Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education
Print ISSN: 2814-0885 e-ISSN: 2814-0931
www.fnasjournals.com
Volume 5; Issue 2; March 2024; Page No. 69-77.

Differential Effects of Peer Pairing, Cooperative, and Indirect Instructional Strategies on Reducing Dyscalculia Among Junior Secondary School Students

[1]Oladayo, O. T., & *[2]Oladayo, C. E.
[1]Guidance & Counseling/Psychology Unit, Michael And Cecilia Ibru University, Delta State, Nigeria
[2]Department of Science Education, Federal University Otuoke, Bayelsa State, Nigeria

***Corresponding author email:** oladayoce@fuotuoke.edu.ng

Abstract
This is a quasi-experimental research designed to determine the differential effects of peer pairing, cooperative, and indirect instructional strategies on dyscalculia reduction among Junior Secondary Mathematics students. The population consisted of all the public Junior Secondary School I (JSSI) students in Ideato-South Local Government Area of Imo State, Nigeria. A sample of 85 students from four (4) intact classes was drawn using a Dyscalculia Test (DT) to determine students with dyscalculia problem while Diagnostic Mathematics Test (DMAT) was used to determine high achieving students for Peer Pairing. The experimental groups A, B, and C belonged to the experimental group, and D belonged to the control group. Students in the experimental group were taught with the peer pairing, cooperative, and indirect instructional strategies while those in the control group were taught with the teacher's conventional method. The treatment lasted for 8 weeks of 16 sessions. Students' Mathematics Achievement Test (SMAT) was administered to the subjects at the end of treatment. DT, DMAT and SMAT were validated by experts and their reliability assessment produced coefficients of 0.73 0.77 and 0.85 respectively. Data collected were analyzed with Mean (x), Standard Deviation (SD), t-test, One Way and Two Way Analysis of Variance (ANOVA). Results obtained after data analysis indicated that there was a significant effect of the peer pairing, cooperative, and indirect instructional strategies on dyscalculia reduction among students; the peer pairing strategy emerged as the most effective in dyscalculia reduction; there was a significant difference in dyscalculia reduction between students in the experimental and control groups, in favour of those in the experimental group. Finally, gender was found to be a factor in the effects of treatment in dyscalculia reduction, in favour of male students. Based on these results, the recommendation was made for the adoption of peer peer-pairing instructional approach in dyscalculia reduction among secondary school students.

Keywords: Peer-Pairing, Cooperative Learning, Indirect Instruction, Dyscalculia; Inclusive Education

Introduction

Education is geared towards training the mind and the world around an individual, bringing out the innate potential of the individual and developing him into a functional being to himself and society when he/she finds himself. It is also geared towards the acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live and contribute to the development of his society (FRN, 2004). These goals are embedded in the study of Mathematics which is the language of orderliness and ordered thinking which also involves analytical thinking. Nwankwo and Oladayo (2014) stated that Mathematics is a language of precision while according to Adeneye et al. (2013) Mathematics is a "whetstone of creativity, thinking and problem solving needed essentially to bring harmony, exactness, compactness and accuracy into the knowledge of science, technology and engineering their products. It requires skilful trained teachers, and a sound programme of mental aptitude coupled with effective instrumental methods (Olaogun, 2002).

There are several learning deficiencies in Mathematics. Nagavalli (2015) and Newman (1998) posited that dyscalculia is a term used to describe specific difficulties in learning mathematics. It refers to a wide range of learning disabilities

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

involving mathematics in a simple way severe difficulties in mathematics. Department For Education and Skills (DFES) (2001) defined dyscalculia as a condition that affects the ability to acquire arithmetical skills. Jyoti (2016); Nagvalli (2015) and Dowker (2004) also posited that dyscalculia affects the ability to acquire mathematical skills which includes all types of mathematical problems ranging from the inability to understand numbers, to the inability to apply mathematical principles while solving problems. This implies that dyscalculia involves the inability to understand the meaning of numbers and quantities. Dyscalculia is also regarded as a disability in Mathematics and is a specific learning disability involving innate difficulty in learning or comprehending arithmetic. This includes difficulty in understanding numbers, learning to manipulate numbers, learning mathematical facts and several other related symptoms. The word 'dyscalculia' means 'difficulty with calculations' and refers to severe difficulty in understanding and using symbols or functions needed for success in Mathematics.

