DIAGNOSIS AND INSTRUCTIONAL INTERVENTIONS FOR JUNIOR SECONDARY STUDENTS WITH DYSGRAPHIA IN GEOMETRIC CONSTRUCTION TASK

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Abstract
The study was conducted to enhance the academic performance of junior secondary students with dysgraphia in the Bida local government area of Niger State. The intervention focused on diagnosing and remedying their learning difficulties. The study used a quasi-experimental design with two groups: control and experimental. The sample included 81 students (experimental: 38, control: 43). Dysgraphia was identified in two stages using the Diagnostic Dysgraphia Test (2DT) and General Cognitive Ability Test (GCAT), validated by three experts in mathematics education (reliability: r = 0.75). The experimental group received reciprocal peer-tutoring (RPT), while the control group followed conventional teaching methods (CTM). Descriptive statistics (mean, standard deviation, mean difference, mean gain) analyzed the data and answered research questions, while ANCOVA tested the null hypothesis. Results showed that RPT improved the academic performance of dysgraphia learners compared to CTM. Gender did not significantly affect dysgraphia performance. The recommendation is for mathematics teachers to incorporate RPT when teaching students with dysgraphia.
Keywords: Dysgraphia, Instructional Intervention, Diagnosis, Reciprocal Model, Conventional Model

Introduction

Mathematics is a fundamental academic subject that encompasses the study of numbers, patterns, space, quantity, and their applications in various fields. It plays a crucial role in science-based professions and fosters problem-solving, creativity, and critical thinking skills. Mathematics is considered a core subject for learners at all levels of education, from nursery to secondary school. In Nigeria, admission into tertiary institutions for both science and non-science courses requires a credit pass in mathematics in external examinations such as WAEC, SSSE, and NECO, making it a compulsory subject of high importance.Despite its significance, student performance in mathematics is generally poor, as reported by Ahmad & Zakariyya (2023). Several factors have been attributed to this underachievement, including the adherence to conventional teaching methods by many mathematics teachers (Wonu & Nwoko, 2022). Conventional Teaching Method (CTM) is teacher-centered and primarily relies on oral presentations. This method tends to favor academically advantaged learners while neglecting those who are educationally disadvantaged. Ahmad & Zakariyya (2022) emphasize that using appropriate learning strategies can enhance effective teaching and learning outcomes. They suggest that mathematics teachers should be open to innovative learning strategies that engage learners' experiences, since the conventional mode of instruction delivery has been found to be ineffective in producing desired learning outcomes. Therefore, it is crucial to incorporate innovative instructional strategies that promote improved outcomes and address Mathematics Learning Difficulties (MLD).

MLD, also known as a learning disorder, refers to various difficulties learners face when it comes to mathematics. It encompasses learning deficits and low academic performance in the subject. Individuals with MLD may struggle to learn in a traditional classroom setting and may face challenges in developing basic mathematical skills compared to their peers. MLD can be caused by factors such as genetics, psychological trauma, parental and neonatal risks, and physical trauma (Sufiyanu et al., 2019). Conditions like Dysgraphia, Dyslexia, and Dyscalculia

are examples of MLD identified by scholars such as Wonu & Zalman (2017), Sufiyanu et al. (2019), and Wonu & Nwoko (2022). These learners often have fundamental difficulties in understanding, representing, and manipulating mathematical problems. These challenges can become more significant as learners' progress to higher grades, given that mathematics curricula are cumulative and interconnected.

Dysgraphia is a writing disorder characterized by impaired letter formation and difficulties in writing (Mahesh, 2019). Communication plays a crucial role in learning, and it serves as an indicator of a learner's level of success. Writing, reading, listening, and speaking are components of communication that are interconnected and essential for acquiring and expressing knowledge. Learners with dysgraphia may struggle with tasks in mathematics that involve sketching, drawing, constructing place values, fractions, aligning numbers, organizing complex mathematical expressions, and equations. This learning disorder affects the student's ability to learn and apply mathematics skills, particularly in construction tasks, as dysgraphia is tied to visuo-spatial abilities, which are fundamental in mathematics (Sufiyanu et al., 2019).

Dysgraphia goes beyond difficulties in spatial awareness when writing or drawing. Many experts consider dysgraphia as a problem with a set of skills known as transcription, which includes drawing, handwriting, typing, and spelling (Sufiyanu et al., 2019). Learners with dysgraphia may struggle with the mechanics of writing or constructing, and some may have comorbidities with language, reading, and numeracy disorders, further affecting their ability to write or construct (Taruly, 2019).

