SYSTEMATIC DESENSITISATION AND MINDFULNESS TECHNIQUES IN THE MANAGEMENT OF MATHEMATICS ANXIETY AMONG SECONDARY SCHOOL STUDENTS IN THE IBADAN METROPOLIS, NIGERIA

BY

Sekinat Olayemi, SALAHUDEEN

(MATRIC. NO.: 160477)

B.Ed Guidance & Counselling/Mathematics (Ibadan), M.Ed. Educational Psychology (Ibadan)

A Thesis in the Department of Counselling and Human Development Studies,

Submitted to the Faculty of Education

In partial fulfilment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

of the

UNIVERSITY OF IBADAN

AUGUST, 2023

CERTIFICATION

I certify that this work was carried out by Salahudeen Sekinat Olayemi with Matric No: 160477, in the Department of Counselling and Human Development Studies, University of Ibadan.

…….

Supervisor

A. E. Awoyemi

BA.Ed (Ife), M.Ed., Ph.D (Ibadan)

Professor, Department of Counselling and Human Development Studies,

University of Ibadan, Nigeria.

DEDICATION

This work is dedicated to God Almighty

ACKNOWLEDGEMENTS

All glory, honour and adoration go to God Almighty. He that can do what man cannot do for sparing my life to this stage of living. I appreciate Him for the strength given, always meeting me at every point of need, granting me sound mind in a healthy body which are priceless to the successful completion of this programme.

I acknowledge the Head of Department and my supervisor, Professor A. E. Awoyemi, my tireless supervisor and mentor, deserves a great deal of respect and honour. He was always ready to provide unimaginable assistance whenever the need arose, and I am truly grateful for his patience and encouragement throughout my study. He will continue to be accompanied, guided, protected, and directed by God Almighty.

My appreciation also goes to other lecturers in the Department. They are Profs. Charles Uwakwe, Ajibola Falaye, Oyesoji Aremu, Teslim Ayo Hammed, Chioma Asuzu, David Akinlolu Adeyemo, Rotimi Animasahun, David Adebayo Oluwole, and Moses Ogundokun. I appreciate Dr Ndidi Ofole, Dr Joseph Fehintola, Dr Micheal Audu Jimoh, Dr Adetola Adeyemi, Dr Abdul-Fatai Owodunni, Dr Kabir Taiwo, Dr Bunmi Oyekola, Dr. Kunle Odedokun, Dr. Olukemi Akinyemi, Dr. Olaide Akintola and Dr. Temitope Adeleye.

I thank my parents, Chief Oladosu Olanrewaju Ogundare and Chief Moriyike Adedoja Ogundare, and siblings for their unflinching support towards the success of this program. Special thanks also go to my husband, Kola Salawu and children, Abdulhameed Salahudeen and Faridah Salahudeen. I can’t forget my cousin, Dr. Olayiwola Ojo for his untiring assistance, editing, proof reading and giving his invaluable time to take me through the end of this research work.

Sekinat Olayemi SALAHUDEEN

ABSTRACT

Mathematics anxiety, an intense emotional feeling of apprehension that manifests when one engages in mathematical tasks often results in low achievement in mathematics. Evidence from literature has shown that secondary school students in the Ibadan Metropolis, Nigeria, exhibit mathematics anxiety. Previous studies focused more on predictors of mathematics anxiety than on interventions. This study, therefore, was designed to investigate the effects of Mindfulness Technique (MT) and Systematic Desensitisation (SD) in the management of mathematics anxiety among secondary school students in the Ibadan Metropolis, Nigeria. The moderating effects of gender and mathematics self-efficacy were also determined.

The study was anchored to Deci and Ryan's Self-Determination Theory, while the pretest- posttest control group design with a 3x2x3 factorial matrix was adopted. The multistage sampling procedure was used. The simple random sampling technique was used to select three (Ibadan North East, Ibadan North and Ibadan South East) out the five Local Government Areas (LGAs) in the Ibadan Metropolis. Three schools (one from each LGA) were randomly selected. The students in the selected schools were screened with Dave Wood Mathematics Anxiety Scale (α=.74) and those who scored 50 points benchmark and above were selected and assigned to MT (35), SD (36) and control (32) groups. The instruments used were Betz Mathematics Anxiety (α=.89),Betz and Hackett Mathematics Efficacy(α = 0.81) scales, and instructional guides. The intervention lasted eight weeks. Data were analysed using descriptive statistics, Analysis of covariance and Scheffe Post-hoc test at 0.05 level of significance.

The majority (65.0%) of the participants were female. There was a significant main effect of treatment on mathematics anxiety ($F_{(2;85)} = 3.77$; partial$\tilde{\eta}^2 = 0.08$). The participants in the MT had the least mean score (36.28) on mathematics anxiety, followed by those with SD (42.27) and the control (48.56) groups. There was a significant main effect of mathematics self-efficacy on mathematics anxiety ($F_{(2;85)} = 4.81$; partial $\tilde{\eta}^2 = 0.10$).The participants with high mathematics self-efficacy had the least mathematics anxiety mean score (32.33), followed by those in the moderate (43.50) and low (44.53) mathematics self-efficacy groups. There was a significant interaction effect of treatment and mathematics self-efficacy on mathematics anxiety ($F_{(4;85)}^{=} 4.08$; partial$\tilde{\eta}^2 = 0.16$) in favour of the participants with high mathematics self-efficacy (32.33) in the MT group. There was no significant main effect of gender on mathematics anxiety. The two-way interaction effect of treatment and gender as well as the three-way interaction effect were not significant.

Mindfulness and systematic desensitisation techniques reduced mathematics anxiety of the secondary students, in the Ibadan Metropolis, Nigeria with special attention to mathematics self-efficacy. Educational and counselling psychologists should utilise these interventions to manage mathematics anxiety among the public secondary school students.

Keywords: Mathematics anxiety, Mathematics self-efficacy, Mindfulness technique, Systematic desensitisation

Word count: 446

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Mathematics is one of the core subjects offered by all students in the secondary school as it also manifests in many courses till tertiary levels of education (National Policy on Education, 2013). The compulsory nature of Mathematics carries with it the assumption that the knowledge of the subject is essential for all members of our society. Taiwo (2014) notes that indeed, no nation that wants to develop scientifically and technologically neglects the mathematical component of her school curriculum. The increasing attention given to Mathematics stems from the fact that without Mathematics, there is no science, without science, there is no modern technology and without modern technology, there is no modern society.

The learning and teaching of Mathematics all over the world, most particularly in the developing countries like Nigeria, has been of great concern to the generality of the people. The reason is not far from the fact that a number of events in the educational world have made people to realize the indispensable role that the knowledge of Mathematics can play in the life of every individual in the world today. It has been observed that Mathematics is indispensable because it has substantial application of all subjects, especially more in Science and Technology. This is responsible for the status of the subject as a core and compulsory subject for students in primary and secondary schools in Nigeria.

Indeed, the evolution of Information and Communication Technology (ICT) derives a lot from Mathematics. The subject of Mathematics is very important to all human existence because it is all about finding solutions to problems. Several studies have established the role that Mathematics can play in the study of other school subjects (Olowojaiye, 1998a; Baiyelo, 1998) and also affirm that the depth of mathematical knowledge of an individual dictates and widens the post-secondary educational and career options one would take. Furthermore the study of Mathematics was established to

produce a competent person who is able to apply knowledge of Mathematics in everyday life effectively and responsibly in solving problems and making decisions. Despite the increasing importance of Mathematics, it is very disappointing to note that students' performances in the subject in both internal and external examinations have remained consistently poor (Muraina, 2016). Mathematics educators have put up noble and spirited efforts aimed at identifying the major causes of the decline in the students' performance in Mathematics in Nigerian school systems. With all these noble efforts, the problem of students' poor achievement in Mathematics has continued to rear its ugly head in the nation's public examinations. To substantiate this claim, the results of students in Mathematics in the West African Senior School Certificate (WASSCE) from 2010 to 2020 are presented in the table below.

Table 1: ANALYSIS OF WAEC RESULTS IN MATHEMATICS (2010 – 2020)

Year	Total number of candidates who sat the examination	Number of candidates who obtained (A1-C6)	Percentage of those who obtained (A1-C6)	Number of Students with (D7-F9)	Percentage of Students with (D7-F9)	Number of Unreleased Results	Percentage of Unreleased Results
2010	1,351,557	409,116	30.27	892,298	66.02	50,143	3.71
2011	1,540,250	415,251	26.96	1,029,041	66.81	95,958	6.23
2012	1,675,224	628,879	37.54	949,182	56.66	97,163	5.80
2013	1,543,683	638,930	41.39	799,937	51.82	104,816	6.79
2014	1,692,435	638,217	37.71	910,192	53.78	144,026	8.51
2015	1,593,442	550,694	34.56	911,449	57.2	131,299	8.24
2016	1,544,234	483,191	31.29	949,704	61.5	111,339	7.21
2017	1,471,151	443,699	30.16	921,529	62.64	105,923	7.20
2018	1,572,396	511,186	32.51	938,878	59.71	122,332	7.78
2019	1,590,173	544,316	34.23	920,551	57.89	125,306	7.88
2020	1,538,445	510,302	33.17	911,683	59.26	116,460	7.57

Source: Test Development Division, West African Examination Council (WAEC) 2021

In daily life, the perception is that Mathematics is very important but viewed as a difficult subject. Yang (2014) asserted that to many people "MATH" is a scary four letters word; they don't like it or feel they are good at it'. This has to do with preconceived notions about Mathematics and the anxiety several individuals have for Mathematics.

Anxiety is a subjective feeling of unease, discomfort, apprehension or fearful concern accompanied by a host of autonomic and somatic manifestations. It is a normal, emotional, reasonable and expected response to real or potential danger. Anxious people are likely to have intrusive thoughts about how badly they are doing, which may distract attention from the task or problem at hand and overload working memory resources. It has been found in many studies over the years that general anxiety as a trait is associated with working memory deficits (Berggren and Derakhshan, 2013).

Mathematics anxiety is an intense emotional feeling of anxiety that people have about their ability to understand and do Mathematics. Thus, Mathematics anxiety has consistently been proven to be debilitating on Mathematics achievement (Preston, 2008). Students who suffer from Mathematics anxiety feel that they are incapable of doing activities and classes involving Mathematics. They therefore tend to perform poorly on Mathematics tasks (Finlayson, 2014; Nunez-Pena, Pellicioni, and Bono, 2013). Such an experience can leave a student believing he or she is deficient in Mathematics. This belief can actually result in poor performance, which serves as confirming evidence to the students.

The concept of Mathematics anxiety is referred to as feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations. It is also described as a person's negative affective reactions to situations that involve Mathematics, numbers, and calculations. These reactions range from mild to severe and could manifest through feelings of panic, discomfort, flurry, avoidance, fear of failure, a blank mind, and helplessness (Bekdemir, 2010). Mathematics anxiety could weaken an individual's state of mind and eventually progress to Mathematics avoidance and Mathematics phobia, resulting in low achievement in Mathematics. There is a negative relationship between students' Mathematics anxiety and Mathematics achievement (Khatoon and Mahmood, 2010;

Merritt, 2011). According to Ashcraft and Moore (2009), Mathematics anxiety is a significant impediment to Mathematics achievement, one that affects a considerable portion of the population and one that merits serious attention both in terms of assessment and intervention.

Similarly, Mathematics anxiety was defined as the level of discomfort that occurs among students in response to situations involving mathematical tasks, which is seen as a threat to their self-ability. It is a construct that involves cognitive and affective behaviours. This construct is related to personality type, negative attitudes toward Mathematics, Mathematics avoidance, Mathematics background teaching behaviour, achievement levels, lack of confidence and negative experiences in school (Sloan, Daane, and Giesen, 2002). Putch (2002) described Mathematics anxiety as a repetitive process that is based on information gathered by individuals from their surroundings. This information is accumulated and becomes the personal experience of individuals which finally informs their beliefs toward Mathematics. These beliefs produce behavioural situations to escape Mathematics because of an overriding fear of being unable to master Mathematics.

According to Putch (2002) teachers, peers, and parents are responsible for triggering anxiety among students of Mathematics, if students perceive that" Mathematics is difficult" during their formative years, Mathematics anxiety will be triggered. Due to the presence of Mathematics anxiety, such students will strive to escape from any situation that involves Mathematics and strengthen their belief that they are not capable and lack the knowledge to engage in Mathematics and the students will continue to lose confidence in their Mathematics skills as a result. Although these students will continue their course of study in Mathematics, most likely failure will again occur because of their prescribed belief system (Effandi, Normalizam, Nur and Ayu, 2012). Mathematics anxiety can be a disabling condition, causing humiliation, resentment, and even panic, students who experience mathematical problems have their mind go completely blank and feel they cannot do it. Mathematics anxiety has to do with a sense of discomfort while required to work on mathematical problems and with fear and apprehension to specific Mathematics-related situations. Studies point out a host of factors associated with Mathematics anxiety. These variables range from environmental

factors such as family pressure for higher achievement, to intellectual factors as learning styles or to personality factors such as low self- esteem (Taiwo, 2014).

In other words, Mathematics anxiety is a multifaceted construct with affective and cognitive dimensions. Personality, self-concept, self-esteem, learning style, parental attitudes, high expectation of parents, negative attitudes toward Mathematics, avoidance of Mathematics, teachers' attitudes, ineffective teaching styles, negative school experiences and low degree of achievement in Mathematics are among the concepts and constructs related to Mathematics anxiety. Negative school experiences might also contribute to the development of Mathematics anxiety. For example, teachers' threatening and authoritarian attitudes could lead to fearsome classroom climate in which students might hesitate to ask questions or answer the teachers' questions. Furthermore, students fearing their Mathematics teacher might have a conditioned reaction to Mathematics as well. Observing teachers Mathematics homework as punishment could also cause students to perceive Mathematics as unpleasant. As punishment is inherently negative, extra Mathematics assignment as punishment could play a role in cultivating negative attitude toward Mathematics in students who receive the punishment as well as those who witness it. Low grades or failure in Mathematics could also lead to Mathematics anxiety or exasperate students' exiting levels of anxiety for Mathematics (Bursal and Paznokas, 2006).

According to Hughes (2016), Mathematics anxiety was related to students' feelings such as tension, panic and fear towards Mathematics. Students with Mathematics anxiety will avoid facing with situations related to Mathematics. Kargar, Ahmad Tarmizi and Bayat (2010) said that students that had anxiety in Mathematics may be influenced directly by not attending Mathematics classes and this can reflect on their ability to solve Mathematics problems. Students with high anxiety in Mathematics will not perform well in Mathematics tasks since they were not interested in Mathematics. The level of anxiety in Mathematics was different among students. Some of them may have a high level of anxiety and they will become nervous when dealing with Mathematics problems (Puteh and Khalin, 2016).

The impact of Mathematics anxiety varies based on each individual student. Students who suffer from higher levels of Mathematics anxiety typically develop

negative attitudes and emotions toward Mathematics. The most severe consequence of Mathematics anxiety is a decreased level of mathematical achievement. Cates and Rhymer (2003) found that students with higher levels of Mathematics anxiety had significantly lower computational fluency in all areas of mathematical computations; these students, in turn, had lower levels of achievement in Mathematics. Ashcraft and Ridley (2005) found that individuals who suffered from Mathematics anxiety experienced a physical reaction to Mathematics that can be likened to pain. As a result, they generally avoid Mathematics, mathematical courses and career paths that require the mastery of some mathematical skills. Lyons and Beilock, (2012) found that these individuals, avoid Mathematics as natural a response as avoiding pain, since, to them, even the mere anticipation of being confronted with a mathematical problem can be painful.

Researches have been done to investigate the extent of Mathematics anxiety at the secondary level (Aremu, 2014; Taiwo, 2014; Effardi Zakaria, 2012). Research has shown that Mathematics anxiety is one of the psychological factors that affect Mathematics achievement. Students who are weak in Mathematics worry while attempting to use Mathematics skills to solve problems (Mohamed and Tormizi, 2010; Aremu, 2003), the findings of March and Topia (2002) indicate that students with low levels of Mathematics anxiety feel more excited, more confident and highly motivated to learn Mathematics when compared to students who have high anxiety levels. Mathematics anxiety is one of the most serious limitations to education. Many children and young adults develop a fear for Mathematics while they are in school.

Failure in Mathematics, fear and anxiety about it could cause extreme feelings of dislike about Mathematics. Indeed, Hopko, Mahadevan, Bare, and Hunt (2003) observed that persons with Mathematics anxiety make more mistakes in dealing with mathematical problems. Such mistakes lead to lower grades in Mathematics which in turn increases anxiety about Mathematics. As such, the vicious cycle of anxiety, failure and anxiety is perpetuated. Mathematics has been viewed as an inherently difficult subject. Many students are unable to see its practicality and teachers seldom attempt to make the connections. It was also observed that due to its cumulative and sequential nature, when students missed out something along the way, it is likely that they may never fully comprehend it. Furthermore, some students have repeatedly performed poorly, leading to

loss of self-confidence and increased tension. The problem of Mathematics anxiety has been having ripple effects on the major goals and objectives of the school and needs very urgent attention. Studies have been carried out locally on the management of Mathematics anxiety among students. For instance, Falaye and Okoiye (2011) researched on effect of cognitive restructuring and systematic desensitization in the management of Mathematics phobia among secondary school students and Taiwo (2014) investigated the effects of Numerical Cognition and Emotional Freedom Techniques (EFT) on Mathematics anxiety and achievement among students of selected secondary schools. Similarly, Yiyinola, (2009) Muraina, (2016) and Oladosu, (2021) have all conducted researches on management and reduction of Mathematics anxiety, yet, the problem continues unabated. This study therefore, investigates the effects of Systematic desensitization and Mindfulness Techniques in the management of Mathematics anxiety among secondary school students in Ibadan metropolis.

Systematic desensitization means decreasing one's level of anxiety or fear very gently and gradually. Systematic desensitization (SD) is a behaviour modification technique developed by Joseph Wolpe in 1958, 1969, 1973 and 1982 respectively. Joseph Wolpe was not the first to suggest the use of the behavioural technique, but he is generally credited with perfecting it and applying it to the treatment of anxiety disorders. The behavioural approach differs significantly from psychoanalytic thinking in that it is not concerned with the unconscious sources of the problem or with repressed conflicts. The fundamental idea of Systematic desensitization is realization that one has learned an ineffective behaviour (the phobia), and now it must be unlearnt. This formed the basis for Wolpe's method for the treatment of phobias.