One of the instructional strategies used other than to aid students' understanding is the cooperative learning strategy. Igboanugo (2011) posited that cooperative learning is the deliberate instructional use of small groups of students who work together to maximize each other's learning. It is based on the premise that no child learns effectively in isolation. Cooperative learning is the deliberate instructional use of small groups of students by a teacher. Members of each group work together to maximize their learning of a given instructional task. Nnaka (2006) sees cooperative learning as a successful teaching strategy in which small groups of students with different levels of ability, use a variety of learning activities to improve their understanding of a topic or subject matter. The teacher who adopts the cooperative learning strategy organizes the students in small groups. Each group should be heterogeneous in abilities and socio-cultural background. They work in concert through a given instructional assignment until every member successfully understands, and completes the assignment. This is in line with NTI (2006) which viewed cooperative learning as an instructional model where learners cooperate to perform or complete a particular task, usually in small groups of between four to six members. Anaekwe (2006) however pointed out that cooperative learning differs from the usual classroom group work whereby the teacher for convenience or because of inadequate materials or large class size directs his students to work together in small groups.

For cooperative learning to be effective, Anaekwe (2006) enumerated six teacher characteristics and nine student characteristics which include assigning the learners to their groups; noting the critical variables: ability, sex; Outlining tasks/skills to be learnt very clearly for instance, process skills, estimation of size, volume; assigning roles to group members (which must be varied on every new task/exercise); ensuring conducive classroom environment (space and needed materials); planning to direct learners on materials to improvise for the next days work; and creating opportunities for general class discussion and expression of ideas. In cooperative learning, students are expected to work in small groups of 4 – 6 pupils; work in mixed ability grouping in terms of performance; work in mixed-sex grouping (males and females in a group); work as a team; contribute ideas and suggestions together; make a decision by consensus; complete assignments and class work together; seek for assistance primarily from group members; and be rewarded as a team, not a person. Peer pairing is another instructional strategy used to aid understanding of low achieving or students who have deficiencies in Mathematics. Igbo (2004) found peer-pairing effective in improving learning-disabled achievement in Mathematics. Oladayo (2014) posited that peer pairing is a method of providing supportive services initiated in diverse settings. They are young students trained by teachers and supervised, who adhere to ethics and standards/instructions given to them geared toward teaching specific concepts to their counterparts who have difficulty in understanding or assimilating the concepts taught in Mathematics. He further stated that peer-pairing involves students of the same age helping those who need more help with academic materials in the same class. It is also regarded as a method for increasing student achievement and academic response time. It is a method through which students tutor each other under the direction of a teacher to learn and practice academic skills most especially in Mathematics.

Peer-pairing is an instructional approach in which students in their groups under the guidance of the teacher work together through a given instructional assignment with the brilliant student as a peer-pair teacher, providing assistance and instruction to others. Agu (1995) opines that peer teaching is fruitful and successful because the hierarchical atmosphere in the classroom is removed and a cordial, friendly and free atmosphere that facilitates learning is obtained. There is now no more fear in the students of criticism, blame or punishment from the teacher when they are not coping, as the teacher wants. Igbo (2004) sees peer-pairing as a teaching process whereby one child who has proficiency in a skill teaches another child under the teacher's supervision. It is a process of chain teaching whereby the teacher shows

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

a child how to perform a skill and the child in turn trains a second child to the same or similar skill. This means that for the effectiveness of the instruction, the teacher plans the peer-teaching. Kane and Alley (1980) found peer teaching effective in providing individual instruction to learning in disabled students. It promotes the performance of the teacher and the learner.

