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DIAGNOSIS AND REMEDIATION OF MATHEMAPHOBIA AMONG JUNIOR SECONDARY STUDENTS IN ETCHE LOCAL GOVERNMENT AREA OF RIVERS STATE

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Abstract
The study conducted an educational intervention to enhance the academic outcomes of junior secondary students with mathemaphobia in Etche Local Government Area of Rivers State by focusing on the diagnosis and remediation of their mathematical challenges. This research employed a quasi-experimental design, involving 100 Junior Secondary School two (2) students with mathemaphobia in Algebra. The study involved the random selection of two junior secondary schools, with one serving as the experimental group and the other as the control group. Three steps were included in the identification and selection of mathemaphobic students for participation in the study. viz: the existing school records and teachers' evaluations, and the Diagnosis of Mathemaphobia Questionnaire (DMQ). While to assess the students' performance in Algebra, the Algebra Achievement Test (AAT) was employed. Experts in mathematics education validated the research instruments. Cronbach Alpha and Kuder-Richardson (KR-21) formulas were used to determine their reliability to obtain indices of 0.89 and 0.92 for DMQ and AAT respectively. The control group was instructed using lectures, while the experimental group used Polya's problem-solving strategy to teach Algebra to the students. The mean, Standard Deviation, and ANCOVA were used for data analysis. The results showed that students with mathemaphobia taught using Polya's problem-solving strategy performed better than their counterparts taught using the lecture method in terms of achievement and retention of concepts of Algebra. The study recommends that mathematics teachers incorporate Polya's problem-solving model in their teaching methods, encouraging all students to actively participate and collaborate to enhance their learning outcomes.

Keywords: Diagnostic, Remediation, Mathemaphobia, Mathematics, Problem-Solving

Introduction
Throughout history, mathematics has been essential to the advancement of every nation. Mathematics is a powerful tool for problem-solving and critical thinking. It is used in various scientific and practical applications, including engineering, physics, computer science, finance, cryptography, and more. It is also an essential part of the educational curriculum, providing students with valuable skills and a deeper understanding of the world. The systematic and abstract study of numbers, quantities, forms, structures, and patterns, as well as their attributes and manipulation, is the focus of mathematics. It offers a structure for applying mathematical language and symbols to represent complicated events to solve problems and reason logically. Mathematics is also Known as the "universal language of science," mathematics is essential to comprehending and explaining many facets of the physical universe as well as the interactions between distinct elements. It encompasses a wide range of branches and concepts, such as arithmetic, algebra, geometry, calculus, statistics, probability, and more, and it is used extensively in scientific research, engineering, technology, finance, and many other fields. According to Oyegoke et al. (2016), mathematics is known as the queen of science, the language of nature, and a key pillar of civilization in both practical and aesthetic senses. Mathematics developed from counting, calculating, measuring, and the methodical study of shapes and motion of physical objects. The word "mathematics" originates from the Greek word "mathema," which implies learning, study, and science. Even in classical times, the word also came to imply "mathematical study," which is a more specialized meaning (Roy. 2011 as cited in Kunwar. 2020). Development here is conceived as the capacity of a nation to apply technology for the exploitation of resources of nature. Such exploitation relies heavily on the knowledge of mathematics. Mathematics is viewed by Fajemidagba et al. (2012) as a fundamental topic and a tool for the

advancement of any science-based profession, including industry, technology, astronomy, graphics, and everyday analytical reasoning. Agreeing with the findings that there can be no real development technologically without a corresponding development in mathematics both are conceived as practice. There is much more to mathematics than just a set of definitions, hypotheses, and demonstrations. Visualizing, imagining, manipulating, analyzing, abstracting, and associating ideas are all part of this intricate web of connections (Gbolagade et al., 2013).