Systematic desensitization is a type of behavioural therapy based on the principle of classical conditioning. This therapy aims to remove the fear response of a phobia and substitute a relaxation response to the conditional stimulus gradually using counter conditioning (McLeod, 2015). Selection of systematic desensitization for this study stems from the relative effectiveness over other single therapeutic strategies in phobia management (mathophobia) as attested by available data (Kleinkneck 1986). For example, Barer (1968) used systematic desensitization to modify mathophobia among students. The treatment operates on the belief that relaxation and anxiety cannot exist

simultaneously, thus a client that can relax comfortably in anxiety-provoking imagination would feel less anxious in real life situation.

Systematic desensitization in the context of Mathematics anxiety may be defined as a gradual exposure to the mathematical concepts that are causing students to become distressed and teaching them how to cope with that fear they are dealing with. Each time students are exposed to the Mathematics they fear, they should improve in their techniques in coping with their anxious feelings. Being able to talk about their history with math and releasing their anger, hatred and fear of the subject may be therapeutic in nature and then eventually students can work toward, come to terms with this anxiety, and overcome it. Through these types of counseling approach, students will be able to come to understand that their anxiety was a learned behaviour i.e they were not born with these feelings toward math, and that they can be taught to overcome them by consistently implementing their self-monitoring strategies to become less anxious.

Systematic Desensitisation (SD) is based on the principle of classical conditioning by Wolpe in the 1960s. SD as a method has consistently proven to be effective in the treatment of anxiety and phobias (Richmond, 2017). Systematic Desensitisation (SD) has been found to be effective in reducing test anxiety among Nigerian Secondary School students (Anyamene, Nwokolo and Azuji, 2015; Abood and Abumelhim, 2015; Askhia, 2014; Otta and Ogazie, 2014; Egbochuku and Obodo 2005 and Egbochuku, 1998).

The word ‘mindfulness’ was first coined from the Buddhist/Pali term ‘sati’ around 1881 (Gethin, 2011), although mindfulness has been practised by Buddhists for over 2500 years (Black, 2011). Kabat-Zinn is the leading pioneer for modern day Western mindfulness, defining it as “paying attention on purpose, in the present moment and non-judgmentally” (Kabat-Zinn, 2006, p.145). The mindfulness is a purposeful and nonjudgmental consciousness of what is obtainable or experienced at the present moment. Mindfulness Technique is aimed at increasing adolescents' awareness and knowledge of their status, including their academic status, and makes an individual aware that he is weak in a particular course, and this awareness helps to practice and, consequently, master further and it has been found to be effective in reducing students' Mathematics anxiety. Mindfulness is to fully focus on the present experiences in a purposeful and non-judgmental way. These experiences include human thoughts and

feelings that are accepted only as transient mental phenomena and, unlike cognitive behavioural methods, they are accepted without any need for content analysis or changing them. Mindfulness Technique helps people to accept their thoughts and feelings as they appear. Accordingly, mindfulness results in reduced rumination and thereby, reducing the anxiety and negative mood (Jain, et al. 2007).

Baer, Smith, Hopkins, Krietemeyer, Toney (2006) proposed a model of Mindfulness which includes five different facets of observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Sadjadian, 2015). Mindfulness is an unintentional contemplation with regard to the present and current events. It can also be considered as the ability to self-regulate attention and direct it towards an experience. Accordingly, the thought-out adjustment of attention is the central component of mindfulness Technique. In essence, mindfulness is a method of directing attention to the present moment sensations and perceptions as opposed to rumination about the past or anxiety about the future.

Mindfulness interventions are increasingly used in a school setting (Glomb, Duffy, Bono, and Yang, 2011). The goal of using a mindfulness-based intervention to decrease test related stress and anxiety is to allow students to develop the skills to pay attention to what is happening in the moment, both internal thoughts and bodily sensations, as well as external stimuli, including their physical and social environment. Improvements in third grade-standardized testing with school-based mindfulness interventions have shown to be beneficial in other studies. Increased mindfulness results in increased self-regulation of thoughts, emotions, behaviours, and physiological reactions, which increases the ability to facilitate learning by enhancing cognitive, psychological, and physiological functioning (Glomb, Duffy, Bono, and Yang, 2011). Implementing early intervention can reduce anxiety and stress while teaching students new skills. These new skills can reduce test related anxiety and stress and improve student performance.

The two main components of mindfulness are present-moment awareness and acceptance, with the latter being especially useful for students suffering from anxiety. The acceptance approach teaches individuals to be aware of both positive and negative feelings but to react nonjudgmentally. Instead of fixating on the thoughts, they are

encouraged to let them pass without interference. Some of the benefits that have been attributed to mindfulness practice include: enhanced skill in concentration, improved memory, greater flexibility when responding to events, and increased "self-insight, self-regulation, compassion, wisdom and other outcomes" (Crowley and Monk, 2017). The use and acceptance of mindfulness as an intervention technique to address anxiety and other attention problems in school settings has continued to increase over the last two decades.

The moderating variables of this study are gender and Mathematics self-efficacy. There is no consensus regarding gender differences in Mathematics anxiety. A number of studies reported females are more anxious about Mathematics than males (Bonnstetter, 2007). Also, Ashcraft (2002) found that girls display a higher level of Mathematics anxiety than do boys. Ma (1999) stated that gender differences in Mathematics anxiety do not appear until the end of elementary grades, while this difference becomes stronger among high school and college students where female students have higher anxiety. On the other hand, some researchers reported no difference or minimal differences between Mathematics anxiety levels of males and females (Birgin, Baloglu, Catlioglu, and Gurbuz, 2010). Even in a more recent study, Olmez and Ozel (2012) reported that secondary school males were significantly more anxious than females.

Self-efficacy is the term used to describe how one judges personal competence to complete task and reach a goal (Ormords, 2006). It is the belief in one's ability to succeed in certain situations and thus has a major influence on how challenges are approached. Persons with strong self-efficacy are more confident in their capacity to execute tasks. Self-efficacy affects every area of human endeavour, determining the belief individual holds regarding his or her power to affect situations and face challenges completely (Schwarzer, 2005). Mathematics self-efficacy is commonly defined as individuals' beliefs or perceptions regarding their abilities in Mathematics. Hackett and Betz (1989) defined Mathematics self-efficacy as ''a situational or problem-specific assessment of an individual's confidence in her or his ability to successfully perform or accomplish a particular [Mathematics] task or problem'' (262). Pajares and Miller (1995) also remarked that the confidence assessment should consist of students' judgments of their confidence to solve specific problems rather than of global confidence statements

infused with personal judgments of self-worth. In specific areas, such as Mathematics or science, high levels of self-efficacy can encourage increased interest in the subject, which in turn leads to increased achievement, and a continued path down the Mathematics or science pipeline (Wang, 2013). In a nutshell, Mathematics self-efficacy can have positive or negative effect on Mathematics achievement and anxiety.

It is a known fact that, Mathematics is an important core and compulsory subject in the secondary school curriculum and as such, it is expected that much importance and seriousness should be attached to the subject by all students. However, many students do not perform optimally in Mathematics as a result of many factors, one of which is Mathematics Anxiety.

Mathematics anxiety could lead to inability of students to have incomplete subject combination. A science student who fails Mathematics would not be able to gain admission into higher institutions of learning. Even, those who plan to study courses in humanity like Law, Languages and Mass Communication must have a credit pass in Mathematics as prerequisite for their admission. Equally, Mathematics as a bedrock of science and technology in the modern society requires students who are mathematically inclined. Dearth of these set of students could leads to low technological development. Another problem of Mathematics anxiety is the tendencies of the students to be involved in examination malpractices, a situation that results into low self- esteem and stigmatization. In the same vein, the syndrome also leads to waste of time and resources where students keep repeating and registering the subject. All these equally subject the parents to psychological trauma, worry and anxiety. Teachers of Mathematics equally are not left out of this anxiety. Teachers and school authorities may also devise ways of illegally assisting the students to pass the examination, because of the bad image the failure of students will create for the school. This is a common phenomenon and occurrences in private secondary schools.

It is then the opinion of this researcher that, since Mathematics is a core and compulsory school, subject, students cannot run away from the subject. It is the duty of the teachers, counseling psychologist and other stakeholders to proffer solutions to this malady among the students. Despite the fact that some researchers Akinsola (2002), Taiwo (2014) and Muraina (2016) among others have conducted researchers into

Mathematics anxiety, the anxiety and failure still persist and this has created great gap in the academic performance of students in Mathematics. Based on the above, the researcher intends to empirically investigate the effect of systematic desensitization and mindfulness techniques in reducing Mathematics anxiety among secondary school students in Ibadan, Nigeria.

1.2 Statement of the Problem

Mathematics is a universal subject, so much a part of life that anyone who is a participating member of society must have a considerable knowledge about. The subject is so important that without a credit pass in Mathematics, secondary school students cannot move or promote from one class to the next. It has been observed that students shy away from the study of Mathematics, even though it is the bed rock of science and technology, and this is partly due to Mathematics anxiety.

Mathematics anxiety which refers to the feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations leads to the negative attitudes and poor performance in Mathematics. It is one of the affective reactions to learning Mathematics, and has received a large amount of attention from researchers. As a result of Mathematics anxiety, secondary school students strive to escape from any situation that involves Mathematics and strengthen their belief that they are not capable and lack the knowledge to engage in Mathematics. Thus, the students continue to lose confidence in solving Mathematics problems. It can be a disabling condition, causing humiliation, resentment, and even panic, students who experience Mathematics anxiety have their mind go completely blank and feel they cannot do it whenever they come in contact with any work that involves numbers. A lot of students in Nigeria have been deprived of certain professional and personal opportunities when they become graduates simply because they fear or perform poorly in Mathematics.

Research on Mathematics anxiety consistently demonstrates that the low-anxious students outperform their highly-anxious peers in Mathematics (Hembree, 1999). Although the cause of Mathematics anxiety still cannot be identified clearly, the consequences of being anxious reported low achievement in Mathematics, avoidance of

taking Mathematics courses, pursuing Mathematics as a college major, or even pursuing a Mathematics-related career path. Mathematics anxiety is usually linked to prior negative Mathematics experience. This could include being punished by present or past teachers for failing to solve or understanding mathematical concepts, having a bad grade in Mathematics at school, a lack of encouragement from parents or teachers, and/or a lack of positive role models. These prior negative experiences with Mathematics are often transferred and result in a lack of understanding of Mathematics. Though, a number of solutions have been suggested to help reduce Mathematics anxiety, the problem still continues to persist especially in secondary school and colleges.

Despite several kinds of efforts by individuals and government agencies in response to the consistent poor performance in Mathematics in the West African Senior School Certificate Examination (WASSCE) and National Examination Council (NECO), the country continues to witness the poor performance in the subject. The problem of Mathematics anxiety needs to be addressed for the achievement of the major goals of the school. This study therefore, investigates the effects of Systematic Desensitization and Mindfulness Techniques in reducing Mathematics anxiety among secondary school students in Ibadan.

1.3 Purpose of the Study

This study investigated the effects of Systematic Desensitization (SD) and Mindfulness Techniques (MT) in reducing Mathematics anxiety among secondary school students in Ibadan, Nigeria.

Specifically, this study aims at achieving the following objectives:

- to examine the effect of Systematic desensitization and Mindfulness Techniques in reducing Mathematics anxiety among secondary schools students
- to determine the effect of moderating variables (gender and Mathematics self-efficacy) in reducing Mathematics anxiety among secondary school students
- to examine the interaction effects of treatment, gender and Mathematics self-efficacy in reduction of Mathematics anxiety among secondary school students.

1.4 Hypotheses

The following null hypotheses were tested at 0.05 level of significance

Ho_1. There is no significant main effect of treatment on Mathematics anxiety among secondary school students.

Ho_2. There is no significant main effect of gender on Mathematics anxiety among secondary school students.

Ho_3. There is no significant main effect of Mathematics self-efficacy on Mathematics anxiety among secondary school students.

Ho_4. There is no significant interaction effect of treatment and gender on Mathematics anxiety among secondary school students.

Ho_5. There is no significant two-way interaction effect of treatment and Mathematics self-efficacy among Mathematics anxiety of secondary school students.

Ho_6. There is no significant interaction effect of gender and Mathematics self-efficacy on Mathematics anxiety among secondary school students.

Ho_7. There is no significant interaction effect of treatment, gender and Mathematics self-efficacy on Mathematics anxiety among secondary school students.

1.5 Significance of the Study

The outcomes of this study would be of immense importance to stakeholders in the educational sector especially those saddled with the management of primary and secondary levels of education in Nigeria. The beneficiaries of this study would be the students, teachers of Mathematics, government, policy makers, curriculum planners and counselling psychologists.

The study would help educate students on the factors that contribute to Mathematics anxiety in secondary schools and help them find solution through consulting school counselors or psychologists. Having known the causative factors and consequences of Mathematics anxiety, the students would be able to avoid the ones that are avoidable and face squarely with more confidence the factors that are not avoidable.

Teachers who are saddled with the responsibility of imparting the knowledge of Mathematics as a core subject would gain from the outcome of this study. Thus, in the first instance, findings arising from this study would help in identifying challenges of

learning Mathematics and the causes of failure in the subject as well. Once, identified, teachers, can make use of the findings to understand the language of Mathematics and subsequently, teaching-learning of Mathematics will be fun and Mathematics anxiety will be drastically reduced.

More so findings from this study would propel educational policy makers to formulate policies and design curriculum that will take into cognizance, the needs and characteristics of secondary school students so as to reduce Mathematics anxiety. Apart from these, this study is expected to assist and enlighten the policy makers on the problems facing Mathematics education and relevant solutions to these problems.

Since the youths of today are undoubtedly the leaders of tomorrow, the outcome of the study is highly germane to a better future of the Nigerian nation. The students upon the recommendation made in this study would come out less anxious in Mathematics, thus enhance a more technologically advanced country.

Also, the outcome of this study would be of immense benefit to counselling psychologists. The two therapies used in this study would be added to the body of knowledge on the means of reducing Mathematics anxiety among the students and solving some of the problems encountered learning Mathematics as a school subject. This research would help contribute to the existing body of knowledge especially in the area of Mathematics and related disciplines. This study would gear researchers and academic institutions to research into effective means of solving the problems related to Mathematics anxiety. Finally, future researchers can, through the lens of this research, bridge some existing gaps in literature.

1.6 Scope of the Study

The study examined the effect of Systematic desensitization and Mindfulness Techniques on Mathematics anxiety in Mathematics. Participants in the study consisted of senior secondary school II students which were randomly selected from all the schools in the five local government areas in Ibadan. The schools are co-educational (mixed) schools with similar academic standard. The scope of the study was limited to SSS2 students.

1.7 Operational Definition of Terms

The following terms are defined as used in this study.

Mathematics anxiety: This is an intense emotional feeling of anxiety that secondary school students have about their ability to understand and do Mathematics.

Systematic desensitization: This is defined as a gradual exposure to the mathematical concepts that are causing students to become distressed and teaching them how to cope with that fear they are dealing with

Mindfulness Technique: This is a technique which is aimed at increasing adolescents' awareness and knowledge of their status, including their academic status, and makes an individual aware that he is weak in a particular course, and this awareness helps the client to put self-effort aimed at overcoming the weakness.

Mathematics Self-efficacy: This refers to secondary school students' perceptions of confidence in their abilities to perform well on Mathematics related tasks

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter deals with the review of both theoretical and empirical literatures that are relevant to the study. This is to facilitate an understanding of the various concepts embedded in the research work. The study is anchored to Self-Determination theory. Literatures are reviewed under the following headings;

2.1.1 Concept of Mathematics Anxiety

Mathematics anxiety is generally defined as unpleasant feelings of tension or fear that interfere with Mathematics performance (Ashcraft, 2002; Ma and Xu, 2004). Mathematics anxiety has two components, emotional and cognitive (Liebert and Morris, 1967). The emotional component includes nervousness, tension, dread, fear, and discomfort when doing math (Morris, Davis, and Hutchings, 1981). The cognitive component includes concerns of one's performance, self-doubt, lack of confidence, and negative attitudes (Cemen, 1987; Morris et al., 1981). Learners who are anxious when confronting Mathematics problems are known to experience rapid pulse, nervous stomach, heart palpitations, tension headaches, upset feelings, and sweaty palms (Adams, 2001). The consequences of Mathematics anxiety include lower Mathematics achievement, the avoidance of taking Mathematics related courses, negative attitudes towards Mathematics, and less self-confidence in doing Mathematics (Frost, Hyde, and Fennema, 1994; Hembree, 1990).

Psychological literature provides a number of conceptualizations of Mathematics anxiety (Rabalise, 1988). Richardson and Suinn (1972) defined Mathematics anxiety in terms of its (debilitating) effect on mathematical performance. They observed that the feeling of tension and anxiety interfere with manipulation and solving of mathematical problems in a wide variety of ordinary life and academic situations. Many students who suffer from Mathematics anxiety have little confidence in their ability to do Mathematics and tend to take the minimum numbers of required Mathematics courses, greatly limiting their career choice options (Garry, 2005). Mathematics anxiety is an outcome of low self-esteem and fear of failure. It causes problems for processing the next oncoming information as well as in using previously learned information for problem solving. Students with high level of Mathematics tend to avoid Mathematics whenever or wherever possible (Daane, Judy and Tina, 1986).

By definition, Mathematics anxiety is exclusively related to Mathematics (Hembree, 1990). However, an important issue concerning Mathematics Anxiety's specificity relates to whether Mathematics Anxiety is only linked to mathematics performance or whether it also has associations with other academic domains and skills. The vast majority of research on academic anxiety has focused on Mathematics, yet

research indicates that reading/literacy anxiety may also exist. For instance, children and adolescents with poor literacy have been shown to exhibit more language anxiety than their literate peers (Carroll, Maughan, Goodman, and Meltzer, 2005) and researchers have noted an association between reading difficulties and anxiety symptomology (Carroll and Iles, 2006). Furthermore, Punaro and Reeve (2012) revealed that nine-year-old children reported high levels of worry in a literacy judgement task corroborating the possibility that literacy can elicit anxiety.

Nevertheless, Punaro and Reeve (2012) also discovered that, whilst the high mathematics-worry subgroup only reported a mathematics task to be worrisome and not a language task, the high language-worry subgroup reported both mathematics and language tasks to be worrisome. It may be that these children were worried about Mathematics and about language simply because they were generally anxious children, with a disposition towards many forms of anxiety. General anxiety (GA) differs conceptually and in definition from MA in that it does not relate to a specific situation or activity, but rather refers to an individual's general disposition to worry about events, behaviours and personal abilities. However, evidence suggests that GA and MA may not be entirely independent; GA is moderately correlated with MA (Hembree, 1990) and, in a study exploring the genetic variance of MA, genetic and non-shared environmental factors associated with GA were found to influence MA, implicating GA in MA aetiology (Wang et al., 2014).

