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Diagnosis and remediation of learning difficulties on students' performance in geometry in Port Harcourt Local Government Area, Rivers State

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Abstract
The study diagnosed and remediated learning difficulties on senior secondary school students' Performance in circle geometry in Port Harcourt Local Government Area (PHALGA), Rivers State. The study was a quasi-experimental design, guided by three research questions and hypotheses. The population of the students comprises of (7,719) SS2 students in Port Harcourt Local Government Area, Rivers State. A sample size of 314 was drawn from four schools out of the sixteen public schools in PHALGA using purposive sampling technique. Two instruments were used, Diagnostic Test on Circle Geometry (DIATOCG) and Remediation Test on Circle Geometry (REMTOCG). The instruments were validated by the researcher's supervisors and three lecturers in the department of Curriculum Studies and Educational Technology and two lecturers from Measurement and Evaluation Departments of Faculty of Education, University of Port Harcourt. The essay questions of the instruments were designed based on the format of WAEC and NECO questions standard. The reliability of the instruments was determined using test retest and a reliability coefficient of 0.80 for (DIATOCG) and 0.89 for (REMTOCG) were obtained using Pearson Product Moment Correlation. Percentage, frequency count, mean and standard deviation were used to answer the research questions while the hypotheses were tested using Chi Square and ANCOVA at 0.05 significant level. The findings of the study revealed the presence of adaptive reasoning, procedural formulation, strategic competence and conceptual understanding learning difficulties among students. The study revealed that students' performance, and retention improved after diagnosis and remediation based on diagnostic test result. Based on the findings it was recommended that teachers should carry out diagnosis and remediation of learning difficulties on students from time to time for an improved performance. Also, Educational stakeholders should organize workshops, seminars where in-service Mathematics teachers could be trained on how to diagnose and remediate learning difficulties experienced by students.

Keywords: diagnosed, remediated, learning difficulties, geometry

Introduction

Mathematics is the base rock of Science and technology and the queen of all subjects that cut across every field of life. It is the pillar on which all scientific theorems stand on and derived their meanings and general acceptance. According to Mbanefo, (2018) [11] Science, Technology and Mathematics education is not only glowing in its use for technological innovations and inventions but has been proved to be the determinant factor for measuring any nations socio economic standard of living and geopolitical development. It is an indispensable part of human nature. The major challenge in the practice of Mathematics is poor performance which set to bring to nothing all the efforts of concerned stakeholders towards success in the practice of the subject. According to Okoafor, (2016) [14] poor performance and achievement of students' in Mathematics in external and internal examination have its cause traced to learning difficulties experienced by students. The poor performance of students on the subject inject fear and anxiety which reduces their self-esteem and confidence on the subject; that pushes them in the selection of careers where Mathematics practice is not required (Olubukola, 2015) [15]. According to Aysen, (2012) [4], attested geometry as one branch of Mathematics that students perceived to be difficult. He identified certain factors to be attributed to learning difficulties experienced by students in the study of geometry, such as; poor foundational knowledge on basic geometrical concepts that set a base on which difficult and advanced geometry of senior secondary are learnt, lack of in-depth understanding of students on proofs which implies how they are applied in related Mathematical problems, lack of knowledge of Mathematical language on geometry involving how and when to use them, poor visualizing abilities, teaching learning process, inadequate learning resources required for various concept learning. Wonu and Zalmon, (2017) [17] identified circle geometry as one aspect of Mathematics that students' experiences weakness that contributes to their poor performance in external examination. The analyses result of WAEC chief examiners of (2015-2017) report revealed circle geometry as one area where students' experience weakness and poor performance. A student who fails to perform or achieve as expected at the end of any academic program is an indication that he/she experiences learning difficulties. Learning involves extensive use of the brain, which is dependent on the mental processing. Better understanding of any concept in Mathematics depends on the internal representation that lies on individual information processing ability by decoding the input data for a better comprehension of the new learning with a link of previous knowledge in construction of new information, which are stored and recalled when needed in any problem-solving situations. The above process defines the intelligent level of student in their practice of Mathematics, which is used to ascertain the degree of learning difficulties experienced by the student. (Hewson & Thorley, (1989) [8] in Adegun & Adegu (2013) [8]. Obigwe,

2016, defined Learning difficulties as an indication of deficiency which tend to restrict a student from achieving set educational goals on a particular subject domain or general; clearly observed in their performance in both internal and external examination. Students with learning difficulties are academically sick, therefore, requires diagnosis and remediation for improvement.

