Research in Educational Policy and Management

https://repamjournal.org

E-ISSN: 2691-0667

Volume: 7 Issue: 1 2025

pp. 27-46

# Investigating the Academic Performance of Math-Phobic Middle School Students

Martin Chukwudi Ekeh*[a] & Princewill Chinagorom Onuike[b]

* Corresponding author
**E-mail:** mekeh@uj.ac.za

**a.** Department of Childhood Education, Faculty of Education, University of Johannesburg, South Africa.

**b.** Department of Physics, Faculty of Science Abubakar Tafawa Balewa University, Bauchi, Nigeria.

**Article Info**
Received: April 22, 2024
Accepted: October 5, 2024
Published: January 21, 2025

10.46303/repam.2025.2

**How to cite**
Ekeh, M. C., & Onuike, P. O. (2025). Investigating the Academic Performance of Math-Phobic Middle School Students. *Research in Educational Policy and Management*, *7*(1), 27-46. https://doi.org/10.46303/repam.2025.2



**ABSTRACT**
A staggering 80% of middle school students in Owerri Educational Zone 1, Nigeria, exhibit significant maths phobia, severely impacting their academic performance in mathematics. Based on a representative sample of 9,873 JSS2 students, this study reveals a statistically significant negative correlation between maths phobia and academic achievement, highlighting the detrimental influence of this pervasive issue. To address this critical challenge, the researchers propose a multi-faceted intervention encompassing three key areas: (1) Demystifying Mathematics: Traditional, phobia-inducing pedagogical approaches must be replaced with engaging and student-centred methods. Interactive activities, real-world applications, and positive reinforcement can foster positive attitudes and reduce phobias, transforming maths from a feared subject into an accessible and rewarding experience. (2) Strengthening Student Support: Recognising the isolating nature of maths phobia, the study emphasises the need for robust school counselling services. Equipped with appropriate coping mechanisms and strategies for managing phobia, students can navigate maths challenges with increased resilience and confidence. (3) Empowering Parents: Collaborative efforts between schools, parent-teacher associations, and educational professionals are crucial in educating parents on effective support strategies. Creating a supportive and inclusive environment where educators, counsellors, and parents work together can pave the way for a future where all students thrive in mathematics.

**KEYWORDS**
Maths phobia; academic performance; multi-faceted interventions

## INTRODUCTION

Historically, humanity has relied extensively on numbers for various purposes, including counting and numeration. Whether represented through objects, marks, symbols, or alphabets, numbers have played a crucial role in enabling individuals to manage their accounts, track dates, and enhance communication. The significance of numbers is demonstrated to be vital and indispensable for daily life, as it contributes to advancements in various aspects of societal progress (Hodanova & Nocar, 2016). The discipline of mathematics, centred around these numerical concepts, has proven its utility across a wide array of domains, spanning from the natural world to industries, banking, politics, architecture, research, and even the inherent patterns of nature. Consequently, it's virtually impossible to envision a successful career and a fulfilling life without engaging with the application of numbers. In educational pursuits and everyday learning, the formal study of numbers, known as mathematics, is an essential grasp for every student, regardless of their chosen field of study. Mathematics establishes direct or indirect links with all other subjects, a perspective supported by Das (2020) and consistently observed across all levels of education.

Whether in the early stages of schooling, middle school, or higher education, an inherent connection exists between a learner's chosen subject or field and the realm of mathematics. Given this pervasive interrelation, it becomes imperative to wholeheartedly embrace mathematics and strive for a harmonious understanding of the subject in order to succeed as a learner. Abd-Algani (2022) elucidates that the essence of mathematics lies in its exploration of quantity and space and concepts conveyed through symbolic representations. This academic field encompasses establishing overarching principles governing the domains of amount and area. The term "quantity" encapsulates computations and arithmetic operations. At the same time, the domain of space encompasses geometry, spatial relationships, and theories, including the scientific aspects of measurement and the application of deductive reasoning through axioms, definitions, and logical arguments. The concept of space thus envelops the spheres of geometry, spatial relationships, and theoretical constructs, incorporating measurement science and the systematic process of deriving conclusions through axiomatic frameworks, definitions, and logical deductions. From these fundamental insights arise the discernment of patterns, the formulation of assumptions, the derivation of hypotheses, and, ultimately, the attainment of conclusive findings.

Merriam-Webster's Collegiate Dictionary (n.d) avows phobia as an intense and often irrational aversion or fear towards a particular individual, thing, or circumstance. It manifests as an amplified and frequently unexplainable dread of an object, a group of objects, or a scenario. This phenomenon is categorised as an anxiety disorder characterised by a consistent and persistent fear linked to a specific object or situation (American Psychiatric Association [APA], 2013), which typically leads to rapid fear onset and persists for more than half a year. The APA (2013) has stated that the person afflicted with this condition will go to great extents to evade encountering the feared object or circumstance, and if avoidance is impracticable, substantial

distress is experienced. Phobias can be divided into sub-categories, including specific, social, and agoraphobia (Garcia, 2017; Hamm, 2009). Specific phobias encompass fears tied to particular animals, natural environments, blood, injuries, or specific circumstances that can occasionally be traced back to negative experiences involving the object or situation (Garcia, 2017; Hamm, 2009). Social phobia emerges when the anxiety is rooted in fear of judgment by others, as the individual worries about being evaluated by them (Garcia, 2017; Hamm, 2009). Agoraphobia, on the other hand, surfaces when the fear of a situation arises due to the belief that escape from that scenario would be impossible (APA, 2013).

According to Kunwar (2020), Mathematics-related phobia is categorised into two primary types: general arithmophobia and specific arithmophobia, also known as numerophobia. General arithmophobia encompasses an intense fear of all numbers, significantly impairing students' mathematical abilities and limiting their educational and professional prospects. On the other hand, specific arithmophobia targets certain numbers, affecting individuals susceptible to this fear. This type of phobia is often rooted in superstitions or religious beliefs and tends to be less severe than general arithmophobia. A notable instance of specific arithmophobia is the fear of the number 13, referred to as triskaidekaphobia. Across the globe, numerous individuals harbour apprehensions toward specific numbers. These fears can revolve around individual numbers, and while some might fear one number, others may experience different numerical anxieties. According to Ihekwaba et al. (2020), phobia of a particular subject can be learned just by observing or listening to others. For instance, a young learner can develop a fear of mathematics by merely listening to an older sibling talking about how complicated mathematics is to them. This perception impedes the development of interest in mathematics as the learner cannot see what the subject is made of.

