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CONFRONTING THE PROBLEM OF MATHEMATICAL ANXIETY AT ORDINARY LEVEL AT ONE RURAL DAY SECONDARY SCHOOL IN ZIMBABWE

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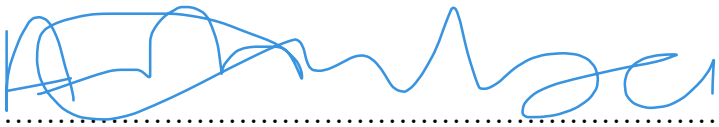
DECLARATION

I, MANDIVAMBA ALOIS declare that this research project for an Honors Bachelor of Science Education in Mathematics Degree at Bindura University is my own design and execution. I further certify that the document has not previously been submitted to this or any other University in support of an application for a post, degree or any other qualification.

Signature:  …….

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DEDICATION

I would like to dedicate this research project to my family, friends, and colleagues who have supported me throughout this journey. Their encouragement, guidance, and patience have been invaluable. I also dedicate this project to the students and teachers who participated in this study, without whom this research would not have been possible. I hope this study will contribute to a better understanding of mathematical anxiety.

ABSTRACT

This research investigates the prevalence and impact of mathematics anxiety among ordinary level students at a rural school in Zimbabwe. The study explores the factors contributing to this anxiety, including socio-cultural influences, teaching methodologies, and individual learning styles. Through quantitative and qualitative data collection methods, such as surveys, interviews, and classroom observations, the research aims to identify the specific challenges faced by students and teachers in addressing mathematics anxiety. The findings will inform the development of targeted interventions and pedagogical strategies designed to alleviate mathematics anxiety and improve students' mathematical performance and overall learning experience within the specific context of a rural Zimbabwean school. The study contributes to the existing literature by providing a localized understanding of mathematics anxiety within a resource-constrained environment and offering practical recommendations for improving mathematics education in similar settings.

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APPROVAL FORM

The undersigned certified that they have supervised and recommended Bindura University of Science Education for acceptance of dissertation entitled:

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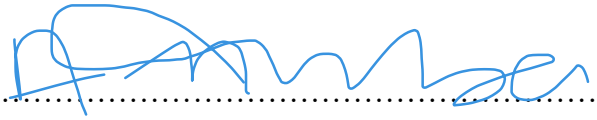
Signed 

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TABLE OF CONTENTS **PAGE NUMBER**

CHAPTER ONE: RESEARCH PROBLEM AND ITS SETTING

1.1 INTRODUCTION

This chapter explores the motivation and context surrounding the research into mathematical anxiety among Ordinary Level students at a rural Zimbabwean secondary school. Mathematics, a cornerstone of education fostering critical thinking and problem-solving, is often a source of significant anxiety for many students. This anxiety, particularly pronounced at the Ordinary Level, significantly impacts learning and performance. This study addresses this issue by investigating the root causes of mathematical anxiety within the specific context of a rural school, aiming to identify effective interventions. The impetus for this research stems from the growing recognition of mathematical anxiety as a systemic problem affecting educational outcomes (Ashcraft, 2002), particularly acute in resource-constrained rural environments. Students in these settings face multiple challenges, including limited access to resources, inadequate teaching materials, and a shortage of qualified teachers (Gonzalez et al., 2010). These factors create an environment conducive to anxiety, leading to disengagement and poor academic performance. Understanding the unique context of this rural school is crucial. Socio-economic disparities within the community, varying levels of parental educational support, and potentially prevalent cultural stigmas associated with mathematics (Schoenfeld, 1989) all contribute to the problem. These cultural stigmas, encompassing negative attitudes and beliefs about mathematics, can significantly impact students' self-efficacy and attitudes towards the subject (Bandura, 1997), creating a self-fulfilling prophecy of failure (Beilock et al., 2010). Furthermore, traditional teaching methodologies focused on rote learning and standardized testing (Hembree, 1990) may exacerbate anxiety rather than alleviate it. The research acknowledges the crucial interplay between cognitive processes and emotional well-being in mathematics learning (Zeidner, 1998). Addressing mathematical anxiety is not solely about improving academic scores but also about fostering a supportive learning environment where students feel safe to learn and explore. This study aims to bridge the gap in understanding the specific manifestations of mathematical anxiety in this rural context and develop targeted interventions. By engaging with students, teachers, and the community, the research seeks to create tailored strategies to mitigate anxiety and promote a positive attitude towards

mathematics, ultimately empowering students to overcome their fears and succeed. The lack of comprehensive research specifically addressing math anxiety amongst Ordinary Level students in this context further highlights the need for this investigation.

1.2 MOTIVATION AND CONTEXT

Mathematics is a cornerstone of education, playing a pivotal role in developing critical thinking, problem-solving skills, and logical reasoning. Despite its importance, many students experience mathematical anxiety, which can severely hinder their learning and performance, particularly at the Ordinary Level in secondary education. This research aims to confront the problem of mathematical anxiety at one rural day secondary school, exploring its underlying causes and potential interventions.

The motivation behind this study stems from the growing recognition that mathematical anxiety is not merely an individual issue but a systemic problem that affects educational outcomes (Ashcraft, 2002). In rural areas, where socio-economic challenges often limit access to resources and support, the effects of mathematical anxiety can be exacerbated. Many students in these settings face additional barriers, such as limited exposure to technology, inadequate instructional materials, and a lack of qualified teachers. These factors contribute to a learning environment where anxiety can flourish, leading to disengagement from mathematics and poorer academic performance (Gonzalez et al., 2010).

Understanding the context of this rural day secondary school is crucial for addressing mathematical anxiety effectively. Rural schools often serve communities with varying levels of economic stability, and students may come from backgrounds where educational attainment is not prioritized or where there are cultural stigmas associated with mathematics (Schoenfeld, 1989). Cultural stigmas in mathematic refer to negative attitudes, beliefs and values that are associated with mathematics within a particular culture or society. In such environments, students may internalize negative beliefs about their mathematical abilities, further perpetuating their anxiety. Research indicates that cultural perceptions of mathematics can influence students' self-efficacy and attitudes towards the subject (Bandura, 1997). When students believe that they

are inherently "bad" at mathematics, they are less likely to engage with the material or seek help when needed.

Moreover, the teaching methodologies employed in rural schools may not adequately address the diverse needs of students. Traditional pedagogical approaches often emphasize rote memorization and standardized testing, which can heighten anxiety rather than alleviate it (Hembree, 1990). Students who struggle with understanding concepts may feel overwhelmed and discouraged, leading to avoidance behaviours that further diminish their opportunities for success in mathematics. This cycle of anxiety and poor performance can create a self-fulfilling prophecy, where students' fears become reality as they disengage from the subject altogether (Beilock et al.2010)

The emotional and psychological dimensions of learning mathematics cannot be overlooked. Research has shown that anxiety can interfere with cognitive processes essential for problem-solving and comprehension (Zeidner,1998). As such, addressing mathematical anxiety is not just about improving academic performance; it is also about fostering a positive learning environment where students feel safe to explore mathematical concepts without fear of judgment or failure.

This study aims to fill the gap in understanding the specific manifestations of mathematical anxiety within this rural context and to identify effective strategies for intervention. By engaging with students, teachers, and the broader community, the research seeks to develop tailored approaches that can mitigate anxiety and promote a more positive attitude towards mathematics. Ultimately, the goal is to empower students to overcome their fears and build the confidence necessary for success in mathematics and beyond. While the existence of math phobia is widely acknowledged, there is a need for comprehensive research that explores its impacts on ordinary level students specifically. By examining the experiences, perceptions, and consequences of math phobia in this specific age group, educators and policymakers can gain valuable insights into the scope of the problem and develop targeted interventions to address it effectively.

Understanding the level of math phobia in ordinary level students is essential for several reasons. Firstly, it will provide a clearer picture of the prevalence and severity of math phobia at this stage, enabling educators to identify students who may require additional support. Secondly, it will shed light on the specific academic challenges faced by students with math phobia, allowing for the development of instructional strategies that cater to their needs. Lastly, it will contribute to the growing body of research and knowledge on math anxiety, helping to inform educational policies and practices aimed at reducing math phobia and promoting a positive learning environment for all students.

By conducting this research, the researcher aim to bridge the existing knowledge gap and provide valuable insights into the impacts of math phobia in ordinary level students, ultimately working towards creating a supportive and inclusive mathematics learning environment that fosters confidence, engagement, and academic success.

1.2 PERSONAL CONNECTION WITH THIS RESEARCH

Mathematics has always been a subject that evokes a spectrum of emotions, ranging from excitement to dread. My personal journey with mathematics reflects this complexity, particularly during my formative years in a rural setting similar to the one I now study. Growing up in a small community, I experienced first-hand the challenges that students face when grappling with mathematical concepts. For many of us, mathematics was not just a subject; it was a source of anxiety that could overshadow our academic experiences.

I vividly recall my early encounters with math, where the classroom atmosphere was often charged with tension. The teacher’s well-meaning attempts to explain complex concepts sometimes fell flat, leaving many of us confused and frustrated. I remember sitting in class, heart racing, as I struggled to keep up with the lessons, test and examinations. The fear of being called upon to solve a problem on the board loomed large, exacerbated by the stares of my peers. This anxiety not only affected my performance but also

diminished my interest in mathematics, leading me to view it as an insurmountable challenge rather than an exciting puzzle to solve.

The societal perceptions surrounding mathematics played a significant role in shaping my experience. In our community, there was a prevailing belief that certain individuals were “naturally good” at math while others were not. This stereotype created an environment where students like me felt inadequate and discouraged. I often found myself questioning my abilities, convinced that I lacked the innate talent required to excel in mathematics. Such beliefs were further reinforced by the limited resources available in our rural school—textbooks were outdated, and access to technology was minimal. This lack of support made it even more difficult for students to engage meaningfully with mathematical concepts.

However, amidst these challenges, there were glimmers of hope. I was fortunate to have a few teachers who recognized the impact of anxiety on our learning. They employed creative teaching methods that encouraged exploration and collaboration rather than rote memorization. These educators fostered a supportive environment where mistakes were viewed as opportunities for growth rather than failures. Their efforts ignited a spark within me and many of my classmates; we began to see mathematics as a subject that could be understood and enjoyed rather than feared.

Reflecting on these experiences, I am motivated to confront the problem of mathematical anxiety in my research. I believe that understanding the roots of this anxiety is crucial for developing effective interventions tailored to the unique needs of students in rural settings. By exploring the causes and effects of mathematical anxiety, I aim to contribute to creating a more supportive learning environment where students can thrive.

Moreover, my personal connection to this issue drives me to advocate for change within the educational system. I envision workshops for teachers focused on innovative pedagogical strategies that prioritize student engagement and emotional well-being. Additionally, fostering peer support networks can help students share their struggles and successes, reducing feelings of isolation and anxiety.

In conclusion, my journey through mathematics has shaped my understanding of the profound impact that anxiety can have on learning. By addressing this issue in my research, I hope to empower students in rural day secondary schools to overcome their fears and develop a positive relationship with mathematics. It is my aspiration that no student should have to endure the same struggles I faced; instead, they should be equipped with the confidence and skills necessary to navigate the world of mathematics with enthusiasm and resilience.

1.3 STATEMENT OF THE PROBLEM

Mathematical anxiety is a significant barrier to learning that affects students' performance and engagement in mathematics, particularly at the Ordinary Level in secondary education. This phenomenon is characterized by feelings of tension, apprehension, and fear that arise when faced with mathematical tasks (Richardson & Suinn, 1972). In rural day secondary schools, where students often face additional socio-economic challenges and limited access to educational resources, the impact of mathematical anxiety can be even more pronounced.

Preliminary observations at one rural day secondary school indicate a troubling trend; a significant number of students exhibit high levels of anxiety towards mathematics, which correlates with poor academic performance in this subject. This anxiety manifests in various forms, including avoidance behaviours, decreased participation in class discussions, and a lack of confidence in problem-solving abilities. According to Ashcraft (2002), such anxiety can lead to a self-fulfilling prophecy where students who are anxious about mathematics tend to perform poorly, further reinforcing their negative beliefs about their mathematical capabilities.

Several factors contribute to the prevalence of mathematical anxiety in this context. First, the instructional methods employed may not adequately address diverse learning needs or promote a positive learning environment. Research by Hembree (1990) suggests that traditional teaching approaches can exacerbate anxiety by emphasizing rote memorization over conceptual understanding. In addition, the socio-economic

background of students can influence their access to resources such as tutoring or technology, which are critical for building confidence in mathematics (Gonzalez et al., 2010). Cultural perceptions of mathematics also play a crucial role. In many communities, mathematics is viewed as an inherently difficult subject, leading to negative self-perceptions among students (Schoenfeld, 1989). This cultural stigma can create an environment where students feel discouraged from engaging with mathematical concepts, further deepening their anxiety. Teachers in rural settings may also lack the training or resources necessary to effectively support students dealing with mathematical anxiety. A study by Beilock et al. (2010) highlights the importance of teacher preparedness in addressing anxiety-related issues; however, many educators in rural areas may not have access to professional development opportunities that equip them with strategies to mitigate anxiety

Given the critical role that mathematics plays in educational achievement and future opportunities, it is essential to understand how mathematical anxiety manifests in this specific rural context and to identify effective interventions. This research aims to explore the root causes of mathematical anxiety at this rural day secondary school, assess its impact on students' academic performance, and propose strategies that can be implemented to create a more supportive learning environment. By addressing this issue, the study seeks to enhance students' mathematical skills and improve their overall educational experience.

The area under this research study is characterised by several gaps. Mathematical anxiety is one of the pervasive issues affecting students' performance and attitudes toward mathematics, particularly at the ordinary level in secondary schools. While extensive research has been conducted on mathematical anxiety in urban settings (Ashcraft & Krause, 2007; Hembree, 1990), there remains a significant gap regarding its impact in rural educational contexts. Studies such as those by Maloney et al. (2015) indicate that environmental factors, including socio-economic status and access to resources, can exacerbate mathematical anxiety, yet rural schools are often overlooked in this discourse.

Additionally, existing literature primarily focuses on psychological interventions and classroom strategies employed in urban areas (Beilock et al., 2010), leaving a void in understanding how these strategies can be adapted for rural settings where cultural and contextual differences may play a critical role. Furthermore, the interplay between teachers' perceptions of mathematical anxiety and their instructional practices in rural schools has not been thoroughly explored (Pajares, 1996). This lack of research limits the development of targeted interventions that could effectively address mathematical anxiety among students in rural secondary schools, highlighting the need for focused studies that consider the unique challenges faced by these educational environments.

1.4 RESEARCH QUESTIONS/HYPOTHESES

This research is based on the following research questions.

- What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?
- What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?
- What strategies can be employed to handle O-Level students with higher math phobia in a rural secondary school?

1.5 OBJECTIVES

By the end of this research the following objectives should be addressed:

- To determine the levels of mathematical anxiety among O-Level students in a rural day secondary school.
- To identify the factors contributing to the development of mathematical anxiety among O-Level students in a rural secondary school.
- To explore effective strategies for managing mathematical anxiety among O-Level students with higher math phobia in a rural secondary school.

1.6 SIGNIFICANCE OF THE STUDY

Mathematical anxiety is a pervasive issue that affects students' learning experiences, particularly in rural settings where resources may be limited. This study aims to explore the levels, contributing factors and potential strategies for addressing mathematical anxiety among O-Level students in a rural day secondary school. The significance of this study can be understood through the lens of the following research questions.

1. What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?

Understanding the levels of mathematical anxiety is crucial for several reasons. First, it provides a baseline for assessing the severity of the problem within the specific context of a rural school. Previous research indicates that high levels of anxiety can inhibit students' ability to engage with mathematical concepts (Hembree, 1990). By quantifying anxiety levels, educators and policymakers can better understand the urgency of interventions needed.

Moreover, identifying the levels of anxiety can facilitate targeted support. For instance, if a significant proportion of students report high anxiety levels, this may signal the need for immediate curricular adjustments or supplementary programs aimed at alleviating stress (Ashcraft & Krause, 2007). The findings will not only contribute to academic literature but also empower educators to create more supportive learning environments tailored to their students' emotional needs.

2. What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?

Exploring the factors that contribute to mathematical anxiety is essential for developing effective interventions. Factors such as teacher attitudes, parental expectations, and peer influences have been shown to play significant roles in shaping students' perceptions of mathematics (Pajares, 1996). In rural

settings, additional elements like socio-economic status and limited access to educational resources may exacerbate these influences.

By identifying specific contributing factors, this study can inform targeted strategies for intervention. For example, if teacher attitudes are found to be a significant factor, professional development programs can be designed to help teachers adopt more positive and supportive approaches to teaching mathematics (Beilock et al., 2010). Understanding these factors will also enable the development of community-based programs that involve parents and local stakeholders in fostering a more positive attitude toward mathematics.

3. What strategies can be employed to handle O-Level students with higher math phobia in a rural secondary school?

Developing effective strategies to address mathematical anxiety is perhaps the most critical aspect of this study. Previous research suggests various interventions, including cognitive-behavioural techniques, peer tutoring, and classroom-based activities that promote a growth mind-set (Maloney et al., 2015). By focusing on students with higher levels of math phobia, this research can identify which strategies are most effective in alleviating anxiety and improving performance.

The significance of this question extends beyond individual classrooms; it has implications for educational policy and curriculum design. If effective strategies are identified and validated through this research, they can be disseminated across similar rural contexts, contributing to broader efforts to enhance math education in underserved areas (Boaler, 2016). Additionally, these strategies can empower teachers by providing them with practical tools to support their students.

In summary, this study's significance lies in its potential to address a problem affecting O-Level students in a rural day secondary school. By investigating levels of mathematical anxiety, contributing factors and effective coping strategies. This research aims to provide comprehensive insights that can guide educators and policymakers.

The findings will not only contribute to academic literature on mathematical anxiety but also serve as a catalyst for change within educational practices. Ultimately, by confronting the problem of mathematical anxiety head-on, this study seeks to foster an environment where all students have the opportunity to succeed in mathematics, irrespective of their backgrounds or initial anxieties.

1.7 ASSUMPTIONS OF THE STUDY

This study operates under several key assumptions regarding mathematical anxiety among O-Level students in a rural day secondary school. First, it is assumed that emotional factors significantly contribute to the prevalence of mathematical anxiety. Previous research indicates that anxiety can stem from negative past experiences with mathematics, leading to a cycle of fear and avoidance (Hembree, 1990). It is posited that students in this rural setting may face unique emotional challenges, such as limited support systems and heightened pressure to perform academically, which can exacerbate their anxiety levels (Ashcraft & Krause, 2007).

Secondly, the study assumes that the population of the study may contain outliers—students whose experiences or levels of anxiety significantly differ from the norm. These outliers can skew data and create misleading interpretations if not adequately accounted for (Tabachnick & Fidell, 2013). For instance, a small group of students may exhibit extreme anxiety due to personal circumstances, such as family issues or learning disabilities, which could disproportionately affect overall findings. Recognizing and analysing these outliers will be essential for understanding the full spectrum of mathematical anxiety within the student population.

This study also assumes that mathematical anxiety is a significant barrier to student performance in mathematics at the Ordinary Level. It also presupposes that students are willing to openly discuss their feelings of anxiety and that their responses will provide valuable insights into its causes and effects. Additionally, it is assumed that interventions designed based on the findings will effectively reduce anxiety levels and improve student engagement and performance in mathematics. Finally, the research

assumes that the socio-cultural context of the rural school will provide relevant insights applicable to similar educational environments facing mathematical anxiety challenges.

1.8 DELIMITATIONS

The study is deliberately confined to one rural day secondary school, focusing specifically on Ordinary Level students. This delimitation allows for an in-depth exploration of the unique challenges faced in that specific context but limits the applicability of findings to other educational settings. The research will concentrate solely on mathematical anxiety, excluding other forms of academic anxiety or stress.

Furthermore, it will primarily utilize qualitative methods such as interviews and focus groups, thereby narrowing the scope to subjective experiences rather than quantitative measures of academic performance or broader psychological factors.

1.9 LIMITATIONS

This study on confronting mathematical anxiety at a rural day secondary school has several limitations. First, the sample size may be small and not representative of all rural schools, potentially affecting the generalizability of the findings. Additionally, self-reported data on anxiety levels may introduce bias, as students might underreport or exaggerate their feelings. The study's focus on a single school limits the diversity of experiences and contextual factors that could influence mathematical anxiety. Lastly, external factors such as socio-economic conditions and familial support, which also contribute to anxiety, may not be fully explored within the scope of this research.

1.11 DEFINITION OF TERMS

To ensure clarity throughout this study, the following key terms are defined:

1.10.1Maths anxiety

Richardson & Suinn (1972) defined math anxiety as "a feeling of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of

everyday life and academic situations." This definition emphasizes the emotional aspects that disrupt mathematical performance. Ashcraft (2002) also describes math anxiety as "an emotional response to mathematics that can lead to avoidance of math-related tasks and a reduction in performance." This highlights the behavioural consequences of experiencing anxiety in mathematical contexts. Hembree (1990) defines math anxiety as "a situation-specific anxiety that occurs in response to mathematics-related situations." This definition points to the situational triggers that can elicit anxiety, rather than it being a generalized form of anxiety.