The acquisition of mathematical skills is essential for effective functioning in daily life, as well as in professional and academic contexts. Yet the fear of learning and comprehending mathematical concepts has gained remarkable attention from educational researchers over the years. According to Ashcraf (2002), pupils with high levels of anxiety when it comes to mathematics may want to avoid circumstances where they have to do calculations. Sadly, most students go home with the impression that mathematics is a difficult subject which should be left to exceptional students and because of this negative perception of mathematics, there is poor achievement among students as a result of the fear developed in them. Oxford Languages Dictionary defines it as an extreme or irrational fear or aversion to something (irrational fear, obsessive fear, dread horror, terror, dislike, hatred, detestation, distaste, aversion). The term "phobia" originated from the word "Phobus" which in Greek means fear, terror or panic. A phobia is an abnormal fear, intense, threat towards a situation. A phobia is a psychological condition defined by a strong, illogical fear of a particular thing, circumstance, or activity. Usually, this fear is out of proportion to the real threat that the thing or circumstance that is causing the fear poses. It involves an overwhelming urge to avoid something, as well as an unreasonable fear of a certain circumstance, activity, or item (American Psychiatric Association, 2013). People with phobias often experience significant anxiety, distress, or panic when confronted with the source of their fear. These fears can lead to avoidance behaviour, where individuals go to great lengths to avoid the phobic stimulus. Oyegoke, et al (2016), One way to define mathemaphobia is the experience of anxiety, avoidance, and dread in any circumstance involving mathematics. Phobias can interfere with daily life and may require treatment to help individuals manage and overcome their excessive fears.

Mathematics phobia, often referred to as "math anxiety" or "mathematics anxiety," is a psychological condition characterized by a strong and irrational fear or apprehension of mathematics. People with math anxiety experience anxiety, nervousness, or panic when faced with mathematical tasks, such as solving mathematics problems, doing calculations, or even just thinking about mathematics in general. This anxiety frequently outweighs the true complexity of the required mathematical problems. When looking at junior secondary school mathematical proficiency, mathemaphobia is a widespread phenomenon. Mathemaphobia is derived from two Greek words "Mathematics" and "Phobia" which refers to the intense and irrational fear or aversion to learning or dealing with mathematics. Individuals with mathemaphobia may experience anxiety and panic when confronted with mathematical tasks, even when the anxiety is out of proportion to how challenging the mathematical material is in reality. This fear can manifest in various ways, including avoidance of mathematics-related activities, physical symptoms, and negative self-talk. The term "mathematics phobia or mathemaphobia" is used to highlight the emotional and psychological aspects of struggling with mathematics, which can be a barrier to effective learning and problem-solving in this subject. It is important to recognize and address mathematics phobia to help individuals develop a more positive relationship with mathematics and build confidence in their mathematical abilities.

The following are some common types of mathematics phobia:

- Numerical Mathemaphobia (Anxiety): This type of mathematics phobia is related to a fear of numbers and basic arithmetic. Individuals with numerical math anxiety may struggle with performing simple calculations, such as addition, subtraction, multiplication, or division. They might also have difficulty working with fractions or decimals.
- Algebraic Mathemaphobia (Anxiety): Algebra involves solving equations, manipulating variables, and understanding abstract mathematical concepts. Those with algebraic mathematics anxiety may feel overwhelmed when faced with algebraic expressions, equations, and word problems involving algebraic concepts.
- Geometric Mathemaphobia (Anxiety): Geometry involves the study of shapes, angles, lines, and spatial relationships. People with geometric mathematics phobia may find it challenging to visualize and work with geometric concepts, such as the properties of triangles, circles, or three-dimensional figures.
- Calculus Mathemaphobia (Anxiety): Calculus is a field of mathematics that examines accumulation and change rates. Individuals with calculus math anxiety may experience fear or anxiety when dealing with derivatives, integrals, and advanced calculus concepts.

- Computational Mathemaphobia (Anxiety): This type of mathematics phobia is related to performing calculations, often involving numbers, on paper or using calculators. People with computational math anxiety may fear making mistakes during calculations and may avoid tasks that require substantial numerical computation.
- Mathematical Word Problem (Anxiety): Converting real-world scenarios into mathematical phrases is necessary to solve mathematical word problems. Individuals with this type of anxiety may struggle with understanding and solving word problems, particularly if they involve multiple steps or complex scenarios.
- Math-Related Performance (Anxiety): In this type of math anxiety, individuals feel anxious or fearful when they need to perform math-related tasks in front of others, such as public speaking about mathematical topics, presenting mathematical findings, or demonstrating math-related skills in a public setting.