Agraphia, on the other hand, refers to the loss of the ability to write or construct, usually resulting from brain insult or injury in specific areas. In terms of behavioral outcomes, however, the terms agraphia and dysgraphia are synonymous. Dysgraphia can manifest as difficulties in writing at any level, including illegible handwriting, slow writing speed, problems with syntax and composition, among others. Ukwueze (2015) also views dysgraphia as a problem with the set of skills related to transcription, including drawing, handwriting, typing, and spelling. Given that the writing process is complex and involves various skills related to brain functions and motor actions, dysgraphia can have several aspects that impact an individual's ability to write and construct effectively.

i. **Aphasic agraphia:** This refers to leaving out numbers, letters, and words in writing, as well as incomplete symbols, signs, and numerals when copying mathematics from a chalkboard or book.
ii. **Spatial agraphia:** Errors in spatial orientation, spatial organization, and the relative positions of objects in writing can be observed. Individuals with spatial agraphia may struggle to align numbers properly in addition and subtraction or place numbers in their correct positions in multi-digit operations. They may also have difficulty with drawing distorted geometrical figures, accurately representing relative sizes, and integrating figures, dimensions, and representations.
iii. **Apraxic agraphia:** Apraxic agraphia is associated with poor handwriting and is often caused by a condition called dysgraphia. Dysgraphia can be accompanied by Developmental Coordination Disorder (DCD), which affects motor skills and coordination. Learners with apraxic agraphia may struggle with writing symbols, drawing shapes, and accurately reproducing mathematical signs, numerals, and other elements when copying or constructing problems. They may find it challenging to perform calculations and accurately copy numbers, shapes, figures, diagrams, and equations from a chalkboard.
iv. **Aphasia:** Learners with aphasia may omit or substitute letters, symbols, numbers, and operational symbols when writing, copying, or communicating mathematical information.

v. **Acquired dysgraphia:** Some learners, due to poor instruction in handwriting, lack of practice, and a sense of helplessness or distaste for writing, may develop poor handwriting skills. As a result, they may avoid tasks that involve drawing, constructing, or writing (Mahesh, 2019).

These different aspects of dysgraphia can manifest in learners and impact their ability to effectively express mathematical ideas in writing, copying, and other related tasks.
Dysgraphia can manifest in learners and significantly impact their ability to express mathematical ideas effectively through writing, copying, and related tasks. However, despite its prevalence and impact on reading, language, and mathematics, dysgraphia has received limited attention from researchers, particularly in the context of writing in mathematics situations. The role of writing, drawing, sketching, and construction in mathematics, especially in geometric construction, is crucial. Learners with dysgraphia may face difficulties in understanding and performing in mathematics due to challenges in these areas.
Diagnosis plays a vital role in addressing learning difficulties such as dysgraphia. It involves recognizing and analyzing signs and symbols to determine the cause and nature of a problem.

Diagnosis is a systematic evaluation, analysis, and recognition of signs, symptoms, or patterns that leads to a valid conclusion. It is an essential step in the problem-solving and decision-making process, facilitating the development of treatment plans, educational interventions, and strategies to effectively address the identified issues. Diagnosis involves determining the nature and cause of a particular occurrence (Wonu & Nwoko, 2022). In the case of dysgraphia, the diagnosis focuses on identifying, recognizing, and understanding the status and exact causes of difficulties in understanding mathematics-related concepts, particularly in geometric construction.

To assess and evaluate the different disabilities affecting a learner's mathematics proficiency, various mathematics diagnostic tools can be employed. These tools are used in understanding the specific challenges faced by learners with dysgraphia. They include assessments of writing and copying, handwriting analysis, spatial awareness assessments, and math problem-solving tasks. Through the use of these diagnostic tools, educators and professionals can gather valuable insights that inform the development of appropriate interventions, support strategies, and educational plans to effectively address the needs of learners with dysgraphia.
Different mathematics diagnostic tool can be employed to assess and evaluate different disabilities of learner’s mathematics proficiency as opined by Nwuke and Anaekwe, (2023), include:

- **Previous evaluation:** This assessment is conducted at the beginning of a new task or instructional unit to determine learners' prior knowledge and understanding of relevant mathematical concepts and experiences. It helps instructors tailor instruction to meet learners' individual needs.
- **Monitoring evaluation:** This type of evaluation is carried out during or at the end of instruction to track learners' progress and identify areas of weakness. It allows instructors to make timely adjustments and provide additional support to ensure the achievement of learning goals.
- **Summative evaluation:** This evaluation is conducted at the end of a course or a defined period, such as a semester or academic year. It assesses learners' overall mathematical proficiency and provides a comprehensive summary of their performance.
- **Diagnostic examination:** This evaluation is specifically designed to pinpoint learners' areas of strength and weakness in mathematics. It helps identify specific areas where learners may require additional support or intervention.
- **Diagnostic misconception evaluation:** This evaluation is focused on identifying and resolving common misunderstandings or misconceptions that learners may have in

mathematics. It helps instructors address these misconceptions and promote accurate understanding of mathematical concepts.

- **Diagnostic procedure:** This involves determining learners' proficiency in using specific mathematics strategies or techniques. It assesses their ability to apply mathematical knowledge and problem-solving skills effectively. Mathematics teachers, mathematics educators, and researchers in mathematics education play a crucial role in understanding and applying diagnostic tools to address dysgraphia in learners and overcome their learning difficulties. This process is known as remediation, which involves interventions aimed at addressing and managing learners' specific disorders or difficulties. Remediation focuses on developing strategies to help learners cope with their challenges and improve their mathematical abilities. It encompasses assessment, planning, implementation, and continuous monitoring to ensure progress and improvement in learners.

The concept of remediation is applicable in various fields, including education, healthcare, environment, sanitation, and building structures. In the context of mathematics learning difficulties (MLD), remediation refers to the intervention or assistance provided to help learners overcome diagnosed difficulties in a particular topic or subject. Mathematics teachers should employ innovative teaching methods to address identified problems and ensure effective learning and remedial teaching. As a guide, the teacher should facilitate quality learning by actively involving learners in the learning process (Ukwueze, 2015; Wonu & Nwoko, 2022).

It is important to incorporate innovative instructional strategies that enhance students' performance in mathematics, particularly in the context of MLD. Innovative instructional strategies involve using diverse methods to translate complex or abstract theories into real-life experiences in the classroom, ensuring learners' understanding as submitted by (Ahmad & Zakariyya, 2022; Nwuke & Anaekwe, 2023). These strategies are also being found to promote academic performance and reduce boredom among students of all levels. They suggested that collaborative learning, problem-solving strategies, metacognitive strategies, guided discovery strategies, peer tutoring, and the use of technology has some innovative instructional strategies that can be employed to enhance the performance of students with learning difficulties. These strategies provide a structured framework to address MLD and help students develop understanding, confidence, and competence in mathematics (Nwuke & Anaekwe, 2023).

The research conducted by Wonu and Charles-ogan (2017) demonstrated that students with mathematics learning difficulties (MLD) who used metacognitive strategies showed improvements in problem-solving skills, learning outcomes and cognitive knowledge in everyday arithmetic.
Another study by Wonu and Nwoko (2022) focused on collaborative learning strategies for students with developmental dyscalculia (DD). The findings indicated that the collaborative learning model was more effective than the traditional model in enhancing the performance of students with DD in number and numeration. The study did not find significant differences in learning outcomes based on gender. Nwuke and Anaekwe (2023) conducted research on the diagnosis and remediation of math-phobia using Polya 's problem-solving model. The results showed that the model encouraged participation and collaboration among students, leading to improved performance.

Dysgraphia is a learning difficulty characterized by poor drawing, handwriting, spelling, and coordination of numerical figures due to inadequate psychomotor skills. The illegibility of handwriting, non-adherence to rubrics, and lack of skills in drawing shapes and maps have been identified as weaknesses among students by the West African Examination Council (WAEC, 2002). Ukwueze (2015) noted the lack of sufficient research on dysgraphia despite its contribution to academic difficulties.

The reciprocal peer tutoring model (RPT) can be an effective approach for diagnosing and remediating dysgraphia to improve students' construction, handwriting, and performance in mathematics. RPT involves two students working together in a one-to-one setting, where the tutor assists the target learner in practicing or reviewing an academic skill. The model has the potential to support students with MLD by providing peer learning and fostering a supportive learning environment. Working in peers can create a relaxed and supportive learning atmosphere where humor can be used to foster positive experiences. Ahmad and Zakariyya (2023) highlighted the benefits of the RPT model in inclusive classrooms, as peers can cater to a wide range of learning needs and disabilities. Cooperative learning in RPT can positively impact the learning outcomes of students with MLD. Additionally, RPT allows students to track their own progress, promoting a sense of feedback and ownership of their tasks. The RPT lesson model typically involves four steps: predicting, clarifying, solving, and summarizing. Each group member rotates through these roles, ensuring active participation. The teacher's role is to guide the learners and ensure that each learner effectively uses the strategies based on their abilities.