Middle school learners between ages 11 and 14 are easily influenced by their teachers, siblings, and peer groups as they continually seek approval of their opinions. Exaggerations usually characterise their age, worry about their friends' opinions, insecurity about body changes, desire to be taken seriously, and independence (Mauro, 2014). Conformity within a group can fuel negativity. Disliking maths, for example, could spread if one person expresses it, leading to shared complaints about the teacher or subject. Garcia (2017) identified, among others, a lack of positive attitude, lack of valuing mistakes, inappropriate method of teaching, lack of connection between the student and subject, lack of handling the pressure, lack of attention, low IQ, lack of understanding of signs and symbols, not so good mathematics teachers as the reasons why learners have a phobia for mathematics.

The fear of mathematics is not confined to just students; it is sometimes observable in parents. They often push their children to dedicate more time and practice to this subject than others. A prevailing belief exists among students and parents that mathematics is challenging and demands exceptional intelligence to excel. This perception leads students to grapple with comprehending theorems and concepts, and they also encounter difficulties in retaining formulas. This struggle contributes to an escalation in their fear of the subject. To this end, the

researchers are motivated to investigate the academic performance of math-phobic middle school students.

**Research Questions**

1. What is the ratio of high-math-phobic learners to low-math-phobic learners in mathematics?
2. What is the mean performance of high-math-phobic and low-math-phobic learners in mathematics?

**Hypothesis**

**$H_0$1:** There is no significant correlation index between the academic performance of math-phobic learners and their math-phobic level.

## LITERATURE REVIEW

The researchers reviewed a few related literatures to support the study's conceptual framework. The literature includes understanding phobia and its impact, students' subject preferences over mathematics, learners' mathematics performance, and the benefits and challenges of learning mathematics.

**Understanding phobia and its impact**

Exposure to the feared object or situation, or just thinking about it, can elicit physical, mental, and behavioural symptoms associated with phobias. Mental symptoms affect thoughts and emotions, such as experiencing intense or overwhelming fear. Thus, mathematics as a feared object seems to have some impact on students, leading to students avoiding the subject.

Rudaz et al. (2017) explored the role of avoidance behaviour in maintaining anxiety among individuals with social anxiety disorder and specific phobias. The study involved 91 women diagnosed with social anxiety disorder and 130 women diagnosed with specific phobias. The researchers used the Anxiety Disorders Interview Schedule-Lifetime (ADIS-IV-L) and the Beck Anxiety Inventory (BAI) to conduct clinician-rated behavioural avoidance assessments linked to social situations and specific scenarios. The findings indicated that phobia disorders typically emerge during adolescence or early adulthood, while specific phobias tend to develop or be triggered in childhood. Corroborating the findings of Rudaz et al. (2017), Eaton et al. (2018) argued that phobias encompass both fear and avoidance behaviours, emphasising that avoidance can elevate the intensity and persistence of distress and impairment in individuals dealing with these phobias.

Similarly, dos Santos et al. (2019) argue that how mathematics is taught in schools often leads to methodological misunderstandings. These misunderstandings include a focus on the mechanical repetition of calculations, overemphasis on memorising rules and algorithms, dull and meaningless exercises, and authoritarian teaching styles that trigger student avoidance patterns. These avoidance patterns manifest in various ways, such as regular absence from classes, frequent delays and withdrawals, rapid completion of exercises and tests, refusal to participate in math-related activities, postponing studies, prioritising other subjects,

disengagement from maths classes, non-participation, submitting blank work, giving up on the subject, dropping out of school, showing aggression toward teachers, or damaging study materials, even during or before maths exams.

Moreover, it was noted that the importance of phobias lies in their early onset and persistent nature. In their study, Rudaz et al. (2017) highlighted that specific phobias are widespread globally, with a lifetime prevalence ranging from 3% to 15%. Among the most common are fears related to heights and animals. The developmental trajectory of phobias, beginning with fear, evolving into avoidance, and ultimately leading to a clinical diagnosis, implies the possibility of reducing their prevalence by intervening in this progression. Although phobias frequently surface in childhood, their frequency peaks during midlife and old age.

In 2019, Andrea Wodele observed that individuals grappling with phobias often recognise the irrationality of their fears but struggle to manage them effectively. These fears can significantly disrupt various aspects of their professional, academic, and interpersonal lives. Andrea Wodele also highlighted the complex aetiology of phobias, which is influenced by genetic and environmental factors. Regarding causation, he pointed out that children with close relatives affected by anxiety disorders face an elevated risk of developing phobias. For instance, traumatic experiences, such as accidents, kidnapping, and near-drowning incidents, can also act as triggers for the onset of phobias. Exposure to confined spaces, extreme heights, encounters with animals, or insect bites can be sources of phobias. Individuals contending with ongoing medical conditions or health-related concerns are often susceptible to developing phobias, as well (Andrea Wodele, 2019).

Moreover, a substantial proportion of individuals acquire phobias after experiencing traumatic brain injuries. Phobias are linked to substance abuse and depression. Andrea Wodele (2019) differentiates phobias from more severe mental illnesses like schizophrenia. In schizophrenia, individuals may encounter visual and auditory hallucinations, delusions, paranoia, and negative symptoms such as anhedonia and disorganised thinking. Although phobias may encompass irrational fears, individuals with phobias generally retain their connection with reality, preserving their capacity to evaluate and differentiate real-life situations (Andrea Wodele, 2019).

**Students' perception and subject preferences over mathematics**

In a study conducted by Partovi (2016) regarding students' class preferences, it was found that high school students exhibited selection bias. This bias revealed that students tended to express more favourable opinions about the courses they chose, such as electives and Advanced Placement classes, compared to mandatory courses (core or required courses). To address this bias, a subsequent analysis focused exclusively on elective and Advanced Placement classes. Interestingly, the results remained largely consistent, indicating that even within these categories, students preferred the courses they selected over the required ones. Specifically, 64% favoured Arts and Design, while 61% preferred Performing Arts. Computer and Engineering garnered 54%, English 47%, foreign language 44%, Science 39%, history 38%, and Maths 36%,

ranking as the least favoured. This outcome highlighted a notable aversion to mathematics; it was surprising that even disciplines like computer and engineering, which incorporate elements of mathematics, were more favoured than the subject itself.