These definitions collectively underscore math anxiety as a situation-specific, emotional response characterized by feelings of tension, anxiety, and apprehension when encountering mathematics-related situations, interfering with mathematical performance and problem-solving abilities, leading to avoidance behaviours and reduced academic and everyday functioning.

1.10.2 Math Phobia

Hembree (1990) describes math phobia as a debilitating condition characterized by intense feelings of anxiety and fear when faced with mathematical tasks. This definition highlights the emotional distress associated with math-related situations. Richardson & Suinn (1972) define math phobia as an irrational fear of mathematics that can lead to avoidance behaviours and a lack of confidence in one’s mathematical abilities. This emphasizes how such fear can impact individuals' engagement with math. Ashcraft & Ridley (2005) note that "math phobia can manifest as a strong emotional response that results in avoidance of math-related activities and can negatively affect academic performance." This definition underscores the behavioural implications of math phobia.

These definitions collectively illustrate math phobia, also known as numerophobia or mathematical anxiety, as a persistent and debilitating psychological condition characterized by an intense, irrational, and overwhelming fear or anxiety towards mathematics, mathematical concepts, and math-related situations. This phobia manifests as excessive emotional distress, avoidance behaviours, and decreased confidence in

one's mathematical abilities, ultimately leading to impaired academic performance, reduced motivation, and a diminished capacity to engage with mathematical tasks. In more precise, math-phobia, often referred to as math anxiety, is a severe fear or aversion to mathematics that can hinder a person's ability to perform mathematical tasks.

1.10.3 Mathematical attitude

According to Miller & Smith (1987) "Mathematical attitude is defined as the emotional disposition toward mathematics which influences how students approach learning and problem-solving in mathematics." Another scholar, Fennell, (2006) stated that A student's mathematical attitude includes their confidence in their mathematical abilities, their enjoyment of mathematics, and their perception of the relevance of mathematics to their lives. Mathematical attitude can be described as a composite of individual beliefs about mathematics, including self-efficacy, value placed on mathematics, and enjoyment of mathematical activities. (Ma & Kishor, 1997)

Through a holistic understanding of the above definition, Mathematical attitude refers to the feelings, beliefs, and dispositions that individuals hold towards mathematics. It encompasses how students perceive their ability to engage with mathematical tasks and their overall feelings towards the subject.

1.10.4 Mathematical perception

According to Steinberg (1992) “Mathematical perception is the cognitive and emotional framework through which individuals interpret and engage with mathematical concepts, influencing their ability to learn and apply mathematics effectively.” Bishop (1988) stated that “Mathematical perception involves the ways in which students perceive mathematical problems and solutions, shaped by their previous experiences and cultural contexts.” “Mathematical perception reflects the beliefs and attitudes that students hold about mathematics, which can significantly affect their motivation and engagement in learning.” (NCTM (National Council of Teachers of Mathematics, 2000).

In the same vein of the above scholars, mathematical perception refers to the way individuals understand, interpret, and relate to mathematical concepts and tasks. It encompasses students' beliefs about their abilities in mathematics, their views on the relevance of mathematics, and their emotional responses to mathematical challenges.

1.11 Purpose of the research

The purpose of this study is to investigate the level and contributing factors of mathematical anxiety among O-Level students at a rural school in Zimbabwe. Mathematical anxiety is a pervasive problem that affects students' motivation, self-confidence, and overall performance in mathematics (Ashcraft, 2002; Beilock et al., 2010). In Zimbabwe, where mathematics is a compulsory subject at the O-Level, mathematical anxiety can have serious consequences for students' future academic and career prospects (Zimbabwe School Examinations Council, 2019).

This study aims to contribute to the existing body of research on mathematical anxiety by providing insights into the experiences of O-Level students in a rural Zimbabwean context. By exploring the level of mathematical anxiety, contributing factors of mathematical anxiety, and seeks to inform the development of effective strategies for mitigating mathematical anxiety and promoting mathematical literacy among O-Level students.

1.12 ORGANIZATION OF THE RESEARCH

This research is organized into five chapters:

1. Chapter One: Introduction and General Information – This chapter provides an overview of the research problem, personal connection, gap in research, significance of the study, definitions of terms, delimitations, limitations and organization of the dissertation.
2. Chapter Two: Literature Review – This chapter reviews existing literature on math anxiety, its causes, effects on academic performance, and effective interventions for addressing it.

3. Chapter Three: Methodology – This chapter outlines the research design, participants, data collection methods, and data analysis procedures employed in the study.
4. Chapter Four: Results – This chapter presents the findings from the quantitative surveys and qualitative focus group discussions and interviews.
5. Chapter Five: Discussion and Conclusion – This chapter interprets the findings, discusses their implications for educational practice, acknowledges limitations, and offers recommendations for future research.

1.13 CHAPTER ONE SUMMARY

This chapter addresses the critical issue of mathematical anxiety among students at a rural day secondary school, emphasizing its prevalence and impact on academic performance. Mathematical anxiety, characterized by feelings of tension and fear related to mathematics, can hinder students' ability to engage with the subject effectively (Hembree, 1990). This chapter reviews existing literature that identifies contributing factors such as socio-economic challenges, limited resources, and negative classroom experiences, particularly in rural settings (Miller & Bichsel, 2004). The importance of understanding the local context is underscored, as rural students often face unique barriers to learning, including inadequate access to qualified teachers and supportive learning environments (Putwain & Symes, 2011).

The chapter also outlines the research objectives, which aim to identify the causes of mathematical anxiety in this specific setting and explore potential interventions. By employing qualitative and quantitative methods, the study seeks to gather comprehensive data from students, teachers, and parents to inform effective strategies for alleviating anxiety. Ultimately, this chapter sets the stage for a deeper investigation into the roots of mathematical anxiety and its implications for educational equity in rural schools (Ashcraft & Ridley, 2005).

CHAPTER TWO: LITERATURE REVIEW

2.0 INTRODUCTION

Mathematical anxiety is a pervasive issue affecting students across various educational levels, characterized by feelings of tension, apprehension, and fear that hinder math performance. This phenomenon has significant implications for students' academic achievement, career choices, and overall well-being. The prevalence of mathematical anxiety is particularly concerning among adolescents in rural areas, where limited resources and support exacerbate the problem.

This chapter provides an in-depth examination of the existing literature on mathematical anxiety, exploring its definition, causes, and consequences. We will delve into the distinction between mathematical anxiety and math phobia, discussing the characteristics and manifestations of each. The review will also investigate

the factors contributing to mathematical anxiety, including societal and cultural influences, teacher attitudes, and individual differences.

Furthermore, this chapter will discuss the importance of addressing mathematical anxiety through effective interventions, highlighting the role of cognitive-behavioural techniques, supportive learning environments, and parental involvement. By synthesizing the existing research, we aim to provide a comprehensive understanding of mathematical anxiety and its implications for education, ultimately informing strategies to mitigate its effects and promote positive attitudes toward mathematics.

2.1.0 INTRODUCTION TO MATH ANXIETY

Math anxiety is a well-documented phenomenon that affects students across various educational levels. It is characterized by feelings of tension, apprehension, and fear that interfere with math performance (Ashcraft & Ridley, 2005). Research indicates that math anxiety can lead to avoidance of math-related tasks, poor academic performance, and negative attitudes towards mathematics (Hembree, 1990). The prevalence of math anxiety is particularly concerning among adolescents, as it can have lasting effects on their educational trajectories and career choices (Maloney & Beilock, 2012).

2.1.1 Mathematical Anxiety

Mathematical anxiety is defined as a feeling of tension or fear that negatively affects an individual's ability to perform mathematical tasks (Richardson & Suinn, 1972). It can manifest in various forms, including feelings of dread, panic, and frustration when faced with mathematical problems. Research indicates that approximately 20% to 30% of students experience significant levels of mathematical anxiety (Hembree, 1990). This phenomenon is particularly pronounced among students in rural areas, where limited resources and support can exacerbate feelings of inadequacy.

2.1.2 Causes of Mathematical Anxiety

Several factors contribute to the development of mathematical anxiety. Societal and cultural influences play a crucial role; many communities harbour stereotypes that equate mathematical ability with innate talent rather than effort (Stevenson & Stigler, 1992). This belief can lead to a fixed mind-set among students, who may feel discouraged if they struggle with mathematical concepts.

Teacher attitudes also significantly influence students' experiences with mathematics. Teachers who exhibit anxiety can inadvertently transmit these feelings to their students (Ma, 1999). Furthermore, traditional teaching methods that emphasize rote memorization over conceptual understanding can exacerbate anxiety (Booth & Nolen, 2012).

Individual differences such as prior experiences with mathematics, self-efficacy beliefs, and personality traits also contribute to mathematical anxiety. Research shows that students with low self-efficacy are more likely to experience anxiety when confronted with mathematical tasks (Pajares, 1996). Moreover, perfectionist tendencies can lead to overwhelming pressure to perform well, further exacerbating anxiety (Flett et al., 2016).

2.2. Math Phobia

Math phobia is often used interchangeably with mathematical anxiety; however, it represents a more extreme form of fear associated with mathematics. While mathematical anxiety may manifest as discomfort or unease, math phobia can lead to complete avoidance of math-related activities (Ashcraft & Ridley, 2005). Students experiencing math phobia may refuse to take math classes or pursue careers that require mathematical skills.

Math phobia is has some Characteristics of Math Phobia that depicts it. Math phobia can be characterized by physical symptoms such as sweating, increased heart rate, and nausea when faced with mathematical tasks. This condition often leads to a cycle of avoidance, where students develop negative attitudes toward

mathematics and ultimately perform poorly in the subject (Putwain, 2007). The emotional distress associated with math phobia can hinder academic achievement and limit future opportunities.

Addressing math phobia is required to in order to handle it. Addressing math phobia requires targeted interventions aimed at reducing anxiety and building confidence in mathematical abilities. Cognitive-behavioural approaches have shown promise in helping students reframe negative thoughts about their capabilities (Hembree, 1990). Additionally, creating a supportive classroom environment that encourages risk-taking and collaboration can help mitigate feelings of fear and isolation.

2.3 Mathematical Attitude

Mathematical attitude refers to the beliefs and feelings individuals hold about mathematics and its relevance in their lives. Positive mathematical attitudes are associated with increased motivation and engagement in learning, while negative attitudes can lead to avoidance and disengagement (Aiken, 1970).

Mathematical Attitude has components which need to known. One of the components is affective component. This involves emotional responses to mathematics, such as enjoyment or anxiety.

Another component is cognitive component. This includes beliefs about one's abilities and the value of mathematics. We have also behavioural component. This refers to actions taken in relation to mathematics, such as participation in math-related activities.

Research indicates that students with positive mathematical attitudes are more likely to engage in problem-solving activities and persist in the face of challenges (Fennema & Sherman, 1976). Conversely, negative attitudes can lead to avoidance behaviours and decreased performance.

There are several factors that influence mathematical attitudes. Those include teacher practices, peer interactions, and parental attitudes. Teachers who foster a positive learning environment and encourage exploration can significantly impact students' attitudes toward mathematics (Booth & Nolen, 2012).

Additionally, supportive peer relationships can help mitigate feelings of isolation and promote positive attitudes (Perry et al., 2009).

2.4 Mathematical Perception

Mathematical perception refers to how individuals interpret and make sense of mathematical concepts and processes. It encompasses cognitive processes such as understanding, reasoning, and problem-solving. Students' perceptions of mathematics can significantly influence their engagement and success in the subject.

Mathematical perception plays a critical role in shaping students' experiences with mathematics. Research suggests that students who perceive mathematics as relevant and applicable to their lives are more likely to engage deeply with the subject (Boaler, 2016). Conversely, students who view mathematics as abstract or irrelevant may struggle to connect with the material.

To enhance mathematical perception among students, educators must create learning experiences that highlight the relevance of mathematics in real-world contexts. Incorporating project-based learning and real-life applications can help students see the value of mathematics beyond the classroom (Boaler, 2016). Additionally, fostering a growth mind-set—where students believe that abilities can be developed through effort—can positively influence their perceptions of mathematics (Dweck, 2006).

2.5 Interconnections among Mathematical Anxiety, Math Phobia, Attitude, and Perception

The concepts of mathematical anxiety, math phobia, mathematical attitude, and mathematical perception are interrelated and mutually influential. If mathematical anxiety levels is high this can lead to negative attitudes toward mathematics. Students who experience anxiety may develop avoidance behaviours that further reinforce negative perceptions.

On the other hand, math phobia is an extreme manifestation of anxiety that can result in complete disengagement from mathematics. Students with math phobia often hold negative attitudes and perceptions about their abilities.

Positive attitudes can mitigate the effects of anxiety and phobia. Students who view mathematics positively are more likely to engage with the subject despite challenges and how students perceive mathematics influences their emotional responses. A positive perception can reduce anxiety and foster a willingness to tackle challenging problems.

2.6 Theoretical Perspectives on Mathematical Anxiety

Several theories can help explain the phenomenon of mathematical anxiety, including cognitive-behavioural theory, constructivist theory, and the theory of planned behaviour. Each of these perspectives offers unique insights into the causes and effects of mathematical anxiety.

Cognitive-behavioural theory posits that thoughts, feelings, and behaviours are interconnected. According to this theory, students with mathematical anxiety often possess negative beliefs about their abilities and the relevance of mathematics (Beilock & Maloney, 2015). These beliefs can lead to avoidance behaviours and increased anxiety when faced with mathematical tasks. Students may have distorted thoughts about their mathematical abilities, such as “I am bad at math” or “I will fail.” These thoughts can lead to heightened anxiety and reduced performance (Ashcraft & Ridley, 2005). Anxiety also often results in maladaptive behaviours, such as avoidance of math-related activities or procrastination (Hembree, 1990).

Therefore, cognitive-behavioural approaches can help students reframe their negative thoughts and develop more adaptive coping strategies. Techniques such as cognitive restructuring and exposure therapy can be employed to reduce anxiety (Hembree, 1990).

Constructivist theory emphasizes the active role of learners in constructing their understanding of mathematical concepts. According to this perspective, students learn best when they engage with material in meaningful ways (Piaget, 1973). In rural settings, where traditional teaching methods may dominate, students may struggle to connect with mathematics, leading to anxiety. Engaging students in hands-on activities and real-world applications of mathematics can enhance understanding and reduce anxiety (Boaler, 2016). Collaborative learning environments foster peer support and reduce feelings of isolation among students experiencing anxiety (Vygotsky, 1978).

Implications for Intervention: Educators should incorporate active learning strategies that promote collaboration and real-life applications of mathematics. This approach can help students develop positive attitudes toward mathematics and reduce anxiety.

2.7 RELATED STUDIES

Introduction

Mathematical anxiety is a significant barrier to learning and achievement in mathematics, particularly in rural day secondary schools where students may have limited access to resources and support. This research explores similar studies aimed at addressing mathematical anxiety, focusing on effective interventions and strategies that have been implemented in comparable educational contexts.

1. The Role of Cognitive-Behavioural Interventions

A study conducted by Suinn et al. (1990) examined the effectiveness of cognitive-behavioural interventions in reducing mathematical anxiety among college students. The researchers implemented a program that included cognitive restructuring, relaxation techniques, and exposure therapy. Cognitive

restructuring is a cognitive-behavioural therapy (CBT) technique that helps individuals identify and challenge negative thought patterns, replacing them with more balanced and constructive ones (Beck, 2011). Then, relaxation techniques are methods used to help manage stress, anxiety, and other emotional states by promoting relaxation and reducing muscle tension (Kabat-Zinn, 2003). These techniques can help calm the mind and body, leading to a sense of calmness and well-being (Hofmann et al., 2010). Exposure therapy is a type of psychotherapy that involves helping individuals confront and overcome their fears, anxieties, or avoidance behaviours by gradually exposing them to the feared stimulus or situation (Foa & McLean, 2016). Exposure therapy has been shown to be effective in reducing anxiety and avoidance behaviours in individuals with anxiety disorders, including post-traumatic stress disorder (PTSD), social anxiety disorder, and specific phobias (Hofmann et al., 2010). Results indicated a significant reduction in anxiety levels and an improvement in students' attitudes toward mathematics.

The findings from Suinn et al. (1990) suggest that similar cognitive-behavioural strategies could be adapted for rural day secondary schools. By training teachers to implement these techniques, students may be better equipped to manage their anxiety and improve their performance in mathematics.

2. Active Learning Strategies

Boaler (2016) conducted a study in a diverse urban school district that emphasized active learning strategies to combat mathematical anxiety. The program involved hands-on activities, collaborative projects, and real-life applications of mathematics. Students reported increased engagement and reduced anxiety levels, leading to improved performance.

Implementing active learning strategies in rural day secondary schools could foster a more supportive learning environment. By encouraging collaboration and real-world connections, educators can help students see the relevance of mathematics, which may alleviate anxiety (Boaler, 2016).

3. Teacher Training and Professional Development

A study by Ma (1999) focused on the impact of teacher attitudes on student performance in mathematics. The research found that teachers who exhibited positive attitudes toward mathematics significantly influenced their students' experiences and reduced anxiety levels. Professional development programs aimed at enhancing teachers' mathematical knowledge and pedagogical skills were shown to be effective.

Investing in teacher training programs that emphasize positive attitudes toward mathematics can create a more supportive atmosphere in rural schools. By equipping teachers with effective instructional strategies, they can foster a growth mind-set among students and reduce anxiety (Ma, 1999).

4. Peer Support Programs

Putwain (2007) explored the role of peer support in mitigating mathematical anxiety among secondary school students. The study revealed that collaborative learning environments provided emotional support and reduced feelings of isolation. Students who participated in peer tutoring reported lower anxiety levels and improved academic performance.

Establishing peer support programs in rural day secondary schools can enhance students' social connections and reduce anxiety. Group work and peer tutoring initiatives can create a sense of community, making it easier for students to confront their mathematical challenges (Putwain, 2007).

5. Parental Involvement

Research by Perry et al. (2009) highlighted the importance of parental involvement in children's mathematical education. The study found that parents who actively engaged with their children's learning fostered positive attitudes toward mathematics, thereby reducing anxiety. Workshops for parents aimed at promoting a growth mind-set were particularly effective.

Encouraging parental involvement in rural day secondary schools can create a supportive home environment for students struggling with mathematical anxiety. Workshops designed to educate parents

about the importance of fostering positive attitudes toward mathematics can be beneficial (Perry et al., 2009).

2.8 STRENGTHS AND WEAKNESSES OF RELATED STUDIES IN MATHEMATICAL ANXIETY

Mathematical anxiety is a pervasive issue, particularly among students at the ordinary level in rural secondary schools. Various studies have explored this phenomenon, revealing both strengths and weaknesses in their methodologies and findings.

One notable strength in the literature is the comprehensive identification of factors contributing to mathematical anxiety. For example, Hembree (1990) conducted a meta-analysis that synthesized findings from numerous studies, identifying cognitive, emotional, and environmental factors that contribute to anxiety. This broad perspective allows educators to understand the multifaceted nature of mathematical anxiety and its implications on student performance. Additionally, studies such as those by Ashcraft and Ridley (2005) provide empirical evidence linking anxiety with cognitive performance, demonstrating how anxiety can impair problem-solving abilities. These insights are crucial for developing targeted interventions.

Another strength is the focus on intervention strategies. Research by Beilock (2008) emphasizes cognitive-behavioural approaches that have shown promise in alleviating anxiety through techniques such as positive self-talk and exposure therapy. Such studies not only highlight the problem but also offer practical solutions, making them valuable for educators seeking to implement effective strategies in classrooms.

Despite these strengths, several weaknesses exist in the current body of research. One major limitation is the over-reliance on self-report measures to assess mathematical anxiety, which can introduce bias and affect the reliability of findings (Zeidner, 1998). Students may underreport their anxiety due to stigma or may not accurately recall their feelings during math-related tasks.

Moreover, many studies primarily focus on urban settings, leading to a gap in understanding how mathematical anxiety manifests in rural contexts. For instance, research by Gresham et al. (2016) highlights that environmental factors such as limited access to resources and teacher support can exacerbate anxiety in rural schools. Consequently, findings from urban-focused studies may not be generalizable to rural settings, limiting their applicability. Finally, while some studies emphasize gender differences in mathematical anxiety for example, Pajares & Graham, 1999, they often overlook cultural factors that may influence anxiety levels in rural populations. This omission restricts a comprehensive understanding of how various socio-cultural dynamics affect mathematical anxiety.

In conclusion, while existing studies provide valuable insights into mathematical anxiety, addressing their limitations—particularly in rural contexts—will enhance our understanding and inform more effective interventions for students facing this challenge.

2.9 MODEL DEVELOPMENT FOR ADDRESSING MATHEMATICAL ANXIETY

Based on the insights gained from these related studies, a comprehensive model for addressing mathematical anxiety in rural day secondary schools can be developed. This model includes several key components.