Diagnosing is a medical word meaning identification of nature and causes of an illness/sickness. It works together with remediation (treatment) meaning to improve or correct a deficiency or problem. According to Tall and Razali, (2014) [18] defined diagnosis of learning difficulties as a systematic analysis and assessment of the types, causes and extent of learning difficulties experienced by student in a specific area of a subject. According to Uma, (2016) [21] he, described remediation of learning difficulties as a planned action employed in correcting academic defects by nullifying negative learning behaviours for a positive one. It is an act of providing the students with their academic needs in order to make progress. Remediation involves the designing of an instructional package that will assist students in attainment of expected proficiency in particular subject.

Remediation of learning difficulties is a common practice in the educational world but the process seems not to give a desirable outcome because teachers remediate without diagnosis which is likely to a doctor treating a patient without knowledge of the type of sickness and the extent of damage caused by the sickness. The researcher tried to relate the study to modern medical practice of treatment of ailment based on diagnostic test result, the study intends to identify the effectiveness of diagnosis and remediation based on diagnostic test result.

Statement of the Problem

The aim of Mathematics education is to achieve its set goals. The expected academic success in Mathematics has turned into a mirage. It is obvious that there are obstacles that prevent the actualization of its success. The achievement of the desired success requires the elimination of the obstacles. The inability of learners to achieve as expected in Mathematics showed that they are experiencing difficulties. The cause of poor performance can be attributed to factors like; nature of the subject, curriculum design, teaching method, quality of teachers, lack of learning resources and student characteristics. (Umar Sa'ad Abba & Abdullahi, (2014) [22]. Wonu and Zalmon, (2017) [17] attributed learning difficulties experienced by students as the major causes of massive failure in Mathematics. Therefore, the major focus should be how to identify the learning difficulties and ways of remediation for improved performance.

The researcher in her years of experience as a teacher, observed that many teachers remediate learning difficulties without diagnosis of types and nature experienced by students thereby, producing ineffective outcome.

Objectives of the Study

The study specifically intends to

1. Ascertain the presence and proportion of learning difficulties exhibited by students in circle geometry before and after remediation.
2. Determine the performance of students diagnosed and exposed to remediation package designed based on diagnostic test result and those diagnosed but exposed to remediation package not designed based on diagnostic test result.
3. Determine the retentiveness of students on circle geometry diagnosed and remediated using designed package based on diagnostic test result.

Research Questions

The following research questions guided the study

1. What are the proportions and types of learning difficulties exhibited by students on circle geometry before and after remediation?
2. What are the mean performance score of students diagnosed and exposed to remediation package designed based on diagnostic test result and those diagnosed but exposed to remediation package not designed based on diagnostic test result?
3. How does diagnosis and remediation of students learning difficulties on circle geometry based on diagnostic test result affects their retentiveness?

Hypotheses

The following hypotheses were tested at 0.05 alpha level.

Ho_1: There is no significant difference in the types and proportions of learning difficulties exhibited by students on circle geometry before and after remediation.

Ho_2: There is no significant difference between the performance of students diagnosed and exposed to remediation package designed based on diagnostic test result and those diagnosed exposed to remediation package not designed based on diagnostic test result.

Ho_3: There is no significant difference in the retentiveness of students on circle geometry after diagnosis and remediation based on diagnostic test result.

Methodology

The design of the study was quasi experimental. The population of the study was (7,719) consists of all public senior secondary schools two in Port Harcourt Local Government Area of Rivers state. The sample size for the study consists of 314 students. The instrument used were Diagnostic Test on Circle Geometry (DIATOCG) and Remediation Test on Circle Geometry (REMTOCG). They are essay questions. The instruments were validated for content and face validity. The Reliability coefficient of the instruments was determined using test retest; Pearson Product Moment Correlation was used to calculate reliability coefficient of 0.80 for diagnostic instrument while a reliability coefficient of 0.89 was calculated for remediation instrument. A pre-test was administered to the students for diagnoses of presence and types of learning difficulties experienced. The test scripts were marked based on WASSCE marking scheme for essay using the six-step formula and Maths Etiquette. The marking scheme had each question subdivided into; Procedural Formulation (PF) students' ability to use the correct method at any stage of the solution; Strategic Competence (SC) for accurate answer following a correct method/procedure; and independent accuracy marks not proceeded by procedure as Adaptive Reasoning (AR). Total score representing Conceptual Understanding (CU) for each question is made up of scores; AR (20%) + PF (40%) + SC (40%) = CU (100%). The cut off means are; for AR = 10, PF =20, SC =20 and CU =50,