The crucial question revolves around when and by what means mathematics transforms into a source of phobia. Hannula (2019) delves into the early stages of mathematics education, spanning from kindergarten to the initial years of primary schooling. During this period, there was a prevailing perception of mathematics as challenging, while others, like Home Economics and Cultural Arts, seemed to be favoured over mathematics. In a study by Ihekwaba et al. (2021) focusing on the preferred topics of early learners in Owerri, Nigeria, it was discovered that most students, despite the mandatory status of mathematics, would opt to avoid the subject. Instead, they preferred Home Economics, Cultural Arts, Computer, and Basic Science subjects. When questioned about their choices, most indicated that mathematics was too difficult to grasp and that the subject was inadequately taught. The research demonstrated that students would instead choose a subject unrelated to mathematics.

Aguilar (2021) investigated the factors contributing to the unfavourable attitudes of high school students towards mathematics. In this study, students evaluated their sentiments about mathematics compared to other subjects like history, physics, and computer science. Additionally, they were prompted to articulate their attitudes, beliefs, and motivations concerning mathematics. To achieve this, the research employed a convergent parallel mixed-method approach, utilising a questionnaire with various questions, including open-ended, closed-ended (such as forced ranking scale, multiple and single responses), and Likert-scale items. The results revealed that a primary factor behind students' reluctance toward mathematics was their perceived lack of understanding and low self-perception regarding their knowledge of the subject. This knowledge gap contributed to a negative perception of mathematics. Students also noted that their negative perception was not a recent development but something they had harboured since elementary school.

Espino et al. (2017) noted that by age 12, children who view mathematics as intimidating tend to avoid math-related courses, perform poorly in the limited maths classes they attend, and score low on maths proficiency assessments. Additionally, they highlighted a hypothesis proposed by some researchers, suggesting that children with little mathematical aptitude understandably develop an aversion to dealing with numerical concepts. This aversion often influences their subject preferences, leading them to avoid intimidating subjects. In their study titled "Students' Characteristics and Academic Performance in Mathematics," Iddrisu et al. (2023) established that students' academic performance in mathematics was impacted by factors such as their receptiveness to learning the subject, perceptions of its difficulty, readiness to utilise available teaching materials, interactions with mathematics teachers, and engagement during maths lessons.

Likewise, Richardson (2022) explored the factors influencing the academic performance of learners in mathematics during the pandemic. The correlational analysis of the study revealed

that learners' perceived attitudes toward mathematics, encompassing motivation, support, learning anxiety, and self-efficacy, did not have a noticeable impact on their academic performance in the subject. Among various types of parental involvement examined, only the mentoring tactics employed by parents throughout the school year proved advantageous in improving students' performance in mathematics. The research identified a robust correlation between learners' academic success in the subject and the mentoring practices of parents.

Furthermore, dos Santos et al. (2019) proposed five steps to alleviate mathematics anxiety: Overcoming misconceptions about the difficulty of understanding mathematics is crucial. Schools can create a different culture around mathematics and other subjects by challenging the long-standing belief that maths is inherently difficult and suited only for a select few. Addressing gender stereotypes about maths' perceived difficulty is essential in fostering a more inclusive and socially participatory school environment.

Providing individualised support is necessary. Identifying and understanding a student's specific challenges and teaching them foundational skills to enhance their success in mathematics is essential. Using tools like mathematical anxiety scales and inventories of study habits can offer insights into aspects triggering negative emotions in students and hindering their learning. Structured interviews can lead to personalised assistance plans, including the involvement of mentors, such as teachers or trainees, who can devise strategies tailored to students' conceptual and procedural difficulties.

Involving families in the monitoring process is vital. It is crucial to offer families guidance on how to support their children in developing effective study habits. Many family members may also struggle with maths or have an aversion to it, which could limit their ability to assist students. Creating conducive home learning environments, organising study schedules, providing necessary materials, and teaching strategies for seeking help when needed are essential aspects that families need support in developing.

Guiding and supporting teachers is imperative. Helping educators reevaluate their perceptions of mathematics and student errors is crucial in overcoming and preventing negative emotional associations with maths. It's essential to assist teachers in handling students' mistakes differently and encourage schools to actively seek current research on maths learning and effective teaching methods.

Revising the curriculum of teacher training programs is essential. Important topics like mathematics anxiety, developmental dyscalculia, acalculia, and extreme difficulties in mathematics are often overlooked in pedagogy and mathematics degree programs. Incorporating these areas into teacher training curricula is crucial to equip educators with essential knowledge and strategies to address these challenges effectively.

**Benefits of maths learning**

Alec Wilkinson (2022), a contributor to The New York Times since 1980 and the author of "A Divine Language: Learning Algebra, Geometry, and Calculus at the Edge of Old Age," offers an intriguing perspective in his guest essay 'Maths is the Great Secret.' In his opinion, he draws a

compelling parallel between adolescence and algebra. He posits that mathematics demands a unique aptitude and comfort with uncertainties for adolescents, as it involves grappling with unknowns that can be resolved. This requires clear and rational reasoning and a willingness to adhere to rules—qualities not constantly prevalent in teenagers.

Wilkinson reflects on questioning the practical utility of learning mathematics in adult life. He found conventional examples like budgeting or balancing a chequebook insufficient to justify the need for algebra, geometry, or calculus. However, he suggests that viewing mathematics as the ancients did, as something fundamental to the very design of the world and the essence of that design, could have altered his perspective. Understanding its profound integration into our world, its role in every action from navigating a busy street to catching a ball, and its presence in art, architecture, and the natural world might have inspired his awe and excitement.

He contends that perceiving the interdependence of the planet's elements could have motivated him to learn out of pure interest in this interconnectedness. Wilkinson emphasises the importance of mathematics in broadening our understanding of the world, serving as a gateway to more significant issues, instilling respect, and fostering a sense of wonder. He argues that attentiveness to mathematics is crucial, as being compelled to solve problems correctly discourages haphazard and sloppy thinking, promoting methodical reasoning that proves advantageous in all endeavours.

