INNOVARE JOURNAL OF EDUCATION

Vol 9, Issue 5, 2021

ISSN: 2347-5528

Research Article

EFFECT OF DIFFERENTIATED INSTRUCTION ON ACHIEVEMENT OF LOW MATHEMATICS ACHIEVERS IN PRIMARY SCHOOLS IN ABUJA, NIGERIA

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Received: 31 May 2021, Revised and Accepted: 20 July 2021

ABSTRACT

This article examined the effect of two teaching strategies and mathematics achievement on low achievers in Nigeria. Three purposes and three null hypotheses were used. A quasi-experimental research design was used for the study. The sample size for the study consists of 146 (66 males and 80 females) identified low mathematics achievers drawn from six intact classes. The researchers used multi-stage sampling technique. In collecting data, validated Mathematics Achievement Test (MAT) was applied. Internal consistency of the instrument was confirmed. Reliability was determined using Kuder-Rechardson formula 20 (K-R 20) with the estimate of 0.89. The pre-test and post-test data were analyzed and hypotheses tested. Findings of the study revealed that the use of differentiated instruction (DI) in teaching low mathematics achievers in primary school improved the achievement in mathematics more than the control or dictated strategy ($F=19.321$, $P<0.05$); the impact of male and on low mathematics achievers was not significant ($F= 2.176$, $P>0.05$). The reciprocal action of the teaching methods in relation to male and female low mathematics achievers was not significant ($F=1.584$, $P>0.05$). Based on these Findings, differentiated instruction is an effective teaching method for improving the achievement of low mathematics achievers.

Keywords: Conventional method, Differentiated instruction, Low achievers, Mathematics, Mathematics achievement, Primary school.

DOI: https://dx.doi.org/10.22159/ijoe.2021v9i5.42253. Journal homepage: https://innovareacademics.in/journals/index.php/ijoe

INTRODUCTION

Pupils in primary schools learn concepts and curriculum contents in different ways creating different learning needs with pupils of different achievement levels in the same classrooms. With different types of learners in the classroom, the use of a conventional method of teaching may be inadequate to take care of the learning needs of the different types of learner's especially low achievers in the classroom. Low mathematics achievers are pupils who are consistently scoring low marks considered as below class average in mathematics. For Al-Zoubi and Yohanes (2015), low mathematics achievers are pupils with weak marks under the normal average in mathematics. Low mathematics achievers are pupils who are consistently failing mathematics tests and examinations for a period of time. According to Okpole (2016), Mathematic low achievers are pupils who constantly score low marks in their mathematics continuous assessment tests and exams. These are pupils who consistently score below 40 out of 100, which are below class average in mathematics class activities and examinations. Interaction with primary school head teachers and teachers of mathematics indicated a decline in mathematics achievement. Low mathematics achievers score low marks consistently, their homework is poorly done and their attitude and marks in project work are frustrating. These pupils do not answer questions correctly in classes and sometimes appear not to understand the content in mathematics classes. In addition, the experiences of teachers and achievement records have shown that primary school pupils fail multiplication and division of numbers compared to other topics in mathematics. These are areas that have been identified based on experience as presenting difficulty to pupils in primary four. The above scenario may be linked to the conventional method of teaching pupils. The article examined the effect of differentiated instruction on the achievement of low mathematics achievers.

Low achievers in schools could be frustrated if their teachers are not able to cope with their perceived different learning difficulties. According to Alavinia and Farhady (2012), a glance through a typical classroom setting reveals visible and invisible diversities of learning characteristics and preferences. For LSUS Shreveport (2016), some of these characteristics include demographic variables, achievement, and ethnicity, among others. With such variety, the utilization of only conventional teaching method is not adequate. The conventional method does not encourage interactive activity and this could impede on the low achiever's achievement, such as persistent poor achievement in school subjects, especially in mathematics. Mathematics remains the basis for the development of science and technology of all nations and science and technology contribute greatly to the development of any nation.