scores below (B) cut off means; AR(B10), PF(B20), SC(B20) and CU(B50) indicates presence of learning difficulties on each type. Therefore, students with scores below 50% experiences learning difficulties in conceptual understanding, procedural formulation, strategic competency and adaptive reasoning. Students with scores above 50% indicates absence of learning difficulties. After three weeks of intensive learning using various remediation package for the groups. The experimental group remediation package was designed based on diagnostic test result while the remediation package of control group was not designed based on diagnostic test result. A post-test (REMTOCG) was administered to the students of both groups immediately after remediation. A post post-test was administered after two weeks; scores were recorded. The remediation package of the experimental group comprises of laboratory method, collaboration and problem base strategies while remediation of the control group was induction strategy. Data collected were analysed, percentage, frequency count, mean and standard deviation were used to answer the research questions while the hypotheses were tested at 0.05 significant level using Chi square and Analysis of Covariance (ANCOVA)

Results and Discussions

Research Question one: What are the proportions and types of learning difficulties exhibited by students on circle geometry before and after remediation?

Table 1: Percentage and frequency count of types of learning difficulties exhibited by students before remediation.

Experimental Group				Control Group		
Pretest (Before)				Pretest (Before)		
Learning Difficulties (LD)	**n (167)**	**(%)**	**Remark**	**N (147)**	**(%)**	**Remark**
Adaptive Reasoning (AR). Scores below 10	Freq. 123	74	Presence of LD	Freq.116	79	Presence of LD
Scores up to 10	44	26		31	21	
Procedural Formulation (PF) Scores below 20	125	75	Presence of LD	118	80	Presence of LD
Scores up to 20	42	25		29	20	
Strategic Competence (SC) Scores below 20	125	75	Presence of LD	121	82	Presence of LD
Scores up to 20	42	25		26	18	
Conceptual Understanding (CU) Scores below 50	133	80	Presence of LD	121	82	Presence of LD
Scores up to 50	34	20		26	18	

If scores below cut off mean % >50 and scores up to cut off mean % <50 = Presence of Learning Difficulties (LD); of cut off mean (10) for AR, 20 for PF, 20 for SC and 50 for TS.

Table 1 experimental group pre-test result showed frequency count of scores below cut off mean and percentage of learning difficulties of adaptive reasoning difficulties AR as 123(74%), procedural formulation difficulties PF as 125(75%), strategic competence as 125(75%) SC and conceptual understanding CU as 133(80%) while for scores up to cut off mean frequency count and percentage for AR as 44(26%), PF as 42(25%), SC as 42(25%) and TS as 34(20%). The control group also showed frequency count of scores below cut off mean and percentage of learning difficulties of adaptive reasoning difficulties AR 116(79%), procedural formulation difficulties PF 118(80%), strategic competence SC 121(82%) and conceptual understanding CU 121(82%) while for scores up to cut off mean frequency count and percentage for AR as 31(21%), PF as 29(20%), SC as 26(18%) and TS as 26(18%). The result indicated presence of AR, PF, SC and CU learning difficulties for both groups since the percentage of scores below cut off mean are greater than 50% and up to cut off mean percentage scores are less than 50%.

Table 1.2: Percentage and frequency count of types of learning difficulties exhibited by students after remediation.

Expt. Group				Control Group		
Posttest(after)				Posttest(after)		
Learning Difficulties (LD)	**N (167)**	**(%)**	**Remark**	**N (147)**	**(%)**	**Remarks**
Adaptive Reasoning (AR). Scores below 10	Freq. 15	9	Absence of LD	Freq.52	35	Absence of LD
Scores up to 10	152	91		95	65	
Procedural Formulation (PF) Scores below 20	14	8	Absence of LD	54	37	Absence of LD
Scores up to 20	153	92		93	62	
Strategic Competence (SC) Scores below 20	14	8	Absence of LD	58	40	Absence of LD
Scores up to 20	153	92		89	60	
Conceptual Understanding (CU) Scores below 50	10	7	Absence of LD	42	29	Absence of LD
Scores up to 50	157	93		105	71	

Scores below cut off mean % <50% and scores up to cut off mean % >50 = Absence of Learning Difficulties (LD) of cut off mean (10) for AR, 20 for PF, 20 for SC and 50 for TS.