Golding (2018) delved into the intricate implications of mathematics taking centre stage, emphasising its critical role in twenty-first-century economies and its indispensable status as part of our cultural heritage. The pursuit of social justice necessitates equitable access to a robust mathematics education for everyone. It is imperative that every young learner is granted the opportunity to participate in an educational environment that fosters engagement and progress in mathematics (Golding, 2018). As part of their social development, young people should comprehend the nature of the mathematical activity, including the vocabulary, conventions, and modes of thought within the mathematics community, tailored to their appropriate level (Golding, 2018).

For comprehensive participation in twenty-first-century culture and society, a thorough awareness of the delights and challenges inherent in the discipline of mathematics is essential. Students should cultivate an intuitive or qualitative understanding of pivotal mathematical concepts such as symmetry, pattern, proof, infinity, randomness, chaos, recursion, and structure. Found within these concepts are some of the most profound, potent, and captivating ideas ever devised by humankind. They enhance our capacity for thought and offer sublime, beautiful, and even spiritual experiences akin to those encountered in poetry.

Cultures embracing maths historically climb the ladder of progress, argues Abd-Algani (2022). Abd-Algani's study, "Role, Need, and Benefits of Mathematics in Development," paints maths as a bridge, its equations connecting civilisations through science and technology. This universal language transcends borders, uniting humanity in a shared territory of advancement.

History serves as the study support for this bridge: cultures valuing maths tend to boast remarkable achievements. So, prioritising maths isn't just about individual success; it's about building a brighter future for all, brick by intricate, universal brick. The collective efforts of humankind have contributed to developing our understanding of mathematics, a fundamental aspect of civilisational history.

Since economic processes heavily rely on understanding mathematical functions, their practical applications, and the quest for straightforward solutions to complex equations, mathematics is the cornerstone of all enterprises. Gaining proficiency in mathematics yields numerous highly advantageous outcomes, including enhanced mental clarity, the promotion of analytical thought processes, sharpened cognitive functions, encouragement of pragmatism, and widespread applications in day-to-day life.

**Challenges of learning Maths**

Rameli and Kosnin (2016) undertook qualitative research to identify challenges in mathematics learning among school students. The results revealed the following as reasons behind difficulties in mathematics: Lack of cognitive, emotional, and financial support from parents; absence of desirable behaviours, practices, and attributes from instructors; low self-regulation and a negative self-outlook; unfavourable attitudes, actions, and lack of support from peers; and other factors (such as the character of calculus and the pressure of examinations).

Mulwa (2015) explored the difficulties encountered by students in learning and using mathematical terminology. The study suggested that one potential explanation for students' challenges in comprehending and applying mathematical terminology and related concepts is a lack of complete understanding of the mathematical language or the inability to express mathematical terms clearly in everyday language. For instance, 20% of fourth-grade students in the United States display a decreased attitude and confidence towards mathematics. By the time they reach eighth grade, this decrease escalates to 31%, according to data extracted from the International Mathematics and Science Studies -TIMSS (Lewis 2013). In his research, Lewis referred to Skemp (1977), acknowledging that motivation and emotions, such as anxiety and pleasure, significantly influence the process of learning mathematics. Additionally, Skemp attributed anxiety in this context to inadequate teaching methodologies.

Maloney et al. (2013) conducted a review of Turner et al.'s (2002) findings, highlighting that when students were under teachers who emphasised the importance of correctness in mathematics but offered minimal cognitive or motivational support, it resulted in a tendency for these children to shy away from maths. The researchers speculated that such students might perceive themselves as vulnerable to exposing their lack of competence publicly. Their study evaluated mathematics anxiety among American teachers (all female) instructing first- and second-grade (7–9-year-old) students. Additionally, they examined the mathematics performance and endorsement of gender stereotypes in the students within these teachers' classrooms. Initially, there seemed to be no correlation between a teacher's anxiety regarding mathematics and her students' maths achievement at the start of the academic year. However,

by the year's end, the more anxious a teacher felt about mathematics, the lower her students' maths performance tended to be. Moreover, these students were more likely to adopt the stereotype that boys excel in mathematics while girls excel in reading. Interestingly, this trend predominantly surfaced among female students, indicating that observing anxiety regarding mathematics in female teachers might convey specific information about their mathematical abilities to students of the same gender.

## METHODOLOGY

The researchers arrived at their conclusions through the detailed research procedure outlined below.

### *Research approach and design*

The researchers employed a quantitative approach for this study, relying entirely on numerical data for its analysis. Given the researchers' focus on examining an existing challenge, they adopted an ex post facto research design.

### *Research Site and Limitation*

Owerri Educational Zone 1 is the focal area of the research, covering five (5) Local Government Areas in Imo State. These Local Government Areas are Ikeduru, Mbaitoli, Owerri Municipal, Owerri North, and Owerri West. The research was limited to students in Junior Secondary Schools in Owerri Educational Zone 1. It was also limited to the performance of the students in mathematics.

### *Sampling of research participant*

The research encompasses all middle school students, otherwise known as Junior Secondary School students (JSS1, JSS2, and JSS3) in government-owned secondary schools within Owerri Educational Zone 1. Based on 2023 data from the Imo State Ministry of Education, the overall count of middle school learners is 29,039. The researchers purposively selected all JSS2 students from this population for this research. The researchers chose this because JSS3 students do not partake in third-term exams as they prepare for the Basic Education Certificate Examination (BECE). Furthermore, JSS1 students were not chosen, as they were recently admitted in the current school year and are still academically settling. According to the data provided by the Imo State Ministry of Education, the total number of JSS2 students in Owerri Educational Zone 1 is 10,167. Thus, the research sample is set at 10,167.

### *Data Collection Method*

Within three weeks, the researchers visited the selected schools. They distributed a Math-phobic Level Indicator (MLI), a scale designed by the researchers to assess students' levels of phobia in mathematics, to 10,167 middle school two (JSS2) students. However, 9,873 were retrieved responses from students. Additionally, the researchers obtained the third-term results of the sampled participants from their school administrators. These results, presented as percentages, served as indicators of the participants' academic performance scores.

