers in primary school exposed to differentiated instruction (experimental group) and those exposed to directed and dictated strategy (control group). since the associated probability (0.000) was less than 0.05 set as criterion for taking a decision, the null hypothesis two ( $H_{01}$ ) was hence rejected. Therefore, the conclusion drawn was that there was a significant difference in the interest of mathematics low achievers in primary school exposed to differentiated instruction (experimental group) and those exposed to directed and dictated strategy (control group). This means that the use of differentiated instruction in teaching mathematics low achievers in primary school appears to increase their interest in mathematics more than the conventional strategy.

The result in Table 2 also indicated that an F-ratio of 8.250 with associated probability value of 0.005 was obtained with respect to the influence of gender on interest of mathematics low achievers in primary school. Since the associated probability (0.005) was less than 0.05 set as the benchmark for taking a decision, the null hypothesis three ( $H_{03}$ ) was therefore rejected. Hence, inference drawn was that the influence of gender on interest of mathematics low achievers in primary school was significant. The result, F-ratio of 0.205 with associated probability value of 0.651 was obtained with respect to the interaction effect of instructional strategies and gender on mathematics interest of mathematics low achievers in primary school. Since the associated probability (0.651) was greater than 0.05 set as criterion for taking a decision, the null hypothesis five ( $H_{03}$ ) was accepted. Hence, the conclusion drawn was that the interaction effect of instructional strategies (differentiated instruction and lecture method) and gender on mathematics interest of mathematics low achievers in primary school was not significant.

Variable Gender	N	Pre-test		Post-test		Mean gain
		$\bar{x}$	SD	$\bar{x}$	SD	
Male	66	2.30	0.20	3.22	0.39	0.92
Female	80	2.33	0.23	3.28	0.42	0.95

**Table 3:** Pretest and posttest means of the influence of gender on the interest of mathematics low achievers in primary school

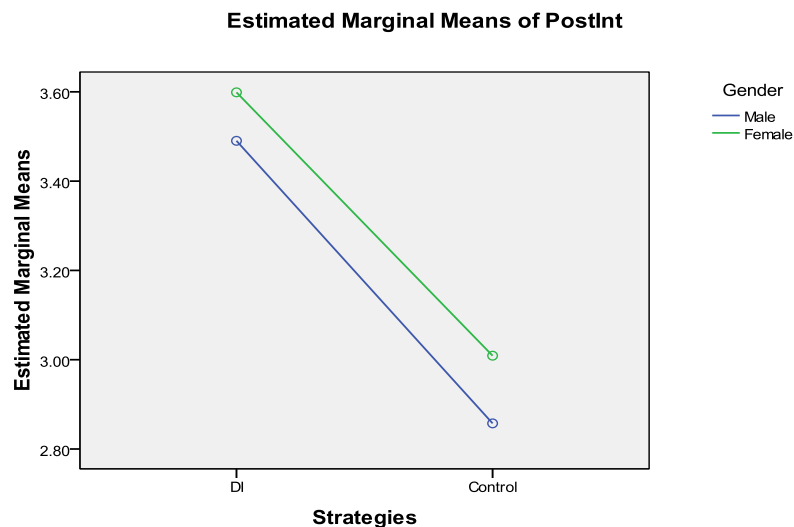
Result in Table 3 showed that male mathematics low achievers had a pretest mean interest score of 2.30 with a standard deviation of 0.20 and a posttest mean interest score of 3.22 with a standard deviation of 0.39. The mean gain between the pretest and posttest mean interest score was 0.92. On the other hand, the results also indicate that the female mathematics low achievers had a pretest mean interest score of 2.33 with a standard deviation of 0.23 and a posttest mean interest score of 3.28 with a standard deviation of 0.42. The mean gain between the pretest and posttest mean interest score for the female group was 0.95. For male and female mathematics low achievers, the posttest interest mean scores were greater than the pretest mean scores with female mathematics low achievers having a slightly higher mean gain than their male counterparts. This revealed that the influence of gender on the interest of mathematics low achievers in primary school appears to favor the females slightly more than their male counterparts.

Variable Instructional Strategies	Gender	N	Pre-test		Post-test		Mean gain
			$\bar{x}$	SD	$\bar{x}$	SD	
DI	Male	37	2.39	0.21	3.46	0.29	1.07
	Female	37	2.29	0.23	3.61	0.28	1.32
Lecture method	Male	29	2.18	0.12	2.91	0.28	0.73
	Female	43	2.36	0.23	2.99	0.28	0.63

**Table 4:** Pretest and posttest means of the interaction effect of instructional strategies and gender on interest of mathematics low achievers in primary school.

Results in Table 4, shows the interaction effect of instructional strategies and gender on interest of mathematics low achievers in primary school. The result indicates that the male mathematics low achievers taught using differentiated instruction (experimental group) had a pretest mean interest score of 2.39 with a standard deviation of 0.21 and a posttest mean of 3.46 with a standard deviation of 0.29. The mean gain between the pretest and posttest means was 1.07. The female mathematics low achievers had a pretest mean interest score of 2.29 with a standard deviation of 0.23 and a posttest mean of 3.61 with a standard deviation of 0.28. The mean gain between the pretest and posttest means for the female group was 1.32. For both male and female groups taught with differentiated instruction (experimental group), the posttest mean interest scores were greater than the pretest means with the females having a slightly higher mean gain than their male counterparts. The results also indicated that male mathematics low achievers taught using the lecture method (control group) had a pretest mean interest score of 2.18 with a standard deviation of 0.12 and a posttest mean of 2.91 with a standard deviation of 0.28. The mean gain between the pretest and posttest means was 0.73. While the female mathematics low achievers had a pretest mean interest score of 2.36 with a standard deviation of 0.23 and a posttest mean

of 2.99 with a standard deviation of 0.28. The mean gain between the pretest and posttest means for the female group was 0.63. For both male and female groups taught with the lecture method (control group), the posttest means were greater than the pretest means, with male mathematics low achievers having a higher mean gain than their female counterparts. However, for the two instructional strategies, the posttest mean interest scores were greater than the pretest means with female mathematics low achievers having a slightly higher mean gain when taught with differentiated instruction than their male counterparts, while the males had a slightly higher mean gain when taught with the directed and dictated strategy than their female counterparts.



