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Mathematics Learning Difficulties And Remediating Dyscalculia Students In Junior Schools In Sokoto State, Nigeria

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ABSTRACT

This study assessed the prevalence of Mathematics learning difficulties and remediating students with dyscalculia in junior secondary schools in Sokoto state. A total of twelve thousand eight hundred and eighty-six (12,886) forms the target population of the study with three thousand two hundred and twenty-four (3,224) students as sampled schools. Multi – stage random sampling and simple random procedure was used to select six (6) Junior Secondary Schools. Proportionate sampling technique was used to select three hundred and forty-one (341) JSS 3 students with ninety-six (96) dyscalculia and two hundred and forty-five (245) normal students which was in line with Roscoe (1975) who state that “a sample size of more than 30 and less 500 is considered appropriate for most research. The average age of the population is 15 years. This involved students from various schools under Ministry Basic Education, Sokoto, Ministry of Science and Technical Education Sokoto and those under Arabic and Islamic Education Board, Sokoto. The data collected was computed using Statistical Package for the Social Scientists (SPSS). Mean scores, standard deviations, one-way analysis of variance and t-test were employed at significance level of 0.05. The scores for the experimental groups increased after remediation. The findings indicated that the treatment given on the experimental groups was significantly effective on dyscalculia students. The study suggested that assessing the level of difficulties and treatment (remediation) of dyscalculia students should always be taken seriously by teachers and be seen as a special tool for reducing the level of difficulties among students in mathematics. Further researches should be conducted using a similar designed at senior secondary school level.

Keywords: Mathematics, dyscalculia, students

INTRODUCTION

Human capital development where education and health belong is one of the key points in Nigeria seeks to address. Improving both the quality and quantity of teaching and learning of Mathematics becomes imperative for the attainment of the objectives of Mathematics educationally. In view of this the study assessed improving dyscalculia in junior secondary school students' performances in mathematics through behaviour modification in Sokoto state, Nigeria, through a designed Mathematics programme of instruction with a view to improving their academic performance. This is because Students' low performance in Mathematics have been the subject of concern among educationists, researchers, teachers, parents, students and administrators. Sometimes slowness or difficulty to learn Mathematics or arithmetic is taken as a sign of dyscalculia. It has been observed by Yusha'u (2006) that difficulties at school that are related to dyscalculia have been the subject of less research in Sokoto. If these recognized difficulties are

not properly managed, may lead to marginalization or even stigmatization of the students in question whose cumulative failures may give rise to difficulties in social life and future schooling (Yusha'u, 2006). Researchers, psychologists, educationists (Alan, 2007; Singh, 2004; Mercel, 2003; Augusto, 1995; Haigh, 1977; Cooney, Davis, & Henderson, 1975; Bloom, 1968) had offered a plethora characteristic of a slow learner. Also, Singh (2004) states that slow learners (dyscalculia) are apt to have deficient languages, symbolic systems, restricted reading and listening, comprehension and weak conceptual and factual backgrounds. They are also likely to have difficulty using abstract symbols, generalizing, ordering, analyzing and maintaining a verbal thought sequence.

Howell (2000) categorized Mathematics difficulties into two (2) categories of learning disabilities, namely; Mathematics computational disabilities, and Mathematical reasoning disabilities, which are characteristics of dyscalculia and are based on the child's performance in classroom which is the outcomes of his or her learning differences. Therefore, assessing these learning difficulties and modifying (treating) students with dyscalculia in Junior Secondary Schools become necessary in order to improve their performance in Mathematics.

Statement of the Problem

It is perceived that students learn mathematics differently. Some do well with abstract Mathematical concepts and symbols others need special instructional materials to cope. Mathematics according to Brain (1999) more than any other school subject, is vulnerable to falling behind. Once this happens, there is a real risk that the child will try to avoid doing or learning mathematics because it's frustrating and embarrassing, and so will fall further behind which will lead to more avoidance and a vicious circle of under achievement. Students with dyscalculia may have difficulty with numbers and remembering mathematical facts as well as performance Mathematical operations. Students may have difficulties with abstract concepts of time and directions, recalling schedules and sequences of events as well as difficulties with Mathematical concepts, rules, formulas, and basic addition, subtraction, multiplication and division of facts (Galadima, 2001).

The persistent poor or low performance in Mathematics in Junior Secondary School 3 students in terminal examinations and Basic Education Certificate Examination (BECE) in Sokoto State, Nigeria has been a major concern for teachers, parents, educators, schools and Government who spent a lot of time and money in funding education but to no avail. The problems comprises negative attitude towards Mathematics, fear and anxiety towards Mathematics, inadequate qualified Mathematics teachers, poor teaching methods, lack of coverage, inadequate teaching materials, overcrowded classes, lack of good background form primary level, abstract in nature of the subject, difficult to be comprehended, boring, blaming the curriculum, Mathematics teachers and methods of teaching rather than student's lack of capacity to learn. The selection of teaching technique is not an easy task. This is because there are many methods that seems to work well for everyone and all situations. In addition, every Mathematics teacher should identify appropriate methodology based on the nature of the subject matter and instruction to be given. Most Mathematics teachers use irrelevant and ineffective methods of teaching which are among other factors contributing to students' poor performance in Mathematics which leads to not having good results in Mathematics in general.