### *Reliability and Validity*

The Math-phobic Level Indicator (MLI) underwent face and content validity by two experts in tests and measurement. To ensure internal consistency of items, a pilot study using a test-retest methodology was conducted on a comparable group not included in the main sample, resulting in a reliability index of 0.85.

***Method of Data Analysis***

The level of math-phobia among the students was determined using the Math-phobic Level Indicator (MLI), which consists of fifteen items on a questionnaire. The evaluation of these items was conducted by employing a Likert scale consisting of four points, with the key: SA (Strongly Agreed) = 4 points, A (Agreed) = 3 points, D (Disagreed) = 2 points, and SD (Strongly Disagreed) = 1 point. The highest score on the MLI was 60 (15×4). The questionnaire was structured, such that the scores are directly proportional to the phobia level of the students. If a student ticked 'strongly Agreed' for an item in the questionnaire, the student had 4 marks and got a mark if 'Strongly Disagreed' was ticked. At the end, the points of the students, depending on what was ticked was summed up. A decision rule was applied to the participants' response scores on the MLI; scores below 30 were classified as low math-phobic, while 30 and above were categorised as high math-phobic. Based on the results, participants were categorised as either low math-phobic or high math-phobic from which the ratio was obtained.

The second data used for the analysis was the third-term results of the students. The result of each students (graded in percentages) were obtained from their schools. The students with high math-phobic scores were grouped differently from those with low math-phobic scores. The scores of students in each group were summed and divided by the number of students in the group. This was done inorder to obtain the mean academic performance of each math-phobic category.

$$Mean\ performance\ of\ math-phobic\ category = \frac{Sum\ of\ academic\ performance\ for\ each\ category}{number\ of\ participants\ in\ each\ category}$$

The math-phobic level of all the participants was correlated with their academic performance score using the Pearson Correlation Coefficient as that revealed the relationship between math-phobia and academic performance.

## DISCUSSION OF FINDINGS

***Research Question 1:*** What is the ratio of high-math-phobic learners to low-math-phobic?

**Table 1.**

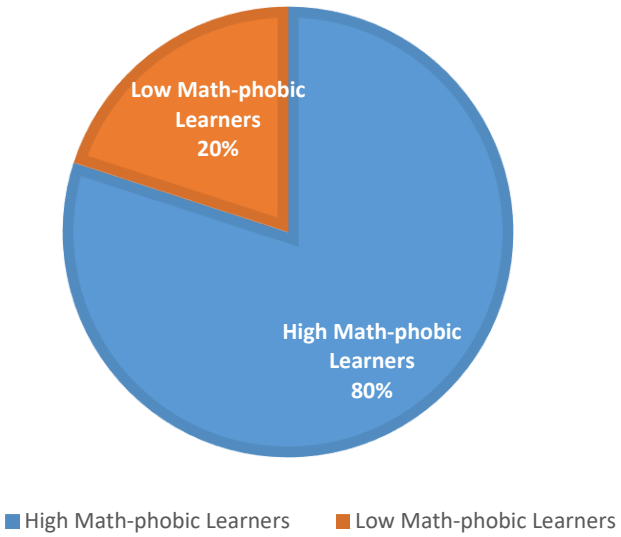
*Ratio of high math-phobic Learners to low math-phobic learners*

| Math-Phobic Level | Number of Participants | Percentage of Participants | Proportion of Participants | Ratio |
|---|---|---|---|---|
| High | 8157 | 82.92 | 0.8292 | |

| | | | | |
|---|---|---|---|---|
| Low | 1680 | 17.08 | 0.1708 | $\frac{8157}{1680} = \frac{8.157}{1.680} \cong \mathbf{8:2}$ |
| Total | 9837 | 100 | 1 | |

**Figure 1.**

*Graphical presentation of the ratio of High math-phobic learners to low math-phobic learners*




Data analysis from Table 1 indicates that the ratio of high math-phobic learners to low math-phobic learners is 8:2. A ratio of 8:2, or 80% of students classified as high math-phobic, is alarming. This reinforces a persistent trend in educational research, where mathematics is often perceived as more complex or intimidating than other subjects. Partovi's (2016) findings align well with this, suggesting that students' preference for non-mathematics subjects may be a coping mechanism to avoid the anxiety associated with math. This preference could stem from various factors, such as teaching methods that fail to engage students, societal attitudes toward mathematics, or how math is traditionally assessed. The perception of mathematics as challenging, as noted by Hannula (2019), further exacerbates this issue. The fact that 8 out of every 10 students exhibit high levels of math anxiety suggests a broad, systemic issue. Math phobia may impact students' confidence, performance, and overall attitudes toward learning, leading to a cycle where negative experiences with math discourage further engagement. This is concerning because math skills are critical for many fields, from science and engineering to finance and technology.

The result shown in Figure 1 graphically emphasizes this reality, where many students feel apprehensive about math. This has profound implications for educational policy and practice, suggesting a need for interventions that not only address students' mathematical abilities but also their emotional and psychological barriers to learning math. To address the issue of math phobia, educators could consider alternative teaching approaches, such as

interactive and applied learning, which may help demystify the subject. Positive reinforcement, math-friendly classroom environments, and fostering a growth mindset—where students are encouraged to see challenges as opportunities for growth—may also help reduce phobia. Additionally, curriculum designers should consider integrating more real-world math applications, helping students see its relevance and utility. These strategies could help reduce the worrisome trend of math anxiety and better equip students for future success in academic and practical fields.