Moreover, Pearson Education (2010) in Oladayo and Oladayo (2012) in opined that Indirect instruction is an approach to teaching and learning in which the process of learning is inquiry, the result is discovery, and the learning is the context of a problem. Also, Brenau (2002) stated that indirect instruction teaches concepts, patterns, abstraction, analysis, synthesis and evaluation of a subject matter. It is a learner-centred approach, passive teaching and recognizes small group instruction. Oladayo and Oladayo (2002) stated that indirect instruction encourages the teacher to begin the lesson with advance organizers that provide an overall picture and that allow for concept expansion. It focuses on student response using induction and/or deduction to refine and focus generalization. In the study of Mathematics over a long period, it has been found that gender is a factor in determining the effects of instructional strategy and teaching of concepts in Mathematics, most of the time in favour of males (Nwankwo and Oladayo, 2014 and Oladayo & Oladayo, 2012; and Oladayo & Oladayo, 2010). This could be a result of the abstract nature of Mathematics which creates fear in the hearts of students generally but which may have more negative effects on the performance of females than their male counterparts. However, Jyvoti (2016) found girls to be well adjusted than dyscalculic elementary school boys irrespective, of levels of locality in elementary schools. Several research studies have been done using different instructional strategies in dyscalculia reduction to enhance Mathematics achievement, yet the combined instructional strategies of peer pairing, and cooperative and indirect strategies have not been explored to know their effectiveness in enhancing Mathematics achievement. The question that needs to be answered in this work therefore is, 'What are the differential effects of peer-pairing, cooperative and indirect instructional strategies on dyscalculia reduction among Junior Secondary Mathematics students? The desire to answer this question necessitated the conduct of this work.

Aim and Objectives of the Study

The purpose of this study was to determine the effects of peer pairing, and cooperative and indirect instructional strategies on dyscalculia reduction among Junior Secondary Mathematics students. Specifically, the study was also designed to:

1. determine the difference in dyscalculia reduction between subjects in the experimental and control groups.
2. determine the difference in dyscalculia reduction between subjects in the experimental and control groups as measured by their post-test scores in the SMAT
3. determine the influence of gender on the effects of peer pairing, cooperative, and conventional instructional approaches on dyscalculia reduction among Junior Secondary Mathematics students.

Research Questions

1. What are the effects of peer pairing, and cooperative and indirect instructional approaches on dyscalculia reduction among junior secondary Mathematics students as measured by their pre-test and post-test scores in the SMAT?
2. What is the difference in dyscalculia reduction between subjects in the experimental and control groups as measured by their post-test scores in the SMAT?
3. To what extent is gender a factor in the effects of peer pairing, and cooperative and indirect instructional approaches on dyscalculia reductions among subjects as measured by their post-test scores in the SMAT?

Hypotheses

The following null hypotheses were tested at 0.05 alpha levels.

1. The effects of peer pairing, cooperative and indirect instructional approach on dyscalculia reduction among the subjects do not differ significantly as measured by their post-test scores in the SMAT.
2. The difference in dyscalculia reduction between subjects in the experimental and control groups is not significant as measured by their post-test scores in the SMAT.
3. The difference in dyscalculia reduction among male and female students in the experimental groups is not significant as measured by their post-test scores in the SMAT.

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

Methodology

This is a quasi-experimental research aimed at determining the differential effects of peer pairing, and cooperative and indirect instructional strategies on dyscalculia reduction among Junior Secondary Mathematics students. The randomized, control pre-test/post-test experimental design was adopted. The population consisted of all the public Junior Secondary School I (JSSI) students in Ideato-South Local Government Area of Imo State, Nigeria while a sample of 85 students was drawn from 4 intact arms (A, B, C and D) of the class under study. A "Dyscalculia Test" (DT) was used to determine students with dyscalculia problems. This test was used to assess the student's level of understanding of Mathematical concepts and skills such as time, place value, number line, addition and subtraction of quantities, etc which are peculiar to dyscalculia problems. Only those who scored below 40 per cent in the DT were used in the experiment. Also, a "Diagnostic Mathematics Achievement Test" (DMAT) was used to determine high-performing students for Peer Pairing with s score of 70 and above. They consisted of 13 in Group A, 21 in Group B, 25 in Group C and 26 in Group D totalling 85 students. Groups A B and C served as experimental groups, while Group D served as control groups. A simple random sampling technique (balloting) was used to assign learning strategies to the experimental groups. Students in the experimental groups A, B and C were taught mathematics using Peer Pairing and Cooperative and indirect instructional strategies respectively. Those in the Control Group (D) were taught using the teacher's conventional teaching strategy. The teachers in the experimental groups were thoroughly educated in the application of each of the instructional strategies under study. The instructional content covered topics relating to time, place value, number line, addition of quantities, etc.