Consistently, some students or pupils cannot identify individual numbers talk less of doing addition, subtraction, multiplication, divisions and identification of shapes. Virtually, students suffer skills and abilities needed in these basic Mathematical operations.

Objectives of the Study

The main objectives of this study in specific terms were:

1. to determine the efficacy of the designed remediation mathematics instruction on dyscalculia students after assessing their level of difficulties.
2. to reinstate the confidence of dyscalculia students in learning Mathematics.

Research Questions

The following research questions were used in the conduct of this study:

1. What are the prevalence of Mathematics learning difficulties among dyscalculia students of Junior Secondary Schools in Sokoto State?
2. Is there any difference between the performance of the experimental groups after treatment?

Research Hypotheses

The following null hypotheses were used in the study.

HO₁: There is no significant difference in the prevalence of learning difficulties before treatment (Remediation) among dyscalculia students of Junior Secondary Schools in Sokoto State.

HO₂: There is no significant difference between the performance of experimental groups of dyscalculia students after treatment (Remediation).

METHODOLOGY

Population of the Study

The target population of this study was all the students of Junior Secondary School III in Sokoto metropolis in Sokoto State, Nigeria with an estimated population of twelve thousand eight hundred and eighty-six (12,886) under the Ministry for Basic and Secondary Education, Sokoto. Public schools were chosen to be the target audience for the study which were found to have difficulties in learning Mathematics (dyscalculia). Six junior secondary schools with population of three thousand, two hundred and twenty-four (3,224) students were sampled.

Sample and sampling Techniques

From the survey conducted by the researchers, only Ninety-six (96) students were considered as dyscalculia and two hundred and forty-five (245) students were considered as students without dyscalculia (normal). Therefore, the sample of all the junior secondary school students were taken which was in accordance with Fox (1969) on purposeful sampling technique. The test results of Junior Secondary School students 3 were used from the selected schools. The last 15 – 20 JSS 3 students from the test list were purposefully selected which was also in accordance with Fox (1969). Proportionate method was employed to determine the sample size using Krejcie and Morgan (1970) table for determining sample size from a given population. This is to enable the researchers obtain homogeneity in gender. in order to get the representative of the sample size. Hence, a sample of three hundred and forty-one (341) JSS 3 students were sampled and used for the study.

Instruments

The instruments used in carrying out this study were;

The research instrument was employed in the study. The instrument provided information about Dyscalculic Mathematics Test (DMT) developed by the researchers with 30 multiple choice objective questions with five (5) options to measure students' performance. The items have been designed to evaluate lower cognitive and higher thinking processes. The 30 item multiple choice questions covered the JSS syllabus as demanded by the Mathematics curriculum. The DMT was designed for both pre testing and post-testing of students' cognitive achievement before and after treatment.

It consists of units as topics based on Junior Secondary School (JSS) curriculum. Questions were selected from both the National Examination Council of Nigeria (NECO), Basic Education Certification Examination (BECE) which the researchers provided solutions to and to serve as teachers instructional guide, students class works and assignments. So also, the items in DMT has been designed to evaluate lower cognitive and higher thinking processes. DMT was designed for both pre testing and post-testing of students' performance before and after remediation. Both, marking scheme and students' answer sheets were provided. Experts from Mathematics Education, Measurement and evaluation were given the instrument to validate. The reliability of the instruments was established by using split-half method. Pearson's product moment correlation formula was used to obtain correlation coefficient of 0.86.

RESULTS

The data collected from the field were presented and analyzed in table 1, 2, and 3 with corresponding hypotheses.

Ho1: There is no significant difference in the prevalence of learning difficulties before treatment (Remediation) among dyscalculia students of Junior Secondary Schools in Sokoto State.

This hypothesis seeks to establish whether there was any significant difference in the prevalence of learning difficulties among dyscalculia students of Junior Secondary Schools in Sokoto State. To test the hypothesis, pre-test mean scores and standard deviations of all the students of the sample schools by sex (male and female) were computed and presented in table 1.

Table 1: Summary of Descriptive Statistics of Pre-test of the Control and Experimental Groups Before treatment

Groups	No	Mean	SD	Std Error
Pre-test Experimental	96	22.14	6.63	0.15
Pre-test Control	245	21.15	7.81	0.06

The result in the Table 1 provided the descriptive statistics of the pre-test of experimental and control groups before treatment (remediation). The mean score of the experimental group for pre-test was found to be 3.45 and standard deviation 1.49, while the control group mean score was 3.44 and standard deviation 2.11. The results obtained indicate homogeneous means scores. To confirm whether there was a significant difference, the data was further subjected to t-test and the summary of the result is presented in the Table 2.