There is the further possibility that methodological issues are clouding the issue. Researchers have distinguished between trait and state anxiety (Bieg, Goetz, and Lipnevich, 2014; Goetz, Bieg, Lüdtke, Pekrun, and Hall, 2013). Trait anxiety refers to habitual emotions, whereas state anxiety relates to transitory, contextual worries elicited by real-life experiences. Self-report measures of state and trait anxiety can lead to different results (Porter et al., 2000) and findings reveal higher intensities of trait as compared to state emotions (Goetz et al., 2013). Yet, researchers typically employ self-report questionnaires measuring trait, rather than state MA. Whereas state MA reflects an individual's momentary anxiety levels in a given mathematics-based situation, trait MA reflects an individual's typical feelings towards mathematics, therefore making it more akin to general anxiety. Furthermore, unlike state MA, trait MA levels have been found

to be influenced by dispositional and temperament-based factors such as subjective beliefs (Robinson and Clore, 2002) and competence beliefs (Goetz et al., 2013). Consequently, it is conceivable that typical self-report (i.e. trait) MA measures are influenced by GA levels. With this in mind, a pertinent (yet often overlooked) question relates to whether, and how, general and mathematics anxiety are associated. Are typical self-report MA measures simply highlighting generally anxious individuals rather than those specifically worried about mathematics?

Mathematics anxiety as defined by Whyte, (2009) is a fear that has a negative relationship with performance Mathematics related tasks. Studies point out that Mathematics anxiety is associated with several factors ranging from environmental factors such as family pressure for higher achievement, to intellectual factors as learning styles or to personality factors such as low self-esteem (Uusimaki and Nason, 2004 and Woodard, 2004). Negative school experiences such as teachers' threatening and authoritarian attitudes might also contribute to the development of Mathematics anxiety (Bursal and Paznokas, 2006). Mathematics anxiety is related to general anxiety as well as test anxiety, but it also extends to a more specific fear of Mathematics (Hembree, 1990; Kazelskis et al., 2000). As Richardson and Suinn (1972) point out: "Mathematics anxiety involves feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations" (p. 551). Mathematics anxiety can often affect students who, otherwise, do not generally experience anxiety in other academic subjects.

Mathematics anxiety is important in psychological research due to its consequences: avoidance of future Mathematics related career (Ashcraft, 2002) and course choices (Chipman et al., 1992) or situations containing Mathematics even in daily life context (Kohn et al., 2013). In the PISA 2012 study, overall 59% of students reported worrying that it will be difficult for them in Mathematics classes, and 30% feel helpless when tackling a Mathematics problem (OECD, 2013). According to a definition by Richardson and Suinn (1972), mathematics anxiety "involves feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations". It arises from unpleasant memories (Ma and Xu, 2004; Rubinsten and Tannock, 2010) and is related to

math ability perception (Meece et al., 1990), self-regulation, and self-efficiency processes (Jain and Dowson, 2009) as well as to pedagogical factors (Rayner et al., 2009) and gender. For instance, girls generally report higher levels of math anxiety than boys (Devine et al., 2012). Math anxiety is considered a multidimensional construct. One of the most well-known questionnaires – the Mathematics anxiety rating scale (MARS) – differentiates between mathematics test anxiety and numerical anxiety factors (Suinn and Winston, 2003). Besides this differentiation, the two dimensions most often confirmed are affective (emotional) and cognitive (worry) (Ho et al., 2000; Hopko, 2003; Harari et al., 2013). Furthermore, other factors such as behavioural, situational and physiological levels (Hembree, 1990; Krinzinger et al., 2009) may also play a role.

Mathematics Anxiety shares properties and mechanisms with test anxiety and general anxiety, but can also be distinguished from them (Baloglu, 1999; Kazelskis et al., 2000). Like other anxieties, high demands on cognitive resources and working memory capacities may moderate the relationship between anxiety and test performance (Owens et al., 2012). However, few studies control for other anxieties. In summary, Mathematics anxiety is a common phenomenon which has considerable impact on the performance in mathematics tasks (e.g., Ashcraft and Kirk, 2001). A solid neuron-scientific understanding would provide better perspectives for interventions and therapies, but the underlying neurocognitive mechanisms are still unclear.

The affective component of mathematics anxiety addresses the actual feelings and physiological reactions elicited by a mathematics task in high mathematics-anxious individuals. Thus, individuals with mathematics anxiety reported negative attitudes such as dislike toward Mathematics (Cornell, 1999), negative emotions such as tension (Richardson and Suinn, 1972), frustration (Hembree, 1990), and emotions related to learning outcomes such as shame, hopelessness (Pekrun et al., 2002). On a neural level, two networks representing the emotionality of mathematics anxiety could be found: the pain network involving the insula (Lyons and Beilock, 2012b) and the fear network centered on the amygdala (Young et al., 2012). Regarding the first, mathematics anxiety elicited increased activation in the pain perception network including the bilateral dorso-posterior insula and mid-cingulate cortex (Lyons and Beilock, 2012b). The insula is supposedly associated with the subjective feeling of visceral threat for the upcoming

Mathematics task and relief when confronted with a non-mathematics task. The mid-cingulate cortex was not selective for pain perception *per se* but reflected similar emotionality. The pain-related activity was observed when high Mathematics-anxious individuals faced a math task but not during the Mathematics task itself, explaining that high Mathematics-anxious individuals try to avoid mathematics. Additional analyses confirmed that math anxiety and not differences in math performance was responsible for the affective component.

Mathematics anxiety exists in some adults (Perry, 2004) and is influenced by people's beliefs (Tobias, 1978). It has been described both as an irrational phobia (Hodges, 1983), and a rational fear rooted in real experience of failure and inadequacy (Perry, 2004). Researchers have recently connected high Mathematics anxiety to lower performance on Mathematics tasks, developmental dyscalculia, and lower self-efficacy and beliefs towards Mathematics learning (Maloney,Ansari and Fugelsang, 2011; Rubinsten and Tannock, 2010; Hoffman, 2010; Kesici and Erdogan, 2010.e.g). Mathematics anxiety has four dimensions. These dimensions include "anxiety of learning Mathematics, anxiety of solving problem, Mathematics teacher anxiety, and anxiety of Mathematics evaluation".

Many learners experience Mathematics anxiety in our schools today. Reported consequences of being anxious toward Mathematics include the avoidance of Mathematics and the decline in Mathematics achievement. Suinn, Taylor and Edwards (1988) suggested that it affects many people and threatens both performance and participation. This kind of 'anxiety' was first detected in the late 1950s. Dreger and Aiken (1957) noticed undergraduate college students reacting emotionally to arithmetic and Mathematics. Although this reaction appeared to be similar to test anxiety in general; they found that Mathematics anxiety has an existence of its own. They labeled it 'number anxiety'. It is often assumed that high level of anxiety impairs performance. A moderate amount of anxiety may actually facilitate performance. Beyond a certain degree, however, anxiety hinders performance particularly in the case of higher mental activities and conceptual process (Shemp, 1986).

Skemp (1971) suggested that the reflective activity of intelligence could be inhibited by anxiety. Reasons for Mathematics anxiety are usually classified as

environmental, personal or cognitive. Environmental causes can include negative experiences in Mathematics classes or with particular Math teachers. Personal causes include low self-esteem, lack of confidence and the influence of previous negative experiences. Cognitive causes involve innate characteristics, being either low intelligence or simply poor cognitive abilities in Mathematics. (Rubinsten and Tannock, 2010)

Mathematics anxiety (MA), feelings of unease and worry experienced when thinking about Mathematics or completing mathematical tasks, has been widely studied because of its negative impact on mathematical learning (Richardson and Suinn, 1972). MA is characterized by both physiological (e.g. increased heart rate) and cognitive symptoms (e.g. negative thoughts) and is often considered one of the biggest obstacles to learning in the Mathematics classroom (Baloğlu, 2003). Neuroimaging studies have demonstrated that highly Mathematics anxious individuals show more activation in neural regions associated with the detection and experience of pain (Lyons and Beilock, 2012). Interestingly, this pattern of brain activation was only observed in anticipation of a Mathematics task and not during task completion. This finding corresponds with conceptualisations of anxiety in the achievement emotion literature that describe MA as an anticipatory emotion where failure is anticipated and control over this outcome seems unachievable (Pekrun, 2006).

Feeling anxious about Mathematics has been linked to avoidant behaviour, poor performance and test anxiety (Ashcraft and Ridley, 2005; Beasley, Long, and Natali, 2001; Ho et al., 2000; Kazelskis et al., 2000). In a study of Australian primary students, anxiety about Mathematics was higher than literacy anxiety (Punaro and Reeve, 2012); self-reported MA was negatively associated with Mathematics performance, yet there was no relationship between literacy anxiety and literacy performance. Some researchers suggest that MA occurs when an individual struggles with Mathematics (Ashcraft and Kirk, 2001; Maloney, Schaeffer, and Beilock, 2013). Corroborating research reveals that poor achievement in Mathematics is associated with the development of anxiety (Ma and Xu, 2004); students with severe numerical processing deficits (diagnosed with dyscalculia) also report high levels of anxiety (Rubinsten and Tannock, 2012). However, the idea that MA is merely an epiphenomenon of poor ability or low achievement is overly simplistic. Not all students who under achieve in Mathematics feel anxious and

some students who experience MA perform well on Mathematics tasks. Across the literature, MA has been conceptualised in different forms. For some researchers, MA is similar to a trait or an attitude (Frary and Ling, 1983; Leder and Forgasz, 2002; McLeod, 1994), whereas others regard anxiety as something that is elicited by Mathematics tasks and which can influence subsequent performance (Ashcraft and Ridley, 2005; DeBellis and Goldin, 2006). What really is the origin of Mathematics anxiety?

2.1.2 Origin of Mathematics Anxiety

So far, research has focused mainly on the consequences of Mathematics anxiety. Its antecedents, however, remain largely unexplored. That is, only a small number of studies have focused on Mathematics anxiety as a dependent variable (Jain and Dowson, 2009). However, while little is known about how Mathematics anxiety actually develops, it is generally assumed to be multifactorial in its origins. Jain and colleagues (2009) described Mathematics anxiety as a consequence of "an inability to handle frustration, excessive school absences, poor self-concept, internalized negative parental and teacher attitudes toward Mathematics, and an emphasis on learning Mathematics through drill without "real" under-standing" (p. 240). A more concise description of the causal factors is provided by Devine and colleagues (2012) who classified variables systematically related to the development of Mathematics anxiety into three groups, namely, environmental variables, intellectual variables and personality variables. Environmental variables include negative experiences in class or in family contexts, teacher and parent characteristics, as well as extrinsic detail following the categorization provided by Devine and colleagues (2012), even though classifying a certain variable as belonging to one category or the other is not always unequivocal.

Environmental Influences

Critical for the development of Mathematics anxiety are the attitudes, stereotypes and the teaching style of a child's teachers, since they affect a student's attitudes, motivations, and learning activities in a very direct manner (Ashcraft and Ridley, 2005). Research has shown that distant and unsupportive attitudes on the part of the teacher lead to avoidance on the part of the students (Turner et al., 2002). Ashcraft and Ridley (2005) assume that a teacher's negative attitude and classroom style in combination with being

unsupportive in general, create avoidance reactions and feelings of anxiety related to Mathematics and to Mathematics testing in students.

Moreover, it was found that female elementary school teachers, who are themselves, anxious about Mathematics, pass their negative attitude down to their students. Interestingly, girls seem to be more affected by female teachers' attitudes as they are found to endorse inappropriate stereotypes more readily than boys (i.e. "boys are good at math, girls are good at reading"; Beilock et al., 2010). Similar associations between levels of Mathematics anxiety and students' previous experiences in the context of formal Mathematics education were reported by Harper and Daane, (1998), and Jackson and Leffingwell (1999).

However, not only teachers' but also parents' attitudes influence a child's attitude towards Mathematics. It has been shown, for instance, that a parent's belief about their child's mathematical abilities are systematically related to a student's mathematical self-efficacy beliefs and performance scores (Ec-cles, Jacobs, and Harold, 1990). Furthermore, Eccles and colleagues (1990) state, that "if parents hold gender-differentiated perceptions of, and expectations for, their children's competencies in various areas, then, through self-fulfilling prophecies, parents could play a critical role in socializing gender differences in children's self-perceptions, interests, and skill acquisition" (p. 189). Since gender and gender stereotypes are relevant issues in the context of research on Mathematics anxiety, these factors will be discussed separately.

Cognitive Variables

It is tempting to assume Mathematics anxiety to be directly related to poor mathematical competencies which, in turn, are determining experiences of threat in classroom situations. Challenging such a seemingly straightforward explanation, Suinn and Edwards (1982) point out that about half of the variance in Mathematics performance measures can be explained by other than intellectual factors. Nevertheless, intellectual aspects (e.g. good abstract thinking abilities) can be assumed to diminish the risk for developing Mathematics anxiety.

Another domain-general factor contributing to the development of Mathematics anxiety may be poor visuo-spatial processing abilities. Maloney, Waechter, Risko, and Fugelsang, (2012), for instance, suggest that higher Mathematics anxiety in females may

in part be mediated by sex differences invisuo-spatial processing abilities. That is, poor visuo-spatial processing abilities may affect the development of Mathematics anxiety, mediated by poor mathematical abilities. Intellectual variables include the child's level of more general cognitive abilities, while personality variables comprise concepts such as self-esteem, self-concept, attitude, confidence and learning behaviour.

In the following, relevant variables will be outlined in more However, the available empirical data concerning a causal link between poor visuo-spatial skills and mathematical abilities are inconclusive (Rotzer et al., 2009). Ben-Zeev and col-leagues (2005), for example, suggest that differences in visuo-spatial abilities may actually be largely attributable to environmental influences and hence, suggest gender-related differences rather than sex-related differences to play a major role in this context.

Personality Variables

According to Stuart (2000), the development of Mathematics anxiety often takes its origin from a lack of confidence in situations involving the necessity to handle numerical information. A recent study with adolescents demonstrates that Mathematics anxiety can be modeled as a function of both a person's self-regulation skills and self-efficacy beliefs (Jain and Dowson, 2009). This suggests self-efficacy beliefs with respect to numerical and arithmetic tasks and related self-regulation skills are key factors in the development of anxious reactions to Mathematics. Indirectly, such a relationship was confirmed by studies that report positive associations between self-efficacy and performance, independently from the specific task domain (Bandura and Locke, 2003; Manstead and Van-Eekelen, 1998; Newby-Fraser and Schlebusch, 1998). These findings can be related to Bandura's (1977) theory of self-efficacy that assumes a change of behaviour (e.g., math avoidance) in response to (in this case, weak) self-efficacy beliefs. More direct associations have been shown by studies that related test-anxiety to self-efficacy beliefs (Dykeman, 1994; Hodapp and Benson, 1997) and even more relevant for the present context, self-efficacy beliefs to Mathematics anxiety (Dennis, Daly, and Provost, 2003). In summary, personal variables seem to play a critical role in the origin of Mathematics anxiety. The description of Mathematics anxiety is the outcome of a complex interplay between test anxiety, a generalized fear to fail, negative attitudes

towards learning, and low self-efficacy beliefs further supports this point (Bandalos, Yates, and Thordike-Christ, 1995).

Domains of Mathematics Anxiety

Expressively, there appear to be three major domains or dimensions which are involved with the development of Mathematics anxiety, namely, social-motivational, intellectual-educational and psychological/emotional domains (Strawderman, 2010). There is naturally some overlap between and among them and their boundaries are not well defined. Coupled with each domain is a continuum with extremes on which any given student at any particular time may fall. The social/motivational domain includes those forces that act upon a person through the agencies of family, friends, and society as a whole. The continuum associated with this domain is behavior because although choices are influenced by others, they are ultimately made by the individual. The behavior continuum has avoidance and pursuit as its opposite extremes. These behaviors are logical consequences of the value placed on Mathematics, which is influenced by the attitudes of significant others and by society in general (ibid). The intellectual/educational domain is characterized by those influences that are cognitive in nature. Specifically, they include but are not limited to, the knowledge and skills an individual has and or is expected to acquire and his/her perception of success or failure in them. Although others may "grade" an individual's performance in this domain, people form their own evaluations of their performance in this area.

The continuum associated with this domain is achievement, where individual perception is paramount. Failure and success are the extremes of the achievement continuum, and are the subjective evaluations regarding one's acquisition or use of Mathematics skill and concepts (ibid). The psychological/emotional domain is actually shaped by the affective faculties. It is largely comprised of the individual's emotional history, reactions to stimuli and arousal states. Hence the continuum coupled with this domain is feelings with the extreme ends revealed as anxiety and confidence. The three domains discussed above are theorized to interact in a reinforcing fashion with avoidance behavior, failure in achievement and anxiety feeling (negative cycle) at one end and pursuit behavior, success in achievement and confidence feeling (positive cycle) on the other (ibid). It is apparently the parents' and instructors' role to lessen the negative cycle

and build on the positive cycle in this reinforcing cycle of interaction. Mathematics anxiety causes students to avoid Mathematics, Mathematics classes, and Mathematics related careers (Hembree, 1990), and this avoidance undoubtedly impairs Mathematics achievement.

As such, students can enter into a vicious cycle in which their anxiety causes them to perform worse in Mathematics, and, as a result, they avoid Mathematics and opportunities to improve their skills. It is thus important to note that disruption of working memory processes is not the only link between Mathematics anxiety and poor Mathematics performance. Students who are struggling with Mathematics anxiety have little confidence in their mathematical ability, which in turn can negatively affect the actual performance in a math class. They also tend to take the minimum number of required Mathematics subjects. This tendency greatly limits their career options after graduation. This is unfortunate especially as society becomes more reliant on mathematical literacy. Mathematics anxiety are caused by some factors, some of them are itemized.

