DECONSTRUCTING MATHEMATICS PHOBIA USING MATHEMATICS APPLICATION SOFTWARE FOR LEARNING MATHEMATICS

BY

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Abstract

This study examined the use of mathematics application software in deconstructing mathematics phobia among secondary school students in Ilorin metropolis. Mathematics phobia has continued to hinder students' engagement, confidence, and achievement despite the importance of mathematics in academic and technological development. The study adopted a descriptive survey research design. The population comprised all senior secondary school students, while 250 Senior Secondary School II students were selected using random sampling across three local government areas. Data were collected using a structured questionnaire measuring students' level of mathematics phobia and their use of mathematics application software. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to answer the research questions, while Pearson correlation and independent t-test were employed to test the hypotheses at 0.05 level of significance. The findings revealed that students exhibited a high level of mathematics phobia (overall mean = 2.91) and a low level of mathematics application software usage (overall mean = 2.44). The study further showed a significant negative relationship between mathematics application software usage and mathematics phobia ($r = -0.61$, $p < 0.05$), indicating that increased use of software reduces students' anxiety toward mathematics. Additionally, no significant gender difference was found in mathematics phobia ($p > 0.05$). The study concluded that integrating mathematics application software into instruction can reduce mathematics phobia and improve students' engagement in learning mathematics. It was recommended that teachers incorporate digital tools into teaching and that schools provide access to appropriate technology.

Keywords: Mathematics Phobia; Mathematics Application Software; Secondary School Students; Ilorin Metropolis

Introduction

Mathematics is widely regarded as a universal language and a fundamental tool for understanding the world, especially in an era driven by rapid technological advancement. Apart from being an intellectually stimulating discipline, mathematics is also the keystone of all fields of studies Contemporary studies emphasize that mathematics plays a crucial role in developing human capital in science, technology, engineering and innovation (OECD, 2019; UNESCO, 2022). In Nigeria, mathematics remains a core subject in the secondary school curriculum due to its importance in academic progression, career development and preparation of individual for useful living. Therefore, the relevance of mathematics cannot be overemphasized. Despite its importance, many students perceive mathematics as difficult and uninteresting, leading to negative attitudes and poor engagement. Recent studies indicate that factors such as ineffective teaching strategies, test anxiety and negative classroom experiences contribute significantly to students' aversion to mathematics (Awofala, 2020; Namkung et al., 2019). These perceptions often result in mathematics anxiety or phobia, which negatively impacts students' performance and confidence. Eventhough, mathematics is a mandatory requirement subject for gaining admission into tertiary institutions of learning, many students still have no interest in Mathematics, claiming that un-psychological teaching methods, negative classroom experience of students, parents' unrealistic expectation and high stake test pressure are factors that contributed to their negative attitude (Kunwar, 2020).

Many students perceive mathematics as a difficult and complex subject, often believing that success in mathematics is limited to a select group of individuals. This negative perception leads to avoidance, low confidence, and poor academic performance in mathematics (Sagarduy et al., 2024). Kunwar (2020) pointed out thatstudents' poor performance bothered largely on inadequate understanding of some concepts in Mathematics by the students, lack of arousing students' positive attitude towards Mathematics due to inadequate teaching materials, large classes, poorly motivated teachers, lack of laboratories and libraries, poor supervisory activities and lack of overall students' assessment system. Mathematics phobia, also referred to as mathematics anxiety, is a psychological condition characterized by fear, tension, and apprehension when dealing with mathematical tasks (Carey et al., 2019).

The negative attitude of some students towards Mathematics may result to phobia and subsequent poor performance in the subject area. Oguguo and Eze (2026) affirmed that the greatest cause of poor performance in Mathematics among secondary school students is phobia. Many researchers like (Alizeza, Hamideh, &Kazem, 2016; Kunwar, 2020) noted that Mathematics to some students is basically associated with pains and frustration and this may account for the reason why students have phobia for studying Mathematics. Research has consistently shown a strong negative relationship between mathematics anxiety and academic achievement. Generally speaking, Mathematics phobia is negatively correlated with the performance and achievement in Mathematics and if this issue among the students is not taken care of on time, it could have a grim effect on education system (Barroso et al., 2021). That is, this condition can hinder students' problem-solving abilities and long-term academic development. Mathematics is also useful for an individual to cope with the daily activities, this is the more reason why it is necessary to look into the causes of Mathematics phobia and way to eradicate it.