Mathemaphobia, or math anxiety, can have various causes, and it often stems from a combination of psychological, educational, and environmental factors. Negative early experiences, such as struggles with mathematics, low grades, or criticism from teachers, peers, or parents, can significantly contribute to mathematics phobia. These early encounters can leave lasting impressions, fostering a sense of unease and apprehension towards the subject. The fear of failure in mathematics, driven by the pressure to excel academically, further intensifies math anxiety. The dread of making mistakes or faltering in mathematical pursuits creates high-stress situations that exacerbate this fear. Peer and social pressures also play a role in mathematics phobia. The fear of being judged or ridiculed by peers for perceived shortcomings in mathematics performance adds another layer of anxiety. Students may worry about making errors in front of others, leading to discomfort in math-related situations. Additionally, a lack of self-confidence in one's mathematical abilities is a significant factor in mathematics phobia. Individuals who harbour doubts about their capacity to understand and perform mathematical tasks are more likely to experience anxiety. Parental attitudes and beliefs regarding mathematics can influence a child's perception of the subject. If parents express their mathematics phobia or communicate negative beliefs about the subject, these sentiments can be transmitted to their children. Ineffective or inappropriate teaching methods that do not cater to different learning styles and abilities can also exacerbate mathematics phobia. Students may struggle if the teaching style does not align with their individual needs.

Biological and genetic factors may contribute to an individual's predisposition to anxiety disorders, including mathemaphobia. Some research suggests a connection between genetics and the likelihood of experiencing anxiety related to mathematics. Cultural and gender biases also come into play, as stereotypes about certain groups being inherently better or worse at mathematics can create additional pressure and anxiety. Early exposure to societal stereotypes that imply certain groups possess natural mathematical prowess or deficiencies can impact an individual's self-perception and contribute to the development of mathematics phobia. The idea of diagnosis for junior secondary mathematics anxiety treatment entails determining and comprehending the particular difficulties, underlying reasons, and unique requirements of each learner. The process of recognizing and ascertaining the type or origin of an issue, ailment, or illness is known as diagnosis. It involves the systematic evaluation, analysis, and recognition of signs, symptoms, or patterns to arrive at a specific conclusion or explanation. Diagnosis is a critical step in problem-solving and decision-making processes. It guides the development of treatment plans, interventions, and strategies to address issues effectively. Diagnosis is a fundamental concept in various fields, including medicine, psychology, education, technology, and more. The process of determining the nature and cause of a certain occurrence is called diagnosis. (Wonu & Zalmon, 2017). Diagnosis of mathemaphobia is an act of identifying, recognizing and discovering the nature and the exact causes of a problem in understanding mathematics and mathematics-related concepts.

Different mathematical diagnostic tools can be performed to evaluate different facets of a student's mathematical proficiency. The following are a few typical categories of diagnostic exams in mathematics:

- **Prior Evaluation**: carried out to determine pupils' past knowledge and comprehension of pertinent mathematical ideas at the start of a new topic or unit.
- **Formative Evaluation**: Continuous evaluations are carried out throughout the learning process to track students' development and pinpoint areas that could require more explanation or assistance.
- **Final Evaluation**: given to assess students' general comprehension and mastery of mathematical subjects after a unit, semester, or academic year.
- **Standardized Examinations**: structured tests intended to gauge a student's aptitude in mathematics and contrast their results with those of a reference group.

- **Diagnostic Examinations:** Particular tests are designed to pinpoint a student's areas of strength and weakness.
- **Diagnosis of Procedure**: assesses a student's proficiency using mathematical techniques, algorithms, and problem-solving techniques.
- **Diagnostic of Misconception:** identifies and resolves typical misunderstandings or misconceptions that students could have about particular mathematical concepts.
- Diagnostic for Mathematical Reasoning: assesses a student's aptitude for mathematical reasoning, particularly their capability to draw connections between various mathematical ideas.
- **Diagnostics of Computational Fluency**: evaluates pupils' speed and accuracy in performing fundamental mathematical procedures.
- **Diagnose for Solving Problems:** focuses on a student's capacity to employ suitable methods and logical thinking to solve challenging mathematical issues.