***Research Question 2:*** What is the mean performance of high-math-phobic and low-math-phobic learners?

**Table 2.**

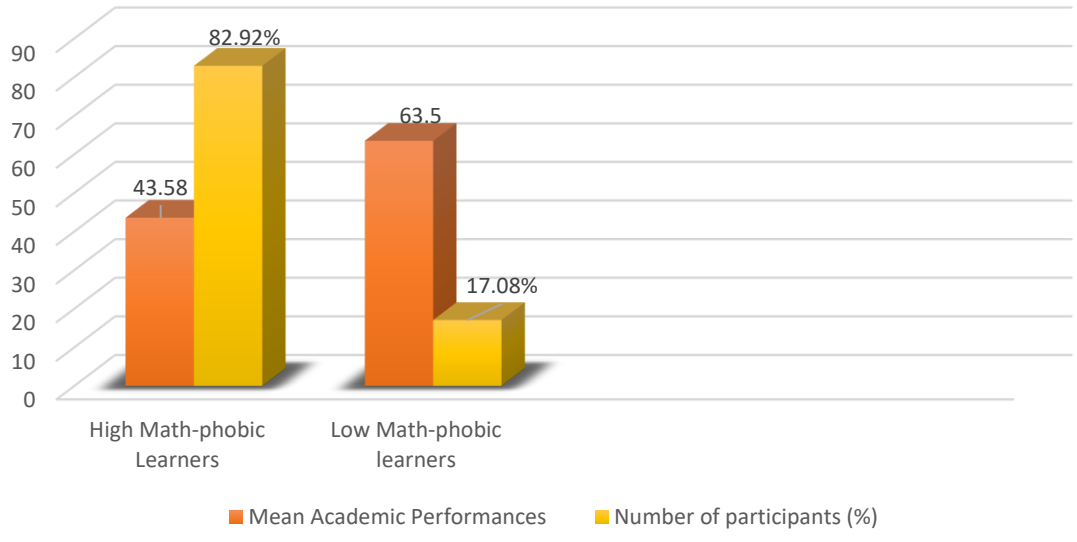
*Mean performance of high and low math-phobic learners*

| Math-Phobic Level | Number of Participants | Summation of Academic Performance Score | Mean Performance Score | Mean Difference | Standard Deviation | Variance |
|---|---|---|---|---|---|---|
| High | 8157 | 355505 | 43.58 | 19.92 | 16.871 | 284.631 |
| Low | 1680 | 106682 | 63.50 | | 18.489 | 341.621 |

**Figure 2**.

*Graphical presentation of mean academic performance of high math-phobic learners to low math-phobic learners*

The analysis presented in Table 2 and supported by Figure 2 draws a clear link between math phobia and academic performance, showing an inverse relationship between the severity of math phobia and academic success. The mean academic score of high math-phobic participants, 43.58%, falls significantly below the 50% pass mark, while their low math-phobic counterparts achieved a considerably higher average score of 63.50%. The mean difference of



19.92% is substantial, suggesting that math phobia strongly determines academic performance. Several psychological and behavioral factors likely contribute to these disparities, as highlighted by Rameli and Kosnin (2016) and other researchers. High math-phobic students may experience emotional instability and self-regulation difficulties, disrupting their focus and hindering effective study habits. Furthermore, a negative self-outlook, characterized by a lack of confidence in one's abilities, can demotivate students, leading them to expect failure in mathematics, thus becoming a self-fulfilling prophecy. Examination pressure, which is particularly intense in subjects perceived as complex, exacerbates this anxiety, pushing students to avoid engaging fully with math content.

Rudaz et al. (2017) and Eaton et al. (2018) discuss how phobia triggers avoidance behaviors, which, in turn, worsen the condition. In this context, math-phobic students will likely avoid tasks or assignments involving mathematical concepts, ultimately depriving themselves of the practice and exposure needed to improve. This avoidance further cements their low proficiency and reinforces a cycle of underperformance and fear. The American Psychological Association (APA, 2013) also emphasizes that phobia results in significant distress when avoidance is impossible. High math-phobic students likely experience heightened anxiety during mathematics lessons or exams, where avoidance is not an option. This distress interferes with their cognitive processes, diminishing their ability to concentrate, think critically, and recall learned material essential for success in mathematics.

In contrast, low math-phobic students, averaging 63.50%, seem to approach the subject with greater emotional stability and resilience. Their higher standard deviation (18.489) and variance (341.621) suggest more varied performance, but their general academic outcome is far better than that of their high math-phobic peers. These students likely experience less fear, allowing them to fully engage with math content and develop problem-solving skills without the same psychological barriers. The inverse proportionality between phobia level and academic performance, as visualized in Figure 2, underscores the importance of addressing math phobia in educational settings. Intervention strategies, such as math anxiety reduction programs, cognitive-behavioral therapy, and positive reinforcement, could play a crucial role in mitigating the effects of math phobia. Creating a supportive, low-pressure learning environment may also reduce avoidance behaviors and build students' confidence in their mathematical abilities, ultimately improving academic performance.

In summary, the data from Table 2 vividly illustrates how math phobia impairs academic outcomes, with the severity of phobia being inversely related to academic performance. Students with high math phobia are trapped in a cycle of avoidance and distress, resulting in lower scores, while those with low math phobia demonstrate stronger academic success. Addressing the psychological factors behind this fear is essential for fostering better mathematics performance among students

***Hypothesis:*** There is no significant correlation index between the academic performance of math-phobic learners and their math-phobic level.

**Table 3**.

*Correlating maths phobia and academic performance of math-phobic learners*

| $n$ | $\Sigma x$ | $\Sigma y$ | $\Sigma xy$ | $\Sigma x^2$ | $\Sigma y^2$ | $r$ | $T_{cal}$ | $T_{tab}$ | $df$ |
|---|---|---|---|---|---|---|---|---|---|
| 9837 | 462143 | 350002 | 1552429 2 | 25160069 | 13312390 | -0.534 | -62.636 | 3.291 | 9835 |

The data from Table 3, with a high negative relationship index of -0.534, clearly indicates that academic performance decreases significantly as the Mathphobic Level Indicator (MLI) increases. This inverse correlation is strong enough to suggest that students with high math-phobic levels tend to perform poorly in mathematics. The t-test, performed at a significance level of 0.001, confirms the statistical importance of this finding. The rejection of the null hypothesis signifies that this correlation is not due to random chance but a meaningful relationship between math phobia and academic performance.