Table 1.2 post test result of experimental group showed frequency count and percentage of students that scored up to the cut off mean of adaptive reasoning difficulties AR 152(91%), procedural formulation difficulties PF 153(92%), strategic competence 153(92%) SC and conceptual understanding CU 157(93%) while for scores below cut off mean frequency count and percentage for AR as 15(9%), PF as 14(8%), SC as 14(8%) and CU as 10(7%). The control group also showed frequency count and percentage of students that scored up to the cut off mean of adaptive reasoning difficulties AR 95(65%), procedural formulation difficulties PF 93(62%), strategic competence SC 89(60%) and conceptual understanding TS 105(71%) while for scores below cut off mean frequency count and percentage for AR as 52(35%), PF as 54(37%), SC as 58(40%) and CU as 42(29%). The result indicated absence of AR, PF, SC and

CU learning difficulties for both groups since the percentage of scores below cut off mean are less than 50% and scores up to cut off mean are greater than 50%.
The diagnosis result showed that greater number of students of both groups experiences learning difficulties of adaptive reasoning, procedural formulation, strategic competence and conceptual in circle geometry while the remediation result showed few number of students proving remediation appropriate and effective in reduction of learning difficulties experienced by students.

Research Question two: What are the mean performance score of students diagnosed and exposed to remediation package designed based on diagnostic test result and those diagnosed but exposed to remediation package not designed based on diagnostic test result?

Table 2: Mean and SD of pre-post scores of Experimental and Control groups.

		Pretest		Posttest		
Group.	**N**	**Mean ($\underline{X}$)**	**SD**	**Mean ($\underline{X}$)**	**SD**	**Mean. Diff.**
Expt.	167	40.2	7.0	65.1	11.9	24.9
Control.	147	40.9	6.5	55.1	9.7	14.1
Total	314	-	-	-	-	-

The findings of table 4.2 showed that the pre-test mean score of the experimental group is (40.2) with SD of (7.0) while that of the control group was (40.9) with SD of (6.5). The post-test mean score of the experimental group is (65.1) with SD of (11.9) while that of the control group is (55.1) with SD of (8.0). The mean difference of experimental group is (24.9) which is higher than that of control group of (14.1).
Table 2 result showed that the pre-test mean scores of both groups are lower than 50 and with lower standard deviation. The result indicated low performance for both groups. The post test mean score of both groups are above 50. The table showed a mean gain of 24.9 for the experimental group and 14.1 for the control group thereby confirming improvement in the performance of both groups. The result proved that students diagnosed and exposed to remediation package (experimental group) designed based on diagnostic test result scored higher than those diagnosed and exposed to remediation package designed not based on diagnostic test result (control group) with an achievement mean gain (post-test mean difference experimental (65.1) and control group (55.1)) of 10. Therefore, ascertaining diagnosis and remediation package designed based on diagnostic test result suitable for performance enhancement.

Research Question three: How does diagnosis and remediation of students learning difficulties on circle geometry based on diagnostic test result affects their retentiveness?

Table 3: Mean and SD of test scores of Experimental group indicating level of retentiveness.

Group.	**N**	**Pre –Test**		**Posttest**		**Post-Posttest**		**Mean. Diff.**
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Expt.	167	40.2	7.0	65.1	10.9	66.0	10.5	0.9
Total	167	-	-	-	-	-	-	-

The findings of table 3 showed that the pre-test, post-test mean and SD score of the experimental group was 40.2(7.0) for pre-test; 65.1(10.9); for post-test 66.0(10.9) for post-post test score and mean difference of post-test and post post-test as 0.9.
Table 3 result showed that the mean value of the experimental group for post-test and post post-test are greater than 50 with mean and SD difference of 0.96 (0.4), therefore, proving that students' retentiveness can be improved through diagnosis and remediation using the appropriate packages designed based on diagnostic test result.

Hypothesis one: There is no significant difference in the types and proportions of learning difficulties exhibited by students on circle geometry before and after remediation.

Chi Square result of hypothesis one.