2.1.3 Causes of Mathematics Anxiety

The most frequently cited cause of Mathematics anxiety is the teacher, identified by Foong (1987) as the main source of students' tension. Highly-tensed students dread presenting solutions in front of their classmates, viewing such situations as threatening (Ashcraft, 2002). Teachers who complained of insufficient instructional time might resort to preparing their students for assessment rather than for understanding. This creates more tension when students encounter unconventional problems or when the Mathematics becomes more advanced. Researchers also claimed that anxious teachers spend lesser time teaching Mathematics and are more likely to pass their phobia to their students (Hembree, 1990; Ma, 1999). Like teachers, parents could also pass their dread of Mathematics to their children (Hembree, 1990). Parents who are overly-concerned about results end up pressurizing their children, more so in Asian countries. Then there exists this myth that mathematical ability is inborn or hereditary (Godbey, 1997). Others believed that females are weaker in Mathematics even though researchers (Hembree, 1990; Ho et al., 2000) have found that though females tend to be more anxious, they are not necessarily weaker in Mathematics.

Studies on the impact of teaching methods have been inconclusive. Norwood (Preston, 2008) argued that traditional methods intensified students' anxieties though he found that college students who were weak in Mathematics were more at ease with lecture-based teaching. Newstead (1998) claimed that students were more nervous working in groups and Preston added that as most teachers were recipients of direct instruction, they might not enjoy teaching in the constructivist way. Next, Mathematics has been viewed as an inherently difficult subject. Many students are unable to see its practicality and teachers seldom attempt to make the connections. Foong (1987) explained that due to its cumulative and sequential nature, when students missed out something along the way, it is likely that they may never fully comprehend it. Furthermore, some students have repeatedly performed poorly, leading to loss of self-confidence and increased tension. There are others who believe that Mathematics is a measure of their intelligence (Puteh, 2002) and are embarrassed by their inadequate performance. Lastly, student cohesiveness within a class has been found to have a significant positive correlation with Mathematics anxiety level (Taylor and Fraser, 2003). The literature review has underlined the multi-faceted and varied nature of the origins of Mathematics anxiety, thus supporting the research aim to diagnose our students' anxieties.

Most people with Mathematics anxiety have had negative, stressful or excluding Mathematics experiences such as embarrassment or humiliation from failure, teachers who are insensitive or may appear uncaring, negative attitudes about Mathematics from peers or family, and traditional rote learning rather than understanding the processes. Mathematical situations therefore trigger negative thoughts and memories, a feeling of mathematical helplessness or the 'fight or flight' response in the brain. Therefore Mathematics avoidance is common with many students opting out of any subject they think may contain Mathematics as soon as possible and this includes statistics courses. However, it is becoming increasingly difficult to avoid statistics in particular with most disciplines expecting students to use or understand quantitative analysis. Mathematics anxiety is an acquired anxiety which can have a big impact on learning but it is treatable. A number of strategies can be used to address Mathematics anxiety and enable students to move from a position of mathematical helplessness to mathematically resilient

learners. Mathematical resilience is a term used to describe a positive stance towards Mathematics where students overcome their barriers to learning, are motivated to persevere with Mathematics and acknowledge that mistakes are part of the learning process (Johnston-Wilder et al, 2014).

The Growth Zone model (Johnston-Wilder et al, 2014) is a useful framework for understanding different learning experiences and the feelings associated with each. Everyone encounters some Mathematics and statistics in daily life which they are comfortable with; for you this might include working out which is the best offer in the supermarket or thinking about which team might win a fourth-coming fixture based on past performance; you may be comfortable with understanding percentages and charts used in newspapers. 'Comfort zone' activities are activities where you feel confident about your abilities and do not require help. However, at University, you are likely to need to move beyond this comfort zone into the 'Growth zone' where new learning happens, you may make mistakes and you will need resources and/or help from others. If you are challenged beyond your current level of resilience you may find yourself in the 'Anxiety zone', where a feeling of helplessness and fear take over, your thinking becomes impaired, you feel 'stupid' and effective learning cannot happen. In order to progress with Mathematics or statistics, you need to move out of that anxiety zone. Ideally you will develop more mathematical resilience and gradually spend more time in your growth zone. Mathematical resilience is the development of confidence, persistence and perseverance (Williams, 2014) to enable learners to stay in the growth zone as long as possible so that more effective learning can take place. Confident, not challenged, work can be done accurately. You are feeling at risk, not thinking clearly, possibly helplessness, tearful or angry

Stage 1: Understand your anxiety and attitudes

Reflect: Think about your previous experiences with Mathematics. How did negative experiences shape the way you feel about Mathematics and your ability? By the time students get to undergraduate level, 93% of students are thought to have had at least one negative or stressful experience with Mathematics (Jackson and Leffingwell, 1999) and 85% are thought to have some form of Mathematics anxiety (Perry, 2004) so talk to your peers about their experiences and feelings.

Challenge unhelpful beliefs: There are many misconceptions and a negative peer culture about Mathematics. It is very common for people to state that they are bad at Mathematics and that they do not have a 'mathematical brain'. Almost everyone is born with the ability to do some Mathematics and everyone is capable of increasing their mathematical knowledge. Unhelpful beliefs result in people lacking motivation and persistence with Mathematics or statistics and often feeling that there is no point in trying.

Improve self-efficacy: Self-efficacy is the belief that you are capable of successfully performing a task and several studies have shown that high scores of self-efficacy are related to good examination performance. If you believe that you can do it, you are more likely to put the effort in, will be more motivated to do Mathematics and persevere with questions which results in better Mathematics scores. If you find yourself having negative thoughts such as, "I can't do it", "I'm terrible at Mathematics", "I'll never pass", etc, recognise that the worries are taking up valuable brain power and stopping you from even reading the question; try to replace them with positive thoughts such as "I can do it if I am properly supported", and "If I practice, I can pass".

De-stressing: You will need to recognise when you are in the 'Anxiety zone' and develop methods which help you to return to the growth zone. Distraction techniques such as writing down how you feel and leaving the room to do another activity briefly can help. One student has a particular music video she likes to watch to calm her down and in situations where she can't watch the video e.g. examinations, she replays the tune in her head. Breathing techniques where you breathe out for 7 seconds and in for 5 or any techniques suggested for reducing state anxiety generally can help. It can also be helpful to remind yourself of what you can do and return to a question you can do (comfort zone) before attempting something slightly harder again.

Relevance: At school, Mathematics is often taught in an abstract way and students often do not realize the value of Mathematics or how it can be applied in day to day life. Most employers want 'Numerate' graduates and almost all disciplines expect quantitative research so avoiding Mathematics or statistics will exclude you from career options. Websites such as http://www.bbc.co.uk/skillswise/Mathematics use practical applications of Mathematics and examples of how mathematical techniques are used in day to day

life. Many students find they understand statistics better when applying techniques to their own data.

Stage 2: Learning strategies (for when you are in your growth or comfort zone)

Practice: The key strategy is not to put off learning the Mathematics or statistics content, revision for an examination or starting your coursework as no-one becomes good at Mathematics overnight. Mathematics requires practice in the comfort zone just like a language; if you were studying Russian, you wouldn't start two days before the examination but Mathematics anxious students who are avoiding studying often do this and then blame stupidity rather than lack of work for poor performance. You need to master the building blocks at the beginning of your course before you can progress to the harder stuff.

Understand rather than memorize: You are less likely to remember how to do something if you don't understand the process. If you have been shown a calculation in class, go over it again at home and rewrite it in steps you understand. This will make it easier to progress to different questions and you will have good notes for revision. It is also important to remember that there may be more than one method for coming to the right answer. Use the method that suits you best.

One-to-one support: Receiving one-to-one support has been shown to have the greatest impact on reducing Mathematics anxiety. There are Mathematics and statistics help centers (MSC's) in almost all Universities e.g. MASH1 at Sheffield University, which offer free individual and group support with any aspect of your Mathematics or statistics courses or projects. In this environment, you are able to ask questions without fear of humiliation and have explanations tailored to your learning style. It also enables feedback on your understanding which is crucial for building your confidence. To get the greatest benefit, start going at the beginning of your course and attend regularly throughout to build up your knowledge slowly.

Peer learning: A common misconception for anxious students is that everyone else in the class can easily do the work but this is rarely the case. Given 26% of students are thought to have moderate to high levels of Mathematics anxiety, and that Mathematics or statistics are often the most challenging, as well as well as the most fear-inducing, modules students have to study, it's likely that you are not alone. It is also common for

University classes to move at a very fast rate particularly for statistics, and many lecturers are unaware that students are being overloaded or unaware of the effects of Mathematics anxiety. Research suggests that collaborative learning, in which groups work together to construct methods for approaching problems and get feedback on their ideas from their peers, increases confidence and reduces anxiety. Setting aside a time each week to work with a couple of friends can help ensure you keep on top of the work. You could meet anywhere but if you are working in the Mathematics support area, there will be a tutor available to answer any questions.

Using online materials: Online learning can be beneficial to anxious students as the fear of looking stupid in front of their peers is removed. Students have also found that reading lecture material in advance helps reduce anxiety in the class and some do this at the Mathematics support centre so they feel fully prepared. If you are not sure about something you learnt in class, use online materials such as videos or worksheets which may explain things in a different way. The national Mathematics and statistics support center websites mathematics center and stats tutor contain a variety of trustworthy resources as well as your own Mathematics support centre webpages.

Test yourself! Doing unassessed tests/getting feedback will build your confidence slowly, so look for online quizzes or check your understanding with your peers or asking a Mathematics support tutor. If you have not tested yourself until the main examination you will be very anxious. Low levels of anxiety are normal prior to tests but high anxiety levels have been shown to be the strongest predictor of poor performance in examinations. Since it has been confirmed that many students suffer from Mathematics anxiety, interventions are needed to ameliorate the problem and one of the interventions employed in this study is Systematic Desensitization.

2.2.1 Systematic Desensitization

Systematic Desensitization (SD) is a behavioural technique in which a person is gradually exposed to an anxiety-producing object, event or place while in some form of relaxation at the same time in order to reduce the symptoms of anxiety. It is an anxiety reduction technique used by mental health professionals in which an individual is repeatedly exposed to a particular stressor in a controlled, nonthreatening environment

until she is desensitized to it (Zettle, 2003). In this study, the stressor is the expectation of increasing reduction in the rate and frequency of anxiety related to Mathematics tasks over the course of an academic quarter of a high school Mathematics course

According to Wadlington et al. (1992) Systematic desensitization (SD; Wolpe, 1961), one of the behavioral therapies, was designed to establish a hierarchy of anxiety situations using common types of cognitive and related techniques. The SD was adapted to remove the fear response of Mathematics anxiety. The intervention was demonstrated in three individual sessions lasting one-hour. They points out that "a series of well controlled group studies also supported the efficacy of systematic desensitization in the treatment of simple and social phobias" (1987, p. 41). Kleinknecht (1986) makes the same point; "Systematic desensitization has been validated in literally hundreds of experimental investigations. Although evidence of effectiveness has been demonstrated for almost all anxiety disorders, it appears to be most fruitfully applied to the phobias" (1986, p. 155).

Kleinknecht (1986) further describes clinical systematic desensitization processes as occurring in three phases, 1) Relaxation Training, 2) Anxiety Hierarchy, and 3) Desensitization Procedure. The goal of relaxation training is to teach the subject to physically relax their muscles. Kleinknect (1986) states that "there are many effective ways to attain a state of relaxation and for the purpose of Systematic Desensitization it makes little difference which is used" (1986, p. 156). The anxiety hierarchy, as described by Kleinknecht, is the process of creating a graduated list of situations that increase levels of anxious arousal. This list is developed by an individual, and is specific to them. The items on the list should represent a gradual increase in anxious arousal, from a low level of anxiety to a high level. The final step in the systematic desensitization process is called the desensitization procedure. Kleinknecht gives an example of this process by describing treatment for fear of dentists.

In terms of procedures, Kleinknecht points out that many variations of systematic desensitization have been shown to be effective. Further, he states "systematic desensitization was also noted to be effective when conducted in groups and when automated by the use of tape-recorded presentations of the procedure" (1986, p. 190). Kleinknecht concludes by stating that the important issue in this process is that subjects

generalize their lack of anxiety response to the real situation (versus the imagined situation). "This carry over or response generalization does indeed occur" (1986 p. 159). Kleinknecht's clear implication here is that generalization is automatic if it is attempted, and constitutes an almost trivial component of the process.

Researchers in Mathematics anxiety propose systematic desensitization (Furner, 1996; Schneider and Nevid, 1993; Hembree, 1990; Trent, 1985; Olson and Gillingham, 1980) as an effective approach for helping people reduce their math anxiety. Kleinknecht points out that it has been theorized that many anxiety responses, such as those related to computers, have been developed through a classical conditioning process, and that to cure the problem, the link between the stimulus and the anxiety response must be broken. The goal of systematic desensitization is to break that link.

Systematic desensitization is usually selected as the standard against which to evaluate the relative efficacy of other therapies and techniques for several reasons. Perhaps most important, systematic desensitization has been empirically supported as a well-established efficacious intervention for treatment of diverse forms of specific phobia ("Task Force on Psychological Procedures," 1995), thus providing a fairly stringent "benchmark". Given the clinical status of Mathematics anxiety as a type of specific phobia, it is not surprising that systematic desensitization, or variations of it, also has been shown to be one of the most efficacious treatments for math anxiety (Foss and Hadfield, 1993; Hembree, 1990; Schneider and Nevid, 1993; Suinn, Edie, and Spinelli, 1970; Wadlington, Austin, and Bitner, 1992). Finally, systematic desensitization was deliberately designed by Wolpe (1954, 1958) to be a first-order change strategy in which conditioned anxiety is thought to be reciprocally inhibited by a state of induced progressive muscle relaxation. Investigating the efficacy of systematic desensitization in the treatment of math anxiety consequently provided a broader opportunity to evaluate differential outcome and therapeutic processes associated with first-order vs. second-order behavioral change strategies.

The task involved in Systematic desensitization is to enable the person to imagine the anxiety-provoking situations from the hierarchy while maintaining relaxation. This is accomplished by first having the subjects deeply relax. Then the therapist begins by presenting the least anxiety provoking scene from the hierarchy for the subject to

imagine. For example, "Imagine opening a magazine and seeing the word 'dentist'." If the person then experiences any anxiety, he or she is instructed to signal the therapist, usually by raising a finger. At the signal of felt anxiety the subject is instructed to stop imagining the word "dentist" and attempt to regain the full state of relaxation. Usually, a neutral or very pleasant scene, determined in advance, such as lying on the beach in the warm sun, is used at this point to facilitate relaxing and to give the subject something peaceful to think about once relaxation is regained, the anxiety scene is presented again. Each successive presentation typically results in a reduction in anxiety until the subject is able to remain completely relaxed while visualizing the scene. At this point, the second item is presented and the process is repeated for each item until the subject masters the entire hierarchy with no signs of anxiety (Kleinknecht, 1986 p. 158).

2.2.2 Theoretical Propositions of Systematic Desensitization

Earlier research by Wolpe and others had discovered that fear reactions in animals could be reduced by a simple conditioning procedure. For example, suppose a rat behaves fearfully when it sees a realistic photograph of a cat. If the rat is given food every time the cat is presented, the rat will become less and less fearful, until finally the fear response disappears entirely. The rat had originally been conditioned to associate the cat photo with fear. However, the rat's response to being fed was incompatible with the fear response. Since the fear response and the feeding response cannot both exist at the same time, the fear was inhibited by the feeding response. This incompatibility of two responses is called reciprocal inhibition (when two responses inhibit each other, only one may exist at a given moment). Wolpe proposed the more general proposition that "if a response inhibitory to anxiety can be made to occur in the presence of anxiety-provoking stimuli ... the bond between these stimuli and the anxiety will be weakened" (p. 180). He also argued that human anxiety reactions are quite similar to those found in the animal lab and that the concept of reciprocal inhibition could be used to treat various human psychological disorders. In his work with people, the anxiety-inhibiting response was deep relaxation rather than feeding. The idea was based on the theory that you cannot experience deep physical relaxation and fear at the same time. As a behaviorist, Wolpe believed that the reason you have a phobia is that you learned it sometime in your life

through the process of classical conditioning, by which some object became associated in your brain with intense fear (see Pavlov's research). We know from the work of Watson (see Watson's study with little Albert) and others that such learning is possible even at very young ages. So, in order to treat your phobia, you must experience a response that is inhibitory to fear or anxiety (relaxation) while in the presence of the feared situation. Will this treatment technique work? Wolpe's article reports on 39 cases randomly selected out of 150, where the subjects' phobias were treated by the author using his systematic desensitization technique.

The same basic process has been described as the most accepted clinical remedy for simple or social phobias, although he gives slightly different names to its three steps. The information given by Kleinknecht was also expanded by pointing out that there is some concern about the theoretical basis of the procedure. This concern has sparked significant research in the area, and he states that current research has found that "(1) Systematic desensitization conducted exclusively in imagination is decidedly inferior to systematic desensitization conducted with concurrent real-life homework practice; and (2) real-life exposure alone is an exceptionally effective treatment for phobias in and of itself' (1987, p. 41). They conclude these remarks by saying "the status of empirical research at the present time indicates that real-life exposure therapy is the treatment of choice for most clients with simple or social phobias" (1987, p. 41). The other intervention employed in this study is Mindfulness Technique.

2.3.1 Concept of Mindfulness

Mindfulness stems from ancient Buddhist practice and from the perspective that our woken state of consciousness is limiting. Meditation allows us to wake up from this and enables us to live our lives with access to all conscious and unconscious possibilities (Kabat-Zinn, 2009). Bodhi (2003) referred to the word ‘mindfulness’ being created from the Pali word ‘sati’, which refers to being aware, paying attention, and remembering. The term ‘mindfulness’ is often referred to as a psychological state of awareness (Kostanski and Hassed, 2008), and is defined as being attentive and aware of what is happening in the present moment (Brown and Ryan, 2003). In essence, mindfulness is about ‘being’ rather than ‘doing’ (Kostanski and Hassed, 2008). The main advocate for mindfulness,

Kabat-Zinn (2006, p.145), defined mindfulness as “the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment”. “Mindfulness is thought to work by reducing the resources devoted to processing negative stimuli which can then be directed to other cognitive tasks” (Buckley, Reid, Goos, Lipp and Thomson, 2016, p.163). Davis (2012) stated that mindfulness should be considered as an overarching term which encompasses different approaches and is not placed in any one distinct framework. It can be considered as a method, perspective, subjective experience and cognitive process.