The Mathphobic Level Indicator (MLI) measures the degree of phobia a student experiences in maths. As the data shows, students with higher MLI scores are likely to encounter significant barriers to learning mathematics, which directly impacts their performance. The more math-phobic a student is, the less likely they are to engage with and succeed in math-related tasks. This inverse relationship aligns with Alec Wilkinson's (2022) perspective that mathematics requires students to grapple with unknowns and uncertainties. Math problems often present challenges that don't have immediate solutions and require persistence and logical reasoning to resolve. However, students with high math-phobic levels lack comfort with these uncertainties. Instead of approaching math challenges as opportunities for problem-solving and intellectual growth, they perceive them as threats or sources of anxiety, leading to poor performance. According to Finell J et al. (2022), Math-phobic students often experience heightened anxiety in situations involving math, which can impair their working memory and cognitive functions, preventing them from focusing, understanding, and recalling mathematical concepts during tests or problem-solving exercises, leading to lower academic scores and heightened avoidance. This avoidance can manifest in various ways, such as skipping homework, procrastinating on math-related tasks, or disengaging during math lessons. As a result, they miss valuable opportunities to practice and reinforce their understanding of mathematical concepts, contributing to their poor performance. Students with high MLI scores often have a negative self-outlook regarding math, as stated by Eihab A. Khasawneh et al. (2021). They may believe they are "not good at math" or are inherently incapable of succeeding in the subject. This mindset creates a self-fulfilling prophecy, where their fear of failure becomes a reality due to a lack of effort and confidence in their abilities. Math-phobic students may experience physical symptoms such as sweating, rapid heartbeat, or nausea during math-related tasks. These

symptoms can further hinder their ability to focus and perform well in exams, exacerbating their poor academic outcomes.

On the other hand, students with low MLI scores perform much better academically, they are more comfortable with the inherent uncertainties in math. Instead of feeling overwhelmed by the ambiguity of math problems, they see them as challenges to overcome. This comfort allows them to engage with the material thoroughly, think critically, and persevere through complex math problems. These students are more resilient in the face of challenges and setbacks. When confronted with a complex math problem, they are less likely to give up and more likely to try different strategies or approaches until they arrive at a solution. This persistence leads to better outcomes as they often have a more positive outlook on their math abilities. They believe that with effort and practice, they can improve their math skills. This growth mindset motivates them to engage more deeply with math and allows them to approach challenges confidently, reducing anxiety and enhancing performance.

The negative relationship between MLI and academic performance underscores the profound impact that math phobia has on student outcomes. Math-phobic students struggle not only with the cognitive demands of mathematics but also with the emotional and psychological barriers that prevent them from engaging fully with the subject. By contrast, those with lower MLI scores are more comfortable navigating uncertainties, enabling them to perform better academically. Addressing math anxiety in educational settings is crucial for improving math performance and helping all students develop the skills they need to succeed.

**Recommendations**

The findings of this study revealed that 80% of middle school learners in the research context are math-phobic, such that only 2 out of every ten (10) middle school learners have a cheerful disposition towards mathematics. As a result, the researchers recommend that mathematics educators demystify the subject, aiming to alleviate the perceived fear among learners by enabling them to perceive the subject more accurately. Given the strong inverse correlation between MLI and academic performance, schools and educators must prioritize interventions that reduce math anxiety and help students develop a healthier relationship with mathematics. Implementing workshops or courses focused on reducing math anxiety could help students learn coping mechanisms for managing their emotions around math. Students should be encouraged to adopt a growth mindset by praising their effort and persistence rather than just success; this can help them feel more comfortable with math challenges, foster resilience, and reduce the fear of failure. Gradually increasing the complexity of math problems can help students build confidence in their ability to tackle uncertainties without becoming overwhelmed, thereby reducing the avoidance behavior often associated with high math-phobic levels. Teachers should be aware of their students' emotional barriers in math and provide support and encouragement. Creating a positive, low-pressure learning environment may help reduce the impact of math phobia. Math-phobic learners are encouraged to utilize their school's counseling services to lessen the fears associated with mathematics. Through the

parents-teachers association, the School management should educate parents on handling math-phobic learners as they are part of education stakeholders.

**Conclusion**

In conclusion, this study sheds light on the pervasive issue of math phobia among middle school learners and its detrimental impact on academic performance. The historical importance of mathematics in various aspects of human life underscores the urgency of addressing this challenge. The research reveals that a significant majority of middle school learners exhibit a high level of math-phobia, contributing to their poor academic performance in the subject.

The ratio of high math-phobic learners to low math-phobic learners, identified as 8:2, emphasises the prevalence of this issue in the educational context. The findings further demonstrate that learners with high math-phobic tendencies exhibit lower mean academic performance scores than their counterparts with lower math-phobic levels. This inverse correlation highlights the need to address math-phobia as a crucial factor influencing students' success in mathematics.

The hypothesis testing confirms a significant negative correlation between the academic performance of math-phobic learners and their math-phobic levels. This emphasises the significance of interventions that mitigate math-phobia to enhance students' mathematical performance.

The recommendations put forward by the researchers emphasise the role of educators, counsellors, and parents in mitigating math-phobia. Demystifying mathematics, providing counselling services, and educating parents on supporting math-phobic learners are crucial steps towards fostering a positive attitude and understanding of the subject. Educators and stakeholders can create a more conducive learning environment by addressing math-phobia, ultimately enhancing students' mathematics success and overall educational experience. Therefore, it is imperative to recognise the significance of addressing math-phobia for the holistic development of learners and the advancement of mathematical education.

**Acknowledgements**

The successful completion of this research owes much to the participants who actively participated in the research process, as well as our families, friends, and colleagues, whose steadfast support played a crucial role in shaping the success of its implementation. Furthermore, we appreciate the incorporation of AI technologies, particularly in enhancing the grammatical structure of the research report.

**Declaration of interest**

The authors declare no actual or potential conflicts of interest, including but not limited to any financial, personal, or professional relationships that could inappropriately influence or be perceived to influence the work reported in this manuscript.

**REFERENCE**

Abd-Algani, Y. M. (2022). Role, need and benefits of mathematics in the development of society. *Journal for the Mathematics Education and Teaching Practices, 3*(1), 23-29.