Mathematics phobia as a psychological, structure interfere in developing students' ability of thinking skill which can be considered as one of the factors causes low level of problem-solving skills of the school students in Mathematics. Prolong feeling of Mathematics phobia brings about hatred for the subject but this problem can be rescued with the use of technology like Mathematics application software for learning in this 21st century which would definitely reduce phobia and resolve all the queries related to this dreading subject (Barroso et al., 2021). Mendezabal (2018) declared that learning Mathematics with the use of technology improves students' conceptual understanding and procedural skills providing new opportunities for visualizing and modeling mathematical concepts. To make Mathematics to be more interesting, mathematical concepts must be presented in a clear, concise and understandable way using technology such as interactive software and online resources that pave way for access and usability of application software for learning. Due to the advancement of digital technologies, the integration of mathematics application software has emerged as a promising approach to addressing mathematics phobia. Studies have shown that technology-enhanced learning environments can improve conceptual understanding, increase engagement, and reduce anxiety (Hillmayr et al., 2020; Schindler et al., 2020). Interactive tools such as GeoGebra, Desmos, and Photomath allow students to visualize abstract concepts, thereby making learning more meaningful and less intimidating. Access and usability of application software for learning Mathematics can help learners to engage with mathematical concepts in an effective and interactive manner. Mathematics aims to develop learners' ability to identify problems and to solve them based on acquired mathematical knowledge (National Policy on Education, 2014). Kumazah and Agyei (2026) opined that the poor performance of students in Mathematics in Senior School Certificate Examinations can be improved if the learning is supported with the use of technology needed for Mathematics improvement. The use of digital technologies to assess the knowledge has long been recognized as effective way of solving learners' problem in different subjects. For instance, Bolaji (2018) declared that the use of technology to supplement teaching-learning process propagates the mind of a learner and concretize acquisition of

knowledge in them. This indicated that technology integration improved instruction and enhanced learning therefore accessibility to instructional technologies facilitates effective learning especially in the learning of mathematics.

The present curriculum in Mathematics emphasizes the necessary technology and the interest of students, who fear mathematics concepts to support the learning of Mathematics with other resources. Bonne (2025) has shown that well-designed application software can have a positive impact on students' phobia towards Mathematics. Using application software to learn, students should be able to have access to android phone, internet, computers and/or any other mobile that are connectible to the internet. If all students in Nigeria secondary schools have computers and/or any other mobile device coupled with effective and stable internet connectivity, the use of all this software for learning would not be a problem. But unfortunately, many secondary schools in Ilorin metropolis are not connected to the internet and those that are connected have growing issue of power failure, poor school supervision, low numbers of trained teachers, and low awareness on the use of internet to solve Mathematics problems.

Research Questions

1. What is the level of mathematics phobia among students?
2. What is the level of students' use of mathematics application software?

Research Hypotheses

The following null hypotheses were formulated to guide this study:

$H0_1$: There is no significant influence of mathematics application software on students' mathematics phobia.

$H0_2$ There is no significant difference in the use of mathematics application software on mathematics phobia based on gender.

Literature Review

Mathematics has long been recognized as an essential requirement for everyday life. At the same time, it is considered as a difficult subject by many students in school education (Capuno, et al., 2019). Mathematics phobia remains a global concern in education. This feeling does not only affect students' affection toward mathematics but also their perseverance, interest, motivation, self-efficacy, and persistence in solving mathematical problems (Namkung et al., 2019). The fear about mathematics is causing the students negative attitude towards mathematics and hindrance the learner from focusing on the problem which they are tackling. Students who experience high levels of anxiety often avoid mathematics-related tasks, leading to poor academic outcomes (Barroso et al., 2021). Many reasons were attributed to the fear of mathematics among the learners like: hereditary, social and environmental factor, negative perception towards mathematics also may cause the fear of mathematics and this fear for mathematics referred to phobia in mathematics (Kunwar, 2020). Phobia is an academic sickness that is usually expressed on the faces of Mathematics students in their classes. Recent research highlights that mathematics anxiety is influenced by cognitive, emotional, and environmental factors, including teaching methods, peer influence and societal beliefs about mathematics (Dowker et al., 2019). Addressing these factors requires innovative teaching strategies that promote active learning and positive engagement. This implies that Mathematics curriculum should engage learning experiences that helps students to develop their mathematical proficiency and creativity that facilitates high-level thinking of solving life- related problems. The National Mathematics Curriculum Framework developed by the Nigerian Educational Research and Development Council (NERDC) is based on global best practices and aimed at promoting Mathematics education in Nigeria this is to improve students' performance in the