The mindfulness is a purposeful and nonjudgmental consciousness of what we obtain or experience at the present moment. (Kabat-Zinn, 1990 quoted by Shiverick, 2012). Mindfulness increases adolescents' awareness and knowledge of their status, including their academic status, and makes an individual aware that he is weak in a particular course, and this awareness helps to practice and, consequently, master further and it seems to be effective in reducing students' math anxiety. Mindfulness is to fully focus to the present experiences in a purposeful and non-judgmental way. These experiences include human thoughts and feelings that are accepted only as transient mental phenomena and, unlike cognitive behavioral methods; they are accepted without any need for content analysis or changing them. Mindfulness helps people to accept their thoughts and feelings as they appear. Accordingly, mindfulness results in reduced rumination and thereby, reducing the anxiety and negative mood (Jain et al. 2007). Baer's Mindfulness Model includes five different facets of observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Sadjadian, 2015). Mindfulness is an unintentional contemplation with regard to the present and current events. Mindfulness can be considered as the ability to self-regulate attention and direct it towards an experience. Accordingly, the thought-out adjustment of attention is the central component of mindfulness (Baer, Smith, Hopkins, Krietemeyer, Toney, 2006). Since there is no comprehensive study on the relationship between mindfulness and math anxiety, present study examines whether there is a relationship between them.

Mindfulness is an approach that has significant potential in addressing the physiological arousal associated with MA. Mindfulness depicts a psychological state of

paying attention to experiences in the moment using an open and non-critical approach (Chiesa, Calati, and Serretti, 2011). Mindfulness is thought to work by reducing the resources devoted to processing negative stimuli which can be directed to other cognitive tasks. Simple mindful breathing exercises utilize sustained attention to breathing and cognitive control to redirect attention back to the focused breathing should attention wander (Moore, Gruber, Derose, and Malinowski, 2012). Even brief interventions are effective in increasing attention, improving mood, improving reaction time, and reducing stress (Tang et al., 2007; Zeidan, Johnson, Diamond, David, and Goolkasian, 2010). Mindfulness training shows benefits in reducing the physiological stress responses elicited by Mathematics tasks (Tang et al., 2007) and in improving performance on Mathematics tasks for individuals with high MA (Brunyé et al., 2013)

Mindfulness research has been conducted on individuals with a range of medical and psychiatric conditions, as well as healthy populations who experience stress, behaviour, and anxiety disorders (Bergen-Cico, Possemato and Cheon, 2013; Dobkin and Zhao, 2011; Mendelson, 2010; Solar, 2013). Increasing mindfulness can significantly reduce anxiety, stress and emotional distress (Bergen-Cico, Possemato, and Cheon, 2013). Participants in a study by Dobkin and Zhao (2011) reported, mindfulness-based training enabled them to bring awareness into their everyday life, leaving them better equipped to respond to outside stressors. Bergen-Cico, Possemato and Cheon (2013), revealed students who participated in a brief, 5-week (10-hour) mindfulness-based intervention program in a school setting experienced considerable improvement in grades. Mindfulness-based intervention also decreased stress in 4th and 5th grade students by improving students' self-regulation (Mendelson, 2010). Constant interaction with their environment, including school, exposes children to multiple stressors, but studies have supported the idea that mindfulness awareness is beneficial in reducing stress.

One effective approach to reducing childhood anxiety and stress is incorporating mindfulness-based intervention into the school curriculum. This can both empower students by addressing anxiety and stress. In studies using quantitative measures of students' perceived levels of stress, evaluations at baseline and at post-test displayed significant reductions in stress (Larson, et. al., 2010; Maynard, Solis, and Miller, 2015;

Zenner, Herrnleben-Kurz, and Walach, 2014; Zoogman, Goldberg, Hoyt, and Miller, 2014). This builds on previous research demonstrating the effects of mindfulness in school based interventions. Specifically, mindfulness-based intervention led to greater well-being, school based competence, and decreased levels of stress. Incorporating mindfulness-based intervention programs into the school curriculum is associated with improved academic performance, self-esteem, mood, concentration, and behavior problems (Costello and Lawler, 2014; Maynard, Solis, and Miller, 2015).

Teachers play an important role in addressing and reducing anxiety and stress in their students. Students who were taught anxiety reducing strategies as part of their curriculum were empowered to learn and practice these techniques (Buchler, 2013). These results compare to a 2010 quantitative study of students who were taught relaxation techniques as part of their curriculum, showed a significant decrease in anxiety from pre-test to post-test (Larson et. al., 2010). Researchers are beginning to understand how mindfulness has the potential to positively influence classroom behaviors (Albrecht, Albrecht, and Cohen, 2012). Teachers implementing classroom-based prevention and intervention to address test related stress and anxiety could be considered a tier one service (providing class-wide intervention), consistent with a multi-tiered system of support (MTSS) framework that is currently promoted in public schools (Vaughn and Bos, 2009). Mindfulness can decrease mental health symptoms and through exposure can increase a students' tolerance to anxious symptoms related to school performance (Malboeuf-Hurtubise, Lacourse, Taylor, Joussemet, and Amor, 2017). Teachers can be trained to model mindfulness for their students. To implement mindfulness interventions in a school-based setting, teachers are considered the appropriate facilitators of change (Zenner, Herrnleben-Kurz and Walach, 2014).

2.3.2 Brief History of Mindfulness

The innovation of Mindfulness came from the Indian sub-continent and owes its roots to the Buddhist meditation practices develop over 2,500 years ago. Modern mindfulness involves techniques from transcendental meditation, yoga, tai chi and other diverse practices. The theory of Mindfulness Based Stress Reduction (MBSR) is a secular, non-religious application of the ancient Buddhist practice that was first initiated

by microbiologist, John Kabet-Zinn during the late 1970s and involves the cultivation of awareness while building skill in attention, executive function, and self-regulation (Buchholz, 2015). MBSR was originally created to treat patients with chronic pain and has grown to be used in the treatment of "emotional and behavioral disorders." The rigorous training in mindfulness techniques is a form of "mental training to reduce cognitive vulnerability to reactive modes of mind" through the mediation of mood and behavior (Bishop et al., 2004, pg. 231).

The mechanism through which regular practice of mindfulness works is believed to result from improvement in switching and sustained attention. Mindfulness practice involves the repeated switching of attention back to the breath each time thoughts wander away from the breath. Practitioners capabilities to keep their awareness on the breath in a "state of vigilance" for longer and longer time intervals is called sustained attention (Bishop et al., 2004, pg.232). Along with regulation of attention, other self-regulation and emotion regulation mechanisms such as decentering, cognitive and emotional flexibility, reduced rumination, self-compassion, and interceptive awareness have also been explored in the literature (Zeidan, 2015, pg. 175). Mindfulness is a truly interdisciplinary theory involving at a minimum the fields of psychology, biology, and neuroscience (Siegle, 2010). Some of the benefits that have been attributed to mindfulness practice include: enhanced skill in concentration, improved memory, greater flexibility when responding to events, and increased "self-insight, self-regulation, compassion, wisdom and other outcomes" (Crowley and Monk, 2017). The use and acceptance of mindfulness as an intervention technique to address anxiety and other attention problems in school settings has continued to increase over the last two decades. The moderating variables in this study are Mathematics Self-efficacy and Gender.

2.4 Mathematics Self-Efficacy

Bandura (2005) defined perceived self-efficacy as "people's beliefs in their capabilities to produce given attainments". Self-efficacy is one's belief, or perception, about one's capability to perform at a certain level on a task. Research has shown that self-efficacy is positively related to academic performance (Hoffman, 2010; Pajares and Miller, 1995; Sartawi, Alsawaie, Dodeen, Tibi, and Alghazo, 2012). Students with high

sense of self-efficacy exhibit strong motivation and approach difficulties as challenges to be mastered; whereas students with low sense of self-efficacy exhibit weak commitment and approach difficulties as threats and with anxiety (Bandura, 1994). On the other hand, some studies in self-efficacy suggested a different perspective. Chen and Zimmerman (2007) and Chen (2003) have found that students who overestimate their self-efficacy tend to show less effort and poor performance. Meanwhile, students who underestimate their self-efficacy are more likely to show more effort and better performance.

Kiamanesh, Hejazi and Esfahani (2005), citing Pajares and Kranzler (1997), define Mathematics self-efficacy as "a situational assessment of an individual's confidence in her or his ability to successfully perform or accomplish a particular mathematical task or problem". Mathematics self-efficacy, then, has concerned whether Mathematics students believed in their abilities to meet the course objectives. An essential characteristic of self-efficacy is that it has a significant relationship with cognitive and non-cognitive constructs, including academic achievement and anxiety (Schunk and Mullen, 2012). Regarding school Mathematics, self-efficacy is found to be one of the most critical variables for explaining difference in Mathematics performance of students that explains quarter of the variance while predicting students' Mathematics achievement (Pajares, 2006). Indeed, Mathematics self-efficacy is a stronger predictor of Mathematics achievement than Mathematics anxiety and previous Mathematics experience (Pajares and Miller, 1994). In an earlier research, Liu and Koirala (2009) investigated the relationship between Mathematics self-efficacy and Mathematics achievement of high school students. Results of correlation analysis and survey linear regression analysis indicated that Mathematics self-efficacy and Mathematics achievement were significantly related. It was also found out that Mathematics achievement could be predicted by Mathematics self-efficacy scores. Over the past three decades, researchers have consistently shown that the belief students hold in their Mathematics capabilities, or *Mathematics self-efficacy*, is predictive of students' achievement and motivation in Mathematics, such as their goal orientation, value, and self-concept (Brown and Lent, 2006; Cheema and Kitsantas, 2013; Hackett and Betz, 1989; Schunk and Pajares, 2005). A host of research has shown that domain-specific self-efficacy measures (e.g., Mathematics self-efficacy) are strong positive predictors of

students' academic behaviours and subsequent motivation in the same domain (Klassen and Usher, 2010). Generalized self-efficacy measures that are not specific to domain are typically unrelated to these same outcomes.

Researchers have reported that the Mathematics Self-efficacy of college undergraduates is more predictive of their Mathematics interest and choice of maths related courses and majors than either their prior math achievement or math outcome expectations (Hackett, 1985, Hackett and Betz, 1989, Lent, Lopeze, Bieschke, 1991, 1993, Pajares and Miller, 1994, 1995). Studies in the second area have investigated the relationship among efficacy beliefs related psychological constructs and academic motivation and anxiety. Self- efficacy has been prominent in studies that have explored its relationship with problem solving (Bouffard- Bouchard, 1989, Larson, Piersel, Imao and Allen, 1990), self-regulation (Bandura, 1991 Shunk, 1982 a), and strategy training (Schunk and Cox, 1985). Math self- efficacy had been shown to be as strong predictor of mathematical problem- solving capability as general mental ability (Pajares and Kranzler 1995), a variable generally found to be a powerful predictor of academic performance (Thorndike, 1986).

In the area of Mathematics performance, various researchers (pajares, 1996; Pajares and Miller, 1994) have reported that student judgment of their capability to solve Mathematics problem are predictive of their actual capability to solve those problems. These judgments also mediate the influences of other predictive such as math background, Mathematics anxiety, and perceived usefulness of Mathematics, prior achievement and gender. Hackett and Betz (1989) defined Mathematics self- efficacy "as a situational or problem- specific assessment of an individual's confidence in her or his ability to successfully perform or accomplish a particular (Mathematics) task or problem" (p.262).

Self-efficacy can be defined as the judgement of one's capabilities to successfully perform a particular given task (Bandura, 1977; Bandura 1997; Zimmerman, 2000). These expectations and beliefs influence whether somebody starts working on a task and the intensity of the performance (Pajares and Kranzler, 1995). As a consequence people with low mathematical self-efficacy will avoid mathematical tasks or situations. Self-efficacy beliefs are a main factor in someone's decision making process, e.g. the choice of

academic courses or career decisions (Hackett and Betz, 1981; May and Glynn, 2008). Especially low self-efficacy beliefs lead to negative decisions in the related domain. Successful learning scenarios – at school or at university – should increase learners' self-efficacy expectations as well as their skills and knowledge. A main source of self-efficacy expectations is one's own successful performance. If a student completes a task autonomously with more or less feedback, s/he develops positive expectations to handle new and unknown situations or problems. However, the effect could be weaker due to the non-existing own performance if learners only 'consume' information about how to solve the task.

In general, self-efficacy expectations "are task and domain specific" (Pajares and Miller, 1995, p.190). For that, measurements of self-efficacy expectations should be always fitted to the related domain or task. For example, questionnaires have been proposed to measure self-efficacy expectations in the field of computer usage (Compeau and Higgins, 1995; Cassidy and Eachus, 2002; Barbeite and Weis, 2004) or Mathematics (Betz and Hackett, 1981; Pajares and Miller, 1995; May and Glynn, 2008). Mathematics self-efficacy expectations indicate the belief of a person in his/her own competence to solve mathematical problems and tasks successfully. Mathematics self-efficacy is positively related to math performance (Pajares and Miller, 1994; Kabiri and Kiamanesh, 2004; Liu and Koirala, 2009). This means that the higher a person rates on Mathematics self-efficacy scales, the better this person performs on solving mathematical problems. There are also gender differences in Mathematics self-efficacy expectations. Males are usually scoring higher in Mathematics self-efficacy questionnaires than females (Betz and Hackett, 1981; Randhawa and Gupta, 2000). It can be assumed that gender effects are based on social and cultural roles and the masculine image of Mathematics.

Mathematics self-efficacy is defined by Betz and Hackett (1983) as quality acquisition of knowledge and skills in Mathematics demonstrated by performance and leads largely to a choice of career in Mathematics/science field. Students with no confidence in the skills they possess shy away from tasks where those subjects are a prerequisite and they are more likely to give up when they face a challenge. Girls have lower confidence in the area of Mathematics than boys. This makes young women non-competitive in this area. Lent, Hackett, and their associates (1987) demonstrated that self-

efficacy beliefs influenced the choice of majors and career decisions of college students. In certain cases, students underestimate their capability and avoid math-related courses and careers, and not lack of competence or skill. Pajares, (2002) found the avoidance affected women more than men. People with a strong efficacy consider a variety of career options and prepare adequately to pursue different occupations. Self-limitation of career development arises more from perceived self-inefficacy than from actual inability. Armstrong and Crombie, (2000) and Rojewski and Yang, (1997) established that occupational aspirations are formed at an early age but are better understood and stabilize over the years.

As college Mathematics instructors respond to the need for fostering students' Mathematics literacy, the important role of students' Mathematics self-efficacy has received increased attention (Hannula, 2006; Pape and Smith, 2002). Bandura (1997) suggested that students with higher levels of self-efficacy tend to be more motivated to learn and more likely to persist when presented with challenging tasks. Bandura identified four main sources of self-efficacy: mastery experiences, vicarious experiences, social persuasion, and physiological states. Students base most of their beliefs about their abilities on their mastery experiences. For example, students who have repeatedly succeeded in previous Mathematics courses will most likely believe that they have the ability to succeed in future Mathematics courses. Vicarious experiences involve students observing social models similar to themselves succeeding with particular tasks. Although this does not contribute as strongly to self-efficacy as mastery experiences, students will feel more confident in Mathematics if they see students they perceive as similar to themselves succeeding in Mathematics. The final two sources contribute the least to students' self-efficacy. Social persuasion refers to encouragement, both positive and negative, from peers, teachers, and parents. Physiological states refer to the student's physical state such as fatigue, pain, or nausea.

Poor Mathematics self-efficacy in college students often decreases their motivation to learn and eventually can lead to low Mathematics achievement. In a study of college freshmen enrolled in a developmental Mathematics course, Higbee and Thomas (1999) found that Mathematics self-efficacy, along with other affective factors such as test anxiety and perceived usefulness of Mathematics, influenced students'

mathematical performances. The results of their study suggest to instructors that focusing on teaching mathematical content is insufficient for some students to learn Mathematics. College Mathematics instructors must also consider emotional or attitudinal factors that influence how students learn Mathematics. The literature on widening participation suggests that high self-efficacy in a subject is crucial to continuing to study a subject (e.g. Bandura and Cervone 1983; Bandura and Locke 2003). Self-efficacy beliefs play a critical role in the academic and career choices of students (Hackett 1985). The importance of considering students' self-efficacy beliefs, in addition to test scores, is stressed in recent research findings, mainly because of its positive influence on academic choices (e.g. Chen and Zimmerman 2007; Pajares and Miller 1997). The relationship between self-efficacy and outcome expectations is not always consistent, according to a recent validation study with middle school Mathematics students (Usher and Pajares 2009): ''A student reasonably confident in her Mathematics capabilities, for example, may choose not to take an advanced statistics course''.

The self-efficacy construct was initially described and contextualised by Bandura, who distinguished two cognitive dimensions in this construct, i.e. personal self-efficacy and outcome expectancy. Self-efficacy (SE) beliefs ''involve peoples' capabilities to organize and execute courses of action required to produce given attainments'' and perceived self-efficacy ''is a judgment of one's ability to organize and execute given types of performances ...'' (Bandura 1997, 3). As such, perceived self-efficacy measures self-belief only in relation to specific activities, for example one's self-belief in one's ability to use Mathematics effectively in the future. In addition, they argued that such global statements decontextualise efficacy beliefs, and transform the construct of self-efficacy into a generalised personality trait rather than the context-specific judgment Bandura (1986) suggested it should be. Several studies (e.g. Marat 2005; Pietsch, Walker, and Chapman 2003; Williams and Williams 2010) have dealt with the relationship of self-efficacy beliefs and students' attainment, in Mathematics. In a recent study, a student's predicted grade was linked to the likelihood of intentions to continue with Mathematics (Brown, Brown, and Bibby 2008). Apart from students' attainment, the latter also refer to students' perceptions of difficulty with Mathematics and their low self-efficacy as other reasons for not studying Further Mathematics. Williams and Williams

(2010) used measures of Mathematics self-efficacy and Mathematics achievement from the Programme for International Student Assessment (PISA) data for 33 countries. They found that there is a reciprocal relationship between students' Mathematics self-efficacy and attainment in Mathematics. Although they found cross-cultural variation in this reciprocal relationship,

Mathematics self-efficacy and Anxiety in their relation to Achievement

Self-efficacy is one of the cognitive concepts from the field of social learning (Bandura, 1997), which can be connected to the classroom climate prevailing in the educational environment. Mathematics self-efficacy is individual's judgment of his capabilities to solve specific Mathematics problems, perform Mathematics related tasks and succeed in Mathematics-related courses (Phan and Walker, 2000a, b; Betz and Hackett, 1983). This definition of Mathematics self-efficacy was used in this study since it suggests specificity and direction to earlier global assessment of Mathematics self-efficacy. Using path analysis, Phan and Walker (2000a, 2000b) investigated the predicting and mediational role of Mathematics self-efficacy and found that students' Mathematics self-efficacy made an independent contribution to the prediction of their performance in Mathematics problem-solving when other motivational variables were controlled.