The research on gender differences in academic performance in mathematics has yielded inconclusive results. Different scholars have reported varying findings regarding the performance of boys and girls in mathematics. Nsofor and Nasiru (2013) found that boys outperformed girls in science subjects, while Gambari et al. (2014) reported that male students achieved better than female students in mathematics. On the other hand, Gimba (2013) reported that female students achieved better than male students in mathematics. Etsu and Manko (2019) conducted a study that revealed no significant difference in the academic performance of male and female students. Based on these studies, there is no consistent result indicating a clear gender difference in mathematics performance. The inconclusive findings highlight the need for continuous investigation into gender issues and academic performance in mathematics. Further research is necessary to gain a deeper understanding of the factors influencing gender differences, if any, and to develop strategies to promote equitable learning outcomes for all students.

Statement of Problem

The poor performance of students in examinations is attributed to some factors such as inadequate preparation, incomplete coverage of the mathematics curriculum, and students' difficulties in writing clearly, among others (Ukwueze ,2015; Etsu & Manko, 2019). They also often blame the parents and teachers for this situation. Taruly (2019) commented that many students struggle in school due to difficulties expressing their thoughts in written form, which they perceive as dysgraphia. This difficulty in writing has a negative impact on students' success in their subjects. The West African Examination Council (WAEC, 2002) also reported that students' weaknesses in examinations include illegible handwriting, failure to follow instructions, and lack of skills in constructing and drawing maps and diagrams.

Ukwueze (2015) expressed concern that dysgraphia is not a widely researched disorder, despite its contribution to school failure. As a result, there is limited available research on the topic. To the best of our knowledge, no research has specifically focused on diagnosing and remediating dysgraphia among junior secondary school students with dysgraphia in geometric construction. To address this gap, the present study aims to investigate the effectiveness of reciprocal peer tutoring (RPT) in enhancing the academic performance of junior secondary school students with dysgraphia in the Bida Local Government Area of Niger State.

Objectives of the Study

This study aims to provide instructional intervention to improve the academic performance of junior secondary school students with dysgraphia in the Bida Local Government Area of Niger State. Specifically, the objectives of the study are to:

1. Find out the difference in the academic performance of students with dysgraphia taught geometric construction using RPT and those taught using CTM.
2. Examine the difference in the academic performance of the male and female students with dysgraphia taught geometric construction.

Research Questions

The research questions were asked to guide this study; include:

1. What is the mean difference in the academic performance of students with dysgraphia taught geometric construction using RPT and those using CTM?
2. What is the mean difference in the academic performance of students with dysgraphia taught geometric construction using RPT?

Research Hypotheses

The following null hypotheses were test at 0.05 level of significance.

$H0_1$: There is no significant difference in academic performance of student with dysgraphia taught geometric construction using RPT and those taught using CTM.

$H0_2$: There is no significant difference in academic performance of male and female students with dysgraphia taught geometric construction using RPT.

Method and Materials

A quasi-experimental research design was utilized in this study. It involved a pre-test and post-test with both an experimental group and a control group. The research was conducted in two selected public schools. The target population for this study comprised all 3,530 J.S.S II students in the Bida Local Government Area of Niger State. Two junior secondary schools were chosen randomly from a total of fifteen schools using a balloting process. In the second stage of randomization, one intact class was selected from each of the selected schools, representing the total number of JSSII classes in each school. The sample size for the study consisted of 81 students. This sample size aligns with the central limit theorem, which suggests that a minimum of 30 samples is suitable for experimental research (Etsu & Manko, 2019). The experimental group consisted of 38 students, comprising 25 males and 13 females, while the control group consisted of 43 students, comprising 32 males and 11 females. The screening method outlined below was used to identify learners with dysgraphia:

Stage One: A diagnostic test titled "Diagnostic Dysgraphia Test" (2DT) was developed. The test comprised ten essay questions focused on simple construction and graph of straight lines. It was administered to JSSII students in each selected school. The maximum score on the 2DT was 100%. For this study, students who scored less than 40% were classified as students with dysgraphia, while those who scored 40% or higher were classified as non-dysgraphia students.