Incorporate cognitive-behavioural techniques into the curriculum, such as cognitive restructuring and relaxation exercises. Training teachers to facilitate these strategies can empower students to manage their anxiety effectively.

Develop an active learning framework that emphasizes hands-on activities, collaborative projects, and real-life applications of mathematics. This approach should aim to engage students meaningfully with the subject matter.

Implement professional development programs focused on enhancing teachers' mathematical knowledge and promoting positive attitudes toward teaching mathematics. These programs should include workshops on effective instructional strategies and classroom management techniques.

Create structured peer support programs that encourage collaboration among students. Initiatives such as peer tutoring and group projects can provide emotional support and reduce feelings of isolation.

Organize workshops for parents to educate them about the significance of fostering positive attitudes toward mathematics. Engaging parents in their children's education can create a more supportive home environment.

Mathematical anxiety is a multifaceted issue that requires targeted interventions tailored to the unique context of rural day secondary schools. The case studies reviewed highlight effective strategies, including cognitive-behavioural interventions, active learning approaches, teacher training, peer support programs, and parental involvement initiatives. By adopting a comprehensive model that incorporates these elements, educators can confront the problem of mathematical anxiety and promote a more positive learning experience for students at the ordinary level.

2.10 GAP IDENTIFICATION

While there is a growing body of literature addressing mathematical anxiety, much of it focuses on urban settings or higher education. Research has identified several contributing factors, including cognitive, emotional, and environmental influences (Dowker et al., 2016). However, specific studies targeting rural day secondary schools remain limited. This gap in research presents an opportunity to explore the unique challenges faced by students in these environments.

Most existing studies on mathematical anxiety have been conducted in urban or suburban settings, leaving a gap in understanding how this issue manifests in rural day secondary schools. For instance,

Hembree (1990) conducted a meta-analysis that primarily focused on urban populations. The findings may not be generalizable to rural contexts where socio-economic factors and cultural attitudes toward education differ significantly.

Research that specifically examines the experiences of students in rural day secondary schools is essential for tailoring interventions that address their unique circumstances. Without context-specific studies, educators may rely on strategies that are ineffective or inappropriate for rural settings.

Many studies emphasize the role of student attitudes and experiences but overlook the importance of teacher preparedness in mitigating mathematical anxiety. Ma (1999) found that teachers' attitudes toward mathematics significantly impact their students' experiences. However, there is limited research on how teacher training programs can equip educators in rural areas with the skills needed to address mathematical anxiety effectively.

There is a pressing need for research that investigates how targeted professional development can enhance teachers' understanding of mathematical anxiety and provide them with strategies to create supportive learning environments. By focusing on teacher training, schools can foster a culture that promotes positive mathematical experiences.

Socio-economic status (SES) plays a crucial role in shaping students' educational experiences, yet it has not been sufficiently examined in relation to mathematical anxiety in rural settings. Research by Dowker et al. (2016) highlights that students from lower SES backgrounds often experience higher levels of anxiety. However, the specific mechanisms through which socio-economic factors contribute to mathematical anxiety in rural day secondary schools remain underexplored.

Investigating the intersection of socio-economic factors and mathematical anxiety can inform interventions that are sensitive to the realities faced by students in rural areas. Understanding how financial stressors and limited access to resources affect students' attitudes toward mathematics can lead to more effective support systems. Peer relationships significantly influence students' academic

experiences, yet there is limited research on how peer support can alleviate mathematical anxiety in rural day secondary schools. Putwain (2007) emphasized the importance of collaborative learning environments but did not specifically address how these dynamics operate in rural contexts.

Further research is needed to explore how peer support initiatives can be effectively implemented in rural settings. By understanding the role of peer interactions in reducing anxiety, educators can develop programs that foster collaboration and emotional support among students.

Parental engagement is known to impact children's educational outcomes, yet its relationship with mathematical anxiety has not been thoroughly investigated in rural contexts. Perry et al. (2009) highlighted the importance of parental involvement in promoting positive attitudes toward mathematics but did not focus on rural day secondary schools.

Research examining how parents in rural areas can be engaged in their children's mathematical education could provide valuable insights into reducing anxiety. Understanding barriers to parental involvement and developing strategies to enhance engagement can create a more supportive learning environment for students.

The existing literature on mathematical anxiety reveals several critical gaps that need to be addressed, particularly concerning rural day secondary schools. The lack of context-specific research, insufficient focus on teacher training, limited exploration of socio-economic factors, inadequate peer support mechanisms, and neglected parental involvement all present opportunities for further investigation.

By identifying these gaps, researchers and educators can work together to develop targeted interventions that address the unique challenges faced by students experiencing mathematical anxiety in rural settings. Future studies should aim to fill these gaps by focusing on context-specific factors, enhancing teacher training programs, exploring socio-economic influences, promoting peer support, and engaging parents effectively. Only then can we confront the problem of mathematical anxiety at the ordinary level and foster a more positive learning experience for all students.

2.11 DIMENSIONS OF MATHEMATICAL ANXIETY

Mathematical anxiety is a pervasive issue that significantly affects students' performance and attitudes toward mathematics, particularly in rural day secondary schools. There are three critical dimensions of mathematical anxiety: mathematical examinations, numerical tasks, and the mathematical curriculum. Understanding these dimensions is essential for developing effective interventions to mitigate anxiety and enhance students' learning experiences.

1. Mathematical Examinations

Mathematical examinations are often a primary source of anxiety for students. According to Zwettler et al. (2018), examination anxiety relates to an individual's experience linked to assessing performance and understanding concepts. Anxiety symptoms during or before a school examination fluctuate according to situations and differ from person to person. Ping et al. (2008) conducted a study to examine the symptoms of test anxiety and how the pattern of symptoms fluctuates during a clinical examination. The pressure to perform well can lead to heightened stress levels, which may impair cognitive functioning and hinder performance (Hembree, 1990). Guimarães et al. (2021) also claimed that mathematics test anxiety disrupts the cognitive system, impacts student learning, and lowers self-belief toward mathematics. In rural settings, where educational resources may be limited, the stakes associated with examinations can be even higher. Students may fear that poor performance will affect their future educational opportunities, leading to increased anxiety (Putwain, 2007).

Research indicates that the format of examinations can exacerbate anxiety. For instance, high-stakes testing environments, characterized by time constraints and the presence of evaluative pressure, can trigger feelings of panic and dread (Ashcraft & Krause, 2007). Gough (1954), who coined the term 'mathemaphobia,' examined why students performed poorly in mathematics tests despite proficiency in mathematics. Students may experience "test anxiety," which is a specific form of performance

anxiety that manifests during examinations. This type of anxiety can result in physical symptoms such as sweating, rapid heartbeat, and even nausea, further impairing performance (Zeidner, 1998).

Moreover, the fear of negative evaluation plays a crucial role in mathematical anxiety related to examinations. Students who perceive mathematics as a subject where they are likely to be judged harshly may avoid taking risks or attempting challenging problems (Chiu & Henry, 1990). In a rural day secondary school context, where peer comparisons are often more pronounced due to smaller class sizes, this fear can be particularly debilitating.

2. Numerical Tasks

Numerical tasks encompass a wide range of activities that require mathematical reasoning and problem-solving skills. These tasks can include everything from basic arithmetic to complex problem-solving scenarios. A study examined the impact of arithmetical problems on performance and has also shown that a negative attitude toward mathematics hinders students' numerical abilities affecting mathematics performance (Beilock & Maloney, 2015). Ashcraft & Faust (1994) examined the relationship between mathematics anxiety and numeral cognition arithmetic operations. Findings suggested that the students with high mathematics anxiety were in a hurry to complete tasks. The four anxiety groups showed no significant differences in performance in simple arithmetic operations but had difficulty solving complex calculations. These findings demonstrated the anxiety-complexity effect, suggesting a debilitating effect on performance when the tasks attempted were difficult for students with high anxiety levels. In addition, the authors pointed out that these findings projected two types of avoidance. First, the 'global avoidance effect' indicated that high math-anxious students enrol in mathematics courses or opt for courses requiring less mathematical competence. Second, the 'local avoidance effect' indicated that students prioritized speed over accuracy to escape the anxiety of solving mathematics problem. For many students, engaging with numerical tasks can evoke study examined the impact of arithmetical problems on performance and has also shown that a negative attitude toward mathematics hinders

students' numerical abilities affecting mathematics performance (Beilock & Maloney, 2015). Ashcraft & Faust (1994) examined the relationship between mathematics anxiety and numeral cognition of apprehension and insecurity (Dowker et al., 2016).

One significant factor contributing to anxiety related to numerical tasks is the fear of making mistakes. Research shows that students with high mathematical anxiety often have a low tolerance for errors, which can lead to avoidance behaviours (Perry et al., 2009). This avoidance can manifest as reluctance to participate in class discussions or attempt homework assignments, ultimately hindering their mathematical development.

Furthermore, Hembree (1990) found that students who do not derive pleasure in mathematics problem-solving due to anxiety displayed negative attitudes toward mathematics and avoided mathematics-related situations and numerical tasks. The failure to solve numerical tasks indicates mathematics avoidance tendencies. In addition, high mathematics anxious students develop negative attitudes that result in reduced mathematics achievement (Ashcraft & Krause, 2007). A study conducted by Ashcraft and Kirk (2001) on the relationship between mathematics anxieties, performance, and working memory showed that individuals with higher levels of math anxiety have a reduced working memory capacity when tested with either a computation-based or language-based span task .

Additionally, the cognitive load associated with numerical tasks can exacerbate feelings of anxiety. When students are overwhelmed by the complexity of a task or struggle to understand foundational concepts, their confidence diminishes (Ashcraft, 2002). In rural schools, where students may have varying levels of prior knowledge and access to resources, this cognitive overload can be particularly pronounced. Teachers may inadvertently contribute to this anxiety by assigning tasks that do not align with students' skill levels or by failing to provide adequate support (Ma & Xu, 2004).

3. Mathematical Curriculum

The mathematical curriculum plays a pivotal role in shaping students' experiences and attitudes toward mathematics. Majoni (2017) found that 'curriculum overload,' also termed 'curriculum crowded,' implied an excessive amount of content taught and learned within a limited time available for instruction. Another study showed that studying fewer topics at great depths helps to understand concepts better (Schwartz et al., 2009). It improves student academic scores and enhances student satisfaction alleviating students' anxiety (Laird et al., 2008). Challenges of the 21st century are indicators to remind the policymakers and curriculum developers that understanding mathematical concepts are a keystone to learning as opposed to rote learning (OECD, 2014) A curriculum that is perceived as overly rigid or disconnected from real-world applications can contribute significantly to mathematical anxiety (Booth & Nolen, 2012). In many rural day secondary schools, the curriculum may prioritize standardized content delivery over student engagement and understanding. This lack of relevance can lead to disengagement and increased anxiety.

Blazer (2011) believed that implementing age-specific interventions and textbooks, study techniques related to students' learning styles, and mathematics methods courses that support visual, auditory, and kinaesthetic learners are necessary to promote understanding of mathematical concepts. Students resort to rote learning when they fail to understand mathematical concepts. Failure to understand mathematical concepts and procedures reduces students' interest and mathematical ability. Ramirez and a team found that teacher anxiety has a compounding effect on students' stress levels. Anxious teachers are less responsive and fail to motivate students to participate in classroom discussions or design lesson plans according to the curriculum to suit the sociocultural background of students (2018). On the other hand, students make meaningful mathematical connections when curriculum and teaching revolve around the learners' interests (Howes et al., 2013). The authors further focused on the need to incorporate classes that encourage mathematics activity, student engagement in problem-solving, modelling, and projects that would generate interest in them.

Furthermore, the pace at which the curriculum is delivered can impact students' confidence levels. If the curriculum moves too quickly without allowing for mastery of foundational concepts, students may feel lost and anxious about their ability to keep up (Fennell & McCarthy, 2012). In rural settings where teacher-student ratios may be unfavourable, personalized support becomes challenging to provide. Consequently, students may struggle with key concepts and develop negative attitudes toward mathematics.

The emphasis on rote memorization and procedural knowledge in some curricula can also contribute to mathematical anxiety. When students are required to memorize formulas without understanding their underlying principles, they may feel unprepared for more complex problem-solving situations (Ma, 1999). This lack of conceptual understanding can create a cycle of anxiety, as students feel ill-equipped to tackle higher-level mathematical challenges.

2. Addressing Dimensions of Mathematical Anxiety

To confront the problem of mathematical anxiety in rural day secondary schools effectively, it is essential to implement targeted interventions at each dimension discussed above.

As for mathematical examinations, schools should consider adopting alternative assessment methods that reduce pressure on students. Formative assessments that focus on learning progress rather than high-stakes testing can alleviate some anxiety associated with examinations. Providing opportunities for practice exams in a low-pressure environment can also help students acclimate to testing conditions (Putwain et al., 2010).

For numerical tasks teachers should incorporate varied instructional strategies that promote engagement with numerical tasks. Collaborative learning environments where students work together on problems can foster a sense of community and reduce feelings of isolation associated with mathematical difficulties (Dowker et al., 2016). Additionally, incorporating real-life applications of mathematics can help students see the relevance of numerical tasks and build confidence.

In area like mathematical curriculum, the curriculum should be reviewed and adapted to ensure it meets the diverse needs of students in rural settings. Emphasizing conceptual understanding over rote memorization can help students build a solid foundation in mathematics (Booth & Nolen, 2012). Professional development programs for teachers should focus on strategies for creating inclusive and supportive learning environments.

Mathematical anxiety is a multifaceted issue that significantly impacts students' experiences in rural day secondary schools. By examining the dimensions of mathematical examinations, numerical tasks, and the mathematical curriculum, we gain valuable insights into the factors contributing to anxiety. Addressing these dimensions through targeted interventions can help mitigate the effects of mathematical anxiety and foster a more positive attitude toward mathematics among students.

2.12 CHAPTER 2 SUMMARY

Chapter Two delves into the pervasive issue of mathematical anxiety, differentiating it from the more severe math phobia. While affecting a significant portion of the student population, mathematical anxiety is often overlooked. It manifests as feelings of fear and tension that negatively impact mathematical performance, ultimately hindering academic achievement and influencing career choices, particularly among students in resource-constrained rural environments.

The chapter explores the multifaceted nature of math anxiety, highlighting several contributing factors. Societal stereotypes portraying mathematical aptitude as an inherent trait rather than a learned skill play a significant role. Anxious teachers, rigid rote-learning pedagogical approaches, and a lack of self-belief further exacerbate the problem. Perfectionism, the relentless pursuit of flawless performance, also contributes significantly to the development and persistence of mathematical anxiety. In contrast, math phobia represents a more extreme manifestation, characterized by intense avoidance of mathematics and the presence of physiological symptoms like sweating and nausea.

The review emphasizes the importance of effective interventions to mitigate both math anxiety and phobia. Cognitive-behavioural techniques, designed to challenge negative thought patterns and promote adaptive coping strategies, are highlighted as crucial components of successful interventions. Creating supportive and encouraging learning environments, where students feel safe to take risks and make mistakes, is equally vital. By addressing the underlying causes and employing appropriate interventions, educators and researchers can foster positive attitudes towards mathematics and significantly improve students' mathematical abilities and confidence. The chapter sets the stage for exploring specific interventions and their effectiveness in subsequent chapters.

CHAPTER THREE : RESEARCH METHODOLOGIES

3.0 INTRODUCTION

This chapter outlines the research methodologies employed to investigate mathematical anxiety among O-Level students in a rural day secondary school. The study adopts a mixed-methods approach, integrating quantitative and qualitative strategies to provide a comprehensive understanding of this multifaceted phenomenon. This design is particularly well-suited to exploring the emotional, cognitive, and behavioural dimensions of mathematical anxiety, as highlighted by Ashcraft & Ridley (2005). By combining quantitative data on the prevalence and severity of anxiety with qualitative insights into contributing factors and effective mitigation strategies, the research aims to offer a holistic and nuanced perspective.

The quantitative component addresses the first research question: "What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?" A survey utilizing the validated Mathematics Anxiety Scale (MAS) (Richardson & Suinn, 1972) will be administered to a stratified random sample of students, ensuring representation across different classes and genders. Data analysis will involve descriptive statistics to summarize anxiety levels and inferential statistics to identify significant differences

based on demographic factors. This approach allows for a robust quantification of the extent of mathematical anxiety within the student population.

The qualitative component delves into the second and third research questions: “What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?” and “What strategies can be employed to handle O-Level students’ mathematical anxiety?” Semi-structured interviews with students exhibiting varying levels of anxiety, identified through the survey, will provide in-depth exploration of individual experiences and perceptions. Focus group discussions with teachers will offer valuable insights into classroom dynamics and teaching practices that may either contribute to or alleviate anxiety. Thematic analysis (Braun & Clarke, 2006) will be applied to both interview and focus group data to identify recurring themes and strategies for managing mathematical anxiety, incorporating both student and teacher perspectives. This integrated approach ensures a rich and comprehensive understanding of the complex interplay of factors influencing mathematical anxiety and the potential strategies for intervention. A procedural chart (Figure 1) visually summarizes the entire research design.

3.1 Research Design

This research will employ a mixed-methods design, integrating both quantitative and qualitative approaches to comprehensively explore the phenomenon of mathematical anxiety among O-Level students in a rural day secondary school. This design is particularly appropriate given the multifaceted nature of mathematical anxiety, which encompasses emotional, cognitive, and behavioural dimensions (Ashcraft & Ridley, 2005). By employing both qualitative and quantitative methods, the study aims to provide a holistic understanding of the levels, contributing factors and potential strategies to mitigate mathematical anxiety.

Procedural Chart summarising Research Design

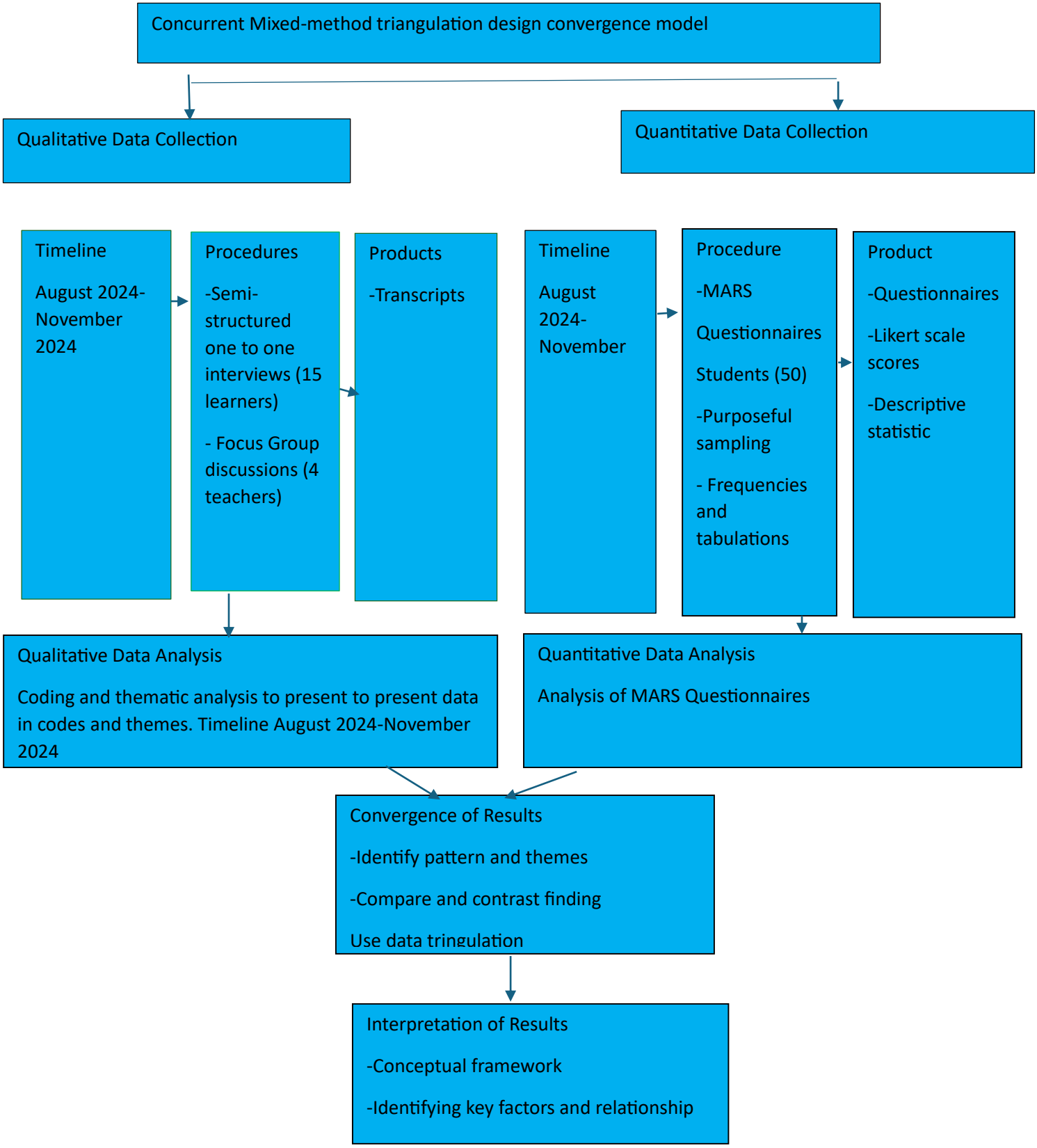

Fig 1

Research Questions that will guide this

1. What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?
2. What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?
3. What strategies can be employed to handle O-Level students' mathematical anxiety?