Mathematics self-efficacy mediated further the effects from multiple sources of self-efficacy information onto performance in Mathematics problem-solving as reported by other researchers as well (Pajares and Kranzler, 1995; Pajares and Miller, 1994). An extensive literature has been summarized on the personal and educational consequences of Mathematics anxiety (Hembree, 1990). Highly Mathematics -anxious individuals are characterized by a strong tendency to avoid Mathematics, which ultimately undercuts their Mathematics competence and forecloses important career paths. Mathematics anxiety is a reaction or phobia (Faust, 1992), with both immediate cognitive and long term educational implications. Turner et al. (2002) hinted the patterns of student avoidance (e.g., not being engaged or seeking assistance) might have resulted from highly demanding teachers for correctness and not providing any cognitive or motivational support during lessons. Highly Mathematics-anxious people also espouse

negative attitudes toward Mathematics, and hold negative self-perceptions about their Mathematics abilities. The correlations between Mathematics anxiety and variables such as motivation and self-confidence in Mathematics are strongly negative, ranging between -.47 and -.82 (Ashcraft, 2002). Mathematics anxiety disrupts cognitive processing by compromising ongoing activity in working memory. The investigations whether Mathematics anxiety has a measurable on-line effect on cognitive processing, that is, whether it actually influences mental processing during problem solving were done earlier (Ashcraft and Faust, 1994; Faust et al., 1996; Ashcraft, 2002). Results consistent with Eysenck and Calvo's (1992) model of general anxiety effects, called processing efficiency theory were found. In this theory, general anxiety is conjectured to disrupt ongoing working memory processes because anxious individuals devote attention to their intrusive thoughts and worries, rather than the task at hand. In the case of Mathematics anxiety, such intrusive thoughts probably involve preoccupation with one's dislike or fear of Mathematics and one's low self-confidence.

Consequently, it lowers Mathematics performance because paying attention to these thoughts acts like a secondary task, distracting attention from the Mathematics task. It follows that cognitive performance is disrupted to the degree that the Mathematics task depends on working memory. In line with these findings, there appears to be a correlation between math anxiety and math achievement. Mathematics anxiety refers to a feeling of fear or tension that interferes with math achievement (Ashcraft, 2002). Mathematics anxiety appears to be a significant predictor of math achievement (Stankov, Lee, Luo, and Hogan, 2012). Controversially, children who are experiencing Mathematics difficulties can develop math anxiety due to experiences of repeated failure (Ashcraft and Krause, 2007; Ashcraft and Moore, 2009). The relation between math anxiety and math achievement is bidirectional (Carey, Hill, Devine, and Szucs, 2016). In the literature, different factors are mentioned that can explain or influence the correlation between Mathematics anxiety and Mathematics achievement. Ashcraft's (2002) study shows that Mathematics anxiety leads to ongoing activity in working memory, which in turn interferes with cognitive processing.

Ramirez, Gunderson, Levine, and Beilock (2013) examined the relation between Mathematics anxiety, problem solving strategies, and Mathematics achievement in a

group of seven- year-old children. The results show that Mathematics anxiety negatively predicts Mathematics achievement, because math anxiety reduces the use of good problem solving strategies. Luo and colleagues (2014) and Wang and colleagues (2015) found a correlation between Mathematics anxiety and Mathematics achievement in young adolescents. The effect of Mathematics anxiety on Mathematics achievement appeared to depend on motivation (Wang et al., 2015). In students with high levels of Mathematics motivation, an average level of Mathematics anxiety facilitated Mathematics achievement. In students with a lower level of Mathematics motivation, a high level of Mathematics anxiety negatively influenced Mathematics achievement (Wang et al., 2015). Hence, the activity of working memory (Ashcraft, 2002), the use of good problem solving strategies (Ramirez et al., 2013) and Mathematics motivation (Wang et al., 2015) are factors that possibly explain or influence the correlation between Mathematics anxiety and Mathematics achievement.

2.5 Concept of Adolescence

Adolescence is the developmental stage between childhood and adulthood; "The period of development from the onset of puberty to the attainment of adulthood. This begins with the appearance of secondary sexual characteristics, usually between the ages of 11 and 13 years of age (Colman 2006). It represents the period of time during which a person experiences a variety of biological changes and involves a dramatic transitions in the physical, social, sexual, and intellectual spheres. This essay will review the theories of adolescences and the extent to which they characterise adolescences as a time of storm and stress as suggested by Hall (1904). Firstly, the changing notion of adolescence through history and its cultural context will be discussed, followed by the biological, psychosocial and cognitive approaches to adolescence. Adolescence as a period of stress and storm can be traced back as far as writings of Plato and Aristotle. Plato (1953) described adolescent boys as constantly arguing and very easily excited. Aristotle (1941) described adolescents as "lacking in sexual self-restraint, fickle in their desires, passionate and impulsive". However, during the middle ages, adolescence was mostly ignored as a life stage and children were viewed as small adults. "Childhood and adolescence were regarded as two sides of the same coin" (Dubasa et al, 2003). The first

person to determine a difference between the two was Rousseau. Rousseau described it adolescence as “A change in humour, frequent anger, a mind in constant agitation, makes the child almost unmanageable. His feverishness turns him into a lion. He disregards his guide; he no longer wishes to be governed.” (Rousseau, 1911)

Psychologists of that time agreed with Rousseau’s ideas and in 1904, influenced by the evolutionary theories of Charles Darwin, G. Stanley Hall defined adolescence as a period of “storm and stress, a time of universal and of inevitable upheaval”. To Hall, adolescence represented a period when early human beings went from being beast-like to being civilized. To Hall, the end of the adolescent stage marked a new birth, in which higher, more completely human traits were born. Culturally, in the 18th century, the period of adolescence was first seen in middle- and upper-class children as education went on longer and children stayed home for an increasing portion of their lives. By the 20th century, after World War II, adolescence became a general phenomenon (Dubasa et al, 2003). According to Koop et al (2003) despite the historically changing view of adolescence and social context in which they developed, these stereotypes of adolescences certainly remain parallel to those of today and act as the foundation of our present-day representations of adolescence.

The biological approach argues that the agitation in adolescence is universal and is not effected by time and social context. Puberty is often considered to initiate adolescence (Petersen & Taylor, 1980). During puberty, the young person achieves their adult size and appearance alongside all the underlying physiological processes (Tanner, 1962). Current evidence indicates that biological changes make some contribution in respect to mood disruptions. Susman et al (1987) found that high levels of various adrenal and gonadal androgens were linked with sad affect, irritable rebelliousness and mild delinquent behaviour in boys. Additional evidence suggests that hormonal changes during puberty contribute to emotional volatility (Buchanan et al., 1992) and also the negative moods (Brooks-Gunn et al, 1994) seen in early adolescence. These studies however, are limited as they focus on only early adolescence and may be subject to reporter bias. They are based on the retrospective memory of mood and behaviour as recalled by the mothers of the adolescent. Puberty is also thought to mark the completion of brain development; the development of neural pathways and the process of

myelinisation of nerve fibres integrating the two hemispheres (Yakolev & Lecours, 1967). Recent evidence however argues that changes continue to occur in the brain over the whole life span (Petersen, 1985).

However, research has shown that the biological changes of puberty alone do not make adolescent storm and stress either universal or inevitable. This can be demonstrated by the fact that not all cultures experience adolescent storm and stress to the same degree and some cultures do not experience it at all. Margaret Mead's study (1928) found that adolescence in Samoa was a blissful, utopian transition. These findings have been confirmed by numerous other studies looking at adolescence worldwide, reporting that most traditional cultures experience less storm and stress among their adolescents, compared with the West (Schlegel and Barry, 1991). Thus the chaotic experience of adolescents is not biologically determined but rather reflects the role of the cultural context in promoting these types of changes. However, the validity of Mead's work has been questioned based on similar observations of the Samoan people by Freeman (1983).

According to Piaget (1950), the changes to the brain and it's functioning during adolescence, the final stage of cognitive development, is thought to take place during adolescence. Piaget described this development in terms of sequential changes in how children think. Cognitive development during adolescence, known as the formal operational stage, involves a movement from concrete to abstract thinking and a decrease in egocentric thought. Egocentric thought during this period leads to some particular behaviour such as imaginary audience; the feeling of constant scrutiny, the personal fable; regarding one's thoughts and feelings as unique, self-consciousness and feelings of invulnerability; which can lead to risk-taking behaviour. This egocentric thinking of early adolescence is diminishes by sixteen due to shared experience with their peers. Once adolescents start to exercise their new reasoning skills, they begin to argue for the sake of it, jump to conclusions, and be overdramatic thinking of only themselves. These behaviours can lead to the view that adolescence is a period of storm and stress. Research indicates that Piaget simplifies the developmental process by overestimating the invariance of the order of stages. It has been argued that Piaget exaggerates the universalism of the stages and lacks ecological validity as all his research was based on children from well-educated, high socio-economic backgrounds.

Freud's theory of psychosexual development also portrays adolescence as being fraught with internal struggle. According to Freud, during the last stage of psychosexual development, the "genital" phase; the child is inundated with instinctual impulses which disrupt the balance between the ego and id. The ego is pulled between the impulses of the id and the restrictions imposed by the superego. This conflict makes adolescence a time of tremendous stress and turmoil. Unfortunately the work of Freud is heavily criticised; his work is based on a small number of case studies and is therefore regarded as unreliable and cannot be generalised to the whole population. This theory may have been applicable at the time it was developed but is not applicable today. Additionally, Freud's theory has no empirical support as the constructs of the id, ego and superego are subjective and cannot be measured.

Based on Freud's psychosexual concept of development, Erikson's psychosocial theory (1968) takes a much wider view of the factors that impact development. Erikson proposed that achieving a sense of personal identity is more important than reaching sexual maturity, he emphasised social and cultural components of an adolescent's developmental experiences. Erikson described identity as a sense of self-continuity. Like Freud, Erikson viewed adolescence as a time of storm and stress and that the turmoil resulted from an identity crisis; a period during which the adolescent is troubled by his lack of identity. Erikson's ideas have been criticised as they were based on his observations of young people undergoing therapy, therefore not being truly representative of adolescents. Research evidence suggests that the vast majority of adolescents do not experience significant psychological difficulties. Offer (1969) concluded that Erikson's concept of identity crisis could not be general since most adolescents never experienced such a crisis; this is supported by Douvan and Adelson (1966). In their survey of over three thousand American adolescents, mainly aged 14-16 years old, they found only a small percentage of adolescents experience signs of restlessness, conflict, or instability. It is uncertain however, if similar results would be found in other cultures.

Marcia's theory of identity achievement (1980) contradicted the notion of adolescence as a time of crisis. Marcia claims that adolescent identity formation has two major parts: a crisis and a commitment. The trauma in adolescence results from having to make difficult decisions about one's identity and moving through the four different

identity statuses: identity diffusion, foreclosure, moratorium and finally identity achievement. Milman (1979) provides some supporting evidence for Marcia's theory. He found that a majority of 12-15 year old children were in the identity diffusion stage in comparison to the identity achievement stage, however, he also found that a large portion of young adults have still not achieved the highest level of identity by their mid-20's, suggesting that identity formation may occur later than suggested by Marcia. There is also evidence that suggests this search for identity continues throughout the whole of the lifespan, with alternating periods of stability and instability and movement back and forth between stages (Marcia, 1980) this suggests that adulthood can involve just as much turmoil as adolescence.

Supporting Marcia, the Strain Theory (Agnew, 1997; Steffensmeier and Allan, 2000), suggests that adolescence is not the period of "storm and stress" as described in earlier theories of development. It claims that adolescents develop an increasing desire for adult privileges, such as autonomy, status and money. Adolescents are usually denied such privileges by adults and are often treated with disrespect. They are therefore more likely to see these stressors as unfair and are more likely to experience objective stressors than children and adults. Contemporary studies have established that conflict with parents increases in early adolescence, compared with younger childhood, and typically remains high for a couple of years before declining in late adolescence (Laursen et al, 1998). Cross-cultural research (Douvan & Adelson, 1966; Offer, 1969) has shown that most adolescents get along well with their parents and even adopt their parents views (Adelson, 1979). Moreover, Kandel and Lesser (1972) found that adolescents shared more views with their parents than with their peers. Conversely, it has been suggested (Steinberg, 1990) that conflict between adolescents and their parents may actually be beneficial to the development of the adolescent, as it promotes the development of individuality and autonomy. High conflict may make adolescence a difficult time for adolescents and their parents even if the conflict ultimately has benefits. "If adolescents have to adjust to so much potentially stressful changes, and at the same time pass through this stage of life with relative stability, as the empirical view indicates, how do they do it?" (Coleman and Hendry, 1999).

The Focal theory (Coleman and Hendry, 1999) suggests that adolescents manage their issues by dealing with only one at a time. Adolescents spread the process of adapting over a number of years, attempting to resolve only one issue at a time so the resulting stresses are rarely concentrated all at one time. There is no evidence to suggest that young children or old age pensioners deal with issues in the same way. This theory also suggests that adolescents play an active role and explains why some adolescents cope whilst others fail to adapt despite having the same number of crises. Unlike the traditional theories of adolescence, the Focal theory has the advantage of being based on empirical evidence. Despite this, coping with one issue at a time does not necessarily indicate stability (Coleman, 1978). There is a need for more evidence, particularly from longitudinal studies, to test Coleman's claim.

The claim that adolescence is indeed a time of storm and stress is based on many theories of adolescent development. Each theory puts forward a unique explanation for the basis of turmoil in adolescence, whether it is sexual, cognitive, or resulting from social challenges such as those based on studies of adolescents in treatment, which represents a small population of youth. Conversely, larger-scale studies of development in adolescence that have focused on the 'normal' adolescent population have concluded that turmoil is relatively uncommon (Douvan and Adelson, 1966; Offer and Offer, 1975). Montemayor (1983) concludes that although some conflict in adolescence is likely to be a normal part of the transformations that occur, it also seems clear that there is little support for more extreme storm and stress notions. Adolescents are simply moving forward to be like the group they are going to become: adults. There are a relatively few areas, such as crime , eating disorders and suicide do adolescents undertake behaviour more often than other age groups. However adolescents are still generally believed to be disruptive or out of control.

2.6 Theoretical Review of literature

2.6.1 Constructivism Theory

Constructivism has established the expectation that student learning is an interdependent process in which only the learner can actively construct personal meaning of the knowledge being acquired based on his or her cognitive developmental stages and

his or her socio-cultural experiences (NCTM, 2000; Piaget, 1971; Vygotsky, 1978). Strictly following directions without reflective thought provides little to no construction of understanding; learning becomes limited because of the barriers of rules and procedures, especially in Mathematics (Van de Walle, 2004).

According to Marlow and Page (2005), the construction of knowledge is the focus of the learning process, not how the information is received. The researchers also communicated that the massive amount of information presented in classrooms is unmanageable when the traditionally stated teacher instruction-learner listening method is used for instruction. Educators must demonstrate the thinking process regarding Mathematics because students have to be taught how to think through the information and use logical judgment to determine how to solve problems in order to avoid anxiety. They must also be provided an opportunity to construct personal knowledge from the information and material presented (Marlow and Page, 2005; NCTM, 2000; Van de Walle, 2004). As communicated by Vygotsky (1978), every function of a child's development first appears on a social level and then on an individual level. In the theorist's assertions, he claims that the higher functions of individuals occur through relationships with other individuals. Without the invested efforts of students learning in the construction of their knowledge, through individualized exploration and interactive communication, a limited amount of ownership and understanding of the Mathematics content takes place (Van de Walle, 2004).

According to Marlow and Page (2005), there are four ways to describe constructivist learning in order to contrast it with traditional learning. First, constructivist learning is based on constructing individual knowledge, not being told the information or receiving the knowledge. This allows for assimilation of the information into existing schemata. Secondly, constructivist learning is not about recall, rather it is practiced understanding and application of knowledge and information. Thirdly, constructivist learning requires thinking and analyzing, not just memorizing and accumulating. It accentuates the thinking process rather than the quantity a learner memorizes. Fourthly, constructivist learning is considered active, not passive. Learners become more effective when they discover their own answers, concepts, solutions, and when they create interpretations and reflection about their own learning (Marlow and Page, 2005; Van de

Walle, 2004). Ultimately, educators that consider themselves constructivists believe students can construct their own knowledge from information, learn new information by constructing from an old base of information, and learn through discussion of their thinking with classmates and teacher. Unfortunately, the constructivist method of instruction in Mathematics is rarely practiced in elementary classrooms; rather, teachers focus on rote memory, recitation of facts, and procedural instruction of algorithms found to be more aligned with behaviourism (Burrill, 1997; Manigault, 1997; Van de Walle, 2004).

The theoretical base and conceptual framework of the majority of mathematical research and mathematical instructional standards are based on the constructivist theory of learning as defined by Jean Piaget and Lev Vygotsky. Fogarty (1999) cited these theorists as being "master architects" (p. 76) in the design of human learning. Piaget's research on the epistemological stages of development, or cognitive constructivism, and Vygotsky's role of social interaction in the learning process, or social constructivism, are critical in understanding the human mind and the building process of cognitive knowledge (Piaget and Inhelder, 1969; Vygotsky, 1978). As identified by Cawelti (2003), the founding theories of these two constructivists allow for deeper understanding of students' learning experiences. Low test scores, anxiety and ineffective teaching practices in our schools have led educators and leaders to focus on students' learning and the construction of knowledge (Brooks and Brooks, 1999). However, many elementary teachers are now focused on performance driven instruction rather than mastery driven instruction because of testing mandates required by No Child Left Behind (Darling-Hammond, 2004; Midgley et al., 2000).

2.6.2 Social Cognitive Theory

Self-efficacy research originated with Albert Bandura in the field of social cognitive theory. Social cognitive theory centered on human agency as the vehicle of change (an agentic perspective) and the efficacy belief system as the foundation of human agency (Bandura, 2004). In other words, it was the individual, with an internal locus of control, working to create change for themselves, based on their self-efficacy beliefs, rather than change having come about as the result of external forces. Belief in

ability to produce desired effects produced incentive to act or persevere in the face of adversity. Social cognitive theory identified four core features of human agency: Intentionality, forethought, self-reactive elements, and self-reflective elements (Bandura, 2004). Intentionality concerned the intentions, action plans and strategies for realizing them. Forethought concerned goals and anticipated outcomes to guide and motivate efforts. Self-reactive elements consisted of the adoption of personal standards and monitoring and regulating actions by self-reactive influence. Self-reflective elements consisted of reflection on efficacy, the soundness of thoughts and actions, the meaning of the pursuits, and the making of necessary adjustments.