Chi Square Table 4

O	**E**	**O-E**	**$(O-E)^2$**	**$(O-E)^2/E$**
31	147	-116	13456	91.54
105	147	-42	1764	12.00
44	167	-123	15129	90.59
152	167	-15	225	1.35
30	147	-117	13689	93.12
97	147	-50	2500	17.01
42	167	-125	15625	93.56
151	167	-16	256	1.53
29	147	-118	13924	94.72
99	147	-48	2304	15.67
42	167	-125	15625	93.56
151	167	-16	256	1.53
26	147	-121	14641	99.60
115	147	-32	1024	6.97
34	167	-133	17689	105.92
157	167	-10	100	0.60
				$\sum$=819.27

$\sum(O-E)^2/E = 819.27$
$X^2 = \sum(O-E)^2 /E$
$X^2 = 819.27.$

Degree of freedom = (c-1) (r-1) where c = column, r = row; (16-1) (4-1) = (15) (3) = 45; the critical X2 = 61.66 and the calculated X2 = 819.27; the critical X^2 = 16.92 and the calculated X^2 = 819.27, since the calculated chi square value is greater than the critical chi square value at 0.05 significant level, then we reject the null hypothesis of no significant difference and accept the alternative indicating that there is a significant difference in the types and proportions of learning difficulties (adaptive reasoning, procedural formulation, strategic competence and conceptual understanding) exhibited by students on circle geometry before and after remediation.

Hypothesis two: There is no significant difference between the performance of students diagnosed and exposed to remediation package designed based on diagnostic test

result and those diagnosed but exposed to remediation package not designed based on diagnostic test result.

Table 4: ANCOVA result of Hypothesis two. Tests of Between-Subjects Effects

Dependent Variable: Performance.						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	14688.678[a]	2	7344.339	103.379	.000	.399
Intercept	8501.988	1	8501.988	119.674	.000	.278
Pre test	6945.631	1	6945.631	97.767	.000	.239
Group	8562.679	1	8562.679	120.528	.000	.279
Error	22094.354	311	71.043			
Total	1182112.000	314				
Corrected Total	36783.032	313				

a. R Squared =.399 (Adjusted R Squared =.395)

The ANCOVA result of table 4 showed a calculated significant value of (.000) which is less than the 0.05 therefore, there is a significant difference between the performance of students diagnosed and exposed to remediation package designed based on diagnostic test result and those diagnosed, exposed to remediation package not designed based on diagnostic test result.

Hypothesis three: There is no significant difference in the retentiveness of students on circle geometry after diagnosis and remediation based on diagnostic test result.

Table 5: ANCOVA result of Hypothesis three

Tests of Between-Subjects Effects						
Dependent Variable: Retentiveness						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	.362[a]	1	.362	.003	.957	.000
Intercept	1276095.883	1	1276095.883	10083.212	.000	.968
VAR00002	.362	1	.362	.003	.957	.000
Error	42016.754	332	126.556			
Total	1318113.000	334				
Corrected Total	42017.117	333				

a. R Squared =.000 (Adjusted R Squared = -.003)

The result of table 5 showed that the calculated significant is (0.957) which is greater than 0.05 significant accepted level, therefore, there is no significant difference in the retentiveness of students on circle geometry after diagnosis and remediation based on diagnostic test result.

Discussion of Findings

The analyses result of the current study established the need for diagnoses and remediation of students' learning difficulties for better achievement in the study of Mathematics. The result proved that students' poor performance in Mathematics are as a result of learning difficulties. It was identified in the study, types of learning difficulties experienced by students (adaptive reasoning, procedural formulation, strategic competence and conceptual understanding difficulties) on circle geometry and the effect of remediation. The study also confirmed the necessity of designing a remediation package based on the type of identified learning difficulties and the effectiveness of laboratory, problem solving base and collaboration strategies in the remediation of learning difficulties experienced by students on circle geometry. The study gives a clear picture of the major problem in the teaching/learning of Mathematics in our secondary schools were teachers adhere to traditional teaching method; remediating students without diagnoses or not based on diagnostic test result and use of inappropriate teaching strategies.