Teachers and researchers can acquire a thorough grasp of junior secondary students' arithmetic anxiety by utilizing these diagnostic ideas. Equipped with this knowledge, they can customize focused actions as a component of the restoration procedure. Implementing techniques and treatments to assist students in overcoming their fear or discomfort with mathematics is known as remediation. Remediation is a process or set of actions taken to address and correct deficiencies, errors, weaknesses, or problems in a specific area or field. Remediation aims to improve or restore a situation or individual's performance to an acceptable or desired level. The concept of remediation is applicable in various contexts, including education, environmental science, healthcare, and technology. Here are some common contexts in which remediation is used. Remedial action refers to the use of a medication or other therapeutic intervention to alleviate discomfort or cure a disease that typically affects miners. It can also be used to fix or solve an issue. To address students' mathematics learning challenges, teachers should implement diagnostic and remedial teaching and learning strategies in the classroom Wonu and Zalmon, (2017). The specific actions and strategies used in remediation vary depending on the context and the nature of the issues being addressed. Remediation typically involves assessment, planning, implementation, and ongoing evaluation to ensure that the desired improvements are achieved. It is an important process for resolving challenges and achieving desired outcomes in various fields. Using George Polya's problem-solving approach, often known as "Polya's Four-Step Problem-Solving Process," can be a valuable approach for diagnosing and remediating mathematics anxiety (mathemaphobia) to improve students' performance in mathematics. This model provides a structured framework for solving mathematical problems and can help students develop confidence and competence in mathematics. Below is how you can apply Polya's problem-solving model to address math anxiety and advance students' mathematics performance:

Polya's Four-Step Problem-Solving Process:
Understanding the Problem (Diagnosis):

- Identification of Math Anxiety: The first step is to identify the presence and source of math anxiety in students. This may involve self-assessment or assessments administered by teachers or mental health professionals.
- Specific Challenges: Determine the specific areas or topics in mathematics that trigger anxiety. Identify the types of problems or concepts that students struggle with.

Devise a Plan (Diagnosis and Remediation):

- Acknowledge Emotions: Encourage students to acknowledge their emotions and fears related to mathematics. This process helps them confront their anxiety rather than avoid it.
- Set Clear Goals: Define specific learning goals and objectives for each student. Understand their strengths and weaknesses.
- Individualized Learning Plans: Create individualized learning plans that target the identified challenges. This may include additional practice, tutoring, or alternative approaches to learning specific math concepts.

Carry Out the Plan (Remediation):

- Provide Guidance: Offer guidance and support throughout the problem-solving process. Help students understand the mathematical concepts and the strategies required to solve math problems.
- Regular Practice: Encourage regular practice in the areas causing anxiety. Ensure that students have ample opportunities to work on problems they find challenging.
- Positive Reinforcement: Provide positive reinforcement and constructive feedback to boost students' confidence as they progress. Celebrate small victories and efforts.

Look Back (Evaluation):

- Monitor Progress: Continuously monitor students' progress. Evaluate whether they are making strides in understanding and solving math problems in areas that were previously challenging.
- Feedback and Reflection: Encourage students to reflect on their problem-solving processes. Discuss what strategies were effective and what could be improved.
- Adjust the Plan: Be flexible in adjusting the remediation plan as needed. If certain strategies are not effective, try different approaches.

Ogunkunle, (2009) opined that different instructional models in connection with related mathematics topics should be used for effective teaching and learning. Ogunkunle added that to improve effective learning, educators should be receptive to the application of suitable learning methodologies. In a similar vein, Dorgu, (2015) supported this by revealing that incorporating different instructional strategies brings about effective teaching that leads to the attainment of objectives of the curriculum irrespective of mathematics.

Statement of the Problem

The fear of learning and comprehending mathematics by students has gained remarkable attention from educational researchers over the years. Stakeholders in Mathematics Education have made multifarious efforts to advance the learning achievement of students in mathematics, not excluding those with Mathematics Learning Disabilities Etche Local Government Area of Rivers State. To the best of the researchers' knowledge, no study has tried out the efficacy of Polya's problem-solving model in advancing the performance of students with Mathemaphobia taught algebra in junior secondary schools in Etche Local Government Area of Rivers State. To close this gap, this study seeks to research how effective Polya's problem-solving model and lecturing model will be in advancing the performance of JSS 2 students with Mathemaphobia taught algebra in Etche Local Government Area of Rivers State using the diagnostic and remediation strategies. The following are the main issues that this study seeks to address:

Aim and Objectives of the Study

The study is an educational intervention to enhance the academic outcomes of junior secondary students with mathemaphobia in Etche Local Government Area of Rivers State. The objectives of this study are to:

i) identify the performance of mathemaphobic junior secondary students taught algebra using Polya's problem-solving model compared to those taught using a lecturing model

ii) find out the extent, to which retention of algebraic concepts differs between mathemaphobic junior secondary students taught using Polya's problem-solving model compared to those taught with the lecturing model

Research Questions

The following research questions guided this study:

1. How does the performance of mathemaphobic junior secondary students differ when taught algebra using Polya's problem-solving model compared to those taught using a lecturing model?
2. To what extent does the retention of algebraic concepts differ between mathemaphobic junior secondary students taught using Polya's problem-solving model compared to those taught with the lecturing model?

Hypotheses

The following null hypotheses were tested at a .05 level of significance

H_{01}: There is no significant difference in the performance of mathemaphobic junior secondary students when taught algebra using Polya's problem-solving model compared to those taught using a lecturing model.

H_{02}: There is no significant difference in the retention of algebraic concepts between mathemaphobic junior secondary students taught using Polya's problem-solving model compared to those taught with the lecturing model.

Methodology

This research utilized a quasi-experimental design. Which was used to ascertain whether Polya's problem-solving approach improved the performance of students with mathematics-related phobias who were taught algebra at junior secondary schools in Etche Local Government Area of Rivers State. One hundred (100) JSS2 students in all took part in the research. For this investigation, two junior secondary schools were chosen at random. The experimental group (n=57) was assigned to one school and the control group (n=43) to the other. Below is a discussion of the procedures used to diagnose, identify, and choose mathemaphobic students who participated in the study.

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Step 1: All JSS 2 students in each chosen school had their mean score for the first and second terms of the mathematics test (continuous assessment scores, first and second term outcomes) calculated. For this study, students who had mean scores higher than the overall mean were categorized as non-Mathemaphobic, and those whose mean scores fell below the overall mean score were identified as Mathemaphobic.
Step 2: A teacher-made Test (AAT) was administered to all identified mathemaphobic students in the chosen schools after the students had been classified. This served to confirm the findings of Step 1 and to identify the mathemaphobic students among them.
Step 3: The classroom teachers decided which underachieving children should be included in the study based on their results falling outside of the range.

Teachers' judgments were used to validate assessments of the students' behaviour connected to their academic performance, so those judgments were employed. (Winne & Perry, 2000). Diagnosis of Mathemaphobia Questionnaire (DMQ) was used to diagnose and identify pupils who have mathemaphobia, and the Algebra Achievement Test (AAT) was the instrument used to gather data. Experts in Mathematics Education established the face and content validation of the instruments. Both instruments had 20 items, with multiple-choice options for AAT and four-point response options for the DMQ. The Cronbach Alpha and Kuder-Richardson (KR-21) formulas were used to determine their reliability to obtain indices of 0.89 and 0.92 for DMQ and AAT respectively. Firstly, a letter of introduction was sent to the principal of each of the selected schools to seek their approval to involve the JSS 2 students in the study. Upon approval, the researchers commenced the study by diagnosing and identifying the students with Mathemaphobia for inclusion in the study. Thereafter, the experimental group's teacher received training on the practical and theoretical application of the efficacy of Polya’s problem-solving model in teaching students with Mathemaphobia using lesson plans designed by the researchers. Before the commencement of the instructions, the students in both groups were made to take a pretest using AAT which was used to ascertain their entry behaviour or baseline performance in Algebra. Immediately after the pre-test, the scripts were retrieved from the students. The instructions commenced in both groups. After the pre-test on the AAT, instructions commenced in both groups.

Students in the experimental group were taught the subject utilizing Polya's problem-solving approach while those in the control group learned algebra through lectures. The stages involved in Polya’s problem-solving model or its strategic components include:
Step 1: Recognize the problem.
Step 2: Construct a strategy (translate).
Step 3: Execute the strategy (solve).
Step 4: Reflect (evaluate and analyze).