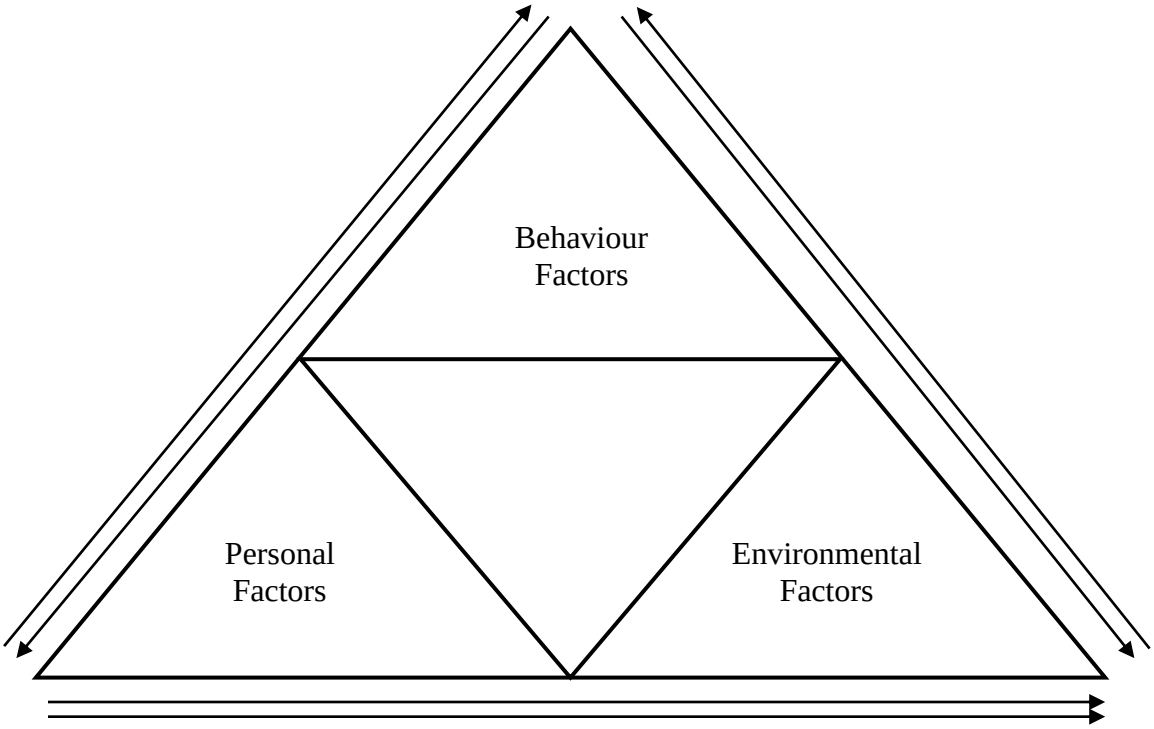
Bandura's theory stated that psychological procedures, whatever their form, alter the level and strength of self-efficacy (Bandura, 1977). He found the contributions of self-beliefs as a determinant of human behaviour to be a missing link in social cognitive theory research (Pajares, 2002). Bandura sought a paradigm shift from the psychodynamic model of human behaviour prevalent in the 1950s. Variants of this model shared three characteristics (Bandura, 2004). First, the causes of behaviour were not seen as residing within the individual. Second, behaviour deviating from prevailing social norms was treated as a kind of "disease". Third, practitioners relied heavily on the interpretive interview as the vehicle of change and provider of client insight. That is, the practitioner would interpret data and provide insight to the individual, contributing to the perception that causality and insight must come from external sources.

In the 1960s, viewpoints on the causes of behaviour shifted to transactional social dynamics (personal, behavioural, environmental). Troublesome behaviour was represented as divergent rather than diseased, and action-oriented treatments replaced interpretive interviews (Bandura, 2004). Pajares (2002) said it this way: "People are viewed as self-organizing, proactive, self-reflecting and self-regulating rather than as reactive organisms shaped and shepherded by environmental forces or driven by concealed inner impulses". The determinants of human behaviour included both personal and environmental factors (Pajares, 2002).

The importance of this shift was the modification in the content, locus, and agent of change (Bandura, 2004). Guided mastery experiences were used to equip people with competencies, enabling beliefs and social resources. Treatments were carried out not in

the practitioner's office, but in the locations where the problems arose: In homes, schools, and the larger community. Talented people implemented change programs under professional guidance; professionals were not considered the exclusive dispensers of treatments. Self-efficacy theory was the final necessary component to the "research puzzle" (Bandura, 2004).

Bandura's Triadic Reciprocal Determinism



Source: Bandura 2004

Albert Bandura's social Cognitive Theory emphasizes how cognitive, behavioural, personal, and environmental factors interact to determine motivation and behaviour (Crothers, Hughes and Morine, 2008). According to Bandura, human functioning is the result of the interaction among all three of these factors (Crothers et al.., 2008), as embodies in his Triadic Reciprocal Determinism model (Bandura and Woods 1989). While it may seem that one factor is the majority, or lead reason, there are numerous factors that play role in human behaviour. Furthermore, the influencing factors are not of equal strength, nor do they all occur concurrently (Wood and Bandura, 1989). For example, Student performances (behavioural factors) are influenced by how the students themselves are affected (cognitive factors) by the school strategies (environmental factors). The figure above therefore illustrates Triadic Reciprocal Determinism as portrayed by Bandura and Wood (1989).

The Social Cognitive Theory is composed of four processes of goal realization: self-observation, self- evaluation, self –reaction and self- efficacy. These components are interrelated, each having an effect on motivation and goal attainment (Crothers, 2008).

Self-Observation

Observing oneself can inform and motivate. It can be used to asses one's progress toward goal attainment as well as motivate behavioural changes. There are two important factors with regards to self- observation: regularity and promixity. Regularity means the behaviour should be continually observed, whereas proximity means the behaviour should be observed while it occurs, or shortly after. Alone, self- observation is insufficient because motivation depends on one's expectations of outcomes and efficacy (Crothers, 2008).

Self- evaluation- Self- evaluation compares an individual's current performance with a desired performance or goal. It is affected by the standards set and the importance of the goals. Goals must be specific and important; therefore, goal such as, "do your best" are vague and will not motivate. (Crothers, 2008) state that "specific goals specify the amount of efforts required for success and boost self – efficacy because progress is easy to gauge. "If one has little regard for his goal, he will not evaluate performance. There are two types of self- evaluation standards: absolute and normative. For example, a grading scale would be an example of a fixed or absolute standard. A social comparison such as

evaluating one's behaviour or performance against other individuals is an example of a normative standard. People gain satisfaction when they achieve goals that they value. When individuals achieve these valued goals, they are more likely to continue to exert a high level of effort, since sub-standard performance will no longer provide satisfaction (Bandura, 1986).

Self- reaction- Reaction to one's performance can be motivating. If the progress made is deemed acceptable, then one will have a feeling of self- efficacy with regard to continuing, and will be motivated towards the achievement of their goal. A negative self-evaluation might also be motivating in that one may desire to work harder provided that they consider the goal to be valuable. Self- reaction also allows a person to re-evaluate their goals in conjunction with their attainments (Bandura, 1986). If a person has achieved a goal, they are likely to re-evaluate and raise the standard (goal); whereas, if a person has not achieved the goal, they are likely to re-evaluate and lower the standard (goal) to an achievable goal.

2.6.3 Theoretical framework: Self-Determination Theory (SDT) (Deci and Ryan, 2000)

The theoretical framework for this study is Self-Determination theory (SDT) by Deci and Ryan, (2000). Self-determination theory guides our understandings of student's developmental needs. The theory posits that individuals have three fundamental needs: to be meaningfully connected to others, to have developmentally appropriate choice and self-direction, and to perceive themselves as competent in their endeavours (Connell and Wellborn, 1991; Deci and Ryan, 1985). Also the theory stipulates that for attainment of improved well-being and reduced anxiety in school activities, some of the prerequisites are self-determination, self-belief, motivation and display of positive attitudes and capabilities which are major components of this study.

Many recent studies have shown the crucial role that motivated behaviours can play in the maintenance of psychological and emotional balance in order to avoid anxiety (Abery and Stancliffe, 2003; Nix, Ryan, Manly and Deci 1999; Bakare, 2010). In fact, the failure of many people to adhere to healthy behaviours represents a public health problem, one with many causes but for which a considerable part is motivational in nature. This highlights the need for a clearer understanding of what motivation is and

how to facilitate it in the context of psychological health behaviour. In short, motivation plays significant role in avoidance of anxiety in school, job and life as a whole. Motivation refers to the psychological forces or energies that impel a person toward a specific goal. In the case of the students, the need to be less anxious and achieve optimum performance in Mathematics could be described as their goals in this study.

Introducing the issue of *quality* of the motivational drive, Deci and Ryan (2001) develop the Self-Determination Theory (SDT) which distinguishes between amotivation (lacking any intention to engage in a behaviour), extrinsic motivation (where the behaviour is engaged in order to achieve outcomes that are separable from the behaviour itself) and intrinsic motivation (where the behaviour is engaged in for the enjoyment and satisfaction inherent in taking part). In addition, SDT distinguishes between qualitatively different forms of extrinsic motivation, by contrasting autonomous or self-determined vs. controlled or non-self-determined types of behavioural regulation. This distinction is represented as a continuum and is characterized in terms of the degree to which the regulation of behaviour has been internalized so that it is engaged in with a true sense of volition and choice. Motivation is autonomous to the extent that a person's perceived locus of causality is internal (i.e. the perceived source of initiation and regulation for motivated behaviours emanates from the self). Motivation is controlled to the extent that people act because they feel pressured or compelled to do so, either by others or by themselves, and this involves having an external perceived locus of causality (Chirkov, Kim, Ryan and Kaplan, 2003).

Fortunately, according to SDT, formerly controlled motivation can be internalized and transformed into autonomous motivation, if supportive conditions are in place. In fact, this contemporary theory of human motivation focuses on the psychological nutrients that engender adaptive motivational, behavioural, cognitive, and affective outcomes, by specifying contextual variables that facilitate (or hinder) these processes. The way a person acts in a particular setting cannot be attributed only to individual differences; contextual variables also exert a significant influence. Thus, SDT also considers the influence of the social environment on motivation. According to Deci and Ryan (2001), although people have an inherent propensity toward maintaining their well-being, this natural tendency can be thwarted by conditions that frustrate the satisfaction of

three basic psychological needs. These needs are for autonomy (feeling volitional and feeling choice and responsibility for one's behaviour), competence (feeling that one can accomplish the behaviours and reach the goal) and relatedness to others (feeling understood, cared for and valued by significant others). In the context of health, socio-environmental conditions that facilitate the satisfaction of these needs will promote the internalization of protective and preventive health behaviours so that they are engaged in autonomously and more likely to be maintained in the long term.

A recent study in the context of psychological well-being clearly indicated that fulfilment of these three basic needs was related to more self-determined motivational regulations (Reeve, Deci and Ryan, 2004). It can generally be stated that people need to feel a sense of choice and volition with respect to their behavioural goals; they need to understand how to attain these goals and feel that they can be effective in carrying out the necessary actions; and feel respected and cared for by practitioners and important others. This means that people not only need to feel that they can carry out a certain behaviour (confidence, efficacy, competence), they also need to feel that they are fully responsible for initiating and maintaining that behaviour and that they are doing so willingly (autonomy, self-determination, responsibility).

According to SDT, a person will develop and maintain more self-determined motivation when the personal context around them is autonomy supportive. The idea of autonomy support refers to eliciting and acknowledging peoples' perspectives, supporting their initiatives, offering choice/options, and providing relevant information, while minimising pressure and control. Previous research has demonstrated that when physicians are perceived by their patients as being autonomy supportive, patients report greater self-motivation for treatment adherence (Chirkov, Kim, Ryan and Kaplan 2003). Another study, designed to test a SDT intervention for motivating tobacco cessation in a clinical trial, show that intervention participants perceived greater autonomy support and reported greater autonomous and competence motivations than did controls, supporting the causal role of autonomy support in the internalization of more internal forms of regulation (Algozzine, Browder, Karvonen, Test and Wood, 2001). From the discussion above, it is observed that self-determination could be a driving force towards achieving reduced Mathematics anxiety among students. This means, no matter the amount of

training as well as provision of viable environment, individual students must be ready to achieve or derive satisfaction from all the processes involved in their school.

This theory and its constructs have been applied to many settings. Domains studied include health care (e.g. Sheldon, Williams, and Joiner, 2003), education (e.g. Williams, Saizow, Ross, and Deci, 1997), parenting (e.g. Deci, Driver, Hotchkiss, Robbins, and Wilson, 1993), organizations (e.g. Deci, Connell, and Ryan, 1989), mental health (e.g. Reis, Sheldon, Gable, Roscoe, and Ryan, 2000) and well-being among the disabled (Bakare, 2010). The results have been extended to cultures throughout the United States, Western Europe (e.g. Schmuck, Kasser, and Ryan, 2000), Russia (e.g. Chirkov, and Ryan, 2001), Asia (e.g. Chirkov, Ryan, Kim and Kaplan, 2003) and Nigeria (Bakare, 2010). The current study will focus on the implication of this theory to management of Mathematics anxiety among secondary school students.

As SDT has expanded both in terms of breadth and depth, both theoretical developments and empirical findings have led SDT researchers to examine a plethora of processes and phenomena integral to personality growth, effective functioning, and well-being. For example, SDT research has focused on the role of mindfulness as a foundation for autonomous regulation of behaviour, leading to both refined measurement and theorizing about awareness. The study of facilitating conditions for intrinsic motivation led to a theory and measurement strategy regarding vitality, an indicator of both mental and physical well-being.

2.7 Empirical Review of Literature

2.7.1 Systematic Desensitization and Mathematics anxiety

A number of studies discussed that the systematic desensitization treatment significantly proves to reduce Mathematics anxiety. Gillingham (1977) reports after thorough investigation involving High school students in an experimental study that systematic desensitization is one of the successful treatment procedures for Mathematics anxiety. In this regard, individuals with treatment display the greater reduction in Mathematics anxiety level as compared to those individuals with no treatment. Similarly, Zettle (2003) conducted a research on the effectiveness of systematic desensitization on management of Mathematics anxiety among students. A pretest posttest experimental

design was employed and the students were screened before the experiment. The finding of the study revealed that systematic desensitization is significant and equally able to reduce students' Mathematics anxiety.

Additionally, Higbee and Thomas (1990) examined the efficacy of the combination of the three techniques of systematic desensitization, relaxation technique, and meta cognition in the reduction of Mathematics anxiety among College students. The level of anxiety of the students in the experimental group were compared with that of the control group and the finding prove that the three techniques have significant effect on reducing college students' Mathematics anxiety and increasing their confidence levels (self-efficacy). Moreover, Suinn and Richardson (1971) find that there is a significant and equivalent progress in Mathematics anxious university students treated by both traditional systematic desensitization and accelerated massed desensitization (AMD). Both treatments also prove to improve the performance for the treatment groups but not with treatment control groups. In his 1990 meta-analysis, Hembree concluded that, while individual psychological treatments such as systematic desensitization were highly successful in reducing MA, whole-class treatments or classroom interventions were not effective.

Otta and Ogazie (2014) investigated the effects of systematic desensitization and study behaviour techniques in the reduction of test phobia among in-school adolescents in Abia State, Nigeria. The quasi-experimental research design was used in the study. Sixty SS 2 students drawn through stratification were used as the subject. A self-developed instrument was used for data collection. T-test and ANCOVA were used for data analysis. The result showed that systematic desensitization and study behaviour technique had a significant effect on the post and follow-up phases.

Also, Ventis, Higbee, and Murdock (2001) conducted a study on the effectiveness of systematic desensitization on fear reduction using humorous hierarchy scenes without relaxation. The sample for the study comprises 40 students (2 men and 38 women) drawn from the College of William and Mary, Williamsburg who were very fearful of spiders. The researcher using a 24 item behavioural approach test with an American Tarantula, subjects were matched on the fear level and randomly assigned to 1 of 3-treatment groups- systematic desensitization, humour desensitization, and untreated control. Each

subject was seen for 6 sessions, including pre-test. Data were analyzed using analysis of covariance of post-test which revealed that the two treatment groups showed a greater reduction in fear while the controls in 3 measures but did not differ from each other. Hence, humour in systematic desensitization reduced fear as effectively as more traditional desensitization.

Researchers in math anxiety propose systematic desensitization (Furner, 1996; Schneider and Nevid, 1993; Hembree, 1990; Trent, 1985; Olson and Gillingham, 1980) as an effective approach for helping people reduce their math anxiety. Davidson and Levitov (1999) advocate the use of relaxation in conjunction with repeated positive messages and visualizations to reduce math anxiety. Antoni (2003) investigated the effect of systematic desensitization (SD) on reduction of Mathematics anxiety of anxious students in the college. In his study, 102 students identified as low achievers were randomly split into experimental and control groups aged between 13-19 years, with a mean of 16 and systematic desensitization of 9.1. Analyzed data showed that students who used systematic desensitization (SD) in the treatment group, performed better as it was recorded that their anxiety level reduced and their self-esteem boosted, from their post test results.

Azuji, Nwokolo and Anyamene (2015) examined the effectiveness of Systematic Desensitization (SD) in reducing Mathematics anxiety and test phobia among secondary school adolescents in Nigeria. The study finding indicates that students who receive the Systematic Desensitization treatment for Mathematics anxiety exhibit a significant reduction in their Mathematics anxiety scores as compared to those students who do not receive any treatment. Therefore, the significant difference in the mean scores of Mathematics anxiety and performance in the students under study is due to the desired effectiveness of the treatment. Abood and Abumelhim (2015) investigated the efficacy of Systematic Desensitization (SD) on management of Mathematics anxiety among adolescents. In this study, participants in the SD treatment group had the lowest mean score for test anxiety. The findings revealed that SD was effective in reducing anxiety among learners in Jordan.SD is a method that has been consistently proven to be effective in the treatment of anxiety and phobias.

Najihah Akeb-urai etal (2020) examined the effectiveness of systematic desensitization treatment on Mathematics anxiety among year one college students. This study employs a quasi-experimental research design. The sample consists of 65 year one students of which 32 are under the experimental group and another 33 are under to control group. The instruments used in collecting data are The Adopt and Adapt Fennama-Sherman Mathematics Attitude Scale (MAS), Neo-Five-Factory Personality Inventory (NEO-FFI), Mathematics Performance Test (MPTs), and The Systematic Desensitization (SD) Module. Quantitative data is analyzed using ANOVAs. The findings revealed a significant reduction in the level of Mathematics anxiety. Therefore, the study found that Systematic Desensitization treatment has significant desired effect on students' Mathematics anxiety.