Before the commencement of the experiment, the “Students Mathematics Achievement Test” (SMAT), a fifty-item objective test, based on the content of instruction was administered to the students to determine their baseline data or pre-test scores. DT was an adapted instrument while DMAT and SMAT were constructed by three experts in Mathematics. They were validated by three experts, one in each of Mathematics, Educational Psychology and Measurement and Evaluation. Test-retest reliability assessment of the instruments produced reliability coefficients of 0.73, 0.77 and 0.85 respectively. The treatment lasted for 8 weeks of 16 sessions. At the end of treatment, the SMAT was administered again to the students to determine their post-test scores, which indicated the extent of dyscalculia reduction achieved after treatment. Since the same SMAT was used for the pre-test and post-test, the researchers took some precautionary measures, which included rearranging the test items in the subsequent administration and reframing some of the questions while retaining their contents. Students' test scores were analyzed using Mean (x), Standard Deviation (SD), t-test, and One-Way and Two-Way analysis of variance (ANOVA).

Results

Results obtained after analysis are presented in the tables below.

Research Question 1: What are the effects of peer pairing, and cooperative and indirect instructional approaches on dyscalculia reduction among junior secondary Mathematics students as measured by their pre-test and post-test scores in the SMAT?

Table 1: Mean (x) and Standard Deviation (SD) of the effects of Peer Pairing, Cooperative and Indirect Instructional Approaches on Dyscalculia Reduction among Junior Secondary Mathematics Students.

Instructional Strategy	Pre-Test			Post-Test		
	N	Mean	SD	N	Mean	SD
Peer Pairing	13	35.69	4.8193	13	73.39	7.4559
Cooperative	21	31.52	6.5086	21	60.67	7.9078
Indirect	26	32.32	4.9893	26	52.64	4.4989

Data in Table 1 showed that the pre-test and post-test mean scores of dyscalculia students taught with the Peer Pairing strategy were 35.69 and 73.39 respectively. For dyscalculia students taught with a Cooperative instructional strategy, their pre-test and post-test mean scores were 31.52 and 60.67 respectively while those taught with an Indirect instructional strategy had their pre-test and post-test mean scores as 32.32 and 52.64 respectively. Table 1 also showed that in all the experimental groups, the post-test scores were higher than the pre-test scores. The subjects taught using the peer pairing instructional strategy had the highest score, followed by those taught with the cooperative strategy and then those taught with the Indirect instructional strategy who obtained the lowest score. The above result implied

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

that all the instructional strategies were effective in dyscalculia reduction among students. However, the peer pairing instructional strategy was found to be the most effective.

Research Question 2: What is the difference in dyscalculia reduction between subjects in the experimental and control groups as measured by their post-test scores in SMAT?

Table 2: Mean (x) and Standard Deviation (SD) of dyscalculia reduction between students in the Experimental and Control groups

Group	N	Mean	S.D
Peer Pairing	13	73.39	7.4559
Control	**26**	**45.31**	**4.3430**
Cooperative	21	60.67	7.9078
Control	**26**	**45.31**	**4.3430**
Indirect	26	52.64	4.4989
Control	**26**	**45.31**	**4.3430**

Table 2 showed that subjects in all the experimental groups obtained higher mean scores than their counterparts in the control group. This means that a greater reduction in dyscalculia was achieved among subjects in experimental groups than those in the control group with peer pairing instructional strategy having the highest mean score and the most effective.

Research Question 3: To what extent is gender a factor in the effects of Peer pairing, Cooperative and indirect instructional approaches on dyscalculia reductions among subjects as measured by their post-test scores in the SMAT?

Table 3: Mean (x) and Standard Deviation (SD) of influence of gender on the effect of Peer Pairing, Cooperative and Indirect instructional strategies on dyscalculia reduction among subjects.

Instructional Approaches	Gender	N	Mean	S.D
Peer Pairing	Male	6	78.33	5.1251
	Female	7	69.14	6.6189
Cooperative	Male	10	64.40	5.0596
	Female	11	57.27	8.6844
Indirect	Male	12	55.50	3.2051
	Female	13	50.00	3.9158

Information in Table 3 showed that male and female subjects taught with peer pairing strategy obtained 78.33 and 69.14 in the SMAT respectively. Again, male and female subjects taught with cooperative instructional strategy scored 64.40 and 57.27 in the SMAT respectively, while male and female subjects taught using the indirect instruction strategy scored 55.50 and 50.00 respectively. The males in all the experimental groups scored higher than the females. This showed that a greater effect of treatment on dyscalculia reduction was found among the males than the females.