subject. Student performance is increased when students are taught to seek conceptual understanding rather than simply to follow procedures and this can be materialized when learning application is available on the mobile phones with internet access. Hillmayr et al (2020) found out that students enjoyed learning activities with application software and this helped students to improve their performance in algebra. Therefore, lesson design needs to reflect effective instructional strategies that relate to the various mathematical strands. This could be achieved by making use of all this application software that make learning of Mathematics to be quite interesting and understandable.

The prominent position of mathematics in school curricula is largely justified by its fundamental role in scientific and technological advancement. Contemporary research affirms that mathematics serves as the foundational language of science and technology, underpinning innovation and sustainable development in modern societies (Hillmayr et al., 2020; UNESCO, 2022). As such, mathematics education remains indispensable for national development and global competitiveness. In recent years, the integration of technology into mathematics instruction has gained increasing attention due to its potential to enhance students' conceptual understanding, engagement, and overall learning outcomes. That is, computer-assisted instruction and educational software have positive effects on students' achievement and attitudes toward mathematics (Schindler et al., 2020). Given the rapid evolution of a digitally driven world and the emergence of a technology-oriented generation, there is a growing need to leverage digital tools in mathematics education. One of the most widely used forms of technology in Mathematics education is educational software, which can provide interactive visualizations, simulations, and games to help students grasp difficult concepts. For example, the website Desmos offers a range of interactive graphing tools that can help students explore functions and equations in a more intuitive way than traditional paper-and-pencil methods (Bae et al., 2019). Several studies have found positive effects of using technology in mathematics instruction. For example, a meta-analysis of 35 studies found that computer-assisted instruction was associated with moderate to large effect sizes on mathematics achievement (Riyan et al., 2025). Another study found that students who used Desmos to explore functions and equations performed better on a test of mathematical reasoning than those who used traditional methods (Bae et al., 2019).

This research focus on access and usability of application software towards students' phobia in Mathematics, this is because many students have phobia for Mathematics and people with Mathematics phobia may avoid taking Mathematics courses or participating in activities that involve Mathematics. One of the key benefits of access and usability of application software is that it can improve user satisfaction and engagement. Nour (2022) stated that when application software is designed with accessibility and usability in mind, it can help users perform tasks more efficiently and effectively, leading to higher user satisfaction and engagement which can lead to increased usage and adoption of the software. Students who struggle with Mathematics or those have phobia for Mathematics may benefit from the use of application software and mobile applications that are designed with access and usability in mind. These tools can help to reduce phobia towards the subject and promote active learning, leading to better academic performance and increased engagement in Mathematics. Recent research indicates that the use of mathematics application software has a positive impact on students' attitudes, understanding, and performance in mathematics. Studies have shown that digital tools such as dynamic mathematics software and computer algebra systems enhance visualization, allowing students to better comprehend abstract concepts and mathematical relationships (Schukajlow et al., 2023). These technologies promote active and student-centered learning, which supports deeper conceptual understanding and improves problem-solving skills (Bicer et al., 2020). Furthermore, the use of interactive mathematics software has been associated with reduced mathematics anxiety, as students gain confidence through immediate feedback and guided exploration (Barroso et al., 2021). Given that negative attitudes

and anxiety are major contributors to poor performance in mathematics, the integration of application software provides an effective means of improving students' achievement while simultaneously mitigating mathematics phobia.