Commenting on the above, Aguele and Usman (2007) asserted that, despite the fact that mathematics is of vital importance to national development, its study in Nigerian schools is plagued with poor achievement among the students. Some factors responsible for this ugly situation in mathematics may include methodology, instructional materials and ill-preparation of pupils from the primary schools, ineffective and unqualified teachers, poor teaching methods and instructional aides and an unconducive school environment. In fact, the problems of teaching and learning mathematics in Nigerian schools have continued to be topical and attract the attention of stakeholders in mathematics. It has been noted that there is a consistent decline in mathematics achievement in primary schools, especially in Abuja the Federal Capital Territory. This is seen from the high numbers of low achievers in primary school. This group of children scores low marks consistently in mathematics in both formative and summative evaluations. The persistent low achievement in mathematics among Nigerian schools is a clear manifestation of low interest and achievement (Unodiaku, 2013). Ale (2010) identified teaching methods and lack of instructional materials as major factors responsible for poor achievements in mathematics. Mbugua, Kibet, Muthaa and Nkonke (2012) and Azuka (2014) identified the following as some of the causes of poor achievement in mathematics; methods of teaching mathematics, the ineffectiveness of mathematics teachers, teachers poor attitude towards mathematics, mathematics teacher's workload and remedial mathematics lessons. Teaching methods adopted and used by mathematics teachers in school remain one of the significant factor that enhances learning and the conventional method is one of the teaching methods.

The conventional method of teaching entails chalk-talk and teacher-centered characteristics of teaching, which also involves the board demonstration of learning content and

accompanied exercises. According to Darakhshan (2018), the conventional method is the most common teaching method found in schools worldwide. The conventional teaching method is described as a teacher-oriented classroom. This is because lesson planning and class activities present the teachers as active participants and pupils as a passive participants. It has the attributes of the lecture method because it is dictated-oriented. Lessons are usually taught by the teacher introducing content using a board accompanied by a verbal explanation. Work for pupils is then assigned, followed by feedback from the teacher. Onu (2017), Kingyong (2014), and Aziz and Hossain (2010) reported poor achievement with the use of the conventional method in a study comparing cooperative learning and conventional method. With this in place, innovative teaching method such as differentiated instruction that considers the pupil's individual differences and enhances achievement becomes imperative.

Differentiated instruction is a teaching strategy that requires the use of different teaching techniques in the classrooms to improve the achievement of different learners. For Kalpana (2014), differentiated instruction is a teaching strategy that emphasized the careful study of learners learning differences and achievement. In addition, Adebayo and Shumba (2014), Mulder (2014), and Tomlinson (2015) opined that differentiated instruction is a strategy of teaching that required the teacher to have full academic achievement knowledge, including the learning needs of all pupils in their classroom. Differentiated instruction is therefore meant to observe and understand the differences and similarities among pupils and use this information to plan instruction.

Differentiated instruction is a strategy that will help teachers to meet each pupil's learning needs and move them towards enhanced academic achievements in all school subjects, especially in mathematics (Carlson, 2015; Hall, Strangman, & Meyer, 2013).

Academic achievements the outcome of learning activities as measures by assessment and examination. According to Abbas and Khurshid (2013), academic achievement is the evaluated learning outcome attained after well-articulated learning objectives, instruction, activities and learning assessment. 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. Bamgbade (2013) described the academic achievement as the marks obtained by pupils and other examinees in a teacher-made test and in standard examinations, especially by examination bodies. It is vital to note that achievement is the outcome of the pupil's academic effort, including investment of time, energy and cognitive work at home and in school. According to Suleymanov (2014), academic achievement is the accomplishment of pre-defined learning objectives in school, which comprise academic efforts such as problem-solving, reading, writing includes and arithmetic, which are considered central in school. Commenting on achievement as an academic measurement, Carter (2018), and Stephens (2018) posited that academic achievement is the outcome of knowledge contents retained by pupils within a defined amount of time as measured by tests and examinations. In this study, academic achievement is the accomplishment in learning content as measured by continuous assessment and examinations after teaching using the pre-articulated curriculum, scheme of work, textbooks, teaching methods and learning activities in school. Academic achievement is the outcome of the measurement of academic learning activities with the academic instrument in the form of continuous assessment and examination. Therefore, the level of one's achievement may determine whether one can be classified as low achiever or not.