Hypothesis 1: The effects of peer pairing, cooperative and indirect instructional approaches on dyscalculia reduction among the subjects do not differ significantly as measured by their post-test scores in the Student Mathematics Achievement Test (SMAT).

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

Table 4: One-way ANOVA of the effect of Peer Pairing, Cooperative and Indirect instructional approaches on dyscalculia reduction among subjects

Source	SS	Df	MS	F-ratio	F- critical	Result
Between Groups	3692.225	2	1846.113			
Within Groups	2403.504	56	42.920	43.01	1.92	S
Total	6095.729	58				

Table 4 showed that the calculated F-value of 43.01 is greater than the critical F-value of 1.92 at dfs of 2 and 50 and 0.05 alpha level. The null hypothesis was therefore rejected. This implied that there is a significant effect of peer pairing, cooperative and indirect instructional strategies on dyscalculia reduction among students in favour of those taught with peer pairing instructional strategy.

Table 5: Scheffe's Post-Hoc Pair-Wise Comparison of Dyscalculia Reduction Due to Treatment

		Peer Pairing	Cooperative	Indirect
Instructional Strategy		73.39	60.67	52.64
Peer Pairing	73.39		*	*
Cooperative	60.67	*	*	
Indirect	52.64	*		*

Key *: Indicates pairs of means which are significant as 0.05 alpha level
The data of Table 5 showed that:

1. Students taught with peer pairing and indirect instructional strategies differed significantly in dyscalculia reduction, in favour of those taught with peer pairing strategy.
2. Students taught with cooperative and indirect instructional strategies differed significantly in dyscalculia reductions; in favour of those taught with combined cooperative strategy.
3. Students taught with peer pairing and cooperative instructional strategies differed significantly in dyscalculia reduction; in favour of those taught with peer pairing strategy.

Hypothesis 2: The difference in dyscalculia reduction between subjects in the experimental and control groups is not significant as measured by their post-test scores in the SMAT.

Table 6: t-test analysis of the difference in dyscalculia reduction between students in experimental and control groups.

Instructional Approach	N	Mean	S.D	Df	Cal. t	Crit. t	Remark
Peer Pairing	13	73.39	7.4559				
Control	26	45.31	4.3430	37	14.90	2.04	Rejected
Cooperative	21	60.67	7.9078				
Control	26	45.31	4.3430	45	8.46	2.04	Rejected
Indirect	25	52.64	4.4989				Rejected
Control	26	45.31	4.3430	49	5.92	2.04	

Information in Table 6 showed that all the calculated t values 14.90, 8.46 and 5.92, showing the extent of difference in dyscalculia reduction between subjects in experimental and control groups, are respectively greater than the t-critical value of 2.04, at 0.05 alpha level and dfs of 37, 45 and 49 respectively. The null hypothesis two was therefore rejected. This implied that significant differences in dyscalculia reduction existed between students in the experimental and control groups in favour of those in the experimental groups with peer pairing instructional strategy being the highest and most effective.

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

Hypothesis 3: The difference in dyscalculia reduction among male and female students in the experimental groups is not significant as measured by their post-test scores in SMAT.

Table 7: Two-way ANOVA of difference in dyscalculia reduction in the experimental groups.

Source	SS	df	MS	F-cal	F- critical	Sig.	Remark
Corrected Model	4390.507[a]	3	1463.502	47.204	2.34	0.000	S
Intercept	29922.819	1	29922.819	965.127	4.03	0.000	S
Gender	698.282	1	698.282	22.522	1.90	0.000	S
VAR0003	3736.345	2	1868.173	60.256	1.90	0.000	S
Error	1705.221	55	31.004				
Total	218976	59					
Corrected Total	6095	58					