Aguilar, J. J. (2021). High School Students' Reasons for Disliking Mathematics: The Intersection Between Teacher's Role and Student's Emotions, Belief and Self-efficacy. *International Electronic Journal of Mathematics Education, 16*(3), em0658. https://doi.org/10.29333/iejme/11294

Alec Wilkinson (Sept. 18th, 2022). Maths Is the Great Secret. An opinion guest essay. *The New York Times*. https://www.nytimes.com/2022/09/18/opinion/math-adole scence-mystery.html on Nov. 12th, 2023.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th edition)*. Arlington: American Psychiatric Publishing, pp. 190, 197-202. https://doi.org/10.1176/appi.books.9780890425596

Andrea Wodele (2019). Phobias. Role, need and benefits of mathematics in the development of society. Journal for the Mathematics Education and Teaching Practices, 3(1), 23-29. https://www.healthline.com/health/phobia-simple-specifi

Das, K. (2020). Action research on mathematics phobia among secondary school students. *IJIET (International Journal of Indonesian Education and Teaching), 4*(2), 239-250. https://doi.org/10.24071/ijiet.v4i2.2610

Dos Santos Carmo, J., Gris, G., dos Santos Palombarini, L. (2019). Mathematics Anxiety: Definition, Prevention, Reversal Strategies, and School Setting Inclusion. In: Kollosche, D., Marcone, R., Knigge, M., Penteado, M.G., Skovsmose, O. (eds) Inclusive Mathematics Education. Springer, Cham. https://doi.org/10.1007/978-3-030-11518-0_24

Eaton, W. W., Bienvenu, O. J., & Miloyan, B. (2018). Specific phobias. *The Lancet Psychiatry, 5*(8), 678-686. https://doi.org/10.1016/s2215-0366(18)30169-x

Espino, M., Pereda, J., Recon, J., Perculeza, E., & Umali, C. (2017). Mathematics anxiety and its impact on the course and career choice of grade 11 students. *International Journal of Education, Psychology and Counselling, 2*(5), 99-119.

Finell, J., Sammallahti, E., Korhonen, J., Eklöf, H., & Jonsson, B. (2022). Working Memory and Its Mediating Role on the Relationship of Math Anxiety and Math Performance: A Meta-Analysis. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.798090.

Garcia, R. (2017). Neurobiology of fear and specific phobias. *Learning & Memory, 24*(9), 462-471. https://doi.org/10.1101/lm.044115.116

Golding, J. (2018). Mathematics education in the spotlight: Its purpose and some implications. *London Review of Education, 16*(3): 460–473. DOI https://doi.org/10.18546/LRE.16.3.08

Hamm, A. O. (2009). Specific Phobias. *The Psychiatric Clinics of North America. International Journal of Environment & Science Education, Vol. 3*(30). https://doi.org/10.1016/j.psc.2009.05.008

Hannula, M. S. (2019). Young learners' mathematics-related affect: A commentary on concepts, methods, and developmental trends. *Educational Studies in Mathematics, 100*(3), 309-316. https://doi.org/10.1007/s10649-018-9865-9

Hodanova, J., & Nocar, D. (2016). Mathematics importance in our life. In L. G. Chova, A. L. Martinez, & I. C. Torres (Eds), *10th Annual International Technology, Education and Development Conference*. IATED Academy, Valencia. https://doi.org/10.21125/inted.2016.0172

Iddrisu, A. B., Bornaa, C. S., Alagbela, A. A., Kwakye, D. O., Gariba, A., Ahusah, E. T.-W., & Badger, T. N. A. (2023). Students' Characteristics and Academic Performance in Mathematics. *Journal of Education, Society and Behavioural Science, 36*(3), 54–67. https://doi.org/10.9734/jesbs/2023/v36i31214

Ihekwaba, C. N., Nwokocha, C. C., & Onuike, P. C. (2020). Phobia and its effect on the academic achievement of Physics students in Imo State, Nigeria. Advances in Social Sciences Research Journal, 7(2), 87-94.

Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students?. BMC Psychology, 9. https://doi.org/10.1186/s40359-021-005372.

Kunwar, R. (2020). Mathematics phobia: Causes, symptoms and ways to overcome. *International Journal of Creative Research Thoughts, 8*(8), 818–822.

Lewis, G. (2013). Emotion and disaffection with school mathematics. *Research in Mathematics Education*, *15*(1), 70-86. http://dx.doi.org/10.1080/14794802.2012.756 636

Maloney, E. A., Schaeffer, M. W., & Beilock, S. L. (2013). Mathematics anxiety and stereotype threat: Shared mechanisms, negative consequences and promising interventions. *Research in Mathematics Education*, *15*(2), 115-128. http://dx.doi.org/10.1080/14794802.2013.797744

Mauro, C. (2014). Middle school students' perceptions on academic motivation and student engagement. *Counselor Education Masters Theses. Paper*, p. *172*.

Merriam-Webster's Collegiate Dictionary (n.d). Anxiety. In *Merriam–Webster Online Dictionary*. Retrieved on Aug. 28th, 2023 from https://www.meriamwebster.com/dictionary/anxiety

Merriam-Webster's Collegiate Dictionary (n.d). Phobia. In *Merriam-Webster.com dictionary*. https://www.merriam-webster.com/dictionary/phobia

Mulwa, E. C. (2015). Difficulties Encountered by Students in the Learning and Usage of Mathematical Terminology: A Critical Literature Review. *Journal of Education and Practice, 6*(13), 27-37.

Partovi H., (2016). What classes do students like the most? https://www.linkedin.com/pulse/what-classes-do-students-like-most-hadi-partovi/

Rameli, M. R. M., & Kosnin, A. M. (2016). Challenges in mathematics learning: a study from school students' perspective. *Universiti Teknologi Malaysia*.

Richardson, J. (2022). Factors Affecting the Academic Performance of Learners in Mathematics Amidst Pandemic. https://doi.org/10.5281/zenodo.7337795

Rudaz, M., Ledermann, T., Margraf, J., Becker, E. S., & Craske, M. G. (2017). The moderating role of avoidance behaviour on anxiety over time: Is there a difference between social anxiety disorder and specific phobia? *PloS one, 12*(7), e0180298. https://doi.org/10.1371/journal.pone.0180298

Turner, J.C., C. Midgley, D.K. Meyer, M. Ghenn, E.M. Anderman, and Y. Kang. (2002). The classroom environment and students' reports of avoidance strategies in mathematics: A multi-method study. Journal of Educational Psychology 94: 88106. https://doi.org/10.1037/0022-0663.94.1.88