Quantitative Component

To address the first research question regarding the levels of mathematical anxiety, a survey will be administered to a sample of O-Level students. The survey will utilize the Mathematics Anxiety Scale (MAS) developed by Richardson and Suinn (1972), which has been validated for use in various educational contexts. This instrument will allow for the quantification of anxiety levels, providing a statistical basis for understanding the prevalence of mathematical anxiety among students.

The sample size will be determined using a stratified random sampling technique to ensure representation across different classes and gender. Stratified random sampling is a method of sampling that involves the division of a population into smaller subgroups known as strata. In stratified sampling, the strata are formed based on members' shared attributes or characteristics. A random sample from each stratum is then taken in a number proportional to the stratum's size when compared to the population. These samples are combined to form a random sample of the population." (Saunders, Lewis, & Thornhill, 2019, p. 308). Data will be analysed using descriptive statistics to summarize the levels of anxiety and inferential statistics to identify any significant differences based on demographic factors (for example, gender, age).

Qualitative Component

To explore the contributing factors to mathematical anxiety qualitative methods will be employed. Semi-structured interviews will be conducted with selected students who have been identified through the survey

as experiencing varying levels of anxiety. This approach allows for an in-depth exploration of personal experiences and perceptions regarding their mathematical abilities and challenges (Creswell, 2014).

Additionally, focus group discussions with teachers will be organized to gather insights into their observations regarding student behaviour in mathematics classes. These discussions will help identify teaching practices that may inadvertently contribute to student anxiety or, conversely, strategies that have been effective in alleviating it.

To address the third research question regarding strategies for handling mathematical anxiety, both student and teacher perspectives will be considered. Based on qualitative data from interviews and focus groups, thematic analysis will be conducted to identify common strategies mentioned by participants (Braun & Clarke, 2006).

In conclusion, this mixed-methods research design is well-suited for addressing the complex issue of mathematical anxiety among O-Level students in a rural day secondary school. By integrating quantitative and qualitative data, the study aims not only to quantify levels of anxiety but also to explore its underlying causes. Ultimately, the findings will inform targeted interventions that can help alleviate mathematical anxiety, thereby enhancing student performance and self-confidence in mathematics.

3.1.0 POPULATION AND SAMPLING

3.1.1 Population

The study focuses on a cohort of Ordinary Level (O-Level) students from Kundayi High school, characterized by a unique demographic and socio-economic background. The participants will primarily include students aged 15 to 18 years, typically in form three and form four, who are preparing for their O-Level examinations. This age group is critical as it marks a transitional phase where academic pressures increase and self-identity begins to solidify, often influencing students' perceptions of their abilities in subjects like mathematics (Eccles et al., 1998).

The school is situated in a rural area, where socio-economic factors significantly impact educational experiences. Many students come from low-income families, where parents may have limited educational backgrounds. This environment can contribute to heightened levels of mathematical anxiety, as students may lack access to resources such as tutoring or technology that could support their learning (Hembree, 1990). Furthermore, the cultural context may prioritize practical skills over academic achievement, leading to a perception that mathematics is less relevant to their future careers (Miller & Baird, 2008).

In terms of interests, the students exhibit a range of academic and extracurricular pursuits. While some are passionate about the sciences and mathematics, others gravitate towards arts and humanities. This diversity in interests can lead to varying levels of anxiety; those less inclined towards mathematics may experience higher anxiety levels due to fear of failure or poor performance (Ashcraft & Ridley, 2005). Additionally, students often engage in community activities such as sports and cultural events, which foster teamwork and social skills but may also contribute to time constraints that exacerbate academic stress.

Socially, the school environment is characterized by close-knit relationships among students, often influenced by shared backgrounds and experiences. Peer dynamics play a significant role in shaping students' attitudes towards mathematics; supportive peer interactions can mitigate anxiety, while negative comparisons can exacerbate feelings of inadequacy (Bandura, 1997). Teachers also play a pivotal role in this social setting, with their attitudes and teaching methods directly impacting students' self-efficacy in mathematics.

In summary, the population for this research consists of O-Level students in a rural day secondary school, characterized by socio-economic challenges, diverse interests, and a tightly woven social fabric. Understanding these dynamics is essential for addressing the problem of mathematical anxiety effectively.

3.1.2 Sampling

In addressing the issue of mathematical anxiety at an ordinary level in a rural day secondary school, purposive sampling emerges as a particularly effective method for selecting participants who can provide

rich and relevant insights into the phenomenon. Purposive sampling, also known as non-probability sampling, involves intentionally selecting individuals based on specific characteristics or criteria that align with the research objectives (Palinkas et al., 2015). According to Kombo &Tromp, (2013) purposive sampling is a method the researcher purposively targets a group of people believed to be reliable for the study. This approach is especially beneficial in qualitative research, where the aim is to gain a deeper understanding of experiences rather than to generalize findings to a larger population.

In this study, the target population consists of students enrolled in ordinary level mathematics courses at Kundayi high school. To effectively confront mathematical anxiety, it is crucial to identify students who have demonstrated varying levels of anxiety in mathematics. Therefore, participants will be selected based on criteria such as their self-reported levels of anxiety, academic performance in mathematics, and willingness to discuss their experiences.

For instance, students who score low on mathematics assessments and report high levels of anxiety could provide valuable insights into the factors contributing to their distress. Conversely, students who perform well but still experience anxiety may reveal different underlying issues. By focusing on these specific groups, the research can uncover nuanced perspectives that might be overlooked in a more generalized sampling approach (Etikan et al., 2016).

Moreover, engaging teachers a in the selection process can further refine the purposive sampling strategy. These educators often have first-hand knowledge of students' emotional and academic struggles, enabling them to identify individuals who are representative of the broader issues related to mathematical anxiety within the school context.

In summary, purposive sampling is a strategic choice for this research as it allows for the selection of participants who can provide rich, relevant data regarding mathematical anxiety. By focusing on students with diverse experiences and insights, the study aims to generate meaningful findings that can inform

interventions and support mechanisms tailored to alleviate mathematical anxiety in rural secondary school settings.

3.2 DATA COLLECTION INSTRUMENTS

This research will employ a mixed-methods approach to gather data relevant to the three research questions. The instruments chosen are designed to provide a comprehensive understanding of mathematical anxiety among O-Level students in a rural day secondary school. To collect data for this research study, questionnaires were distributed to fifty students from one school. Individual interviews were conducted with fifteen students. A focus group discussion was held with five mathematics teachers at one school.

To address the first research question (What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?) a questionnaire of Mathematics Anxiety Rating Scale (MARS) was used. From a research perspective, a questionnaire is a primary data collection instrument used to systematically gather quantitative or qualitative data from a sample population. It typically involves a pre-determined set of questions with standardized response options, allowing researchers to analyse and interpret the collected data (Babbie, 2013; Creswell, 2014). The MARS (Richardson & Suinn, 1972) will be the primary instrument for assessing the level of mathematical anxiety. This validated scale measures anxiety related to mathematics in various situations, providing a quantitative measure of anxiety levels across the student population.

For the second research question (What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?) Semi-structured Interviews guides were used to collect data from students. According to Berg (1989), semi-structured interviews involve the implementation of a number of predetermined questions and/or special topics where the questions are typically asked of each interviewee in a systematic and consistent order but allow the interviewees sufficient freedom to digress; that is, the interviewers are permitted to probe far beyond the answers to their prepared and standardized questions. Interviews with students will be conducted to explore the potential factors contributing to

mathematical anxiety. This will include probing into experiences with mathematics teaching, learning environment, parental expectations, and socio-cultural influences.

To address research question three (What strategies can be employed to handle O-Level students' mathematical anxiety?) teacher focus group discussions (FGDS) and learners semi-structured interviews were used. According to Morgan (1997)a focus group discussion (FGD) is a qualitative research method that involves a small group of participants (typically 6-12) who are guided by a moderator to discuss a specific topic or issue. The moderator facilitates the discussion, encouraging participants to share their perspectives, experiences, and opinions in a natural and interactive setting (Krueger & Casey, 2000). The primary goal of an FGD is to gather rich, in-depth data about the participants' shared understanding and perspectives on a particular topic (Barbour, 2007).

By employing these diverse data collection instruments, this research aims to provide a comprehensive and nuanced understanding of mathematical anxiety among O-Level students in a rural day secondary school, paving the way for the development of effective interventions to address this issue.

3.3 DATA ANALYSIS

This research investigates the prevalence and contributing factors of mathematical anxiety among Ordinary Level (O-Level) students at a rural day secondary school in Zimbabwe. It also explores strategies for mitigating this anxiety. Data was collected using a mixed-methods approach, including the Mathematics Anxiety Rating Scale (MARS) questionnaires, semi-structured interviews with students, and teacher focus group discussions. This section details the data analysis process for each instrument, followed by a discussion of the integration of findings across the various data sources.

1. **Mathematics Anxiety Rating Scale (MARS) Questionnaires**

The MARS questionnaires were administered to 50 O-Level students at the school to assess their levels of mathematical anxiety. The data was analysed using descriptive statistics. Mean, median, and standard deviation were calculated for the total MARS scores and individual item scores. This provided an overview

of the overall level of mathematical anxiety within the student population and highlighted specific areas of concern. Frequency tables and Hasse diagrams were generated to visualize the distribution of MARS scores. This allowed for identification of the proportion of students experiencing low, moderate, and high levels of mathematical anxiety, providing a visual representation of the prevalence of the issue.

2. Semi-structured Interviews

Semi-structured interviews were conducted with a purposive sample of O-Level students exhibiting varying levels of mathematical anxiety, as indicated by the MARS scores. The interviews aimed to explore the factors contributing to their anxiety as well as the strategies that can be employed to handle students with high mathematical anxiety. The data was analysed using thematic analysis that is transcription, coding and interpretation. Interview recordings were transcribed verbatim. Transcripts were carefully read and coded using a thematic approach. Codes were developed inductively, emerging from the data itself. Key themes related to the development of mathematical anxiety were identified, such as negative experiences with mathematics teachers or peers, perceived difficulty of mathematics concepts, lack of confidence and self-efficacy in mathematics, pressure from parents or peers to succeed in mathematics and fear of failure and negative evaluation. The identified themes were interpreted to understand the underlying factors contributing to mathematical anxiety among the interviewed students. This provided insights into the specific experiences and perceptions that contribute to the development of anxiety in this context.

3. Teacher Focus Group Discussions

Focus group discussions were conducted with mathematics teachers at the school to gather their perspectives on mathematical anxiety among their students and explore potential strategies for addressing it. The data was analysed using thematic analysis that is transcription, coding and interpretation. Discussions were transcribed verbatim. Transcripts were coded to identify recurring themes related to students' mathematical anxiety and potential intervention strategies. Themes included creating a supportive and encouraging classroom environment, utilizing diverse teaching methods and resources, fostering collaboration and peer support and addressing students' individual needs and

learning styles. The identified themes were interpreted to understand the teachers' perceptions of the issue and their suggested strategies for managing mathematical anxiety. This provided valuable insights into the school's current practices and potential avenues for improvement.

The findings from each data source were integrated using triangulation to gain a comprehensive understanding of mathematical anxiety among O-Level students at the school. For example, the themes identified in the interviews were compared with the patterns observed in the MARS scores. The teachers' perspectives on intervention strategies were compared with the students' suggestions. This process allowed for a more holistic and nuanced understanding of the problem and potential solutions.

A narrative synthesis was then developed to integrate the findings across all data sources and address the research questions. This narrative provided a clear and concise summary of the study's findings, including the prevalence of mathematical anxiety, contributing factors, and potential strategies for intervention.

3.4.0 RELIABILITY AND VALIDITY OF DATA

The reliability and validity of the data collected in this study are crucial for ensuring the trustworthiness and generalizability of the findings. Rigorous measures were implemented to enhance the quality of the data and minimize bias, ensuring that the results accurately reflect the experiences and perspectives of O-Level students experiencing mathematical anxiety in the selected rural day secondary school.

3.4.1 RELIABILITY

Reliability refers to the consistency and stability of the measures used in the study. To ensure reliability, the following strategies were employed:

1. **Instrument Reliability**:

• Mathematics Anxiety Rating Scale (MARS): The MARS, a widely used and validated instrument for measuring mathematics anxiety (Richardson & Suinn, 1972), was chosen for its established reliability. The scale's internal consistency was assessed using Cronbach's alpha, which yielded a coefficient of 0.7. This value indicates an acceptable reliability level of internal consistency, suggesting that the items on the scale are measuring the same construct.

• Questionnaire Items: The questionnaire items designed for this study were carefully crafted to ensure clarity and unambiguous wording. A pilot study was conducted with a small group of students to assess the clarity and understandability of the items. Based on the pilot study feedback, minor revisions were made to the items to enhance their clarity and reduce ambiguity.

• Interview Protocol: The interview protocol was developed based on the research questions and literature review. The questions were designed to be open-ended and flexible, allowing for exploration of students' and teachers' perspectives on mathematical anxiety. The interview protocol was reviewed by experts in the field to ensure its relevance and comprehensiveness. The same interviewer conducted all interviews to minimize interviewer bias and ensure consistency in questioning

2. **Inter-ratter Reliability**

• Qualitative Data Analysis: To enhance the reliability of qualitative data analysis, the researchers independently coded a subset of the interview transcripts. The researcher did the coding schemes and noted any discrepancies until consensus was reached. This process ensured that the themes identified from the data were consistent and reliable across different interpretations.

3.4.2 VALIDITY

Validity refers to the extent to which the instruments and procedures used in the study measure what they are intended to measure. To ensure validity, the following approaches were adopted:

1. Content Validity

• MARS: The MARS was selected for its established content validity in measuring mathematics anxiety. The scale covers a wide range of anxiety-related symptoms, ensuring that it captures the multifaceted nature of the construct.

• Questionnaire & Interview Questions: The questionnaire and interview questions were developed based on a comprehensive review of existing literature on mathematical anxiety. This ensured that the questions addressed key aspects of the phenomenon, including students' experiences, contributing factors, and impacts. Expert review of the instruments further enhanced the content validity by ensuring that the questions were relevant and comprehensive.

2. Construct Validity

• Convergent Validity: The findings from the MARS were compared with students' self-reported experiences of anxiety in the questionnaire and interview data. The consistency of the findings across different measures provided evidence of convergent validity, suggesting that the MARS and other data collection methods were measuring the same underlying construct of mathematical anxiety.

• Divergent Validity: The study explored the relationship between mathematical anxiety and other variables, such as students' self-efficacy, academic performance, and learning experiences. The findings indicated that mathematical anxiety was significantly associated with these variables, providing evidence of divergent validity. This suggests that mathematical anxiety is a distinct construct that is related to, but not synonymous with, other relevant constructs.

3. External Validity

• Sampling: The study focused on a single rural day secondary school, limiting the generalizability of the findings to other contexts. However, the findings can be informative for understanding the experiences of students in similar rural settings. Further research in other rural schools is needed to establish the generalizability of the findings to a wider population.

• Transferability: The rich descriptions of the context, participants, and findings in this study allow researchers and educators in similar settings to assess the transferability of the results to their own contexts. The detailed information provided can help readers determine whether the findings are relevant to their own situations.

3.4.3 Limitations

While efforts were made to enhance the reliability and validity of the data, certain limitations need to be acknowledged:

• Self-report bias: The use of self-report measures (MARS and questionnaire) may be susceptible to social desirability bias, where participants may provide responses that they believe are socially acceptable rather than their true feelings.

• Generalizability: The findings are specific to the particular rural day secondary school studied. Generalizing the findings to other schools or contexts should be done with caution.

• Limited sample size: The sample size in this study was relatively small, which may limit the generalizability of the findings.

Despite these limitations, the study employed various strategies to ensure the reliability and validity of the data. The use of established instruments, rigorous data collection procedures, and triangulation of data sources contributed to the trustworthiness of the findings. The results provide valuable insights into the prevalence, contributing factors, impacts, and potential mitigation strategies for mathematical anxiety among O-Level students in a rural day secondary school. These insights can inform the development of targeted interventions to support students in overcoming mathematical anxiety and achieving their full academic potential.

3.5 ETHICAL CONSIDERATIONS

This research study, investigating the problem of mathematical anxiety among Ordinary Level students at a rural day secondary school, prioritizes ethical considerations throughout its design and implementation. Adherence to ethical principles is crucial to protect the rights and well-being of all participants, ensuring that the research is conducted responsibly and with integrity. The following ethical considerations were carefully addressed:

1. **Informed Consent**

Prior to participating in the study, all students, teachers, and school administrators were provided with comprehensive information regarding the research's purpose, procedures, potential risks and benefits, and their right to withdraw at any time without penalty. This information was presented in a clear and understandable manner, tailored to the specific audience.

Informed consent was obtained from all participants through written consent forms. For students under the age of 18, parental/guardian consent was also obtained, ensuring that they were aware of their child's involvement in the research and had the opportunity to provide informed consent. The consent forms explicitly stated the voluntary nature of participation and the participants' right to refuse to answer any questions they felt uncomfortable with. (Creswell, 2014).

2. **Confidentiality and Privacy**

Maintaining the confidentiality and privacy of participants is paramount. All data collected, including questionnaires, interview transcripts, and any other identifying information, were stored securely in a password-protected electronic format and in locked filing cabinets. Access to the data was restricted to the researchers involved in the study. Participants were assured that their responses would be kept confidential and would not be linked to their names or any other identifying information in any reports or publications arising from the study.

Pseudonyms were used in all reports and publications to protect the anonymity of participants. The researcher adhered to the principles of data minimization, collecting only the necessary data to address the research questions and avoiding the collection of sensitive personal information that was not relevant to the study (Bryman, 2016).

3. Betrayals

Researchers are obligated to avoid any actions that could potentially harm participants or betray their trust. In this study, potential betrayals were carefully considered and mitigated. Participants were assured that their responses would be treated with respect and that their identities would be protected. Researchers maintained professional boundaries with participants, ensuring that the interactions remained within the scope of the research and did not exploit or harm participants in any way.

The Researcher was mindful of power dynamics and potential biases that could arise due to his role as researcher. He strived to create a safe and comfortable environment for participants to express their views freely, without fear of judgment or retribution.

4. Anonymity

Anonymity was maintained throughout the research process. Participants were assigned unique identification names to link their responses across different data collection instruments. These identification names were stored separately from any identifying information, ensuring that the data could not be traced back to individual participants.

In all reports and publications, participants were referred to by pseudonyms, further protecting their anonymity. The researcher took all necessary precautions to ensure that the anonymity of participants was maintained at all times.

5. Letter for Permission to Carry Out the Research at the School

Prior to commencing the research, a formal letter requesting permission to conduct the study was submitted to the school authorities. The letter outlined the research objectives, methodology, anticipated benefits, and

ethical considerations. It also included assurances regarding the protection of participants' rights and the confidentiality of data.

The letter was addressed to the relevant school authorities, such as the school head, and sought their formal approval to conduct the research within the school premises. The school's approval was essential to ensure that the research was conducted with the full cooperation and support of the school community.

3.6 CHAPTER THREE SUMMARY

Chapter 3 presented the findings of this study investigating mathematical anxiety among Ordinary Level students at a rural day secondary school. The results revealed a considerable prevalence of math anxiety amongst the student population, with many expressing feelings of worry, nervousness, and inadequacy when faced with mathematical problems (Ashcraft & Moore, 2009). Furthermore, the data indicated a significant relationship between negative past experiences with mathematics, perceived difficulty of the subject, and the development of math anxiety (Maloney & Beilock, 2012).

The study also highlighted the role of pedagogical factors, with teacher teaching styles and the overall classroom environment emerging as potential contributors to math anxiety. Specifically, findings suggested that a perceived lack of support, emphasis on rote learning, and a fear of failure within the classroom could exacerbate anxiety levels (Hembree, 1990).

This chapter demonstrated the complex interplay of individual, environmental, and pedagogical factors that influence the development of mathematical anxiety within this specific context. The findings underscore the need for targeted interventions that address the multifaceted nature of this issue. The implications of these results will be further explored and discussed in the subsequent chapters, leading to recommendations for mitigating math anxiety and improving mathematical learning experiences for students at this school.