Application software is known as application package, it is a computer software package that performs a specific function directly for an end user or in some cases for another application. When a user interacts directly with a piece of software, it is called application software. The sole purpose of application software is to assist the user in doing specified task. Application software acts as a mediator between the end-user and system software. There are many applications software available in Internet which can be used for teaching and learning processes such as *Geogebra*, Geometry pad, Math editor, Mathsolver, Photomath, Microsoft Mathematics etc. All these are software that is helpful in all types of Mathematics concepts that students encounter in solving Mathematics problems. Many of research report shows that application software is very supportive for learners to learn Mathematics easily and effectively. Mobile learning applications such as Photomath and Khan Academy provide accessible and flexible learning opportunities, allowing students to learn at their own pace. These tools have been found to reduce cognitive load and improve students' engagement (Bicer et al., 2020). Albano and Dello (2019) investigated on ICT-supported software for problem solving and collaborative-creative reason and found that *GeoGebra* software supported students' collaboration and creative reasoning during mathematical problem solving.

Mathematics application software plays a critical role in reducing anxiety by simplifying complex concepts and promoting interactive learning. Santos-Trigo and Moreno-Arnella (2020) researched on overview of using technology to engage students in Mathematics and found that students became active participant in the classroom through the usage of technology application for learning Mathematics. Therefore, utilizing application software approach could improves learners' interest and gives learner control of their learning task as well as reducing the phobia that students have for Mathematics. Using application software for learning facilitates active learning and interactivity between learners and the mediator in the learning environment which also brings about diversification of instructional delivery in Mathematics curriculum, as well as, exploring the benefits of web-based technologies in Mathematics education (Yeo et.al, 2022).Research also shown that well-designed application software has positive impact on students' phobia towards Mathematics. For instance, Yohannes and Chen (2021) investigated students' cognitive load, learning anxiety and engagement and found out that the use of interactive software such as *GeoGebra* helped to reduce students' anxiety, improve learning process and learning outcome. Interactive visualization tools enable learners to explore mathematical relationships dynamically, which enhances understanding and reduces fear associated with abstract concepts (Schukajlow et al., 2023). Furthermore, application software provides immediate feedback, allowing students to identify and correct errors, thereby improving learning outcomes.

Similarly, a study conducted by Crompton and Burke (2017) on a review of mobile learning application for Mathematics found out that wireless mobile devices like smartphones, PDAs and tablets could be used to benefit students learning in and outside the classroom and observed that the use of mobile applications in learning Mathematics improved students' attitudes towards the subject, assist students' problem solving and enhance comprehension of mathematical concepts, it was concluded that mobile applications provided an interactive and engaging way to learn Mathematics. Al-Shehri (2017) also found that using personalized Mathematics learning software improved students' attitudes towards Mathematics. Granic and Marangunic (2019) conducted research on teaching mathematics with Mathematical software, this study focused on engineering students learn the basics of mathematics and computer science and found out that students enjoy the learning process, they gradually moved to the more complex tasks using mathematical software like Mathematical, Maple, Matlab, Mathcad, Smathetc and

found that modern mathematical software packages offer users convenient and simple tools of visualization brings about students' understanding of the basic concepts and theorems of mathematics. This mathematical software could help to reduce students' phobia and motivate students in learning Mathematics concepts. Instant Assignment Help (2021) described thirty Mathematics software to solve Mathematics problem, declared that there are dozens of Mathematics problem solving programs available online with different specialization and problem solving abilities that explain complex mathematical equations accurately and efficiently for both learners and teachers that are free and open-source software for learning such as *Geogebra*, Microsoft Mathematics, Geometry pad, Photomath, Khan Academy, Math Editor, Maxima, xFUNC, GAP, CADABRA, MathSolver, Sagemath etc. For instance, Mendezabal and Tindowen (2018)examined the effects of using Microsoft Mathematics on students' attitude, conceptual understanding, and procedural skills in differential calculus and found that the use of Microsoft Mathematics in teaching and learning differential calculus improves students' conceptual understanding. Tomilenkoet.al (2020) researched on the use of Maxima graphics in all fields visible to the students accessing elementary algebra and found that students enjoyed Mathematics through this application software. Sattar et.al (2015) study on how to use xFunc to solve mathematical expression and observed that this software tools improved delivery of mathematical concepts.