Stage Two: The 2DT was reshuffled and administered to all the identified students with dysgraphia in the selected schools. This step was taken to confirm the results obtained in Stage One.

Stage Three: Students who underperformed based on their results and fell outside the specified range were included in the study. This decision was supported by Wonu & Nwoko (2022) and Nwuke & Anaekwe (2023).

The research instruments used in this study were the 2DT and the Geometric Construction Achievement Test (GCAT). The GCAT consisted of 20 multiple-choice items with four options (A-D), covering topics such as bisecting line segments and angles, geometric constructions of shapes, and locus of points and circles in the JSSII mathematics syllabus. JSSII students were chosen for the study as it is a foundational class for the geometry course in the curriculum.

Both the 2DT and GCAT were validated by three independent experts who were senior lecturers in the Department of Science Education at Ibrahim Badamasi Babangida University (IBBUL) and Federal University of Technology (FUT) Minna. The reliability coefficients for the two

instruments, 2DT and GCAT, were achieved through the test-retest method using the product moment correlation (PPMC) and yielded values of 0.75 and 0.83, respectively.
The experimental group received instruction on geometric construction using the Reciprocal Peer Tutoring (RPT) lesson model, while the control group was taught using the Conventional Teaching Method (CTM). This instructional intervention lasted for five weeks. After the intervention, the GCAT was administered to both groups. The answer scripts were collected, marked, and scored out of 100%. The data were collected and analyzed using descriptive statistics such as mean and standard deviation to answer the research questions, while hypothesis testing was conducted using analysis of covariance (ANCOVA).

Results

Research Question One: What is the mean difference in the academic performance of students with dysgraphia taught geometric construction using RPT and those taught using CTM

Table 1: Descriptive Statistics on the Performance Experimental and Control group

Group	N	Pre-Test		Post-Test		Mean Difference
		$\bar{X}$	SD	$\bar{X}$	SD	
Experimental	38	19.73	11.9	44.77	7.76	26.04
Control	43	16.92	10.46	20.75	11.51	4.83
Mean gain		1.81		24.02		

The results presented in Table 1 indicate that the experimental group, which was taught geometric construction using RPT, had a pre-test mean score of 18.73 and a standard deviation of 11.90. In comparison, the control group, taught using CTM, had a pre-test mean score of 18.92 with a standard deviation of 10.46. The mean gain between the pre-test and post-test for both groups was 1.81. After the intervention, the post-test mean score for the experimental group was 44.77, with a standard deviation of 7.76. On the other hand, the control group had a post-test mean score of 20.75, with a standard deviation of 11.57. The mean gain in performance between the pre-test and post-test was 24.02 in favor of the experimental group.

Null Hypothesis One: There is no significant difference in the academic performance of students with dysgraphia taught geometric construction using RPT and those taught using CTM

Table2: Analysis of Covariance (ANCOVA) of mean achievement scores of Experimental and Control Groups

Sources of variance	Type III sum of squares	Df	Mean square	F-CAL	P-value	Decision
Corrected Model	27734.269[a]	2	13867.135	1217.605	.000	
Intercept	3209.868	1	3209.868	281.843	.000	
PRETEST	13.744	1	13.744	1.207	.274	
GROUP	25497.058	1	25497.058	223.667	.000	S
Error	1560.274	78	11.389			
Total	477114.000	81				
Corrected Total	29294.543	80				

a. R Squared = .605 (Adjusted R Squared = .576)

The result in Table 2 reveals a significant difference between the mean scores of students with dysgraphia who were taught geometric construction using RPT and those taught using CTM. The F-ratio was calculated to be 223.667, with an associated probability value of 0.00. Since the probability value (p-value) of 0.00 is less than the alpha level of 0.05, the null hypothesis is rejected. This indicates that there was a significant difference in the mean performance scores of students with dysgraphia who were taught geometric construction using RPT compared to those taught using CTM. These findings suggest that Reciprocal Peer-Tutoring (RPT) had a greater positive impact on the academic performance of learners with dysgraphia in geometric construction compared to the Conventional Teaching Method (CTM).

Research question Two: What is the mean difference in the academic performance of male and female students with dysgraphia taught Geometric Construction using RPT.
Null Hypothesis Two: There is no significant difference in the academic performance of male and female students with dysgraphia taught Geometric Construction using RPT.