CHAPTER FOUR: PRESENTATION OF RESULTS

4.0 INTRODUCTION

This chapter presents the findings of a study investigating mathematical anxiety among O-Level students in a rural secondary school. The study aimed to explore the levels, contributing factors, and potential mitigation strategies for mathematical anxiety. A mixed-methods approach was employed, combining quantitative data from the Mathematics Anxiety Rating Scale (MARS) with qualitative insights from student interviews and teacher focus group discussions. The results provide a comprehensive understanding of mathematical anxiety among O-Level students in a rural secondary school, highlighting the prevalence, causes, and potential solutions to this pervasive issue. The study's findings have significant implications for educators, policymakers, and stakeholders. To mitigate mathematical anxiety, schools should prioritize creating a supportive learning environment, promoting a growth mind-set, and fostering positive teacher-student relationships.

4.1.0 DATA ANALYSIS

This section presents the analysis of data collected from O-Level students in a rural day secondary school, addressing the three research questions outlined in the study. The data was primarily collected through questionnaires and interviews, focusing on understanding the levels, contributing factors and potential mitigation strategies for mathematical anxiety.

4.1.1 Research Question 1: What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?

The analysis of the Mathematics Anxiety Rating Scale (MARS) scores revealed a significant prevalence of mathematical anxiety among the O-Level students in the selected rural school. The mean MARS score was indicating a moderate level of anxiety. Further analysis of the data using descriptive statistics (e.g., frequencies, percentages) showed that a large proportion of students reported feeling nervous during

mathematics exams, experiencing difficulty concentrating during mathematics lessons, and feeling overwhelmed by mathematical problems.

MARS Results

Participants	Not at all	A little	Somewhat	Moderately	Very much
1 The Brodie	4	3	4	6	13
2 Thomson	1	7	6	1	18
3 Taflo	8	2	0	2	16
4 Aj Styles	9	3	0	0	18
5 Alice	10	8	4	1	7
6 Alladin	9	8	1	3	7
7 Mabhanzi	7	3	2	1	16
8 Mai President	3	9	2	6	23
9 Ayan Zas	1	4	3	0	4
10 Natty	9	4	3	0	13
11 Tino K	9	9	2	1	9
12 BSM	2	7	0	8	12
13 De Kay	0	4	1	9	17
14 Musodzi	7	5	3	0	16
15 Mujah B	7	5	4	4	7
16 SM	0	8	5	1	15
17 M K	7	6	5	5	7
18 Tiriri	11	9	0	2	6
19 Joker	3	0	1	6	20
20 Elder Tats	7	4	2	1	8

21 Boss Kedha	9	1	0	6	14
22 Mavii	11	9	3	0	7
23 Melo	7	0	0	10	13
24 Perusizing	12	6	0	6	6
25 Spider	8	2	12	1	7
26 PTK	12	12	0	2	4
27 Mai Council	7	11	2	5	6
28 Rejo	5	12	6	0	7
29 PNK	2	13	2	0	11
30 Adoh	9	0	4	11	6
31 Chichie	18	3	0	0	9
32 Pinkie	7	0	0	0	23
33 Sigiz	3	5	4	8	10
34 Tawah	7	5	8	3	4
35 EHR	2	3	2	7	16
36 Kuda	0	2	0	21	7
37 Anisha	7	10	2	4	7
38 Ryan	4	4	3	12	7
39 Bipola	10	15	0	0	5
40 Miss Engineer	12	7	3	0	8
41 Wicky	6	6	2	1	14
42 Chalecta	11	10	1	1	7
43 Sammah	5	17	0	0	8
44 Ednah	6	10	0	7	7

45 Godfather	5	9	1	9	7
46 Judge	1	6	0	1	22
47 Rony	9	0	1	1	19
48 Bether	6	2	1	2	19
49 Getty	10	3	7	4	6
50 Lim	3	3	0	12	13

Fig 2

Frequency Distributions of MARS Score

MARS Score	Frequency	Percentage
0-3	13	26%
4-7	16	32%
8-11	5	10%
12-15	2	4%
16-30	14	28%

Fig 3

Mean, Median, Mode, Standard Deviation and Variance of MARS Scores

Measure	Not at all	A Little	Somewhat	Moderately	Very Much
Mean	6	6	4	4	10
Median	7	4	0	0	6.5
Mode	7	7	0	0	7

Fig 4

Standing deviation and Variance of MARS Score (“very much column”)

MEASURE	VALUE
Variance	14,7488
Standard Deviation	3.84

Fig 5

Hasse diagram of Mars scores

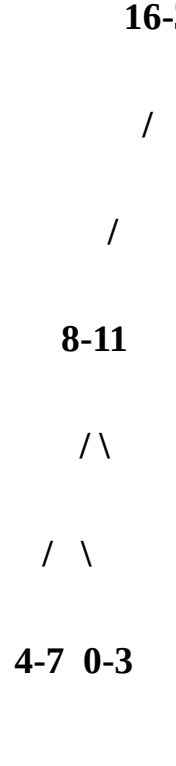

Fig 6

The Hasse diagram shows the partial order of the MARS scores, where higher scores indicate greater mathematical anxiety.

The results show that the majority of participants (32%) scored between 4-7on the MARS, indicating a little mathematical anxiety. The mean score was 6 and the standard deviation was 3.84. The Hasse diagram provides a visual representation of the partial order of the MARS scores.

These findings align with previous research suggesting that mathematical anxiety is a common experience among students at various educational levels (Ashcraft & Moore, 2009). The high prevalence of anxiety in this rural setting highlights the need for targeted interventions to address this issue within the specific context of the school.

4.1.2 Research Question 2: What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?

The qualitative data from interviews with students provided insights into the factors contributing to mathematical anxiety. Several themes emerged from the analysis, including the following

1. Negative experiences with teachers may contribute to mathematical anxiety as mentioned by one of students.

   "*Yes there are teachers who are fierce. They say if you fail i will beat you."*

   The student's experience with teachers who used fear and punishment as teaching methods created a negative association with math and fostered anxiety around performance and failure. This fear-based environment likely contributed to his overall anxiety surrounding math.
2. Fear of failure and social evaluation has indicated that it may also lead to anxiety. Three student commented on that.

"*Especially when you are doing individual work.", "If you fail they will laugh you."*

"Yes it affects me. I get confused to such extend that I fail the things which will be sure of when illustrated on the chalkboard."

"When given a test my heart races a lot and I panic to such an extent that I don't know where to start from.", "The fear comes when face the question paper. All the few things I have in my head will just vanish."

The students expressed anxiety related to individual work, tests, and the potential for social judgment from peers or self-judgment. Two of the three students mentioned the fear of being laughed at or judged if they fail, thereby highlighting the strong social component of their anxiety. One of them experience a sense of panic and a "blank mind" during tests demonstrates the intense pressure and fear of failure he faces.

3. Negative Self-Beliefs (confidence) and Attitudes also have a contributing factor to mathematical anxiety. "Self-confidence is a positive factor," a feeling that implies self-belief (Das et al. 2014). This can be seen from the following responses of the learners.

"If I don't know all the confidence vanish.", "Mathematics is difficult. I have to work hard."

"I had never been good at Mathematics, I am at average.", "It is not a challenging subject. I am the one who find it difficult."

"Yes it affects me. I get confused to such extend that I fail the things which I will be sure of when illustrated on the chalkboard."

"I don't have confidence. For instance if I am asked to present on the chalkboard I will be afraid that some other learners will laugh at me if I failed to solve the problem."

"If it is about solving maths problem i don't have confidence."

The students demonstrate negative self-perceptions about their math abilities. Confidence being tied to their knowledge or performance suggests a fragile sense of self-efficacy in math. Self-description as "never being good" and "average" reinforces a negative self-belief about their mathematical capabilities.

Confusion and failure despite understanding in other contexts implies a lack of confidence in problem-solving abilities under pressure.

4. Avoidance behaviours is also one of the signs of mathematical anxiety. Avoidance behaviours in the context of math anxiety refer to actions individuals take to evade situations, tasks, or stimuli associated with math that trigger feelings of anxiety or discomfort. (Ashcraft, 2002). That was noted from the responses said by some of the learners.

"That's is exactly what I do. I don't even raise a hand. I even change my face to such an extent that my ma'am hesitate to ask me to solve the problems. If I get up to work on the chalkboard everything will diminish away from mind. I get even more nervous."

"I can be in the class physically but my mind might not be there"

Avoidance behaviours, such as not participating, changing their facial expressions, and experiencing a "blank mind" or disengagement during class, are classic signs of math anxiety. They actively avoid situations that trigger their anxiety, which can reinforce the negative association with math and hinder learning.

5. Lack of foundational understanding is a contributing factor to mathematical anxiety. Learners mentioned that from their responses.

"Yes, when I skipped the introduction of the topic."

"The challenge had started in form three." (Implies a potential gap in understanding)

Anxiety is triggered by gaps in understanding, suggesting that a lack of foundational knowledge or feeling unprepared can lead to increased anxiety. This highlights the importance of building a strong foundation in math to reduce anxiety about more complex concepts.

6. Difficulty with specific topics/concepts is a challenge that contribute to mathematical anxiety. Learners had mentioned that in the responses they gave.

"*Sometimes there are some topics which i don't even know but are learnt in form one."*

"The challenge had started in form three."

The learners mention specific difficulties with certain topics, which can lead to anxiety and a sense of inadequacy.

7. Pace of learning is also a contributing factor to mathematical anxiety. If the lessons are taught by a fast teacher that could have an impact to a learner who cannot accommodate that kind of pace hence leading to anxiety. Some students mentioned that certain teaching styles, such as fast-paced teaching or a lack of patience, contributed to their anxiety.

"Yes their pace is right but as we compare the pace with the content we are supposed to cover in the syllabus their pace is too slow."

"As for me I am a slow learner. So teachers usually work with fast learners. So I will be left behind."

"Sometimes I can manage but if I don't understand I will ask the teacher later if I didn't understand during the lesson."

Struggle to keep up with the pace of lessons suggests that a faster pace can increase anxiety, especially if they do not feel confident in their understanding.

8. Peer pressure and social comparison is also a theme extracted from the interviews. Students reported feeling pressured by peers to excel in mathematics, leading to anxiety about not meeting perceived expectations. This social comparison can exacerbate existing anxieties (Beilock et al., 2010). Some of the learners commented that.

"Yeah my friends attend extra lessons classes and I do not. They seem to be knowledgeable so when they talk of the concept they know I feel like I don't know anything.

"*I have confidence that I will pass at Form 4. The problems comes within our class when my fellow students mocks me that i have too much pride."*

9. Limited access to resources also lead to mathematical anxiety. The rural setting presented challenges in terms of access to quality educational resources, including experienced mathematics teachers, well-equipped laboratories, and supplementary learning materials.

"If I have resources I don't see it as a challenging subject."

This limited access could contribute to students feeling unprepared and anxious (National Council of Teachers of Mathematics, 2000).

Overall, the findings suggest that student mathematical anxiety stems from a complex interplay of negative experiences, fear of failure and social judgment, low self-confidence, and avoidance behaviours. Addressing these factors through interventions that foster positive teacher-student relationships, promote a growth mind-set, and build confidence in mathematical abilities is crucial for mitigating math anxiety and improving student learning outcomes.

4.1.3 Research Question 3: What strategies can be employed to handle O-Level students' mathematical anxiety?

Based on the qualitative data from student interviews and the insights gained from focus group discussions, several strategies can be employed to handle mathematical anxiety among students. These strategies aim to address the root causes of anxiety, such as negative experiences, fear of failure, low confidence, and avoidance behaviours. Thematic analysis of learner's semi-structured interviews and teacher focus group discussions will be used

4.1.3.1 LEARNER'S SEMI-STRUCTURED INTERVIEWS THEMATIC ANALYSIS

This report presents a thematic analysis of semi-structured interviews conducted with learners to explore their perspectives on strategies that can mitigate mathematical anxiety. Mathematical anxiety, a prevalent phenomenon that negatively impacts learning and performance, is a significant concern in education.

Understanding how learners perceive and experience this anxiety, and what strategies they find helpful in managing it, is crucial for developing effective interventions and support systems.

The interviews provided a platform for learners to share their personal experiences with mathematical anxiety and discuss strategies they have found beneficial in reducing their anxiety levels and improving their engagement with mathematics. Through a careful analysis of their responses, several key themes emerged, offering valuable insights into the learners' perspectives on effective coping mechanisms and support structures. These themes provide a foundation for developing targeted interventions and support programs that can empower learners to overcome their anxieties and achieve success in mathematics.

Several themes from semi-structured interviews were highlighted as strategies that could be employed to handle mathematical anxiety among O-Level students in rural secondary school set up.

1. From comments given by some learners, proactive preparation and pre-learning can be a strategy that might help the learners to mitigate anxiety. Two of the student gave the comments below

"I study the topic advance so that when our ma'am teaches it I will less anxious."

"Downloading videos from Vidmate helps me to be an ahead such that when the teacher comes it will be easier for me to understand."

This theme highlights the strategy of getting ahead of the topic and its concepts before it is formally taught in class. By studying in advance, learners aim to reduce the anxiety associated with encountering new and potentially challenging concepts for the first time during class. This proactive approach helps build a foundation of understanding and confidence.

2. Seeking external support and collaboration is another them that possible was extracted from the semi-structured interviews with learners. The comments below from learners depicts how this can be.

“I revise at home or asking someone who understand the topics which i find challenging to me.”

“If I am in an examination we work out the problems on rough papers and compare the answers with of my friend. We use mind-sets”

This theme emphasizes the importance of social support in managing math anxiety. Learners seek help from others who understand the concepts either through direct questioning or by comparing answers and strategies. This collaborative approach can reduce feelings of isolation and provide reassurance that they are not alone in facing challenges.

3. Independent revision and practice is also another approach that could be used to handle mathematical anxiety. Responses from the learners below gave a clue on the impact of independent revision and practice to fight mathematical anxiety

“I do some revision individually”

“I revise at home...”

This theme highlights the role of independent practice and revision in reducing anxiety. By revisiting and practicing previously learned topics and concepts, learners reinforce their understanding and build confidence in their abilities. This self-directed approach empowers learners to take control of their learning and address areas where they feel less confident.

4. Relaxation and mind management was is one of themes which are helpful in managing mathematical anxiety. One student commented on that as shown below.

“*When I am at home, I close the textbook and listen to music for a while to relax the mind and i will continue later”*

This theme emphasizes the importance of managing mental and emotional states to cope with anxiety. Learners recognize that taking breaks, engaging in relaxing activities, and calming the mind can improve

their ability to focus and approach math problems with a clearer mind-set. This highlights the interconnectedness of emotional well-being and academic performance.

5. Problem-solving and comparison can be employed as a theme that can help learners to handle mathematical anxiety. One student mentioned that.

"If I am in an examination we work out the problems on rough papers and compare the answers with of my friend. We use mind-sets"

This theme suggests that actively engaging with problem-solving and comparing solutions with peers can be a strategy to reduce anxiety during assessments. By working through problems and comparing their approaches, learners can gain a better understanding of different solution paths and build confidence in their problem-solving abilities.

4.1.3.2 TEACHERS FOCUS GROUP DISCUSSIONS THEMATIC ANALYSIS

This report presents a thematic analysis of focus group discussions conducted with teachers to explore their perspectives on and experiences with student mathematical anxiety. Mathematical anxiety, a prevalent phenomenon among students, can significantly hinder their learning and performance in mathematics. Understanding how teachers perceive and address this issue is crucial for developing effective strategies and interventions to support students in overcoming their anxieties and fostering a more positive learning environment.

The focus group discussions provided a platform for teachers to share their insights, experiences, and practices related to identifying, understanding, and managing student mathematical anxiety within their classrooms. Through a careful analysis of the teachers' responses, several key themes emerged, highlighting the diverse perspectives and approaches employed by educators in addressing this challenge. These themes offer valuable insights into the role of teacher awareness, instructional practices, classroom/learning environment, addressing avoidance behaviours, and collaboration in mitigating student mathematical anxiety.

The following sections will delve deeper into each of these identified themes, providing illustrative quotes from the focus group discussions to support the analysis. By understanding these themes, educational leaders, curriculum developers, and teacher training programs can gain valuable insights into how to better equip teachers to support students struggling with mathematical anxiety and create a more supportive and effective learning environment for all students.

From teachers focus group discussions one of the crucial theme extracted is to foster a positive and supportive learning environment. This can be done by the following sub-themes:

1. Creating a growth mind-set culture which emphasize that mathematical abilities can be developed through effort and persistence, rather than being fixed. This can be achieved by praising effort and strategies, rather than just outcomes, and providing opportunities for students to experience success through gradual challenges (Dweck, 2006). Comments from two of the teachers highlighted that.

"*I have found that shifting my feedback from focusing solely on whether students got the right answer to emphasizing the strategies they used and the effort they put in has been incredibly impactful. Instead of just saying 'Good job, you got it right!' I try to say things like, 'I really like how you broke down that problem into smaller steps. That is a great strategy!' or 'You persevered through that challenging problem, and your effort really paid off.' This has helped students understand that math is about the journey of learning and problem-solving, not just about achieving the 'correct' answer. It is about building their mathematical thinking and resilience."*

"I have noticed a significant change in students' attitudes towards challenges since I started implementing a growth mind-set approach. Before, students would often give up quickly if they encountered a difficult problem. Now, they are more willing to try different strategies and persist even when they make mistakes. I think this is because they have come to understand that their mathematical abilities are not fixed, but rather something they can develop through effort and practice. For example, when a student struggles with

a complex problem, I'll say something like, 'It is okay to find this challenging. Everyone learns at their own pace. Let's work through this together, and I am confident you can figure it out with some focused effort.'"

2. Promoting collaboration and peer support encourage collaborative learning activities where students can support each other, learn from diverse perspectives, and build a sense of community. This can reduce the fear of individual judgment and promote a shared understanding of mathematical concepts. (Slavin, 1995). Several response from different teachers have been given to support the need for collaboration learning.

"I have *noticed a huge shift in student confidence since implementing more group work in my math class. Students who were previously hesitant to participate or ask questions are now actively engaging with their peers and helping each other understand the concepts. It's amazing to see them build on each other's ideas and learn from different perspectives. They seem less worried about getting the 'wrong' answer when they know they have a supportive group to work with."*

"I have been trying to create a culture where students feel comfortable asking for help and collaborating with their classmates. I structure activities where they have to explain their thinking to each other and work together to solve problems. This has not only helped them develop a deeper understanding of the material but also reduced their anxiety about making mistakes. They realize that everyone struggles sometimes, and it's okay to ask for help from their peers."

"One of the most effective strategies I have found is to create opportunities for students to teach each other. For example, I will have students who have mastered a particular concept explain it to those who are struggling. This not only helps the struggling students but also reinforces the understanding of the 'teacher' and builds their confidence. It also creates a sense of shared responsibility for learning, reducing the pressure and anxiety associated with individual performance."

3. Another strategy which can be employed is to emphasize mistakes as learning opportunities. That will create a safe space where students feel comfortable making mistakes without fear of ridicule or

punishment. Teachers can model this by openly discussing their own mistakes and emphasizing that errors are valuable learning experiences (Boaler, 2015). Comments from teachers in teachers' focus group discussions showed the need for creating such a learning environment.

"I have started framing mistakes as 'opportunities to learn' rather than failures. I have noticed that when students understand that mistakes are a natural part of the learning process, they become less afraid to try new things and participate actively. It is been really powerful to see them embrace challenges and learn from their errors, rather than getting discouraged."

"I have been trying to model this myself. I will share my own mathematical mistakes with the class and talk about how I used those mistakes to improve my understanding. It is amazing how this simple act can shift the students' perspective. They realize that even teachers make mistakes, and it is okay to struggle. This has created a much safer and more open learning environment.

"I have implemented a 'mistake celebration' in my classroom. When students identify a mistake in their work or during a problem-solving activity, we discuss it as a group. We analyse what went wrong, explore alternative approaches, and learn from the error. This has been incredibly effective in shifting the focus from the 'wrong' answer to the learning process. Students are now more willing to take risks and try different strategies without fear of judgment."

Through teacher FGD there is need to build confidence and elf-efficacy in learning of mathematics in order to curb mathematical anxiety. That can be done by provide differentiated teaching pedagogics and provide specific and constructive feedback.

4. Another theme is to provide differentiated instruction cater to diverse learning styles and abilities by offering a variety of instructional approaches and resources. This can help students experience success at their own pace and build confidence in their abilities. (Tomlinson, 2014) several comments were given in relation to this.

"I have found that offering a variety of learning activities, like hands-on manipulatives, visual aids, and online resources, really helps students who struggle with traditional math instruction. Some students grasp concepts better through visual representations, while others need to physically interact with materials. By providing diverse options, I have seen a significant increase in student engagement and confidence. It is about meeting students where they are and allowing them to learn in a way that makes sense to them."

"I have started using tiered assignments in my math classes. This allows me to differentiate the complexity and challenge level of the work based on students' individual needs and abilities. Some students might be ready for more complex problem-solving, while others might need more support with foundational concepts. This approach has helped me ensure that every student is challenged appropriately and has the opportunity to experience success. It is also been a great way to foster a sense of accomplishment and build confidence in students who may have previously struggled

5. Provide specific and constructive feedback focus on providing feedback that highlights students' strengths and areas for improvement, rather than just focusing on errors. This can help students develop a more realistic understanding of their abilities and build confidence in their potential for growth.(Hattie, 2012). On this strategy two teachers commented:

"Instead of just marking problems right or wrong, I have started to provide more detailed feedback on students' work. For example, if a student makes a mistake in their calculations, I will point out where they went wrong and explain the correct process. I also make sure to highlight the parts of their work that are correct and show them how they can build on their strengths. This way, they understand that even when they make mistakes, they are still learning and developing their skills. It is about focusing on the process and growth rather than just the final answer."