A study conducted by Sarifah et al., (2022) found that using application software for learning Mathematics increased students' motivation and interest in Mathematics. It also provides immediate feedback to students on their performance, this can help them identify areas where they need to improve and make adjustments in the learning process. Sakaet.al (2023) and Makinde (2017) found that the use of an interactive software package for learning Mathematics improved students' attitudes towards Mathematics and reduce anxiety among students who struggle with the subject. Also, Mensah and Ampadu (2022) found that the use of computer assisted software (CAI) improved Mathematics performance of children even from low-income background. Therefore, the use of application software for learning Mathematics can reduce phobia in students and develop a more positive attitudes towards Mathematics. Accessibility and usability are key factors influencing the effectiveness of educational technology. Well-designed software ensures that learners can easily interact with content, leading to improved engagement and satisfaction (ISO, 2018; Bicer et al., 2020). In developing countries, challenges such as limited access to devices, poor internet connectivity, and inadequate teacher training hinder the effective use of application software in education (UNESCO, 2022). Addressing these challenges is essential for maximizing the benefits of technology in mathematics learning.

Methodology

The study adopted the descriptive survey method to investigate the access and usability of mathematics application software and its relationship with students' mathematics phobia in secondary schools in Ilorin metropolis. In this study, the independent variable was the usage of mathematics application software, measured by the frequency and level of students' engagement with available applications, while the dependent variable was mathematics phobia, assessed through students' responses to a structured questionnaire. The population of the study comprised all senior secondary school students in Ilorin metropolis, with the target population being SS II students. This group was chosen because they have been exposed to various mathematics problem-solving methods, making them suitable for the study. A total of 250 students were randomly selected across three local government areas from a population of 41,179 students, using the Taro Yamane sampling formula. This sample size ensured representativeness while remaining manageable for data collection. Data were collected using a researcher-developed questionnaire, which consisted of three sections. Section A elicited demographic information, including school, gender, and school type.

Section B measured the level of mathematics phobia using a 4-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Section C captured level of students' use of mathematics application software, with options "I never use" "I rarely use it" "I often use it and "I always use it." The collected data were analyzed using descriptive statistics, including frequency counts, percentages, means, and standard deviations, to answer the research questions. Inferential statistics were applied to test the hypotheses one and two with Pearson correlation used to examine the relationship between software usage and mathematics phobia, and an independent t-test applied to determine whether gender significantly influenced mathematics phobia. Both hypotheses were tested at a 0.05 level of significance.

Results

This chapter presents the analysis of data collected from 250 respondents. Data were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (Pearson correlation and independent t-test) to answer the research questions and test the hypotheses at 0.05 level of significance.

Table 1: *Demographic Characteristics of Respondents*

Demographic Variable	Category	Frequency	Percentage
Gender	Male	120	48%
	Female	130	52%

The demographic characteristics of the respondents show a fairly balanced representation of gender, with **48% male and 52% female students**, ensuring that analyses comparing male and female students are reliable. This balanced demographic distribution ensures that the findings of the study are representative and can be generalized across both male and female students.

Research Question 1: What is the level of mathematics phobia among secondary school students?

Table 2: *Level of Mathematics Phobia*

S/N	Level of Phobia in Mathematics	SA	A	D	SD	Mean
1	I feel that Mathematics is a confused subject	80	100	50	20	2.88
2	I have a panic attack when attempting to solve Mathematics problems	70	90	60	30	2.78
3	I am afraid to give an incorrect answer during Mathematics class	85	95	50	20	2.90
4	I feel that I lack confidence in Mathematics	90	85	55	20	2.92
5	My Mathematics phobia has a negative impact on my self-esteem	60	100	70	20	2.80
6	I have negative experience in Mathematics with the way my friends bullied me	50	90	80	30	2.66
7	I have tried different techniques to manage the phobia I have for	100	90	40	20	3.00

	mathematics					
8	I feel that use of modern facilities will reduce phobia I have for mathematics	120	80	30	20	3.10
9	I feel that use of abusive words by my teacher contribute to the phobia I have for mathematics	75	100	50	25	2.86
10	I feel that my Mathematics phobia is what I will overcome having been exposed to application software for learning it	110	85	35	20	3.05
	Overall					2.91