Academic achievement, according to Abbing (2013), is the measurement outcome of pupils after going through a planned learning school activity. The focus of academic evaluation could be to generate pupil's grade points or for academic placement. To Abbing, an achievement determinant test could also be designed to evaluate pupil's general academic weakness and strength areas. However, there is empirical evidence suggesting that different factors can determine success in these domains. Commenting on the above, Cabrera (2018) described the academic achievement as the outcome marks generated from a pupil's academic evaluation with the use of tests, continuous assessment and examination. It is the records of pupil's educational attainment which could be used for different forms of assessment such as observation, pre-test, and post-test and for teacher and school assessment. For Cabrera (2018), Academic achievement marks can be used to pass judgment and to draw the overall value of educational programmes or research studies for decision making and to proffer measures to improve on the weakness identified in the assessment, especially among low achievers. Academic achievement, especially in mathematics, is argued to be gender-based as some groups opined that female pupils perform better in mathematics than male pupils.

Gender is a state of biological consideration with reference to the nature of males and females. According to American Psychological Association (2016), gender refers to one's sense of oneself as male, female or transgender. To the World Health Organization (2016), gender refers to as the natural and social placement and conditioned characteristics of women and men, such as standard societal norms, laid down roles and interaction that exists among men and women. It is pertinent to establish here that biological placements place individually as male or female and individuals are instructed to behave along with specific norms, including how to relate with same and opposite gender in the society and primary school is not left out.

Primary school is a learning environment with structures and trained human resources that handled the learning needs of pupils within the ages of 4-11. According to the Federal Republic of Nigeria (FRN) (2004), primary education is the education given in institutions for children between the ages of 6 to 12 and is for a duration of 6 years and offered free under the Universal Basic Education law in Nigeria. Primary school system has its designed goals. The goals of this level as enumerated by FRN are to: Inculcate permanent literacy and numeracy, lay a sound basis for scientific and reflective thinking, and give the child opportunities for developing manipulative skills that will enable the child to function effectively in the society within the limits of the child's capacity among others. The proper knowledge of mathematics will enable children to acquire these objectives.

OBJECTIVES

Generally, the research article examined the effectiveness of differentiated instruction on low mathematics achievers. Specifically, the research article investigated:

1. Effect of differentiated instruction of low mathematics achievers in primary school.
2. Effect of male and female on low mathematics achievers in primary school.
3. Relationship among the impact of teaching methods and gender on mathematics low achievers in primary school.

Scope of the study

The study was carried out in Abuja Federal Capital Territory, Nigeria. Primary school low mathematics achievers were used. The primary school pupils were chosen because of their poor achievement in mathematics. This study was necessary at this level because there is a need to seek innovative teaching methods that can enhance the achievement of low mathematics achievers and so bring the problem of low achievement under control.

Specifically, the study has its focus on primary 4 pupils in government-registered public primary schools in Abuja Federal Capital Territory, Nigeria. The study focused on the effect of differentiated instruction on the academic achievement of low mathematics achievers. The independent variables in the study include differentiated instruction and gender, while the dependent variable is mathematics achievement. The content scope of the study of mathematics also covered multiplication and division of numbers.

In proceeding further, these inquiries were made in the article:
(1) what is the effect of differentiated instruction on the achievement of low mathematics achievers in primary school?
(2) What is the influence of gender on the achievement of low mathematics achievers in primary school?
(3) What is the interaction effect of instructional strategies and gender on the achievement of low mathematics achievers in primary school?

HYPOTHESES

The following null hypotheses tested at a 0.05 level of significance guided this study.
1. There is no significant difference in the achievement of primary school low mathematics achievers exposed to differentiated instruction and those exposed to conventional methods.
2. The influence of gender on the achievement of low mathematics achievers in primary school is not significant.
3. The interaction effect of instructional strategies and gender on mathematics achievement of low mathematics achievers in primary school is not significant.