"I have found that providing feedback that focuses on specific learning goals is really helpful for students. Instead of just saying 'good job' or 'try again', I try to link my feedback to the specific skills or concepts we were working on. For example, I might say, 'You have shown a great understanding of fractions in this problem, but you could improve your ability to apply that knowledge to word problems.' This type of feedback helps students understand what they need to work on to improve and feel more confident in their abilities. It is about helping them see their progress and potential for growth."

2. Address avoidance behaviours and promote engagement is another theme that is high likely to be employed to handle mathematical anxiety. This can be done by using the following measures:
1. Introduce mindfulness and relaxation techniques

Teach students simple relaxation techniques, such as deep breathing or progressive muscle relaxation, to manage anxiety during challenging math tasks. This can help them develop coping mechanisms for dealing with stressful situations. (Bögels & Storch, 2003). Two teachers mentioned the need for this as indicated below.

"I have noticed that some of my students freeze up when faced with a challenging math problem. They get so overwhelmed that they can't even remember the steps they've learned. If we could teach them some simple relaxation techniques, maybe they could calm down and access their knowledge more easily."

This comment highlights the observation of math anxiety manifesting as a "freeze" response and suggests that relaxation techniques could help students regain composure and access their learned skills

"I think it is important to help students develop strategies for dealing with stress in general, not just in math. If we can teach them how to manage their anxiety in one subject, they can apply those skills to other areas of their lives as well. Deep breathing exercises, for example, could be a really useful tool for them to have in their toolkit."

This comment emphasizes the broader applicability of relaxation techniques beyond math, suggesting that fostering stress management skills can benefit students across various aspects of their lives and learning.

Use a variety of engaging teaching methods

This may help to arouse interest in learners to reduce avoidance behaviours in the learning of mathematics. Teacher or facilitators ma incorporate games, puzzles, real-world applications, and technology to make learning math more enjoyable and relevant. This can help students develop a positive association with math and reduce avoidance behaviours. The comments below give a hint to that.

"*I have found that using math games and puzzles can really capture students' attention and make learning more interactive. When they are having fun, they are more likely to participate and engage with the material. We have seen a significant improvement in student motivation and participation since incorporating these activities into our lessons."*

"Connecting math to real-world scenarios has been a game-changer for some of my students. When they see how math is used in everyday life, like calculating budgets or designing structures, they start to understand its relevance and value. It helped to dispel the misconception that math is just a bunch of abstract concepts with no practical application.

4.2 CHAPTER FOUR SUMMARY

This chapter presents the results of a study on mathematical anxiety among O-Level students in a rural secondary school. The study aimed to identify the levels, contributing factors, and potential mitigation strategies for mathematical anxiety.

The results showed that mathematical anxiety is a significant concern among O-Level students, with a moderate level of anxiety reported (Ashcraft & Moore, 2009). The mean MARS score was 6, indicating a moderate level of anxiety. Further analysis of the data revealed that a large proportion of students reported

feeling nervous during mathematics exams, experiencing difficulty concentrating during mathematics lessons, and feeling overwhelmed by mathematical problems.

The qualitative data from student interviews and teacher focus group discussions provided insights into the factors contributing to mathematical anxiety. Several themes emerged, including negative experiences with teachers, fear of failure and social judgment, low self-confidence, avoidance behaviours, lack of foundational understanding, difficulty with specific topics/concepts, pace of learning, peer pressure and social comparison, and limited access to resources (Beilock et al., 2010).

Students reported that negative experiences with teachers, such as fear-based teaching methods, contributed to their mathematical anxiety. Fear of failure and social judgment was also a significant concern, with students expressing anxiety related to individual work, tests, and the potential for social judgment from peers or self-judgment.

Low self-confidence and negative self-beliefs were also identified as contributing factors to mathematical anxiety. Students demonstrated negative self-perceptions about their math abilities, with self-confidence being tied to their knowledge or performance (Das et al., 2014).

Avoidance behaviours, such as not participating, changing facial expressions, and experiencing a “blank mind” or disengagement during class, were also reported by students. Lack of foundational understanding and difficulty with specific topics/concepts were also identified as contributing factors to mathematical anxiety.

The pace of learning was also reported as a contributing factor to mathematical anxiety. Students struggled to keep up with the pace of lessons, suggesting that a faster pace can increase anxiety, especially if they do not feel confident in their understanding.

Peer pressure and social comparison were also reported as contributing factors to mathematical anxiety. Students felt pressured by peers to excel in mathematics, leading to anxiety about not meeting perceived expectations.

Limited access to resources was also identified as a contributing factor to mathematical anxiety. The rural setting presented challenges in terms of access to quality educational resources, including experienced mathematics teachers, well-equipped laboratories, and supplementary learning materials (National Council of Teachers of Mathematics, 2000).

The study also identified several strategies that can be employed to handle mathematical anxiety among O-Level students. These strategies include proactive preparation and pre-learning, seeking external support and collaboration, independent revision and practice, relaxation and mind management, and problem-solving and comparison.

Teachers reported that fostering a positive and supportive learning environment is crucial in mitigating mathematical anxiety. This can be achieved by creating a growth mind-set culture, praising effort and strategies, and providing opportunities for students to experience success through gradual challenges (Dweck, 2006).

The study highlighted the need for a comprehensive approach to addressing mathematical anxiety among O-Level students in rural secondary schools. The findings suggest that mathematical anxiety stems from a complex interplay of negative experiences, fear of failure and social judgment, low self-confidence, and avoidance behaviours. Addressing these factors through interventions that foster positive teacher-student relationships, promote a growth mind-set, and build confidence in mathematical abilities is crucial for mitigating math anxiety and improving student learning outcomes.

CHAPTER FIVE: SUMMARRY, DISCUSSION, CONCLUSION AND RECOMENTATIONS

5.1 INTRODUCTION

Mathematical anxiety significantly impacts student learning and achievement, particularly in secondary education. This chapter investigates the experiences of O-Level students in a rural Zimbabwean secondary school, exploring both the prevalence of this anxiety and the strategies—both student-centred and teacher-centred—that students find effective in managing it. This study employed a mixed-methods approach, utilizing both questionnaires (the MARS Questionnaire) and semi-structured interviews to gain a comprehensive understanding of the students' perspectives. The quantitative data from the questionnaires provides a measure of the overall level of mathematical anxiety, while the qualitative data from the interviews offers rich insights into the specific coping mechanisms and support systems students utilize. The findings presented here aim to inform the development of targeted interventions to alleviate mathematical anxiety and improve mathematical performance in this context.

5.2 SUMMARY OF THE STUDY

This research study delves into the pervasive issue of mathematical anxiety among students attending a rural day secondary school. Chapter 1, the introductory chapter, establishes the critical importance of this research by highlighting the detrimental effects of mathematical anxiety on students' academic performance, self-esteem, and future prospects. It underscores the particular challenges faced by students in rural environments, where limited resources, inadequate instructional materials, and a lack of qualified teachers can exacerbate the problem. The study's rationale is grounded in the understanding that mathematics, a fundamental subject for developing critical thinking and problem-solving skills, is often a source of anxiety for many students. Chapter 1 emphasizes the need to understand the unique manifestations of mathematical anxiety within this specific context and to develop targeted interventions that can promote a more positive learning environment.

Building upon this foundation, Chapter 2 embarks on a comprehensive review of existing literature on mathematical anxiety. This chapter explores the multifaceted nature of the phenomenon, delving into its causes, including both individual factors for example negative experiences, fear of failure and environmental factors such as teaching methods, classroom climate. The literature review also examines the documented effects of mathematical anxiety on academic performance, demonstrating how it can impede students' ability to learn and apply mathematical concepts. Furthermore, it explores a range of interventions that have been shown to be effective in addressing mathematical anxiety, providing a theoretical framework for the current study.

With a clear understanding of the theoretical underpinnings of mathematical anxiety, Chapter 3 outlines the research methodology employed to investigate this problem in the specific context of the rural secondary school. This chapter details the research design, including the selection of participants, the data collection methods used which included quantitative surveys, qualitative focus group discussions, and semi-structured interviews and the procedures for analysing the collected data. The chosen methodology ensures that the study can gather both quantitative and qualitative data, providing a comprehensive understanding of the students' experiences and perspectives.

Chapter 4 presents the core findings of the research, derived from the data collected through the various methods described in Chapter 3. This chapter presents the results of the quantitative surveys, which may reveal the prevalence and severity of mathematical anxiety among the student population. It also presents the findings from the qualitative data, such as focus teacher focus group discussions and interviews, which offer rich insights into the students' lived experiences with mathematical anxiety. These findings provide a detailed picture of the level of mathematical anxiety, the factors that contribute to their anxiety as well as the strategies that can be employed to handle mathematical anxiety.

5.3 DISCUSSION OF RESULTS

This study investigated the prevalence of mathematical anxiety among O-Level students in a rural secondary school in Zimbabwe and explored the contributing factors. The findings provide valuable insights into the nature and scope of this issue within the specific context of the study.

Research Question 1: What are the levels of mathematical anxiety in O-Level students in a rural day secondary school?

The analysis of the Mathematics Anxiety Rating Scale (MARS) scores revealed a significant presence of mathematical anxiety among the O-Level students in the selected rural school. The mean MARS score of 6 (Figure 3) indicates a moderate level of anxiety within the sample. Further analysis using descriptive statistics (Figures 2 and 3) revealed that a considerable proportion of students (32%) reported experiencing "a little" mathematical anxiety (MARS scores 4-7), while a substantial portion (28%) demonstrated higher levels of anxiety (MARS scores 16-30). This suggests a wide range of anxiety levels within the student population, with a notable portion experiencing significant anxiety related to mathematics.

The Hasse diagram (Figure 5) visually illustrates the partial order of MARS scores, highlighting the distribution of anxiety levels. While the majority of students fall within the lower to moderate range of anxiety, the presence of a considerable number of students in the higher range signifies the need for attention and intervention.

These findings align with previous research suggesting that mathematical anxiety is a prevalent experience across various educational levels (Ashcraft & Moore, 2009). However, the high prevalence observed in this rural setting highlights the unique challenges and potential contributing factors within this specific context. Further investigation into these factors is crucial for developing effective interventions tailored to the needs of these students.

Research Question 2: What factors contribute to the development of mathematical anxiety in O-Level students in a rural secondary school?

The qualitative data gathered through student interviews provided valuable insights into the factors contributing to mathematical anxiety. Analysis of the interview transcripts revealed several recurring themes. Negative experiences with teachers is a significant theme emerging from the interview which shows the negative experiences with mathematics teachers.

Students reported feeling intimidated by teachers perceived as harsh or punitive, particularly in the context of failure or perceived lack of understanding. One student's statement, "Yes there are teachers who are fierce. They say if you fail I will beat you," exemplifies this sentiment. This suggests that teacher-student interactions, particularly those characterized by fear or intimidation, can contribute significantly to the development of mathematical anxiety.

Other themes extracted include fear of failure and social judgment, low self-confidence, avoidance behaviours, lack of foundational understanding, difficulty with specific topics/concepts, pace of learning, peer pressure and social comparison, and limited access to resources. These findings are consistent with previous research highlighting the complex interplay of factors contributing to mathematical anxiety (Beilock et al., 2010). The results from both the quantitative and qualitative data converge to paint a picture of mathematical anxiety as a significant problem within this rural secondary school. The quantitative data establishes the prevalence of anxiety, while the qualitative data provides a deeper understanding of the potential contributing factors, particularly the role of negative teacher-student interactions. This combined understanding is crucial for developing targeted interventions and support systems that can effectively address the root causes of mathematical anxiety and improve the learning experiences of students in this context.

Research Question 3: What strategies can be employed to handle O-Level students' mathematical anxiety?

Based on the qualitative data from student interviews and the insights gained from teachers focus group discussions, several strategies can be employed to handle mathematical anxiety among students. These strategies aim to address the root causes of anxiety, such as negative experiences, fear of failure, low confidence, and avoidance behaviours.

Thematic analysis of learners interviews unveiled strategies for managing mathematical anxiety. This section presents a thematic analysis of semi-structured interviews conducted with learners to explore their perspectives on strategies that can mitigate mathematical anxiety. Mathematical anxiety, a prevalent phenomenon that negatively impacts learning and performance, is a significant concern in education. Understanding how learners perceive and experience this anxiety, and what strategies they find helpful in managing it, is crucial for developing effective interventions and support systems.

The interviews provided a platform for learners to share their personal experiences with mathematical anxiety and discuss strategies they have found beneficial in reducing their anxiety levels and improving their engagement with mathematics. Through a careful analysis of their responses, several key themes emerged, offering valuable insights into the learners' perspectives on effective coping mechanisms and support structures. These themes provide a foundation for developing targeted interventions and support programs that can empower learners to overcome their anxieties and achieve success in mathematics.

Several potential themes from the semi-structured interviews were highlighted as strategies that could be employed to handle mathematical anxiety among O-Level students in a rural secondary school setting. These strategies can be categorized into two main groups that is student-centred strategies and teacher-centred strategies.

Student-centred strategies include proactive preparation and pre-learning, seeking external support and collaboration, independent revision and practice, relaxation and mind management, and problem-solving and comparison. For instance, students can prepare in advance for mathematics lessons by reviewing notes, practicing problems, and seeking help from teachers or peers (Ashcraft, 2002). Additionally, students can engage in independent revision and practice to reinforce their understanding of mathematical concepts and build confidence in their abilities (National Council of Teachers of Mathematics, 2000).

Teacher-centred strategies include fostering a positive and supportive learning environment, providing differentiated instruction, and providing specific and constructive feedback. For example, teachers can create a growth mind-set culture that emphasizes that mathematical abilities can be developed through effort and persistence, rather than being fixed (Dweck, 2006). Teachers can also provide differentiated instruction that caters to diverse learning styles and abilities, offering a variety of instructional approaches and resources (Tomlinson, 2014).

Furthermore, the findings suggest that addressing avoidance behaviors and promoting engagement is crucial in handling mathematical anxiety. Teachers can introduce mindfulness and relaxation techniques, such as deep breathing or progressive muscle relaxation, to manage anxiety during challenging math tasks (Bögels & Storch, 2003). Additionally, teachers can use a variety of engaging teaching methods, such as games, puzzles, real-world applications, and technology, to make learning math more enjoyable and relevant (Slavin, 1995).

5.3 CONCLUSION FROM THE MAIN FINDINGS OF THE STUDY

This research investigated the prevalence, contributing factors, and potential mitigation strategies for mathematical anxiety among O-Level students in a rural Zimbabwean secondary school.

Questionnaires administered to O-Level students in this study provide valuable insights into the level of mathematical anxiety experienced by these students. The results of the study indicate that the students experience a moderate level of mathematical anxiety, with a mean score of 6 on the MARS Questionnaire.

The findings of this study are consistent with previous research, which has shown that mathematical anxiety is a pervasive problem among students, particularly at the secondary school level (Ashcraft, 2002; Beilock et al., 2010). The moderate level of mathematical anxiety reported by the students in this study suggests that they experience a significant amount of anxiety when dealing with mathematics, which can negatively impact their motivation, self-confidence, and overall performance in mathematics.

The findings of this study highlight the importance of addressing mathematical anxiety among O-Level students. The moderate level of mathematical anxiety reported by the students in this study suggests that they require support and guidance to manage their anxiety and develop a positive attitude towards mathematics.

The findings from the learners' semi-structured interviews provide valuable insights into the contributing factors of mathematical anxiety among O-Level students. The interviews revealed that learners experience mathematical anxiety due to a complex interplay of factors, including negative experiences, fear of failure and social judgment, low self-confidence, avoidance behaviours, lack of foundational understanding, difficulty with specific topics/concepts, pace of learning, peer pressure and social comparison, and limited access to resources.

One of the key findings from the interviews is the significant role that negative experiences play in contributing to mathematical anxiety. Learners reported that past experiences of failure, criticism, or embarrassment in mathematics classes have led to the development of anxiety. For instance, one learner mentioned that "I had a bad experience with my previous math teacher, she used to scold me in front of the class, and since then I have been afraid of math."

Another significant finding from the interviews is the impact of fear of failure and social judgment on mathematical anxiety. Learners reported that the fear of failing or not meeting expectations, as well as the fear of being judged by their peers or teachers, contributes to their anxiety. For example, one learner mentioned that "I am afraid of failing my math exams, and I do not want my friends to think I am stupid."

The findings from the learners' semi-structured interviews also provided valuable insights into the strategies employed by O-Level students to handle mathematical anxiety. The interviews revealed that learners employ a range of strategies to manage their anxiety, including proactive preparation and pre-learning, seeking external support and collaboration, independent revision and practice, relaxation and mind management, and problem-solving and comparison.

One of the key findings from the interviews is the importance of proactive preparation and pre-learning in reducing mathematical anxiety. Learners reported that preparing in advance for mathematics lessons by reviewing notes, practicing problems, and seeking help from teachers or peers helps to reduce their anxiety. For instance, one learner mentioned that "I study the topic in advance so that when our teacher teaches it, I will be less anxious.

Another significant finding from the interviews is the role of seeking external support and collaboration in managing mathematical anxiety. Learners reported that seeking help from teachers, peers, or tutors helps to clarify their understanding of mathematical concepts and build confidence. For example, one learner mentioned that "I revise with my friends, and we help each other to understand the concepts."

The interviews also highlighted the importance of independent revision and practice in reducing mathematical anxiety. Learners reported that revisiting and practicing previously learned topics and concepts helps to reinforce their understanding and build confidence in their abilities. For instance, one learner mentioned that "I do some revision individually, and it helps me to understand the concepts better."

Furthermore, the interviews emphasized the importance of relaxation and mind management in managing mathematical anxiety. Learners reported that taking breaks, engaging in relaxing activities, and calming the

mind can improve their ability to focus and approach math problems with a clearer mind-set. For example, one learner mentioned that “When I am stressed, I listen to music or take a walk to calm down.”

The findings from the teachers’ focus group discussions provide valuable insights into the strategies that can be employed to handle mathematical anxiety among O-Level students. The discussions revealed that teachers play a crucial role in mitigating mathematical anxiety by fostering a positive and supportive learning environment.

One of the key findings from the discussions is the importance of creating a growth mind-set culture in the classroom. Teachers emphasized the need to promote a growth mind-set among students, emphasizing that mathematical abilities can be developed through effort and persistence, rather than being fixed. This can be achieved by praising effort and strategies, rather than just outcomes, and providing opportunities for students to experience success through gradual challenges (Dweck, 2006).

Another significant finding from the discussions is the need to provide differentiated instruction to cater to diverse learning styles and abilities. Teachers highlighted the importance of offering a variety of instructional approaches and resources to help students understand mathematical concepts. This can include using visual aids, hands-on manipulatives, and technology to make learning math more engaging and interactive (Tomlinson, 2014).

The discussions also emphasized the importance of providing specific and constructive feedback to students. Teachers noted that feedback should focus on highlighting students’ strengths and areas for improvement, rather than just focusing on errors. This can help students develop a more realistic understanding of their abilities and build confidence in their potential for growth (Hattie, 2012).

Furthermore, the discussions highlighted the need to address avoidance behaviours and promote engagement in mathematics. Teachers suggested introducing mindfulness and relaxation techniques, such as deep breathing or progressive muscle relaxation, to manage anxiety during challenging math tasks (Bögels & Storch, 2003).

5.4 **RECOMMENDATIONS**

The findings of this study highlight the importance of addressing mathematical anxiety among O-Level students. To mitigate the negative effects of mathematical anxiety, several recommendations are proposed.

Firstly, teachers and educators should strive to create a supportive learning environment that encourages students to ask questions and seek help without fear of ridicule or judgment. This can be achieved by fostering a growth mind-set culture, promoting positive attitudes towards mathematics, and providing regular feedback and encouragement. Additionally, teachers should be aware of their own mathematical anxiety and how it may impact their teaching practices.

Secondly, schools and educational institutions should provide professional development opportunities for teachers to enhance their mathematical knowledge, pedagogical skills, and ability to support students with mathematical anxiety. This can include workshops, training sessions, and mentoring programs that focus on teaching strategies, classroom management, and anxiety reduction techniques.

Thirdly, students should be encouraged to develop a growth mind-set and believe that mathematical abilities can be developed through effort, persistence, and practice. This can be achieved by providing opportunities for students to engage in self-directed learning, set goals, and track their progress. Additionally, students should be encouraged to seek help and support from teachers, peers, and tutors when needed.

Fourthly, parents and guardians play a crucial role in supporting their children's mathematical education. They should encourage a positive attitude towards mathematics, provide emotional support, and help students develop a growth mind-set. Additionally, parents and guardians should be aware of their own mathematical anxiety and how it may impact their child's mathematical education.