The result of table 1 and 1.2 proved the presence of learning difficulties of adaptive reasoning (AR), procedural formulation (PF), strategic competence (SC) and conceptual understanding (CU) among students. The proportion and percentage of students with scores below the assigned cut off mean scores AR(AR0), PF(B20), SC(B20), CU(B50) for the identified learning difficulties were higher than those with scores above assigned cut off mean scores AR(SC0), PF(A20), SC(A20), CU(A50) before remediation; and after remediation the number of students with scores below assigned average scores AR(AR0), PF(B20), SC(B20), CU(B50) were reduced, causing an increase in the number and percentage of students that scored above assigned average scores AR(A10), PF(A20), SC(A20), CU(A50), thereby confirming reduction or elimination of learning difficulties experienced by students. This was ascertained with the chi square result of hypothesis one proving that there is a significant difference in the proportion of learning difficulties exhibited by students' before and after remediation. This is supported by the study of Adindu, (2016) [1] that greater number of students' experiences learning difficulties on circle theorem before remediation which she attributed as the causal factor of poor performance among them. The findings were also supported by the study of Jaja, (2018) [10] that a higher proportion of senior secondary students' experiences learning difficulties on some topics of the senior secondary Mathematics curriculum which circle geometry was among. The findings agreed with the findings of Tall and Razali, (2014) [18], they identified thinking process as one of the difficulties experienced by students in Mathematics attributing it as the major cause of poor performance on the subject. They recommended the use of higher-level learning strategies in the teaching of Mathematics content and procedures. The study also agrees with the findings in the study of Syukriani,

Juniati and Siswonu (2017) [17]; which identified adaptive reasoning difficulty as a learning difficulty experienced by students. The study is also in line with the study of Hlabane, (2017) [9] who identified higher order thinking skills as part of Mathematics learning difficulties experienced by students that requires remediation. This is in harmony with the study of Uja, (2017) [19] that students' experiences difficulty in procedural deduction and improved after remediation. The findings also agree with the work of George and Charles-Ogan (2015) [5]; they identified process difficult experienced by students as the casual factor of students Mathematics errors that leads to failure in problem solving. The findings are in accord with the findings of Adindu (2016) [1] and Syukriani, Juniati and Siswonu (2017) [17]; they identified strategic competence difficulty as a learning difficulty experienced by students with an improvement after remediation. This is in line with the study results of Opitz, Freesmann and Prediger (2016) [16]; Adindu, (2016) [1]; Halbane, (2017) and Okafor (2016) in their diagnoses of learning difficulties experienced by students identified conceptual understanding as one and its improvement after remediation confirmed with a positive change on students' performance. George and Charles-Ogan (2015) [5] in their study identified conceptual understanding problem as one of the causal factors of Mathematics error exhibited by students that results into failure in solving Math problem correctly.

Students performance, diagnosis and remediation

The findings are in congruence with the study results of Adindu, (2016) [1] and Uja, (2017) [19] that diagnosis and remediation using effective strategies improves students' performance in Mathematics. It is also in pact with the study of Yusha'u (2013) proving increase in students' performance after remediation of diagnosed learning difficulties (dyslexia and dyscalculia) using effective strategies. The study is in line with the work of Ajogbeje and Falorinso, (2012) [2] on improved performance in Mathematics by remediation of students' using appropriate strategies based on feedbacks. The remediation package comprises of laboratory method, collaboration and problem base strategies which its application resulted into positive change in performance. The findings are in agreement with the study of Okigbo and Osuama, (2012) [13] and Fima, (2017) [6] that the teaching of trigonometry using laboratory and problem base strategies has a positive influence on students' performance. Also supported were the studies of Awaja, (2015) [3] and Chales-Ogan, (2014) [7], confirming improved performance on Mathematics using collaboration and problem base strategies.

Retentiveness and students' Diagnosis and remediation of learning difficulties.

The analysis result of the study is in line with the findings of Adindu, (2016) [1]; and Uja, (2017) [19] proving diagnosis and remediation of learning difficulties of positive influence to students' level of retention. Fima, (2017) [6] in his study proved that the use of laboratory improves students' retention in trigonometry and Awaja (2015) [3] proving collaboration and problem base improves retention, are also in line with the current study.

Conclusion

It was established from the findings of this study that students with identified learning difficulties of adaptive reasoning, procedural formulation, strategic competence and conceptual understanding if remediated using the appropriate instructional package designed based on diagnosis test result improves their performance and retentiveness.

Recommendations

1. Mathematics teachers should be encouraged and effectively trained on how to diagnose and remediate students with learning difficulties in Mathematics using appropriate teaching methods together with strategies. This will enhance better performance and retentiveness in Mathematics.
2. Curriculum planners should take cognizance of diagnosis and remediation of learning difficulties using innovative strategies and incorporate them when designing curriculum.
3. Educational stakeholders should organize workshops, seminars where in-service Mathematics teachers could be trained on how to diagnose and remediate learning difficulties experienced by students.
4. Mathematics teachers should join professional bodies like Mathematics Association of Nigeria (MAN) where they can be sensitized and enlightened on contemporary skills in lesson delivery to ensure students optimal achievement in Mathematics.

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