METHODOLOGY

The study adopted a quasi-experimental research design to determine the effect of differentiated instruction on the achievement of primary school low mathematics achievers. It is a non-randomized pre-test, post-test, non-equivalent experimental and control group design with experimental group receiving treatment. The quasi-experimental design establishes cause and effect relationship. It is the most powerful and valid design which can be used to identify the cause of any given effect confidently (Nworgu, 2006). This study was conducted in Abuja, Nigeria's Federal Capital Territory (FCT). Its geographical area covers 2,824 square miles (7,315 square km). Abuja was chosen because of the persistent poor achievement of public primary school pupils in mathematics.
The population of the study consisted of 2017/2018 primary 4 pupils in the FCT numbering 7,477, 3,388, Male and 4,089 Female (Bwari Area Council Education office). The sample size for the study consisted of 146 (66 males and 80 females) identified low mathematics achievers drawn from six intact classes in Kubwa, Bwari Area Council of the FCT. The researchers used a multi-stage sampling technique. MAT was the instrument used for the research. MAT was subjected to face validation by three experts in the Faculty of Education at the University of Nigeria Nsukka. Kuder-Richardson Formula 20 (K-R 20) was used to determine the reliability of the MAT. This yielded a reliability estimate of 0.89.
Prior to the commencement of the research work, the researchers sought the cooperation of the schools involved to enable the researchers to build the research programme into the school schedule without disrupting the academic programme. The researchers explained the purpose of the study and the benefit that could be derived if properly conducted. This helped the researchers to obtain their cooperation throughout the study. The researchers were directly involved in the execution of the treatment programme. Class teachers helped as research assistants and also helped to maintain orderliness during treatment and administration of the instrument. During the actual research work, the pupils in the treatment and control groups were pre-tested with MAT instruments before commencing the treatment. The treatment involves teaching the experimental group using Differentiated Instruction (DI), as summarized below.
Week 1: The researchers interacted with the pupils and obtained comprehensive background information socially and academically. This was followed by the administration of pre-test using the MAT.
Week 2: The researchers implemented the differentiated instruction with specific use of collaborative, free study time and teach-up strategies in teaching multiplication of two-digit numbers by 1-digit numbers in unit one and collaborative learning, questioning and varied homework strategies in teaching 3 by 1-digit numbers in unit two.
Week 3: The researchers used learning station, taskboard and free study time in teaching multiplication of 2by 2-digit numbers in unit 3 and collaborative, worksheet and individualized coaching strategies were used in teaching multiplication of 3by 3-digit numbers in unit 4.
Week 4: Unit 5 and 6. The researchers applied collaborative and questioning patterns in teaching multiplication of factors of numbers.
Week 5: The researchers used class discussion, learning station and teach up in the class interaction with the teacher in teaching division of 2-digit numbers without remainder in unit 7 and collaborative, questioning and individualized coaching strategies in teaching 3-digit numbers without remainder in unit 8.
Week 6: The researchers interacted with pupils with the use of collaborative, independent work and individualized feedback strategies in division of 3-digit numbers with remainder and collaborative, questioning, and free study time strategies for word problems in the division of numbers for units 9 and 10, respectively.
Week 7: The researchers administered the reshuffled MAT as a post-test.
The control group was taught using the conventional method as each lesson lasted for 40 minutes. At the end of the research work, the experimental and control groups were post-tested with the reshuffled Mathematics Achievement Test. The pre-test and post-test data obtained from the administration of the Mathematics Achievement Test were analyzed using mean and standard deviations for research questions and Analysis of Covariance (ANCOVA) for testing the hypotheses. Analysis of Covariance was used to test the hypotheses at a 0.05 level of probability. 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.

RESULTS

Table 1: Pretest and post-test mean achievement scores of low mathematics achievers in primary school taught using differentiated instruction (DI) and those in the dictated strategy

Variable teaching strategies	N	Pre-test		Post-test		Mean
		Mean	SD	Mean	SD	
Differentiate instruction	74	20.32	6.58	36.41	8.14	16.09
Dictated strategy	72	19.17	5.93	30.42	6.70	11.25

The result presented in table 1shows the pre-test and post-test mean achievement scores of low mathematics achievers in primary school taught using differentiated instruction (DI) and those in the control group. The result indicated that the pre-test mean achievement score of low mathematics achievers taught using differentiated instruction-DI (experimental group) was 20.32 with a standard deviation of 6.58 and a post-test mean achievement score of 36.41 with a standard deviation of 8.14. The difference between the pre-test and post-test mean achievement scores of low mathematics achievers taught using differentiated instruction-DI (experimental group) was 16.09. Table 1 also showed that low achievers in the control group had a pre-test mean achievement score of 19.17 with a standard deviation of 5.93 and a post-test mean of 30.42 with a standard deviation of 6.70. The difference between the pre-test and post-test mean achievement scores of low mathematics achievers in the control group was 11.25. For both experimental and control groups, the post-test mean achievement scores obtained were greater than the pre-test mean achievement scores, with low mathematics achievers taught using differentiated instruction-DI (experimental group) having a higher mean gain. This revealed that differentiated instruction (DI) improved the achievement of low mathematics achievers in mathematics than the conventional strategy.