Finally, policymakers and educational administrators should develop and implement mathematics education policies that promote mathematics education, provide resources and support for teachers and

students, and foster a growth mind-set culture. Additionally, they should ensure that mathematics education programs are regularly monitored and evaluated to identify areas for improvement and ensure that students receive a high-quality mathematics education.

In conclusion, addressing mathematical anxiety among O-Level students requires a multi-faceted approach that involves teachers, educators, students, parents, and policymakers. By implementing the recommendations proposed in this study, we can work towards creating a supportive learning environment that promotes mathematical literacy, reduces anxiety, and fosters a growth mind-set culture.

5.5 SUGGESTIONS FOR FURTHER STUDIES

The findings of this study provide valuable insights into the prevalence, causes, and effects of mathematical anxiety among O-Level students. However, there are several areas that require further investigation to deepen our understanding of mathematical anxiety and its impact on students' learning outcomes. Below there are suggestions which the researcher propose.

Firstly, future studies could investigate the impact of mathematical anxiety on students' academic achievement in other subjects, not just mathematics. This could help to identify whether mathematical anxiety has a ripple effect on students' overall academic performance.

Secondly, further research could explore the relationship between mathematical anxiety and other variables, such as cognitive abilities, learning styles, and socio-economic status. This could help to identify whether certain groups of students are more prone to mathematical anxiety and why.

Thirdly, studies could investigate the effectiveness of different interventions aimed at reducing mathematical anxiety among students. For example, researchers could compare the impact of cognitive-behavioural therapy, mindfulness-based interventions, and mathematical literacy programs on students' mathematical anxiety levels.

Fourthly, future research could explore the role of teachers' mathematical anxiety in shaping students' mathematical anxiety. This could involve investigating whether teachers' mathematical anxiety influences their teaching practices, student-teacher interactions, and ultimately, students' mathematical anxiety levels.

Fifthly, studies could investigate the impact of mathematical anxiety on students' career choices and aspirations. This could help to identify whether mathematical anxiety influences students' decisions to pursue mathematics-related careers or avoid them altogether.

Lastly, further research could explore the cultural and contextual factors that contribute to mathematical anxiety among students from diverse backgrounds. This could involve investigating whether cultural norms, parental expectations, and societal pressures influence students' mathematical anxiety levels.

In conclusion, this study provides a foundation for further research into mathematical anxiety among O-Level students. By exploring the suggestions outlined above, researchers can gain a deeper understanding of mathematical anxiety and its impact on students' learning outcomes, ultimately informing the development of effective interventions and strategies to mitigate mathematical anxiety.

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APPENDIX 1

MATHEMATICS ANXIETY SCALE (MAS-30)

Instructions

Please read each statement carefully and indicate how much you agree or disagree with it using the following scale:

1 = Not at all

2 = A little

3 = Somewhat

4 = Moderately

5 = Very much

STATEMENTS

1.	I feel my heart beat faster when I have to do math problems	☐1	☐2	☐3	☐4	☐5
2.	I feel tense when I have to solve a math problem	☐1	☐2	☐3	☐4	☐5
3.	I feel uncomfortable when I have to work with numbers	☐1	☐2	☐3	☐4	☐5
4.	I get a sinking feeling when I have to take a math test.	☐1	☐2	☐3	☐4	☐5
5.	I feel nervous when I have to explain a math problem to someone else	☐1	☐2	☐3	☐4	☐5
6.	I feel uneasy when I have to use a calculator	☐1	☐2	☐3	☐4	☐5
7.	I feel anxious when I have to use mathematical formulas	☐1	☐2	☐3	☐4	☐5
8.	I feel worried when I have to solve word problems	☐1	☐2	☐3	☐4	☐5
9.	I feel stressed when I have to work with graphs or charts	☐1	☐2	☐3	☐4	☐5
10.	I feel confused when I have to learn new math concepts	☐1	☐2	☐3	☐4	☐5
11.	I feel overwhelmed when I have to do a lot of math problems.	☐1	☐2	☐3	☐4	☐5
12.	I feel frustrated when I can’t solve a math problem	☐1	☐2	☐3	☐4	☐5

13. I feel my palms sweat when I have to do math in class. ☐1 ☐2 ☐3 ☐4 ☐5

14. I feel my stomach churn when I have to take a math test. ☐1 ☐2 ☐3 ☐4 ☐5

15. I feel my mind go blank when I have to solve a math problem. ☐1 ☐2 ☐3 ☐4 ☐5

16. I feel like I'm going to fail when I have to do math ☐1 ☐2 ☐3 ☐4 ☐5

17. I feel like I'm not smart enough to do math. ☐1 ☐2 ☐3 ☐4 ☐5

18. I feel like math is too difficult for me. ☐1 ☐2 ☐3 ☐4 ☐5

19. I feel like I'm not good at math. ☐1 ☐2 ☐3 ☐4 ☐5

20. I feel like math is a waste of time. ☐1 ☐2 ☐3 ☐4 ☐5

21. I avoid taking math courses whenever possible. ☐1 ☐2 ☐3 ☐4 ☐5

22. I avoid situations that involve math whenever I can ☐1 ☐2 ☐3 ☐4 ☐5

23. I try to avoid talking about math with others. ☐1 ☐2 ☐3 ☐4 ☐5

24. I feel relieved when I'm finished with a math class or assignment. ☐1 ☐2 ☐3 ☐4 ☐5

25. I feel proud of myself when I succeed at a math problem. ☐1 ☐2 ☐3 ☐4 ☐5

26. I feel a sense of accomplishment when I understand a new math concept. ☐1 ☐2 ☐3 ☐4 ☐5

27. I enjoy learning new things in math. ☐1 ☐2 ☐3 ☐4 ☐5

28. I find math to be interesting and engaging ☐1 ☐2 ☐3 ☐4 ☐5

29. I believe that I can improve my math skills with practice. ☐1 ☐2 ☐3 ☐4 ☐5

30. I am confident in my ability to solve math problems ☐1 ☐2 ☐3 ☐4 ☐5

APPENDIX 2

INTERVIEW QUESTIONS

Student Interview Questions

1. Interviewer: **Can you describe your feelings when you think about mathematics?**

Interviewee:_____

_____

2. Interviewer: **How confident are you in your ability to solve mathematical problems?**

Interviewee:_____

_____

3. Interviewer: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Interviewee:_____

_____

4. Interviewer: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Interviewee:_____

_____

5. Interviewer: **If you have experienced anxiety, can you describe what triggers it?**

Interviewee:_____

_____

6. Interviewer: **How does mathematical anxiety impact your performance in mathematics?**

Interviewee:_____

_____

7. Interviewer: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Interviewee:_____

_____

8. Interviewer: **How do you typically prepare for mathematics exams or tests?**

Interviewee:_____

_____

9. Interviewer: **Do you find the pace of mathematics lessons to be manageable?**

Interviewee:_____

_____

10. Interviewer: **Have you ever avoided participating in mathematics class due to anxiety?**

Interviewee:_____

_____

11. Interviewer: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Interviewee:_____

_____

12. Interviewer: **Do you feel that your peers influence your feelings about mathematics?**

Interviewee:_____

_____

13. Interviewer: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

Interviewee:_____

_____

14. Interviewer: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Interviewee:_____

_____

15 Interviewer:. **What are your thoughts about the relevance of mathematics in your future life and career?**

Interviewee:_____

_____

16.Interviewer: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Interviewee:_____

_____

17. Interviewer: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Interviewee:_____

_____

18. Interviewer: **Do you believe that mathematical anxiety is a common experience among your peers?**

Interviewee:_____

_____

19. Interviewer: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Interviewee:_____

_____

APPENDIX 3: Samples of Transcribed Interview Response

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

Ryan: It's scaring. Especially when you are doing challenging topics.

2. AM: **How confident are you in your ability to solve mathematical problems?**

Ryan: If I don't know all the confidence vanish.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Ryan: Not always. Sometimes there are some which I don't even now but are learnt in form one.

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Ryan: Yes, especially when you are doing individual work.

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

Ryan: Our mind-set

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Ryan: I fail

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Ryan: Yes there are teachers who are fierce. They say if you fail i will beat you.

8. AM: **How do you typically prepare for mathematics exams or tests?**

Ryan: I look and revise the exercises we once wrote.

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Ryan: Yes

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Ryan: That's is exactly what i do. I don't even raise a hand. I even change my face to such an extent that my ma'am hesitate to ask me to solve the problems. If I get up to work on the chalkboard everything will diminish away from mind. I get even more nervous.

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Ryan: No

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Ryan: Some of them. If you fail they will laugh you.

13. AM: Do **you think your parents or guardians have any influence on your feelings about mathematics?** Ryan: They encourage to work hard.

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Ryan: Yes from my peers

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Ryan: Yes, the programme i want requires maths.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Ryan: I study the topic advance so that when our ma'am teaches it i will less anxious.

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Ryan: Be friendly to teacher and peers who are good at mathematics. Doing presentations

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Ryan: Yes.

19: AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Ryan: Mathematics is difficult. I have to work hard.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Tino: I had never been good at Mathematics, I am at average. When I think of mathematics I feel in between no matter how hard I try

2. AM: How confident are you in your ability to solve mathematical problems?

Tino: When I know the task given, i am over confident because I will be sure that I know this.

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Tino: It is not a challenging subject. I am the one who find it difficult. I had never got a mark in red.

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems

Tino: Yes, when I skipped the introduction of the topic

5. Interviewer: If you have experienced anxiety, can you describe what triggers it?

Tino: Feeling that everyone knows but me I don't know anything, especially when a question is asked can trigger my anxiety

6. Am: How does mathematical anxiety impact your performance in mathematics?

Tino: I just tell myself here Tino you don't know anything and I quit.

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Tino: Sometimes, if the teacher uses the lecture method it needs to pay attention. You seem as you have understood but with time you forgot everything

8. AM: How do you typically prepare for mathematics exams or tests?

Tino: I revise past exam questions. Having group work. I go for extra lessons.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Tino: Well, if the teacher is fast when we start a new topic I have to apply what I have learnt from the previous topic in order to cope with the pace

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Tino: Yes especially when I am not sure. I pretend as if I am not in the class. I even pretend to know such that the teacher will leave me and look for others who seem not to know.

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Tino: Mmm some of the books write lies.

12. AM: Do you feel that your peers influence your feelings about mathematics?

Tino: Sometimes, as for me i noted maths is challenging to me and I look friend who knows

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Tino: No, they just push me to work harder

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Tino: Yes, when I go for extra lessons.

15 AM: What are your thoughts about the relevance of mathematics in your future life and career?

Tino: It is relevant

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Tino: I revise at home or asking someone who understand the topics which i find challenging to me.

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Tino: For mathematics to be less frightening we have to do it in more practical way so that one would understand, unlike saying 8 donkeys plus 8 donkeys is equal to 15 donkeys.

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Tino: Yes, they sometimes tell me how they feel especially towards examination

19 AM: Do you think there is a stigma associated with struggling with mathematics or experiencing mathematical anxiety?

Tino: Yes, especially when you are poor in your performance no one would want to associate with you.

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Tino: Mathematics need thorough revision and working hard so that you will not forget what you had learnt. Repeating the concept you have learnt from previous levels as well as writing practice

1. AM: **Can you describe your feelings when you think about mathematics?**

Pnk: When i hear of afraid i got afraid

2. AM: **How confident are you in your ability to solve mathematical problems?**

Pnk: Sometimes if I know I am confident but if I don't know I am not confident.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Pnk: Yes when i go home at the end of the term I see that I have failed mathematics

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Pnk: Yes there are times I feel anxious. I would even ask myself why the teacher came for the lesson

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

PNK: I cannot able to figure out where the fear is coming from

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Pnk: Yes it affects me. I get confused to such extend that i fail the things which i will be sure of when illustrated on the chalkboard.

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Pnk: I don't think so

8. AM: **How do you typically prepare for mathematics exams or tests?**

Pnk: if i know that i will have a test, i take all my past written exercises bools from form and start to revise.

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Pnk: Sometimes I can manage but if I don't understand I will ask the teacher later if I didn't understand during the lesson

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Pnk: I can be in the class physically bt my mind might not be there

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Pnk: Yeah there are some textbooks

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Pnk: they didn't.

13. AM: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

Pnk: Yes

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Pnk: Yes i do from my peers and teachers

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Pnk: Mathematics is very important. As for my combination i don't know i will do.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Pnk: I just close my eyes and let myself calm down

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Pnk: I think when we learn we have to go stage by stage.

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Pnk: Yes,

19. AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Pnk: I don't have anything.

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

Wicky: When i am given a maths question i got afraid. In the previous forms i was good at maths, the challenge had started in form three. When given a test my races a lot and i panic to such an extent that i don't know where to start from.

2. AM: **How confident are you in your ability to solve mathematical problems?**

Wicky: If it is about solving maths problem i don't have confidence.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Wicky: I don't see it like that. I believe that if I work hard and more seriously I can do better. If the teacher explains well to me while we are one on one I can understand.

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Wicky: I don't afraid. The problem comes when the tasks are challenging, that's when i become nervous.

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

Wicky: It is triggered if I don't know how to tackle the maths problem. This usually happens when I am lagging behind others.

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Wicky: The fear comes when i face the question paper. All the few things I have in my head will just vanish.

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Wicky: The methods are good but the problem comes when the teacher ask my peer to teach. That will cause me to have a sense of doubt.

8. AM: **How do you typically prepare for mathematics exams or test**?

Wicky I usually don't prepare. I just tell myself that I will face it in the exam or test.

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Wicky: If the teacher is fast i cannot accommodate the speed. I prefer to a teacher who is slow.

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Wicky: I don't participate. I will be just wait to be picked randomly by the tear

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Wicky: It's okay

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Wicky: Partly

13. AM: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

Wicky: They don't go after it so often.

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Wicky: Yes

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Wicky: As for my plans i don't see the relevance of mathematics especially the study of equations.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

.Sometimes I memorise.

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Wicky: As for me I have to research. Here they don't allow the use of cell phones at the school but if we are allowed we can access YouTube video which explains well some of the concepts.

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Wicky: I don't see as if they are afraid. I see my peers as if they are better than me.

19. AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Wicky: As I it already, I don't want to be taught in a large class. I want to be taught one on one.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Mai Councilor: if I head of maths I got afraid because the subject is so challenging. I don't understand some of the topics. And if I heard of a test I start to be afraid especially thinking of form four examinations.

2. AM: How confident are you in your ability to solve mathematical problems?

Mai Councilor: A little.

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Mai Councilor: Yes whenever I head of maths i got afraid because the subject is so challenging.

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Mai Councilor: Yes especially the topics which are difficult to me.

5. AM: If you have experienced anxiety, can you describe what triggers it?

Mai Councilor: Lack of confidence. In the class a lot of people are good at mathematics. Fear to fail.

6. Am: How does mathematical anxiety impact your performance in mathematics?

Mai Councilor: I can get half of the marks

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Mai Councilor: The methods are good. But in some topics i find it hard to work out the problems

8. AM: How do you typically prepare for mathematics exams or tests?

Mai Councilor: I use my notes to revise. I go through past written exercises.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Mai Councilor: When we at form one our teacher was fast. But in formed 3 we were given a new teacher she is slow and that helps us to grasp the concepts.

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Mai Councilor: Yes

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Mai Councilor: No the content in textbooks is fine

12. AM: Do you feel that your peers influence your feelings about mathematics?

Mai Councilor: Yeah my friends attend extra lessons classes and I do not. They seem knowledge so when they talk of the concept they know i feel like i don't know anything.

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Mai Councilor: I stay with my dad, he wants me to an account so he encourages me to study.

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Mai Councilor: Yes from my friends and our teachers

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Mai Councilor: Mathematics is relevant

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Mai Councilor: I do some revision individually

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Mai Councilor: By having personal study time.

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Mai Councilor: Yes. I can hear them talking how challenging is the subject.

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Mai Councilor: Mathematics is challenging subject but if you work hard you can pass with good grade.

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

Bsm: When I think of maths I feel afraid especially when l don't know or having no

2. AM: **How confident are you in your ability to solve mathematical problems?**

Bsm: When I face a maths problem I don't conclude I cannot solve it before I give a try.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Bsm: It's not challenging but through practice I can do it.

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Bsm: I got worried but not for so long. For instance one day I got worried when i failed to solve a physics question until I figured it out

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

Bsm: In my own view anxiety is triggered when I am no sure of maths problem given to me. Sometimes lack of revision may lead to fear.

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Bsm: It sometimes affect. Let say I faced a challenge on a first question that will affect me on the rest of the questions. I will perform badly.

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Bsm: The teaching styles are good, the teachers give us extra work such homework or assignments.

8. AM: **How do you typically prepare for mathematics exams or tests?**

Bsm: I revise past exam questions. Having group work. I go for extra lessons.

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Bsm: The fastness pace is good as compared to slowness. Slowness leads to relaxation.

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Bsm: No

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Bsm: Textbooks like New General Mathematics and best approach in Mathematics are good. But at our schools the textbooks are limited at that affect us a lot. We end up relying on soft copies.

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Bsm: Yes, they influence as they may fail to raise the money for extra lessons.

13. AM: Do **you think your parents or guardians have any influence on your feelings about mathematics?**

Bsm: Yes, several times

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Bsm: Yes several times

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Bsm: As for me it is relevant for the choice of a career I want to pursue.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Bsm: Downloading videos from Vidmate App helps me to be ahead such that when the teacher comes it will be easier for me to understand.

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Bsm: It should be done in more practical way.

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Bsm: Yes, some usually avoid participating in the class.

19 AM: **Do you think there is a stigma associated with struggling with mathematics or experiencing mathematical anxiety?**

19 AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Bsm: I see, if I managed to solve some tasks I have to share that with someone and that will eventually help me to have a better understanding.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Sammah: I feel a sort of fear.

2. AM: How confident are you in your ability to solve mathematical problems?

Sammah: I don't have confidence. For instance if I am asked to present on the chalkboard i will be afraid that some other learners will laugh at me if I failed to solve the problem.

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Sammah: Yes. You may find it challenging in solving some tasks.

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Sammah: Sometimes

5. AM: If you have experienced anxiety, can you describe what triggers it?

Sammah: The fear of maths result from lack of confidence.

6. Am: How does mathematical anxiety impact your performance in mathematics?

Sammah: Yes, due to lack of confidence even if I worked out a problem and got a correct answer i will tend to copy from a peer who might have found a wrong answer thereby affecting my performance.

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Sammah: No. Let say if our ma'am come for a lesson I don't understand. I understand better if we have one on one lessons.

8. AM: How do you typically prepare for mathematics exams or tests?

Sammah: we prepare through revising past exam question papers.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Sammah: Yes I can manage the pace

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Sammah: No I haven't.

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Sammah: No the books are written properly.

12. AM: Do you feel that your peers influence your feelings about mathematics?

Sammah: Yes because most of them complain that mathematics is difficult. So end up having the same mind.

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Sammah: Most people had failed mathematics and that mind is also in my mum. However she always encourages me to work hard.

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Sammah: I sought it from other learners. I hadn't yet seek help from teachers.

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Sammah: Mathematics is relevant in career choice. As for me i want to be an accountant so there is no way i can run away from mathematics. Most of the jobs need mathematics.

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Sammah: so far i don't have any strategies.

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Sammah: I don't know what to say because generally mathematics causes fear. But you have create time to practice on solving mathematical problem. Sometimes at home i don't get time to revise.

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Sammah: Yes we feel the same. I can tell that from what they talk

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Sammah: I have nothing to say.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics

Judge: I enjoy mathematics. As for me when I feel downhearted I find some mathematical task to solve.

2. AM: How confident are you in your ability to solve mathematical problems?

Judge: If we once learnt the concepts I feel confident

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Judge: No, if you practice its simple.

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Judge: Yes, especially when I told there will be a test.

5. AM: If you have experienced anxiety, can you describe what triggers it?

Judge: The feeling that i may fail increases my anxiety

6. Am: How does mathematical anxiety impact your performance in mathematics?

Judge: The more you think that you may fail will definitely become true.

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Judges: sure, there are some teachers who scare a lot saying that these staffs in maths are difficult. But there are some who encourages that mathematics is simple

8. AM: How do you typically prepare for mathematics exams or tests?

Judges: Two weeks before I start to revise though i even practice every day.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Judge: Yes

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Judge: No i haven't

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Judge: No

12. AM: Do you feel that your peers influence your feelings about mathematics?

Judge: Yes, some might already have anxiety. Just hearing the word maths it's enough to scare them.

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

No, they are supportive encouraging me to try if i fail.

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Judge: Yes from teachers and my peers.

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Maths is important you can't even count money without mathematics. For instance here you can't proceed to A-Level without mathematics.

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Judges: When I am at home, I close the textbook and listen to music for a while to relax the mind and I will continue later

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Judge: You may work in groups and that will help to be less anxious since you are working with others.