Table 2: Summary of t-test for Pre-test of the Control and Experimental Groups Before treatment

Control and Experimental Groups Pre-test Before Remediation	T-test for equality of Variances				
	F	Sig	T	Df	Sig (2 tailed)
Equal Variances not Assumed	33.68	0.000	-0.05	95	0.96
Equal Variances not Assumed			-0.06	330	0.95

The result in Table 2 showed that there was no significant difference between groups $t(330) = -0.059$ $p = 0.953 > \alpha = 0.05$. Therefore, Ho1 was retained. By this finding, it can be concluded that there was no significant difference between the experimental and control groups before treatment. This was a clear indication that both the control and experimental groups were of equal ability. Ho1: There is no significant difference in the performance of experimental groups of dyscalculia students after treatment (Remediation).

To test this hypothesis, the pre-test mean scores and post-test mean scores with their respective standard deviations of the experimental groups were computed and compared as presented in Table 3.

Table 3: Summary of Descriptive Statistics of Experimental Groups Pre-test and Post-test Scores After treatment

Groups	No	Mean	SD	Std Error
Pre-test Experimental	96	5.63	2.92	0.12
Post-test Experimental	95	7.67	4.81	0.21

The result in Table 3 provided the descriptive statistics of the experimental groups' pre-test and post-test mean scores after treatment. The means score of the students' pre-test was found to be 5.63 and standard deviation was 2.92, the students post-test mean scores after treatment was 7.67 and standard deviation was 4.81. It is clear that the mean score of the post-test was 7.67 greater than the mean scores of the pre-test which was 5.63. This difference was further confirmed using t-test as presented in Table 4.

Table 4: Summary of t-test for Experimental Groups Pre-test and Post-test After Treatment

Experimental Groups	T-test for equality of Variances				
	F	Sig	T	Df	Sig (2 tailed)
Equal Variances not Assumed	71.67	0.000	-8.94	98	.000
Equal Variances not Assumed			-9.16	351	.000

The result in Table 4 shows that there was a significant difference between the groups where $t(351) = -9.16, p = .00 < \alpha = 0.05$. Therefore, H_0 was rejected.

DISCUSSION OF THE FINDINGS

Research Question 1 seeks to find out the extent of the difference in the occurrence of learning difficulties in Mathematics before treatment among dyscalculia students of Junior Secondary Schools of Sokoto state? The H_{01} was used the corresponding hypotheses and has been retained confirming no significant difference in the occurrence of learning difficulties in Mathematics before treatment (remediation) among dyscalculia students of Junior Secondary Schools in Sokoto state.

This finding supported the findings of Galadima (2001) whose research was on comparative performance by sub-topics of Junior Secondary School Algebra in Sokoto State found out equality in terms of Mathematical difficulties. The same finding also supported the finding of Doyle (2010) who asserts that worldwide studies estimated the prevalence of dyscalculia within the range 3% to 11% and most likely dyscalculia students perform below average in the Mathematical tests. Yusha'u (2006) Also confirmed both boys and girls to have had homogenous problems in learning difficulties after diagnosing and remediating Mathematics learning difficulties among Senior Secondary Schools in Sokoto State. It was therefore advised that teachers should always start with evaluation when we want to help "slow learning" children meet their challenges (Andrew, 2010). The finding provides the basis for the study to be carried out, after confirming their levels of learning difficulties.

This is a clear indication that both boys and girls in Junior Secondary Schools in Sokoto State have the same level of dyscalculia.

However, research question two sought to find out the extent of academic improvement of the dyscalculia students in experimental group after remediation. The H_{02} used was rejected because there was a statistically significant difference in the academic performance of dyscalculia students as a result of the explicit treatment (remediation) instruction they have received by the researchers. This finding supported the finding of Yang (2003) which confirmed statistically significant difference after instruction between pre-test and post-test scores for the experimental classes.

CONCLUSION

As a result of the findings of this study the following conclusion are reached:

1. There was a significant academic improvement of dyscalculia students as a result of the treatment given.
2. The traditional method of teaching had no significant effect on dyscalculia academic improvement.
3. The designed Dyscalculia Mathematics Test (DMT) was an appropriate research tool for conducting performance test (the pre-test and post-test, etc).

RECOMMENDATION

This study assessed the prevalence of learning difficulties and provides remediation to dyscalculia students in Junior Secondary Schools in Sokoto State.

1. Remedial teaching of dyscalculia students should be taken seriously by qualified Mathematics teachers and it should be seen as a special tool for reducing the level of difficulties among students and improving standard in Mathematics.

2. School administrators should always encourage teachers to give remedial teaching of Mathematics on difficult topic(s) or exercise(s) to students with dyscalculia.
3. Professional bodies like Mathematical Association of Nigeria (MAN), Science Teachers Association of Nigeria (STAN), Comparative Educational Study and Adaptation Centre (CESAC) and Nigerian Educational Research and Development Council (NERDC) should be encouraged to incorporate the use different techniques in the teaching and learning of Mathematics in junior secondary schools.
4. Remediation techniques should be incorporated into teaching and learning of mathematics in junior secondary schools in Nigeria.

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