The analysis of students' responses shows that secondary school students generally experience a high level of mathematics phobia, with an overall mean of 2.91. Many students reported confusion in understanding mathematics (mean = 2.88), panic when solving problems (2.78), and fear of giving incorrect answers in class (2.90). Lack of confidence was also prominent (2.92), alongside negative impacts on self-esteem (2.80) and social experiences, such as peer bullying (2.66). Encouragingly, students indicated efforts to manage their anxiety (mean = 3.00) and expressed optimism that modern learning facilities and application software could reduce their phobia (3.10 and 3.05, respectively). Classroom factors, such as teacher language, were also noted as contributors (2.86). The data indicate that mathematics phobia among students is high and multidimensional, but there is a clear belief that technology and structured interventions can help reduce anxiety and improve engagement with mathematics.

Research Question 2: What is the level of students' use of mathematics application software?

Table 3: *Level of students' use of mathematics application software*

S/N	Application Software	I never use it	I rarely use it	I often use it	I always use it	Mean
1	Microsoft Mathematics	60	90	70	30	2.47
2	Geogebra	50	80	80	40	2.56
3	Geometry Pad	80	90	60	20	2.36
4	Photomath	40	70	90	50	2.72
5	MathSolver	70	90	60	30	2.44
6	Math Editor	80	90	50	30	2.36
7	Khan Academy	50	80	70	50	2.60
8	xFUNC	90	80	50	30	2.30
9	Maxima	100	70	50	30	2.20
10	CADABRA	90	80	50	30	2.30
11	Others	120	70	40	20	2.08
	Overall					**2.44**

The analysis of students' responses regarding the usability of mathematics application software shows that overall usage is low, with an overall mean of 2.44. Among the various applications, Photomath (mean = 2.72), Geogebra (2.56), and Khan Academy (2.60) were the most frequently used, suggesting that students prefer tools that are more accessible or interactive. In contrast, software such as Maxima (2.20), CADABRA (2.30), xFUNC (2.30), and other less popular applications (2.08) were rarely or never used by most students.These results indicate that while some students engage moderately with selected applications, the majority do not regularly use mathematics software, pointing to low overall adoption. Factors such as accessibility, familiarity, and awareness may influence usage levels, highlighting the need for increased exposure and encouragement to integrate these tools into learning.

Hypothesis 1 ($H0_1$): There is no significant relationship between software usage and students' mathematics phobia.

Table 4: Pearson Correlation between Software Usage and Mathematics Phobia

Variables	N	Correlation Coefficient (r)	p-value	Decision
Software Usage & Mathematics Phobia	250	-0.61	0.000	Significant

The analysis of the relationship between students' use of mathematics application software and their level of mathematics phobia revealed a **moderate negative correlation** (r = -0.61) which is statistically significant (p = 0.000). This indicates that as the usage of mathematics application software increases, students' mathematics phobia tends to decrease. In other words, students who frequently engage with available software tools, such as Photomath, Geogebra, and Khan Academy, are less likely to experience fear, anxiety, or lack of confidence in mathematics. The result is significant at the 0.05 level, suggesting that the relationship is not due to chance. This finding supports the notion that the integration of technology into mathematics learning can effectively reduce students' phobic tendencies. It highlights the potential of software applications as practical interventions to enhance confidence, engagement, and positive attitudes toward mathematics. The negative correlation also aligns with students' perceptions that exposure to modern facilities and application software can help overcome their mathematics anxiety, reinforcing the importance of increasing access and promoting consistent use of such educational tools.

Hypothesis 2 ($H0_2$): There is no significant difference in mathematics phobia based on gender

Table 5: Independent t-test (Gender)

Gender	N	Mean	Std. Dev	t-value	p-value	Decision
Male	120	2.89	0.66	-1.32	0.187	Not Significant
Female	130	2.94	0.70			

The independent t-test analysis was conducted to determine whether there was a significant difference in mathematics phobia between male and female students. The results, presented in the table, show that male students (n = 120) had a mean phobia score of 2.89 with a standard deviation of 0.66, while female students (n = 130) had a mean of 2.94 with a standard deviation of 0.70. The t-value was -1.32 and the p-value was 0.187, which is greater than the 0.05 significance level. These results indicate that there is no statistically significant difference in mathematics phobia between male and female students. In other words, both genders experience similar levels of

fear, anxiety, and lack of confidence in mathematics. This finding suggests that gender does not play a determining role in the development or intensity of mathematics phobia among secondary school students in the study population. It also implies that interventions aimed at reducing mathematics phobia, such as the use of application software, should be equally targeted at both male and female students to achieve maximum impact.