These formed part of the objectives of the study. The drive of learning through the problem-solving model is to enhance student class productivity and enhance collaboration with each other as pairs or groups. Each pair or group of students were asked to act following the instructions given by the teacher. During the activities, the teacher's job was to oversee how the activities were run and provide guidance to the students by posing questions that elicited answers that helped the process move along smoothly and encouraged the students to work as a group to come up with solutions. The students took the AAT again as a post-test after three weeks. However, to obtain scores for the retention, a post-posttest was administered after two weeks of the posttest. The pretest, post-test and post-posttest scripts were gathered, graded, and given a score over 100. Statistical Package for Social Sciences was used to analyze the collected data. Descriptive and inferential statistics were used to analyze the data. The mean, Standard Deviation, were used to answer the research questions whereas the ANCOVA was used to test the hypotheses at 0.05 level of significance.

Results

Table 1 Summary of descriptive statistics and ANCOVA result on the difference in the mean performance of mathemaphobic junior secondary students in both groups

Strategy		Pretest		Posttest		Gain	
	N	Mean	SD	Mean	SD	Mean	SD
Polya's strategy	57	26.23	6.22	63.68	14.22	37.46	11.84
Lecturing strategy	43	25.70	5.30	45.81	8.01	20.12	8.34
		F1,97=66.237	p-value=0.00	Type III Sum of Squares =7361.06	R^2=.507	Adjusted R^2=.496	

The result in Table 1 shows the descriptive statistics in the mean performance of mathemaphobic junior secondary students in Etche local government of Rivers State when taught algebra using Polya's problem-solving model compared to a lecturing model. The null hypothesis states that there is no significant difference in the performance of mathemaphobic junior secondary students when taught algebra using Polya's problem-solving model compared to a lecturing model. The result shows the performance mean on the pretest for the students taught using Polya's strategy was (Mean=26.23, SD=6.22), the performance mean on the posttest was 63.68±14.22, and the mean gain was 37.46±11.84. On the other hand, the pre-test performance for students exposed to the Lecturing strategy was 25.70±5.30 whereas the post-test performance mean score was 45.81±8.01, with a mean gain of 20.12±8.34. the table also showed The ANCOVA difference in the performance of mathemaphobic junior secondary students when taught algebra using Polya's problem-solving model compared to a lecturing model. Furthermore, the F-value of 66.237 for the intervention is significant at 0.000, which is less than 0.05 alpha levels. Hence the null hypothesis was rejected. It is then concluded that there is a significant difference in the performance of mathemaphobic students between these two teaching methods. All sources, including the model, strategies, and pretest, have low p-values, indicating statistical significance between the teaching methods. The R-squared value of 0.507 (adjusted R-squared of 0.496) indicates that the model explains a significant portion of the variation in the data, but it doesn't differentiate between the two teaching methods.

Table 2 Summary of descriptive statistics and ANCOVA in the retention of algebraic concepts among mathemaphobic junior secondary students in both groups

Strategy		Posttest		Post posttest		Retention	
	N	Mean	SD	Mean	SD	Mean	SD
Polya's strategy	57	63.68	14.22	84.95	10.71	21.88	12.27
Lecturing strategy	43	45.81	8.01	53.14	8.31	7.44	6.11
		F1,97=71.632	p-value =0.00	Type III Sum of Squares =8149.19	R^2=.532	Adjusted R^2=.522	

The result in Table 2 shows the descriptive statistics in the retention performance of Algebraic concepts among mathemaphobic junior secondary Students in Etche Local Government Area of Rivers State when taught using Polya's problem-solving model compared to the lecturing model, considering the Diagnosis and Remediation Strategies. The null hypothesis (H02) states that there is no significant difference in the retention of algebraic concepts among mathemaphobic junior secondary students when taught using Polya's problem-solving model compared to the lecturing model. The result further shows the retention performance mean on the post-test for the students taught using Polya's strategy was (Mean=63.68, SD=14.22), the retention performance on the post-test was 84.95±10.71, and the Retention mean was 21.88±12.27. On the other hand, the post-test retention performance for students exposed to the Lecturing strategy was 45.81±8.01whereas the post posttest retention performance score was 53.14±8.31, with a Retention mean of 7.44±6.11. The ANCOVA result shows the difference on the retention of algebraic concepts differs among mathemaphobic junior secondary students when taught using Polya's problem-solving model compared to the lecturing model. Furthermore, the F-value of 71.632 for the intervention is significant at 0.000, which is less than 0.05 alpha levels. Hence the null hypothesis was rejected. It is then concluded that there is a significant difference in retention of algebra concept between mathemaphobic students taught using Polya's problem-solving model and lecturing model. The R-squared value of 0.532 (adjusted R-squared of 0.522) indicates that the model explains a significant portion of the variation in the data.