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

Source	Type III sum of squares	df	Mean square	F-value	P-value
Corrected model	2078.250	4	519.563	10.096	0.000
Intercept	9717.956	1	9717.956	188.843	0.000
PreAchi	590.915	1	590.915	11.483	0.001
Strategies	994.285	1	994.285	19.321	0.000
Gender	112.000	1	112.000	2.176	0.142
Strategies and gender	81.488	1	81.488	1.584	0.210
Error	7255.914	141	51.460		
Total	172714.000	146			
Corrected total	9334.164	145			

The result in table 2 shows that an F-ratio of 19.321 with associated probability value of 0.000 was obtained with regards to the difference in the mathematics achievement of low achievers in primary school exposed to differentiated instruction (experimental group) and those exposed to conventional strategy (control group). Since the associated probability (0.000) was less than 0.05 set as a criterion for taking a decision, the null hypothesis one (1) was therefore rejected. Hence, the inference drawn was that there is a significant difference in the achievement of low mathematics achievers in primary school pupils exposed to differentiated instruction than those exposed to conventional strategy. This implies that the use of differentiated instruction (DI) in teaching low mathematics achievers in primary school improved the achievement in mathematics as against those exposed to conventional teaching strategy.

The result in table 3 indicated that the male low mathematics achievers had a pre-test mean of 19.92 with a standard deviation of 6.59 and a post-test mean of 34.74 with a standard deviation of 7.34. The mean gain between the pre-test and post-test means was 14.82. The results also showed that the female low mathematics achievers had a pre-test mean of 19.61 with a standard deviation of 6.03 and a post-test mean of 32.39 with a standard deviation of 8.45. The mean gain between the pre-test and post-test means for the female group was 12.78. For male and female low mathematics achievers, the post-test mean achievement scores in mathematics were greater with male low mathematics achievers having slightly higher mean gain than their female counterparts.

The result in table 2 also indicated that an F-ratio of 2.176 with associated probability value of 0.142 was obtained with regard to the influence of gender on the achievement of low mathematics achievers in primary school. Since the associated probability (0.142) was greater than 0.05 set as a criterion for taking a decision, null hypothesis two (2) was not rejected. Thus, it was concluded that the influence of gender on the achievement of low mathematics achievers in primary school was not significant.

Table 3: **Pre-test and post-test means of the influence of gender on the achievement of low mathematics achievers in primary school**

Variable Gender	N	Pre-test		Post-test		Mean
		Mean	SD	Mean	SD	
Male	66	19.92	6.59	34.74	7.34	14.82
Female	80	19.61	6.03	32.39	8.45	12.78

Table 4: **Pre-test and post-test means of the interaction effect of instructional strategies and gender on mathematics achievement of low achievers in primary school**

Variable instructional strategies	Gender	N	Pre-test		Post-test		Mean
			Mean	SD	Mean	SD	
DI	Male	37	20.68	6.74	36.65	7.71	15.97
	Female	37	19.97	6.48	36.16	8.65	16.19
Dictated	Male	29	18.97	6.37	32.31	6.13	13.34
	Female	43	19.30	5.68	29.14	6.83	9.84

Results in table 4, show the interaction effect of instructional strategies and gender on the achievement of low mathematics achievers in primary school. The result showed that the male low mathematics achievers taught using differentiated instruction (experimental group) had a pre-test mean of 20.68 with a standard deviation of 6.74 and a post-test mean of 36.65 with a standard deviation of 7.71. The mean gain between the pre-test and post-test means was 15.97. The female low mathematics achievers had a pre-test mean of 19.97 with a standard deviation of 6.48 and a post-test mean of 36.16 with a standard deviation of 8.65. The mean gain between the pre-test and post-test means for the female group was 16.19. For both male and female groups taught with differentiated instruction (experimental group), the post-test means were greater than the pre-test mean, with the females having a slightly higher mean gain than their male counterparts. Table 4 also showed that male low mathematics achievers taught using the directed and dictated strategy (control group) had a pre-test mean of 18.97 with a standard deviation of 6.37 and a post-test mean of 32.31 with a standard deviation of 6.13. The mean gain between the pre-test and post-test means was 13.34. The female low mathematics achievers had a pre-test mean of 19.30 with a standard deviation of 5.68 and a post-test mean of 29.14 with a standard deviation of 6.83. The mean gain between the pre-test and post-test means for the female group was 9.84. For the two instructional strategies, the post-test mean achievement scores were greater than the pre-test means, with female low mathematics achievers having a slightly higher mean gain when taught with differentiated instruction than their male counterparts, while the males had a higher mean gain when taught with the conventional or dictated strategy than their female counterparts.