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Judge: yes, this can be noted when they start to scratch their heads even close their papers

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Judge: maths needs practice every. One should not over doing it. You should work moderately.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Aj Styles: I don't feel much

2. AM: How confident are you in your ability to solve mathematical problems?

Aj Styles: I am not really that confident

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Aj Styles: No

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Aj Styles: It happens to when writing tests

5. AM: If you have experienced anxiety, can you describe what triggers it?

Aj Styles: As for me the fear comes when I am in the exam. What I do when in the exam i look challenging problems and attempt to answer then. So because they are difficult I will get afraid of failing them

6. Am: How does mathematical anxiety impact your performance in mathematics?

Aj Styles: Sometimes the fear cause my performance to be poor.

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Aj Styles: No but Sometimes they ask another learner to explain to us and this is uncomfortable to us.

8. AM: How do you typically prepare for mathematics exams or tests?

Aj Styles: Sometimes i ask someone to set a test for me and solve the problems.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Aj Styles: Yes their pace is right but as we compare the pace with t the content we are supposed to cover in the syllabus their pace is too slow.

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Aj Styles: No

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Aj Styles: Some of the textbooks omit some relevant step and they don't use the methods we are taught. So during an examination you would be afraid and not be sure of you are using the right method.

12. AM: Do you feel that your peers influence your feelings about mathematics?

Aj Styles: No

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Aj Styles: No

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Aj Styles: Yes my friends help me on areas where i face challenges

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Aj Styles: Yeah because everything we do contributes to maths

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Aj Styles: Sometimes when i open a paper I start by attempting the questions which I know and I omit the ones I find difficult.

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Aj Styles: They have to start by explaining the methods which are simple and then use the challenging methods as optional methods.

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Aj Styles: No

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Aj Styles: I noted that when doing mathematics you don't need to be told by someone. You need to see it yourself. Because the people who will be telling might had faced challenges but if you see it yourself the mathematics problems will be easy.

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

Ronie: When I am doing maths I have a feeling that I like maths. I go afraid to an extent that i don't know where to start from.

2. AM: **How confident are you in your ability to solve mathematical problems?**

Ronie: As for now I am not because I lack resources.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Ronie: If I have resources I don't see it as a challenging subject

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Ronie**:** Not really

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

Ronie: You may work out a question and find out that you are getting to the right answer

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Ronie: There is a point where you obtain low marks that will impact as your mind will tell you that you are not good at mathematics

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Ronie: Mostly, since we started here the teacher were changing so the moment you get used to one teacher he/she got changed. And that affect me a lot.

8. AM: **How do you typically prepare for mathematics exams or tests?**

Ronie: work through the past papers.

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Ronie: As for me i am a slow learner. So teachers usually work with fast learners. So i will be left behind.

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Ronie: Yes I avoid

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Ronie: No it doesn't contribute a lot.

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Ronie: No

13. AM: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

Ronie: They don't

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Ronie: yes from teachers through extra lessons

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Ronie: Mathematics is of relevance in our day to day life especially for buying and selling

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Ronie: I don't have any strategy yet.

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Ronie: It needs clear explanation from the teacher while you are two.

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Ronie: Almost everyone

19 AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Ronie: No.

Student Interview Transcribed Response

1. AM: Can you describe your feelings when you think about mathematics?

Brodie: I usually quit if I fail to solve a mathematics problem.

2. AM: How confident are you in your ability to solve mathematical problems?

Brodie: Some time ago i was confident. What is needed is seriousness

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Brodie: Yes mostly when it is difficult i got bored

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Brodie: Not yet

5. AM: If you have experienced anxiety, can you describe what triggers it?

Brodie: afraid of being picked by the teacher

6. Am: How does mathematical anxiety impact your performance in mathematics?

Brodie: If I noted that the test is hard I will perform poor

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Brodie: They are good but I choose to attend extra lessons

8. AM: How do you typically prepare for mathematics exams or tests?

Brodie: I seek someone who is knowledge. I also revise past exercises

9. AM: Do you find the pace of mathematics lessons to be manageable?

Brodie: As for our pace we are rushing. But i can manage

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Brodie: Not yet

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Brodie: Partly

12. AM: Do you feel that your peers influence your feelings about mathematics?

Brodie: No

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Brodie: The just tell me to be serious

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Brodie: Yes

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Brodie: Yeah especially on calculating money and accounting

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Brodie: I don't have any strategy yes.

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Brodie: Self-confidence is required

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Brodie: Yes

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Brodie: this time mathematics is difficult for me. I am lacking seriousness.

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

Bether: We are happy if we know us going to have a test. The fear comes when we are about sit for the test. Mathematics needs someone who focuses his/her mind on one place. It needs someone who is not overloaded with work to do.

2. AM: **How confident are you in your ability to solve mathematical problems?**

Bether: I have confidence that I will pass at Form 4. The problems comes within our class when my fellow students mocking that i have pride.

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

Bether: Yes it's challenging. I have a challenge in equations.

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

Bether: At times I get bored questioning ourselves why our ma'am is coming for the lesson

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

Bether: Fear in mathematics is caused by lack of concentration and by having an absent mind.

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

Bether: As for mathematics my marks are not good because I am too playful.

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

Bether: Our ma'am is good she goes step by step.

8. AM: **How do you typically prepare for mathematics exams or tests?**

Bether: We use the formats and formulas for solving the problems

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

Bether: Yes, our ma'am does not rush.

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

Bether: I banged some of the maths lesson last term.

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

Bether: No

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

Bether: Yes, especially when you seek help from them.

13. AM: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

Bether: They support me

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

Bether: Yes from several teachers.

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

Bether: Mathematics is important without mathematics you don't have the job.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

Bether: If I am in an examination we work out the problems on rough papers and compare the answers with of my friend. We use mind-sets

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

Bether: It needs yourself and the teacher to work together. Avoid using Meta

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

Bether: A few or two of my friend understand mathematics and I know science so we help each other.

19. AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

Bether: I have nothing to share but you can help me if you have anything to share.

Student Interview Transcribed Responses

1. AM: **Can you describe your feelings when you think about mathematics?**

EHR: Yes, I was afraid what will happen if I fail

2. AM: **How confident are you in your ability to solve mathematical problems?**

EHR: I have little confidence

3. AM: **Do you find mathematics to be a challenging subject? If so, in what ways?**

EHR: Yes, because of failing to understand. I think I need one on one lessons

4. AM: **Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?**

EHR: On some topics especially on simultaneous equations

5. AM: **If you have experienced anxiety, can you describe what triggers it?**

EHR: It fails me

6. Am: **How does mathematical anxiety impact your performance in mathematics?**

EHR: It fails me

7. AM: **Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?**

EHR: No

8. AM: **How do you typically prepare for mathematics exams or tests?**

EHR: I revise. I go through my notes. I don’t memorize because i forget easily

9. AM: **Do you find the pace of mathematics lessons to be manageable?**

EHR: No I want a teach who teach step by step

10. AM: **Have you ever avoided participating in mathematics class due to anxiety?**

EHR: I don't because I am afraid to fail

11. AM: **Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?**

EHR: No the examples are clear

12. AM: **Do you feel that your peers influence your feelings about mathematics?**

EHR: No

13. AM: **Do you think your parents or guardians have any influence on your feelings about mathematics?**

EHR: No

14. AM: **Have you ever sought help with mathematics from teachers, peers, or other resources?**

EHR: Yes from teachers

15. AM: **What are your thoughts about the relevance of mathematics in your future life and career?**

EHR: Yes because if we will face problems in life we will be able to solve them. For example in civil engineering.

16. AM: **What strategies do you use (or have you used) to manage your mathematical anxiety?**

EHR: sometimes if we had a lesson with our ma'am we go and ask her if we didn't understand while we are few and she explains to us.

17. Am: **What do you think could be done to make learning mathematics less anxiety-provoking?**

EHR: Working in groups

18. AM: **Do you believe that mathematical anxiety is a common experience among your peers?**

EHR: Yes

19. AM: **Is there anything else you would like to share about your experiences with mathematics and anxiety?**

EHR: Our ma'am needs to explain in a way that help us to understand. Giving formulas that are easy to understand

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Sigz: As for me I feel like my heart have been taken away.

2. AM: How confident are you in your ability to solve mathematical problems?

Sigz: Sometimes I try but mostly it's hard for me.

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Sigz: It's a matter that sometimes the method used in teaching mathematics are difficult to understand:

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Sigz: Yes

5. AM: If you have experienced anxiety, can you describe what triggers it?

Sigz: If our ma'am teaches with a fast pace I end up left behind and I will even hesitate to ask since other learners will seem to be catching up with her.

6. Am: How does mathematical anxiety impact your performance in mathematics?

Sigz: I usually fail

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Sigz: they are slow in teaching we will be behind the syllabus

8. AM: How do you typically prepare for mathematics exams or tests?

Sigz: I revise you textbooks, pas exercise and revision tests

AM: Do you find the pace of mathematics lessons to be manageable?

Sigz: Our ma'am is slow and that helps us to grasp the concept.

9. AM: Have you ever avoided participating in mathematics class due to anxiety?

Sigz: No.

10. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Sigz: No

11. AM: Do you feel that your peers influence your feelings about mathematics?

Sigz: Yes, sometimes others don't write exercise and you end up copying them.

12. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Sigz: Yes the pay for the extra lessons.

13. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Sigz: Yes

14. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Sigz: Mathematics is important because of the businesses we wish to do in future.

15. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Sigz: When I am at home i attempt some the mathematical problems aloneto see if i had grasped the matter.

16. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Sigz: You know for yourself the reason what you come to school for and the career you want to pursue.

17. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Sigz: The are afraid too

18. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Sigz: I have nothing to share.

Student Interview Transcribed Responses

1. AM: Can you describe your feelings when you think about mathematics?

Ednah: Mathematics is frightening

2. AM: How confident are you in your ability to solve mathematical problems?

Ednah: I don't have confidence. People will laugh you if you fail solve

3. AM: Do you find mathematics to be a challenging subject? If so, in what ways?

Ednah: Yes but not too much.

4. AM: Have you ever experienced feelings of anxiety or nervousness during mathematics lessons or when solving math problems?

Ednah: Yes several times

5. AM: If you have experienced anxiety, can you describe what triggers it?

Ednah: I started from form one to be afraid of mathematics. We were not used to solve for x and y

6. Am: How does mathematical anxiety impact your performance in mathematics?

Ednah: Last time got an A

7. AM: Do you believe that your teachers' teaching style contributes to your feelings about mathematics? How so?

Ednah: Yes our ma'am speaks while she is nosing that you could not hear what she says clearly.

8. AM: How do you typically prepare for mathematics exams or tests?

Ednah: I use textbooks to revise what we have learnt.

9. AM: Do you find the pace of mathematics lessons to be manageable?

Ednah: i want a moderate pace.

10. AM: Have you ever avoided participating in mathematics class due to anxiety?

Ednah: No but i am not confident in solving in front of others on the chalkboard

11. AM: Do you think the way mathematics is presented in textbooks or other learning materials contributes to your anxiety?

Ednah: No I read and understand from a textbook.

12. AM: Do you feel that your peers influence your feelings about mathematics?

Ednah: My friend likes maths

13. AM: Do you think your parents or guardians have any influence on your feelings about mathematics?

Ednah: My mum wants me to do mathematics and pass it.

14. AM: Have you ever sought help with mathematics from teachers, peers, or other resources?

Ednah: Yes from our ma3

15. AM: What are your thoughts about the relevance of mathematics in your future life and career?

Ednah: The job I want to do requires mathematics. I want to be a medical doctor.

16. AM: What strategies do you use (or have you used) to manage your mathematical anxiety?

Ednah: I work out individually

17. Am: What do you think could be done to make learning mathematics less anxiety-provoking?

Ednah: Given work to work on individually

18. AM: Do you believe that mathematical anxiety is a common experience among your peers?

Ednah: Yes it is worse in our class

19. AM: Is there anything else you would like to share about your experiences with mathematics and anxiety?

Ednah: Mathematics needs self-study rather than only waiting for the teacher.

APPENDIX 4: Teacher Focus Group Discussion Questionnaire: Strategies for Handling Mathematical Anxiety

Introduction

• Thank you for participating in this focus group discussion.

• The purpose of this discussion is to explore effective strategies for addressing mathematical anxiety among O-Level students in rural schools.

• Your insights and experiences are invaluable in developing practical and relevant solutions.

• Please feel free to share your thoughts openly and honestly. All responses will be kept confidential.

Discussion Points

1. What are the common challenges faced by O-Level students in rural schools regarding mathematics?
2. How prevalent is mathematical anxiety among O-Level students in your experience?
3. What are the potential contributing factors to mathematical anxiety in this specific context?
4. What strategies are currently being employed in your school to address mathematical anxiety?
5. How effective have these strategies been in mitigating mathematical anxiety?
6. What are the challenges associated with implementing these strategies in a rural school setting?
7. What innovative strategies could be employed to effectively address mathematical anxiety among O-Level students in a rural setting?
8. How can we make mathematics more engaging and accessible for students who experience anxiety?
9. What role can teachers, parents, and community members play in fostering a supportive environment for students struggling with mathematical anxiety?
10. What are the practical considerations for implementing these strategies in a resource-constrained environment?

Appendix 5: Teacher Focus Group Discussions Transcribed Sample

Teachers Responses

Discussion Point 1

What are the common challenges faced by O-Level students in rural schools regarding mathematics?

T1: Lack of access to quality learning materials, outdated textbooks, and limited resources.

T2: Large class sizes making individual attention difficult. Many students lack basic numeracy skills from primary school.

T3: Poor infrastructure – inadequate classrooms, lack of electricity for technology use.

T4: High student-teacher ratio, leading to less individual support. Students often have to walk long distances to school, affecting their concentration.

T5: Limited parental involvement due to factors like poverty and lack of education. Students often have household chores that take away from study time.

Discussion Point 2

How prevalent is mathematical anxiety among O-Level students in your experience?

T1: Very prevalent. Many students visibly panic during tests and exams.

T2: Significant. I have noticed that some of my students freeze up when faced with a challenging math problem. They get so overwhelmed that they can't even remember the steps they have learned. If we could teach them some simple relaxation techniques, maybe they could calm down and access their knowledge more easily.

T3: Quite high. A considerable number of students underperform in math despite having the potential.

T4: It is a major issue. Many students express fear and negative self-talk about mathematics.

T5: I would say it's a widespread problem affecting a majority of our students.

Discussion Point 3

What are the potential contributing factors to mathematical anxiety in this specific context?

T1: Poor teaching methods, focusing too much on rote learning and not enough on understanding.

T2: Lack of early intervention for students struggling with foundational math concepts.

T3: Negative experiences with mathematics in primary school, creating a fear of failure.

T4: Socioeconomic factors: poverty, lack of parental support, and limited access to resources.

T5: The pressure to succeed academically, coupled with limited resources and support, creates intense stress.

Discussion Point 4

What strategies are currently being employed in your school to address mathematical anxiety?

T1: I have found that shifting my feedback from focusing solely on whether students got the right answer to emphasizing the strategies they used and the effort they put in has been incredibly impactful. Instead of just saying 'Good job, you got it right!' I try to say things like, 'I really like how you broke down that problem into smaller steps. That is a great strategy!' or 'You persevered through that challenging problem, and your effort really paid off.' This has helped students understand that math is about the journey of learning and problem-solving, not just about achieving the 'correct' answer. It is about building their mathematical thinking and resilience.

T2: I have noticed a huge shift in student confidence since implementing more group work in my math class. Students who were previously hesitant to participate or ask questions are now actively engaging with their peers and helping each other understand the concepts. It's amazing to see them build on each other's ideas

and learn from different perspectives. They seem less worried about getting the 'wrong' answer when they know they have a supportive group to work with.

T3: I have been trying to create a culture where students feel comfortable asking for help and collaborating with their classmates. I structure activities where they have to explain their thinking to each other and work together to solve problems. This has not only helped them develop a deeper understanding of the material but also reduced their anxiety about making mistakes. They realize that everyone struggles sometimes, and it's okay to ask for help from their peers.

T4 One of the most effective strategies I have found is to create opportunities for students to teach each other. For example, I will have students who have mastered a particular concept explain it to those who are struggling. This not only helps the struggling students but also reinforces the understanding of the 'teacher' and builds their confidence. It also creates a sense of shared responsibility for learning, reducing the pressure and anxiety associated with individual performance.

T5: We offer extra help sessions for students struggling with the subject.

Discussion Point 5

How effective have these strategies been in mitigating mathematical anxiety?

T1: Somewhat effective, but we need more comprehensive approaches.

T2: Limited success. The underlying anxiety often persists.

T3: They have helped some students, but not all. We need more targeted interventions.

T4: The impact has been marginal. More resources are needed.

T5: While they have helped create a better learning environment, they haven't fully addressed the root causes of anxiety.

Discussion Point 6

What are the challenges associated with implementing these strategies in a rural school setting?

T1: Limited resources, lack of training for teachers, and large class sizes.

T2: Lack of access to technology and other learning aids.

T3: Parental involvement is often low due to various factors.

T4: The geographical isolation of the school makes it difficult to access support and resources.

T5: High teacher workload makes it difficult to dedicate enough time to individual students.

Discussion Point 7

What other strategies could be employed to effectively address mathematical anxiety among O-Level students in a rural setting?

T1: Incorporating technology, if accessible, through interactive learning platforms.

T2: Using real-world examples and applications of mathematics to make it relatable.

T3: Mentoring programs connecting older students with younger ones.

T5: Instead of just marking problems right or wrong, I have started to provide more detailed feedback on students' work. For example, if a student makes a mistake in their calculations, I will point out where they went wrong and explain the correct process. I also make sure to highlight the parts of their work that are correct and show them how they can build on their strengths. This way, they understand that even when they make mistakes, they are still learning and developing their skills. It is about focusing on the process and growth rather than just the final answer.

T5: I have found that providing feedback that focuses on specific learning goals is really helpful for students. Instead of just saying 'good job' or 'try again', I try to link my feedback to the specific skills or concepts we were working on. For example, I might say, 'You have shown a great understanding of fractions in this problem, but you could improve your ability to apply that knowledge to word problems.' This type of

feedback helps students understand what they need to work on to improve and feel more confident in their abilities. It is about helping them see their progress and potential for growth.

Discussion Point 8

How can we make mathematics more engaging and accessible for students who experience anxiety?

T1: Use storytelling and real-life examples to make math relatable.

T2: Focus on conceptual understanding rather than rote memorization.

T3: Incorporate group work and collaborative learning.

T4: I have noticed a significant change in students' attitudes towards challenges since I started implementing a growth mind-set approach. Before, students would often give up quickly if they encountered a difficult problem. Now, they are more willing to try different strategies and persist even when they make mistakes. I think this is because they have come to understand that their mathematical abilities are not fixed, but rather something they can develop through effort and practice. For example, when a student struggles with a complex problem, I'll say something like, 'It is okay to find this challenging. Everyone learns at their own pace. Let's work through this together, and I am confident you can figure it out with some focused effort.

T5: Create a non-judgmental and supportive classroom environment.

Discussion point 9

What role can teachers, parents, and community members play in fostering a supportive environment for students struggling with mathematical anxiety?

T1: I have started framing mistakes as 'opportunities to learn' rather than failures. I have noticed that when students understand that mistakes are a natural part of the learning process, they become less afraid to try new things and participate actively. It is been really powerful to see them embrace challenges and learn from their errors, rather than getting discouraged.

T2: I have been trying to model this myself. I will share my own mathematical mistakes with the class and talk about how I used those mistakes to improve my understanding. It is amazing how this simple act can shift the students' perspective. They realize that even teachers make mistakes, and it is okay to struggle. This has created a much safer and more open learning environment.

T3: I have implemented a 'mistake celebration' in my classroom. When students identify a mistake in their work or during a problem-solving activity, we discuss it as a group. We analyse what went wrong, explore alternative approaches, and learn from the error. This has been incredibly effective in shifting the focus from the 'wrong' answer to the learning process. Students are now more willing to take risks and try different strategies without fear of judgment.

T4: Collaboration between teachers, parents, and community is crucial for success. This is practical, if the student knows that the teacher and his/her work together he develops more confidence

T5: Open communication and shared understanding of the issue are key.

Discussion Point 10

What are the practical considerations for implementing these strategies in a resource-constrained environment?

T1: I have found that using math games and puzzles can really capture students' attention and make learning more interactive. When they are having fun, they are more likely to participate and engage with

the material. We have seen a significant improvement in student motivation and participation since incorporating these activities into our lessons.

T2: Connecting math to real-world scenarios has been a game-changer for some of my students. When they see how math is used in everyday life, like calculating budgets or designing structures, they start to understand its relevance and value. It's helped to dispel the misconception that math is just a bunch of abstract concepts with no practical application.

T3: Leverage community resources and partnerships.

T4: Adapt strategies to fit the available resources.

T5: Creative and resourceful solutions are essential.

APPENDIX 6: LETTER OF SEEKING PERMISSION TO CARRY OUT THE RESEARCH

APPENDIX 7: CONFIRMATION LETTER OF CARRYING OUTTHE RESEARCH