Data in Table 7 above showed that all the F-calculated values were respectively greater than the F-critical values, at 0.05 alpha level and dfs of 1 and 59. The null hypothesis three was therefore rejected. The result showed that there was a significant difference in dyscalculia reduction among male and female students in favour of the males. The result in Table 7 also showed that the F-calculated value for gender by instructional strategies interaction (22.522) is greater than the F-critical value of 1.90 at 0.05 alpha level and dfs of 1 and 59. Hence, the interaction effect of gender and instructional strategies in dyscalculia reduction among students is significant. To determine a pair of means that are significantly different, the Scheffe's post-hoc test was conducted. A summary of the test is presented below:

Table 8: Post-Hoc Pair-Wise Comparison of Dyscalculia Reduction among male and female students due to Treatment

Instructional Approaches	Gender	Mean	
Peer pairing	Male	78.33	
	Female	69.14	*
Cooperative	Male	64.40	
	Female	57.27	*
Indirect	Male	55.50	
	Female	50.00	*

Key *: Indicates pairs of means which are significant as 0.05 alpha level.

It can be observed in Table 8 that male and female students in all the three experimental groups studied, differed significantly in dyscalculia reduction in favour of the males. This means that the effect of the instructional strategies on dyscalculia reduction was not consistent across gender levels.

Discussion

The differential effects of peer pairing, cooperative, and indirect instructional strategies on dyscalculia reduction among students were investigated in this study. Findings indicated dyscalculia reduction was highest among students who were taught with peer pairing instructional strategy followed by those taught with the cooperative instructional strategy and then the students taught with the indirect instructional strategy. Peer pairing instructional strategy was therefore found to be the most effective. The result of hypothesis one also showed a significant difference in dyscalculia reduction of students across the three instructional strategies in favour of those taught with the peer pairing instructional strategy. This result serves as an eye-opener to teachers concerning the effectiveness of these strategies, especially peer pairing instructional strategy in dyscalculia reduction among students. The result corroborates with the findings of research by Mastropieri et al.(2007) who found that peer pairing instructional strategy results are effective in helping individuals with a disability (dyscalculia is a mathematics disability) read directions and gather material. Baker et al.(2002) also found that peer pairing creates a supportive, encouraging and engaging learning environment in general education which has helped improve the computational skills of students with mathematics disability (dyscalculia).

Cite this article as:
Oladayo, O. T., & Oladayo, C. E. (2024). Differential effects of peer pairing, cooperative, and indirect instructional strategies on reducing dyscalculia among junior secondary school students. *FNAS Journal of Mathematics and Science Education, 5*(2), 69-77

Results also indicated that there was a marked difference in dyscalculia reduction between students in the experimental and control groups. Subjects in all the experimental groups obtained higher mean scores than their counterparts in the control group. This difference in dyscalculia reduction between students in the experimental and control groups was found to be significantly different in favour of the peer pairing instructional strategy. This is in line with Harper and Maheady (2007) who stated that peer pairing instructional strategy emphasises collaboration, repeated practice, and instant feedback that keep distracted students engaged and improve their self-esteem and their capability to learn. Gender was found to be a factor in the effects of peer-pairing, cooperative and indirect instructional strategies in dyscalculia reduction among the students in favour of males. This finding was in contrast to Jyoti (2015) who found girls to be better adjusted in dyscalculia than boys in elementary schools irrespective of location. Yet, other findings by Nwankwo and Oladayo, (2014); Oladayo and Oladayo, (2012); and Oladayo and Oladayo, (2010) asserted that gender is a factor concerning students' achievement in Mathematics, in favour of males.

Recommendations

Based on the following findings, it was therefore recommended that

1. Peer pairing instructional strategy should be adopted by teachers in teaching mathematics, especially for the management of dyscalculia, to improve performance.
2. Teachers should endeavour to bridge the gap in Mathematics achievement between male and female students through encouragement and motivation of female students during teaching.
3. Teachers are enjoined to encourage teamwork in solving Mathematics problems to improve students' intellectual functioning.
4. Government and private school proprietors should establish inclusive schools to bring together regular students and special needs students for effective teaching and learning.

References

Adeneye, O. A., Abayomi, A. A., & Awoyemi, A. A. (2013). Effects of team-assisted individualised instructional strategies on senior secondary school students' attitudes toward mathematics. *ACTA DIDACTICA NAPOCENSIA, 6*(1).