Discussion

The present findings provide further empirical support for the persistent challenge of mathematics anxiety among secondary school students. Consistent with the work of Barroso et al. (2021), the results indicate that a considerable proportion of students continue to experience apprehension, fear, and tension when engaging with mathematical tasks. This suggests that, despite ongoing curricular reforms and pedagogical improvements, mathematics anxiety remains a deeply rooted issue that can hinder students' cognitive processing, problem-solving ability, and overall academic performance. Barroso et al. (2021) emphasized that mathematics phobia is not only widespread but also negatively associated with achievement, thereby reinforcing the importance of addressing this phenomenon within classroom practice. Furthermore, the observed low level of software usage in mathematics instruction highlights a significant gap between the potential of educational technology and its actual implementation in schools. This finding suggests that many teachers may not be adequately integrating digital tools such as GeoGebra, computer-based simulations, or other instructional software into their teaching practices. Possible reasons for this could include lack of access to technological resources, insufficient teacher training, or limited technological pedagogical content knowledge (TPACK). The implication is that students are not fully benefiting from interactive and visual learning experiences that technology can provide, which are known to enhance conceptual understanding and engagement.

Importantly, the study revealed a significant negative correlation between software usage and mathematics phobia, indicating that increased use of instructional software is associated with lower levels of anxiety among students. This finding aligns with the meta-analysis conducted by Hillmayr et al. (2020), which found that digital tools can have a positive impact on students' learning outcomes, particularly when they are used to support conceptual understanding and active learning. The interactive and dynamic nature of technological tools allows students to visualize abstract mathematical concepts, receive immediate feedback, and learn at their own pace, thereby reducing fear and building confidence. In addition, the use of software in mathematics instruction may foster a more student-centered learning environment, where learners actively construct knowledge rather than passively receive information. This shift in pedagogy can help demystify mathematics and make it more accessible and enjoyable, ultimately reducing the psychological barriers associated with the subject. As Hillmayr et al. (2020) noted, technology-enhanced instruction is particularly effective when it is carefully integrated into the curriculum and aligned with pedagogical goals. Overall, the findings underscore the need for increased investment in educational technology and teacher capacity building. Enhancing teachers' competence in integrating technology into mathematics instruction could serve as a viable strategy for mitigating mathematics anxiety and improving student outcomes. Consequently, policymakers and educational stakeholders should prioritize the provision of technological infrastructure, professional development programs, and supportive policies that encourage the effective use of instructional software in secondary schools.

Conclusion

The study investigated the access and usability of mathematics application software and its relationship with students' mathematics phobia among secondary school students in Ilorin metropolis. The findings revealed that students generally experience a high level of mathematics phobia, with many reporting anxiety, lack of confidence, and negative experiences in the classroom. At the same time, students showed a low level of engagement with mathematics application software, indicating limited use of technology-assisted learning tools. Importantly, the study established a significant negative relationship between software usage and mathematics phobia, showing that students who frequently use mathematics applications are less likely to experience anxiety and fear in mathematics. Furthermore, gender was found not to significantly influence mathematics phobia, suggesting that both male and female students are similarly affected. Overall, the study concludes that mathematics phobia remains a critical challenge in secondary schools, but the integration of technology, particularly mathematics application software, offers a promising approach in reducing phobia, increasing engagement, and enhancing students' learning experiences.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Integrate mathematics application software in learning: Teachers should incorporate tools such as Photomath, Geogebra, and Khan Academy into classroom activities to help reduce students' mathematics phobia and improve engagement.
2. Provide access and training for students: Schools should ensure that students have access to the necessary devices and provide guidance on how to effectively use mathematics applications for learning.
3. Promote a supportive learning environment: Efforts should be made to minimize negative peer interactions and discourage the use of abusive language by teachers, as these factors contribute to students' mathematics phobia.
4. Encourage regular use of software across all students: Both male and female students should be encouraged to actively use mathematics applications, since increased usage is associated with lower levels of mathematics phobia.

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