The result in table 2 also showed that an F-ratio of 1.584 with associated probability value of 0.210 was obtained with regards to the interaction effect of instructional strategies and gender on mathematics achievement of low mathematics achievers in primary school. Since the associated probability (0.210) is greater than 0.05 set as a criterion for making a

decision, null hypothesis three (3) was accepted. Therefore, the conclusion drawn was that the interaction effect of instructional strategies and gender on mathematics achievement of low mathematics achievers in primary school is not significant.

Interaction graph

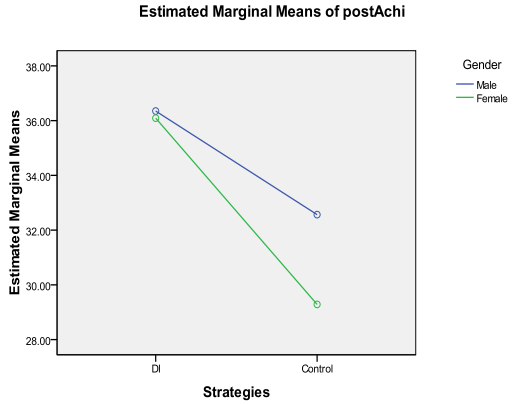

Fig. 1: Interaction graph for instructional strategies and gender on mathematics achievement of low mathematics achievers

The result in figure 1 shows that there is a little contact but no intersection point between differentiated instruction (DI) strategy and gender, while no contact nor intersection point was found between the control (Directed and dictated strategy) and gender. This, therefore, confirms that the interaction effect of instructional strategies and gender on mathematics achievement of low mathematics achievers in primary school is not significant.

DISCUSSION

The findings in this study revealed that low mathematics achievers who were exposed to differentiated instruction had higher mean achievement scores than their counterparts exposed to the conventional method of instruction. Differentiated instruction assisted pupils who were identified as low mathematics achievers to score high marks in multiplication and division of numbers. DI also helped pupils to improve on their homework, attitude to projects and answered mathematics questions in class. The understanding of mathematics content becomes clearer with their involvement in various class activities and DI techniques. DI generally improved the achievement of low mathematics achievers. This finding is in agreement with the study conducted by Stavroula, Leonidas and Mary (2011), which revealed that differentiated instruction promoted equality and quantities for all mixed-ability classrooms. Implementation of differentiated instruction based on the main characteristic of effective differentiated teaching, as shown by the study, enhanced the learning process and improved student achievement. Differentiation is feasible, effective and necessary in order to promote quality and equity dimensions of effectiveness.

This finding is also in agreement with the study conducted by Muthomi and Mbugua (2014), which indicated that differentiated instruction significantly improved the student's achievement in mathematics and teacher effectiveness in teaching mathematics. The findings of the study demonstrated that differentiated instruction has the ability to improve academic scores. That is to say that the implementation of differentiated instruction has had a positive impact on student achievement. Students who were taught using differentiated instruction performed better than those taught using a conventional instructional approach. Differentiated instruction is a promising approach for supporting the diverse needs of all students. For most studies reviewed indicated that it has positively influenced student's academic achievement. However, the finding of this study differs from that of Badru (2016) which reported that treatment has no significant influence on the student's achievement in mathematics. The study results indicated that problem-based instructional strategy, which is similar to differentiated instruction, had no significant influence on the mathematics achievement of secondary school students. This could be due to the failure of the researcher to create adequate time to plan and utilized all the contents of the problem-based instructional strategy.

Findings of this study revealed that male low mathematics achievers had higher mean gain than their female counterparts and that gender as a factor has no significant influence on the achievement of low mathematics achievers, thereby revealing that male and female students are capable of benefitting from DI when taught under the same conditions. This is in agreement with the study conducted by Ajai and Imoko (2015) on gender differences in mathematics achievement and retention by using Problem-Based Learning (PBL). The study revealed that male and female students taught algebra using PBL did not significantly differ in achievement and retention scores. The findings of this study are also in line with the findings of Gwarjiko (2015) on the effect of mixed-gender streaming on the performance of senior secondary school students in the English language in Niger State. The study reported that there was no significant difference between the performance of males and females students in mixed-gender streams though the females are performing slightly better than the males. Both males and females performed poorly. It was then concluded that the mixed-gender stream was less effective in enhancing good academic performance for both genders and was more detrimental to male students. However, the finding differs from that of Unity and Igbudu (2015), which reported that there is a gender difference in academic achievement and interest. The difference is a result of a better performance of female participants against the male in the course of the study.