Table 3: Descriptive Statistics of Performance of Gender in Experimental Group

Group	N	Pre-Test		Post-Test		Mean Difference
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	25	18.40	10.88	53.85	6.16	34.45
Female	13	19.21	11.02	52.76	4.70	33.55
Mean Gain		9.19		1.09		

Table 3 presents the results for male and female students in the experimental group who were taught geometric construction using RPT. The male students had a pretest mean score ($\bar{X}$) of 18.40, with a standard deviation of 10.88, while the female students had a pretest mean score of 19.21, with a standard deviation of 11.02. After the intervention, the posttest mean score for the male students was 53.85, with a standard deviation of 6.16. On the other hand, the female students had a posttest mean score of 52.76, with a standard deviation of 4.70. The difference in the mean gain scores between the two groups was found to be 1.09.

Table4: Analysis of Covariance (ANCOVA) achievement scores male and female students in Experimental Group

Sources of variance	Type III sum of squares	Df	Mean square	F-Cal	P-value	Decision
Corrected Model	2768.059[a]	2	1384.030	7.148	.001	
Intercept	13016.035	1	13016.035	67.223	.000	
PRETEST	2707.487	1	2707.487	13.983	.000	
GROUP	530.849	1	530.849	51.431	.239	NS
Error	26526.483	36	193.624			
Total	477114.000	38				
Corrected Total	29294.543	37				

a. R Squared = .532 (Adjusted R Squared = .521)

The results in Table 4 indicate that there was no significant difference in the mean scores of male and female students with dysgraphia when taught geometric construction using RPT. An F-

ratio of 1.41 was recorded, with a corresponding probability value of 0.239. Since the probability value (p-value) of 0.239 is greater than the significance level of 0.05, the null hypothesis is upheld. This suggests that there is no significant difference in the mean scores of male and female students with dysgraphia when they are taught geometric construction using RPT. Thus, gender is not a significant factor in determining the performance of students with dysgraphia in geometric construction.

Discussion

The results in Table 1 provide evidence for the first research question, which examined the performance of students with dysgraphia taught geometric construction using RPT compared to those taught using CTM. The post-test mean score for the experimental group taught with RPT was 44.77, while the control group taught with CTM had a mean score of 20.75. This suggests that students with dysgraphia who were taught with RPT performed better than those taught with CTM, as indicated by their higher post-test mean score. Statistical analyses of the data confirmed a significant difference in the performance of students with dysgraphia taught using RPT compared to CTM. This finding aligns with previous studies by Ahmad and Zakariyya (2023) that highlight the positive impact of innovative teaching strategies, such as RPT, on students' learning outcomes. RPT caters to a wide range of learning needs and disabilities, and the collaborative and problem-solving nature of the approach contributes to better outcomes compared to CTM (Sufiyanu et al., 2019; Wonu & Nwoko, 2022).

Table 2 addresses the second research question, which explored the performance of male and female students with dysgraphia taught geometric construction using RPT. The post-test mean score for male students was 52.85, while female students had a mean score of 52.76. The mean gain between the pre-test and post-test scores for both genders was 1.09. The relatively close mean scores indicate that both genders performed at a similar level. Moreover, the statistical analysis confirmed that there was no significant difference in the academic performance of male and female students with dysgraphia when taught using RPT. This finding supports previous research by Etsu and Manko, which found no significant difference in the academic performance of male and female slow-learners in geometry concepts when using peer-tutoring. Additionally, the study by Wonu and Nwoko (2022) reported no discernible difference in the performance of junior secondary school students with developmental dyscalculia when taught with a collaborative strategy, irrespective of gender. The influence of gender on performance was found to be minimal, as indicated by the low partial Eta square value of 0.050, representing a 5% variation, as explained in Cohen's theory (Wonu & Nwoko, 2022).

Conclusion

The study provides strong evidence that reciprocal peer-tutoring (RPT) is an effective instructional remediation for students with dysgraphia in junior secondary school. The findings demonstrate that RPT significantly improves the academic performance of these students, irrespective of gender. This inclusive approach caters to a wide range of learning needs and encourages active participation, making it a valuable tool for enhancing learning outcomes. Implementing RPT as a teaching strategy can have a positive impact on the academic success of students with dysgraphia, fostering a supportive and inclusive learning environment.

Recommendation

The following recommendations are made based on the results of the study:

1. Mathematics teachers should be well-versed in effective RPT to enhance student learning outcomes.
2. Mathematics teachers should create a relaxed and supportive learning environment that encourages and motivates both male and female students to learn effectively.

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