**Figure 2:** Interaction graph for instructional strategies and gender on mathematics interest of mathematics low achievers

The result in Figure 2 shows that there is no intersection point between differentiated instruction (DI) strategy and gender, and also there is no intersection point found between the control (conventional strategy) and gender. This therefore affirms that the interaction effect of instructional strategies and gender on mathematics interest of mathematics low achievers in primary school is not significant.

## DISCUSSION

Findings revealed that mathematics low achievers who were exposed to differentiated instruction had higher mean interest scores than their counterparts exposed to the conventional method of instruction. The findings indicated that differentiated instruction significantly increased the interest of mathematics low achievers. DI enhanced the interest of mathematics low achievers as pupils became more interested in mathematics. This finding is in line with studies conducted by Ascher (2016) which indicated that differentiated instruction significantly enhanced pupils' interest. Chavan added that mathematics interest of pupils is above average and that Mathematics Interest Enhancement Programme was effective. The study is also in agreement with the study conducted by David, Clement and Benjamin (2015) on effect of mathematical manipulative skills on upper basic education one student's interest in algebra. The study reported significant increase in the interest of mathematics low achievers and also indicated that teaching mathematics using mathematical manipulative approach significantly improved students' interest with no gender difference. The findings differ from that of Mulder (2014) which reported that differentiated instruction has no statistically significant effect on student mathematics achievement and interest. This could be due to the inability of the researcher to fully implement the teaching strategies contained in differentiated instruction and also failed to assign enough time for its implementation in the classroom.

The findings of this study revealed that female mathematics low achievers had higher mean interest gain compared to their male counterpart. This indicated that the influence of gender on interest of mathematics low achievers in primary school appears to favor the females slightly more than their male counterparts in the area of study. Thus, influence of gender on interest of mathematics low achievers in this study was significant. This finding is in agreement with the finding of the study carried out by Adigun, Onihunwa, Irunokhai, Sada & Adesina (2015) who investigated the relationship between student's gender and academic performance in computer science. The findings of the study showed that the male students had better performance compared to the female students. This implies that there are no longer distinguishing cognitive, affective and psychomotor skill achievements of students in respect of gender. The female achievements scores in the administered test were even slightly better compared to their male colleagues in public schools even though without significant difference. The finding is also in agreement with that of Ihenko (2017) who worked on influence of gender on interest and achievement of integrated Science students. The author revealed that gender has a significant influence on interest. The findings of this study contradict the findings of Okonma, Ushie and Okworo (2014). The findings revealed that male trainees performed better than the female trainees; however, the difference is not significant as shown by analysis of covariance of performances of male and female trainees taught with Web-based resources. Based on the findings, it was concluded that there exists no significant difference between the academic performance of male and female maritime trainees when Web-based resources are used for instruction. This happened because all the trainees which belong to both male and female exhibited strong commitment to the work.

The study revealed that there was no significant interaction effect of instructional strategies and gender on mathematics interest of mathematics low achievers in primary school. The findings also indicated that male mathematics low achievers taught using the conventional method (control group) posttest means were greater than the pretest means, with male mathematics low achievers having a higher mean gain than their female counterparts. However, for the two instructional strategies, the posttest mean interest scores were greater than the pretest means. Female mathematics low achievers having a slightly higher mean gain with those taught with differentiated instruction than their male counterparts, while the males had a slightly higher mean gain with those taught with the conventional method than their female counterparts. This finding is in agreement with the study of Valiande (2011) which revealed that there was no significant interaction effect of instructional strategies and gender on students' interest. This finding is also in agreement with Kumar (2015) who reported that high achievers scored more on temperamental educational dimensions of self-concept and total scores of self-concept than low achievers. It also revealed that there was no significant interaction of instructional strategies and gender on self-concept.

## CONCLUSIONS

Differentiated instruction is an effective teaching method that can be used to enhance the interest and achievement of mathematics low achievers. DI can be utilized for both male and female mathematics low achievers. This is not gender biased. It is evident that each classroom encompasses pupils of different achievement level including mathematics low achievers. In the first instance, the study provides empirical evidence that differentiated instruction can be a valuable tool for enhancing interest and achievement of mathematics low achievers. It is the responsibility of the teacher to employ versatile teaching strategy such as differentiated instruction for comprehensive teaching and learning. This will help to promote positive and supportive interaction among pupils of different achievement which will in turn enhance interest and achievement of mathematics low achievers.

The findings of this study, made it obvious that there is need for authors in various subjects offered in primary schools to incorporate differentiated instruction in their course books as this will help the teachers and learners to understand the strategies and learning activities to enhance pupils' interest and achievement. Differentiated instruction could avail the opportunity to establish cordial relationship among classmates since the method may help them to interact with each other in small groups. Pupils

could be motivated to learn with high interest because of the activities in differentiated instruction and that could improve the interest and achievement of mathematics low achievers.

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