Discussion

When junior secondary students with mathemaphobia were taught using Polya’s problem-solving model and lecturing model, different results from Table 1, The results demonstrated that JSS 2 students with mathemaphobia who learned algebra through the Polya problem-solving approach did better than those who received instruction through lectures. The difference in learning gain of 17.34 was shown by the mean gain between Polya’s problem-solving model and the lecturing model. findings indicate that the choice of teaching strategy significantly influences student performance, with Polya's strategy leading to greater gains in posttest and the gain scores compared to the Lecturing strategy. The result in Table 2 shows the student retention difference of the mathemaphobic students taught algebra using Polya's problem-solving model did better than those who were taught using the lecturing model. The retention difference in learning gain was 14.44 is shown by the mean gain between Polya’s problem-solving model and the lecturing model. According to the ANCOVA result in Table 1, there is a significant difference between the performances of JSS 2 students with Mathemaphobia who were taught Algebra using the polya’s problem-solving model and those who were taught using lecturing model ($F=66.237$, $p.=0.000$). Meaning that the 0.05 threshold of significance is used to reject the first null hypothesis. findings indicate that the choice of teaching strategy significantly influences student performance, and students' pretest scores also play a significant role in explaining posttest performance. The model, which includes both factors, explains a substantial portion of the variation in student outcomes. The teaching strategy has a particularly strong impact on student performance, as indicated by its high F-value and significance level ($p < 0.001$).

The ANCOVA result in Table 2, shows that there is a significant difference in the retention of algebra concepts between mathemaphobic students taught using Polya's problem-solving model and lecturing model. ($F=71.632$, $p.=0.000$). This means that the 0.05 threshold of significance is used to reject the second null hypothesis. The study consolidated the previous research done by Wonu and Nwoko (2022) which investigated the diagnosis and instructional remediation amongst learners with developmental dyscalculia in number and numeration. The study found that students with DD who were instructed NAN using the CLM outperformed those who were instructed using the TTM. This study consolidated the previous research done by Onuoha-Chidiebere and Ezenwa (2020) which examined how a constructivist approach might be used in Abia State, Nigeria, to reduce math fear and increase students' mathematical achievement. The results showed that, when taught using a constructivist approach, students' mean achievement scores were greater than those taught using a lecture style. This showed that after engaging in the constructivist method of instruction, students in the experimental group (constructivist approach) had increased their results. The study consolidated the previous research done by Yousef and Younis (2021) which looked at how using the cooperative learning approach affected Northern Israeli primary school children's academic performance in mathematics. According to the study, pupils who utilized the cooperative learning approach performed better academically in mathematics than their peers who used the standard learning method.

Conclusion

As a result, this study offers strong evidence in favour of using Polya's problem-solving paradigm as a successful remedial approach for mathemaphobia in junior secondary students in Etche LGA of Rivers State. The results highlight how important it is for educators and legislators to take into account cutting-edge, student-centred teaching strategies that actively include learners in the educational process. In addition to improving performance, Polya's problem-solving methodology can help students in Etche LGA of Rivers State retain mathematical ideas better, thereby overcoming the obstacles presented by mathemaphobia and fostering a happy learning environment. The research findings illustrated how well the Polya problem-solving approach was used in improving the performance of students with mathemaphobia in Algebra, by promoting the broad application of Polya's problem-solving approach in Etche local government of Rivers State algebra instruction for kids who are mathemaphobic, improving their mathematical skills, and ultimately enhance their overall educational experience.

Recommendations

1. Diagnosis and remedial teaching of mathematics should be applied by teachers in promoting the broad application of Polya's problem-solving approach in Etche Local Government Area of Rivers State for kids who are mathemaphobic.
2. The promotion of active learning techniques, through cooperation among students, should be encouraged in learning mathematical concepts.

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