Agu, N. N. (1995). The teachers' position in curriculum implementation. In U. M. Nzewi, E. N. Okpara, & L. R. Akudolu (Eds.), *Curriculum Implementation* (pp. 107–123). Nsukka: University Trust.

Anaekwe, M. C. (2006). Application of cooperative learning and concept mapping as instructional strategies in science teaching and learning. Paper presented at the workshop by the Science Teachers Association of Nigeria, Awka.

Baker, S., Gersten, R., & Lee, D. S. (2002). A synthesis of empirical research on teaching mathematics to low-achieving students. *The Elementary School Journal, 103*(1), 51–73.

Brenau, R. C. (2002). Direct and Indirect Instruction. *Ho_06_02*, 1–2.

Department for Education and Skills. (2001). *Guidance to support pupils with dyslexia and dyscalculia*. London: DfES. [DfES circular 0512/2001]

Dowker, A. (2004). Dyscalculia in children: Its characteristics and possible interventions. Paper presented at OECD Literacy and Numeracy Network Meeting, El Escorial.

Federal Republic of Nigeria (2004) National policy on education. NERDC Lagos.

Harper, G. F., & Maheady, L. (2007). Peer-mediated teaching and students with learning disabilities. *Intervention in School and Clinic, 43*(2), 101–107.

Igbo, J. N. (2004). Effect of peer tutoring on the mathematics achievement of learning disabled children. Unpublished doctoral thesis, Faculty of Education, University of Nigeria Nsukka.

Igboanugo, B. I. (2011). Effects of cooperative learning and peer-teaching on senior secondary school students' achievement and interest in some difficult chemistry concepts. A Thesis Submitted to the Faculty of Education, University of Nigeria, Nsukka, in Partial Fulfilment of the Requirement for the Award of Masters Degree in Education (Science Education).

Jyoti, J. (2016). A Study of Adjustment of dyscalculia elementary school students of Shimla District. *International Journal of Emerging Trends in Science and Technology, 3*(12), 4822–4826.

Kane, B. J., & Alley, G. R. (1980). A peer tutored instructional management in cognitive development in children and adolescents. In R. J. Sternberg & C. A. Erg (Eds.), *Intellectual development* (pp. 107–123). New York: Cambridge University Press.

Mastropieri, M. A., Scruggs, T. E., & Berkeley, S. L. (2007). Peers helping peers. *Educational Leadership, 64*(5), 54–58.

Nagavalli, T. (2015). A Study of dyscalculic primary school children in Salem district and evaluation of applicability of innovative strategies as remedial measures. Department of Educational Research and Policy Perspectives (NCERT), New Delhi.

National Teachers Institute. (2006). *Manual for the retraining of primary school teachers*. Kaduna: NTI Press.

Newman, R. M. (1998). The Dyscalculia Syndrome. Special Education Thesis. Dyscalculia.org.

Nnaka, C. V. (2006). Innovative strategies for effective teaching and learning of science, technology, and mathematics (STM) in schools. Paper presented at the workshop by Science Teachers Association of Nigeria, Awka.

Nwankwo, O. C., & Oladayo, O. T. (2014). Effects of Individualized and Conventional Instruction on Mathematics Achievement of Low-Achieving Students. *Asian Academic Research Journal of Multidisciplinary, 1*(23), 279–293.

Oladayo, O. T. (2014). Differential Effects of peer pairing, direct and individualized instructional strategies in mathematics achievement of low achieving students. Unpublished Ph.D. dissertation, University of Port Harcourt, Rivers State, Nigeria.

Oladayo, O. T., & Oladayo, C. E. (2012). Effects of direct and indirect instructional strategies on students' achievement in mathematics. *African Research Review International Multidisciplinary Journal, 6*(4), 349–361.

Oladayo, E. C., & Oladayo, O. T. (2010). Effects of constructivist and lecture method on students' attitude in mathematics. *Nigerian Journal of Empirical Studies in Psychology and Education (NJESPE), 1*(11), 176–185.

Olaogun, O. (2002). *Guidance & Counselling in Education System*. Minson Publishers, Port Harcourt.

Pearson Education Inc. (2010). Indirect instruction strategies. Pearson Education Inc., Publishing as Pearson Prentice Hall Legal and Privacy Terms.