The interaction effect of instructional strategies and gender on achievement of low mathematics achievers in primary school indicated that for both male and female groups taught with differentiated instruction (experimental group), the post-test means were greater than the pre-test means with the females having a slightly higher mean gain than their male counterparts. However, for the two instructional strategies, the post-test achievement mean scores were greater than the post-test means with female low mathematics achievers having a slightly higher mean gain than their male counterparts, while the males had a higher mean gain with those taught with the conventional method than their female counterparts. This finding is in agreement with the study of Adene (2017), which revealed that there was no significant interaction effect of collaboration strategy and gender on academic self-efficacy belief of students with problem behaviours. This finding is also in agreement with Oluwaseun (2016), who reported that there was no significant interaction effect of instructional strategies and gender and academic performance of the student. Therefore, the conclusion drawn was that there was no significant interaction effect of instructional strategies and gender on the mathematics achievement of low mathematics achievers in primary school.

Educational implications

The findings of the study have relevant educational implications for teachers, low mathematics achievers, curriculum planners, authors, researchers, school proprietors, and school counselors. In the first instance, the study provides empirical evidence that differentiated instruction can be a valuable tool for enhancing the academic achievement of low mathematics achievers. It is evident that each classroom encompasses pupils of different achievement levels, including low mathematics achievers. It is the responsibility of the teacher to employ versatile teaching strategies such as differentiated instruction for comprehensive teaching and

learning. This will help to promote positive and supportive interaction among pupils of different levels of academic achievement, which will in turn enhance the achievement of low mathematics achievers with all the school subjects. Curriculum planners may need to modify the primary and lower basic school curriculum to include differentiated instruction as one of the best approaches to educating pupils of different levels. In order to achieve this, there is a need for the various teacher training institutions to train teachers on how to incorporate differentiated instruction in the classrooms. The findings of this study made it obvious that there is a need for authors in various schools to incorporate differentiated instruction in their course books as this will help teachers and learners to understand the strategies and learning activities to enhance pupil's achievement. The strategy could be useful to pupils and school counselors as a valuable tool that could help to improve the achievement of low mathematics achievers as a result of differentiated instruction since achievement necessary for the learning and understanding of mathematics. Differentiated instruction could avail the opportunity to establish cordial relationships among classmates since the method may help them to interact with each other in small groups.

CONCLUSION

Based on the above findings and discussions, the following conclusions were made: that differentiated instruction is an effective teaching method that can be used to enhance the achievement of low mathematics achievers and DI can be utilized for both male and female low mathematics achievers. This is not gender-biased in the application of differentiated teaching strategy.

Recommendations

The Federal and State Ministries of Education should incorporate DI as an essential part of the teacher training program in Faculties of Education in Universities, Colleges of Education and National Teacher Institutes. In this way, potential teachers who will teach pupils with different achievement levels will be well equipped to face the challenge of meeting the diverse social and academic needs of the learners in the general classroom settings. The Federal and State Ministries of Education should mandate professional bodies like Curriculum Organizations to organize seminars and conferences for teachers on differentiated instruction, its incorporation and implementation in schools.

ACKNOWLEDGEMENT

The authors wish to appreciate other senior colleagues who helped through their encouragement while the study was going on. The authors also appreciate Chukwuma Ikenna, who helped in sending the article out in spite of the poor network services in our environment.

AUTHORS CONTRIBUTIONS

Conceptualization: Igbo, J N and Ojonugwa, D.S; Investigation: Igbo, J N.; Methodology: Igbo.J N. and Ojonugwa, D S.; Project Administration: Igbo, J N.; Supervision: Igbo, J N.; Writing – Original Draft: Igbo, J N. and Ojonugwa, D.S.; Writing- Review and Editing: Igbo, J N.

CONFLICT OF INTEREST

There was no conflict of interest between the authors.

FUNDING SOURCE

The authors personally and single-handedly sponsored the article without any financial help.

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