Osenweugwor Ngozi Aihie and Osenweugwor Ngozi Aihie (2018) investigated the differential efficacy of Solution Focused Brief Therapy (SFBT), Systematic Desensitization (SD) and Rational Emotive Behavioural Therapy (REBT) in reducing the test anxiety status of undergraduates in a Nigerian University. The study adopted the pre-test, post-test non-equivalent control group quasi experimental design. Spielberger's (1980) Test Anxiety Inventory (TAI) was revalidated and used to collect data for the study. The instrument consists of twenty items in three subscales: Test- Anxiety- Total (TAI-T), Test- Anxiety- Worry (TAI-W) and Test- Anxiety- Emotional (TAI-E). The instrument was revalidated in Nigeria by Paraform Psychometric Centre (PPC, 1997) and a Crombach's alpha value of 0.80 was obtained. The instrument was revalidated in Nigeria by Paraform Psychometric Centre (PPC, 1997) and a Crombach's alpha value of 0.80 was obtained. Obodo (2006) obtained Crombach's alpha value of 0.90 for the same instrument. The results of the study reveal that Systematic Desensitisation (SD) was effective in the reduction of test anxiety of the participants in the study.

Kingston Rajiah, MPharma and Coumaravelou Saravanan (2014) used psycho-education, relaxation therapy, and Systematic Desensitization as interventions of reducing Mathematics anxiety among University students. An experimental design was employed. The results showed that the two techniques are found to be effective in reducing Mathematics anxiety among the University students. The study concluded that

the use of psychoeducation, relaxation therapy, and systematic desensitization as they have been found to be effective in reducing cases of anxiety among the students.

Ernest-Ehibudu Ijeoma Regina and Wayii Augustine Lezorgia (2017) examined the effect of cognitive restructuring and systematic desensitization in the management of mathophobia (that is, Mathematics anxiety) among secondary school students in Khana Local Government Area of Rivers State, Nigeria. The result obtained from the study revealed that application of systematic desensitization on students with mathophobia led to a reduction in their mean mathophobic level. In addition, it was observed that a statistically significant difference exists in the mathophobic level of students treated with systematic desensitization and those in the control group. The result so far obtained that systematic desensitization had a positive effect in the management of mathophobia among students.

2.7.2 Mindfulness and Mathematics-anxiety

A number of Mindfulness based activities have been shown to help reduce Mathematics Anxiety (MA). For instance, Brunyé et al. (2013) found that MA was largely alleviated by a focused breathing exercise, which increased rated calmness and enhanced performance on an arithmetic test amongst those with high MA. Park et al. (2014) noted that a short expressive writing task (about thoughts and feelings regarding an impending Mathematics examination) reduced intrusive thoughts, improved working memory availability, and boosted performance. However, this writing task may have had negative effects on individuals with low/no anxiety as they were concentrating on negative feelings which may have made them nervous (Park et al., 2014).

Furthermore, Weger et al. (2012) discovered that five minutes of mindfulness was sufficient to reduce the effect of stereotype threat (stereotype that females underperform in Mathematics) and therefore the female participants performed better at the Mathematics test. Bellinger et al. (2015) reported that mindfulness indirectly benefitted Mathematics performance in undergraduate psychology students by reducing the experience of state anxiety. Quinnell, Thompson and LeBard's (2013) model explained the benefits of mindfulness with regards to Mathematics in science, and demonstrated the application of mindfulness across the curriculum in order to assist individuals with MA

Wisner and Starzec (2015) conducted a qualitative study wherein nineteen adolescents at an alternative school practiced mindfulness for seven months. The mindfulness program consisted of meditation, breathing exercises, and journaling as a technique to allow acceptance of the present moment without judgment. Teachers slowly increased meditation and breathing techniques from two minutes to ten over the course of seven months. High scholars self-identified the theme of relationships as a benefit of the program (Wiser and Starzec, 2015). Students noted improved relationships with their teachers, their peers, and their parents. Due to the troubled nature of the student demographic at the alternative school, many students began the program not able to trust their classmates. By the end of seven months, there was a significant reduction in the level of anxiety.

While there is limited research assessing the effects of mindfulness on anxiety, there are even fewer studies that specifically focus on the Mathematics and science fields. One study assessed the effects of mindfulness training on test anxiety in high school math students (Niss, 2012). Before beginning mindfulness training, students completed the Subjective Units of Distress Scale to gauge their baseline score. Then for the spring semester prior to each examination, they underwent mindfulness training where students would focus on breathing and body awareness for nine minutes (Niss, 2012). The examination scores from spring semester were compared to the fall semester, where no mindfulness exercises were completed. Results indicated some improvement in test scores between semesters and suggested that mindfulness was most helpful to students with very high levels of anxiety (Niss, 2012).

A study by Turkish scholars assessed the effectiveness of using this nonjudgmental awareness to fight test anxiety (Senay, Cetinkaya and Usak, 2012). 87 college freshmen were separated into either a control or experimental group and told to use either the avoidance or acceptance strategy. The results determined that both strategies were independently effective (Senay et al., 2012). Another study that aimed to assess the efficacy and role of mindfulness in an academic setting implemented a group mindfulness meditation session in a population of high school females. Despite the small sample, pre and post-test scores on the Spielberg Anxiety Test suggest that mindfulness sessions do decrease examination anxiety (Sohrabi, Mohammadi, and Delavar, 2013).

Individuals also reported lower levels of emotional anxiety and worry (Sohrabi et al., 2013). In regards to the effects of mindfulness on test anxiety, one study reported no change in its participants. Paterniti (2007) randomly sorted students into a mindfulness group or a study skills group, which met for an hour a week for three weeks. During this meeting, the study skills group learned proper note taking and time management techniques, while the mindfulness group learned sitting meditation, yoga, mindful eating and body scan skills (Paterniti, 2007). It was determined that neither of the groups showed significant reductions in test anxiety, worry, or emotionality (Paterniti, 2007). However, these findings may indicate that a longer period of time is needed for the mindfulness program to yield better results.

Another study in 2016 yielded similar results. Harpin et al. (2016) completed a mixed-methods study observing elementary students who followed a daily, ten-week mindfulness program. Two fourth-grade classrooms were selected. One classroom of eighteen children was chosen to practice daily mindfulness while the other classroom of the same size continued with their typical homeroom routine. Following the intervention, teachers and students completed three different surveys to gather data on changes of prosaically behavior, emotional regulation, and academic competency. After implementing the program, the classroom teacher noted her students could relate to one another better than before the training.

Lastly, a quantitative study by Black and Fernando (2013) adds to the evidence that mindfulness-based curriculums improve relationships. A kindergarten through sixth-grade school in California implemented the program Mindful Schools for five weeks. Seventeen teachers rated the behaviors of 409 students three different times throughout the study: pre-intervention, post-intervention, and seven-weeks post-intervention. One of the study measures was students caring for and respecting their teachers and peers. Researchers calculated significant improvement in respect from the pre-test to the post-intervention test. Students maintained their level of improved relationships; there was not a significant change from the first week post-program to the seventh week post-program (Black and Fernando, 2013).

When the effects of mindfulness training on anxiety and high-stakes Mathematics examinations were studied, Bellinger, et al (2015) found that mindfulness indirectly

benefited students' performance on high-stakes quizzes and tests through an association with reduced cognitive test anxiety. Researchers suggest that the working memory enhancement and greater attention focused on the Mathematics examination might be the mechanism mediating the impact of mindfulness on reduced math anxiety (Bellinger, DeCaro and Ralston, 2015). This effect has been replicated through mindful practice before testing, a study found that using meditation to cope with the anxiety response in testing situations assists students to score higher than a control (no-meditation) group (Rhoads and Healy, 2013).

The positive effects of mindfulness are apparent, but the method on how to implement a mindfulness program in a classroom remains in question. In a study comparing the efficacy of informal versus formal mindfulness programs, it was concluded that the latter seems to have a more significant effect on the student. Hindman's study (2013) assessed the effectiveness of two Mindful Stress Management programs, one that focused formal mindfulness meditation with informal practice (MSM) and one that utilized brief mindfulness exercises with informal practice (MSM-I). While both six-week programs showed positive outcomes when compared to the wait-list control group, MSM participants showed more improvement in psychological inflexibility and stress than those who partook in the MSM-I program (Hindman, 2013). These findings suggest that a formal 6-week program with informal practice would be the promising intervention for undergraduate and graduate student stress (Hindman, 2013). Incorporating a long-term, formal mindfulness program into a school curriculum would allow both students and educators to function optimally.

Courtney (2016) explored student and teacher perceptions on the usefulness of teaching students to practice positive coping strategies for managing math anxiety in a high school International Baccalaureate Mathematics classroom. The study used a reflective action research methodology in which students' math anxiety levels were assessed using Alexander and Martray's Abbreviated Mathematics Anxiety Rating Scale (1989). The results indicated that there is a need for Mathematics educators to include a discussion of math anxiety and how to cope with it in their classrooms.

Nadine Yildiz (2018) also investigated the effectiveness of mindfulness technique in managing Mathematics anxiety among students. The study tested whether a classroom-

based mindfulness intervention reduced math anxiety among 4th and 5th grade students. The finding revealed that the intervention is one of the most effective interventions for math anxiety. Mindfulness has been used as a treatment for anxiety, and it was particularly found to be effective in decreasing stress, improving emotional regulation, and self-regulation skills. Hannah Rosholt et al (2021) worked on the usefulness of mindfulness technique in solving anxiety problems, analyzing how mindfulness practice impacts students' behavior, emotional well-being, and cognitive functioning. He found that the technique had significant positive effect on the participants.

2.7.3 Gender and Mathematics Anxiety

The relationship between gender and levels of Mathematics anxiety has been investigated for decades, and to this date no consensus has been reached. For example, Haynes, Mullins and Stein (2004) report no significant differences in Mathematics anxiety levels in male and female college students, however they identify different factors affecting male and female levels of Mathematics anxiety. More specifically, Mathematics anxiety levels for males were significantly related to general test anxiety. On the other hand, females' Mathematics anxiety was most strongly affected by perceived Mathematics ability, perceptions of college Mathematics teachers' teaching ability, as well as general test anxiety

Malinsky, Ross, Pannells and McJunkin, (2006) conducted a study on the gender difference in Mathematics anxiety among secondary school students. The findings show that in early grades, there is no significant difference in the math anxiety experience in either gender, but females exhibit more math anxiety in secondary school and college. These differences carry into adulthood and directly affect what majors are taken in college and what careers are chosen based on those selections.

Some studies report that female college students experience significantly more Mathematics anxiety than their male counterparts (Khatoon and Mahmood, 2010; Malinsky, Ross, Pannells and McJunkin, 2006). However, inconsistencies regarding the effects of gender on Mathematics anxiety are present even in these findings. Student Mathematics preparedness level is one of the facets affecting the relationship between gender and Mathematics anxiety. However, for a sample of men and women with similar backgrounds in Mathematics, there was no significant difference in the Mathematics

anxiety experienced. In addition, Dew, Galassi and Galassi (1983) suggested that gender differences in Mathematics anxiety are related to other factors affecting these experiences.

Woodward (2004) acknowledged that women report more Mathematics anxiety than men. However, these outcomes are not accompanied, as might be expected, by more negative attitudes toward Mathematics, poorer performance, or avoidance behaviour by female students. This contradiction may be explained by Hembree's assumption that "females may be more willing than males to admit their anxiety, in which case their higher levels are no more than a reflection of societal mores;" and that "females may cope with anxiety better" (Hembree, 1990).

That gender affects Mathematics anxiety in conjunction with other factors is also suggested by a study by Wigfield and Meece (1988). While there was no significant difference in Mathematics anxiety in male and female elementary and secondary school students, female students did acknowledge more negative reactions towards Mathematics. Similar to these results are those of a study by Malinsky et al. (2006), which reported that no significant differences in Mathematics anxiety levels in males and females were noted in early grades, but that females experienced more maths anxiety in college.

Several studies have been conducted to investigate the level of Mathematics anxiety among male and female students. Some researchers have argued that females have higher Mathematics anxiety than males (Tuan and Salleh, 2001; Woodard, 2004; Yüksel-Şahin, 2008; Karimi and Venkatesan, 2009; Khatoon and Mahmood, 2010). In addition, female students are often labeled as shy and this characteristic can harm their ability to learn. Male students were found to be more active in a wider range of social activities than female students (Khatoon and Mahmood, 2010). Yüksel-Şahin (2008) study on secondary school students in Turkey reported that the stereotypical view of this issue has a powerful impact.

Differences in Mathematics anxiety levels as a function of gender are also affected by other aspects of life, such as social desirability. While overall scores on Mathematics anxiety measures do not differ significantly for females and males, Mathematics anxiety levels for males seem to be highly correlated with measures of social desirability (Zettle and Houghton, 1998). Furthermore, gender has been found to

moderate the relationship between Mathematics anxiety and Mathematics performance (Miller and Bichsel, 2004). Mathematics anxiety levels were found by Miller and Bichsel to be predictive of female performance in basic and applied Mathematics tasks, while they were only a statistically significant predictor in basic Mathematics tasks for males (Miller and Bichsel, 2004).

Jakobsson et al., (2013) surveyed the difference in Mathematics anxiety between male and female students. His finding revealed that males tend to show more confidence and rate themselves higher in a number of domains than females do. Thus, it is not surprising that this should also apply to Mathematics, and, given the associations between anxiety and self-rating, that it might contribute to gender differences in Mathematics anxiety.

Also, the study of Grills-Traquechel et al, (2012) examined the relationship between gender and Mathematics anxiety and found a significant difference in anxiety based on gender. The studies did not agree about who showed more anxiety. Robinson (1966) found that male students were significantly more likely to suffer from anxiety. Grills-Traquechel et al (2012) found higher levels of anxiety in female students. One study found that more females were more likely to attribute their grades to the effort they put in to a test or assignment. McClure et al., (2011) found that students to attribute academic performance to effort are more likely to suffer from anxiety. On the contrary, Marsh and Tapia, (2002); Elenchothy, (2007); Mohamed and Tarmizi, (2010) examined the influence of gender on Mathematics anxiety and their finding upon conclusion is that that there is no significant difference in Mathematics anxiety between males and females.

Much recent research indicates that males and females, in countries that provide equal education for both genders, show little or no difference in actual mathematical performance (Spelke, 2005). However, they do indicate that females tend to rate themselves lower and to express more anxiety about Mathematics (Else-Quest et al., 2010; Devine et al., 2012), though such differences are not huge (Hyde, 2005). Most studies suggest such gender differences only develop at adolescence, and that primary school children do not exhibit gender differences in Mathematics anxiety (Dowker et al., 2012; Wu et al., 2012; Harari et al., 2013) though even in the younger age group boys often rate themselves higher in Mathematics than girls do (Dowker et al., 2012). This

increased anxiety may come from several sources, including exposure to gender stereotypes, and the influence and social transmission of anxiety by female teachers who are themselves anxious about Mathematics (Beilock et al., 2010). It may also be related to more general differences in anxiety between males and females

Lastly, Many studies indicate that females tend to show higher levels of trait anxiety and the closely related trait of Neuroticism than males (e.g., Feingold, 1994; Costa et al., 2001; Chapman et al., 2007) and show higher prevalence of clinical anxiety disorders (McLean et al., 2011). They have been found to show greater anxiety than males even in subjects where their actual performance tends to be higher than that of males, such as foreign language learning (Park and French, 2013). However, there is some evidence that gender differences in Mathematics anxiety cannot be reduced to gender differences in general academic self-confidence or in test anxiety.

2.7.4 Mathematics Self-efficacy and Mathematics anxiety

There is a reciprocal relationship between self-efficacy and anxiety in Mathematics namely, that high levels of self-efficacy are linked to low levels of anxiety and vice-versa (Ahmed, Minnaert, Kuyper, and van der Werf, 2012). Based on social cognitive theory and the reciprocal relationship between math self-efficacy and anxiety, it is possible that lower success rates among developmental math students are linked to lower levels of self-efficacy and higher levels of anxiety in Mathematics. Just as many variables can impact student success, a variety of variables have a strong correlation to Mathematics self-efficacy and anxiety. Jameson and Fusco (2014) reported that adult learners had lower levels of self-efficacy and higher levels of math anxiety compared to traditional college students.

McMullan et al. (2012) studied 229 undergraduate British nursing students and found a statistically significant relationship between anxiety, self-efficacy, and ability. Anxiety was associated with self-efficacy and ability in a negative direction, whereas self-efficacy and ability had a positive association. Mathematics self-efficacy and anxiety correlate to student success and that math self-efficacy and anxiety correlate to each other.

Kurbanoglu (2011) examined the Mathematics self-efficacy, Mathematics anxiety, and math attitudes of 372 university students in Turkey. Akin and Kurbanoglu found that Mathematics anxiety was negatively related to positive attitudes and self-efficacy and that Mathematics self-efficacy was positively associated with positive attitudes. Akin and Kurbanoglu, 2011; McMullan et al. 2012 conducted a research the relationship between Mathematics self-efficacy and Mathematics anxiety. The sample comprised 342 college students. The finding revealed a significant relationship between the two variables.

Similarly, Ahmed et al. (2012) found that among 522 seventh grade students in the Netherlands, there was a reciprocal relationship between Mathematics self-efficacy and anxiety, but the magnitude of the relationship was not significantly high. Previous research has established a strong connection between high levels of Mathematics self-efficacy and Mathematics anxiety, as well as performance in Mathematics (Ayotola and Adedeji, 2009). While Mathematics self-efficacy correlates negatively with Mathematics anxiety, it maintains positive relationship with Mathematics performance.

Lower self-efficacy of students can lead to higher levels of anxiety (Ahmed, Minnaert, Kuyper, and van der Werf, 2011). In a quantitative, non-experimental study, researchers had 495 seventh grade students complete questionnaires about math self-efficacy and Mathematics anxiety. The results indicated that higher self- efficacy correlated with lower levels of anxiety. Researchers were unable to determine whether lower self- efficacy leads to higher levels of anxiety or if higher levels of anxiety lead to lower levels of self- efficacy. The situation is different for different students. However, when comparing the data using a chi-square difference test, data suggest that low self-efficacy is a strong cause of anxiety more than anxiety is a cause of low self- efficacy.

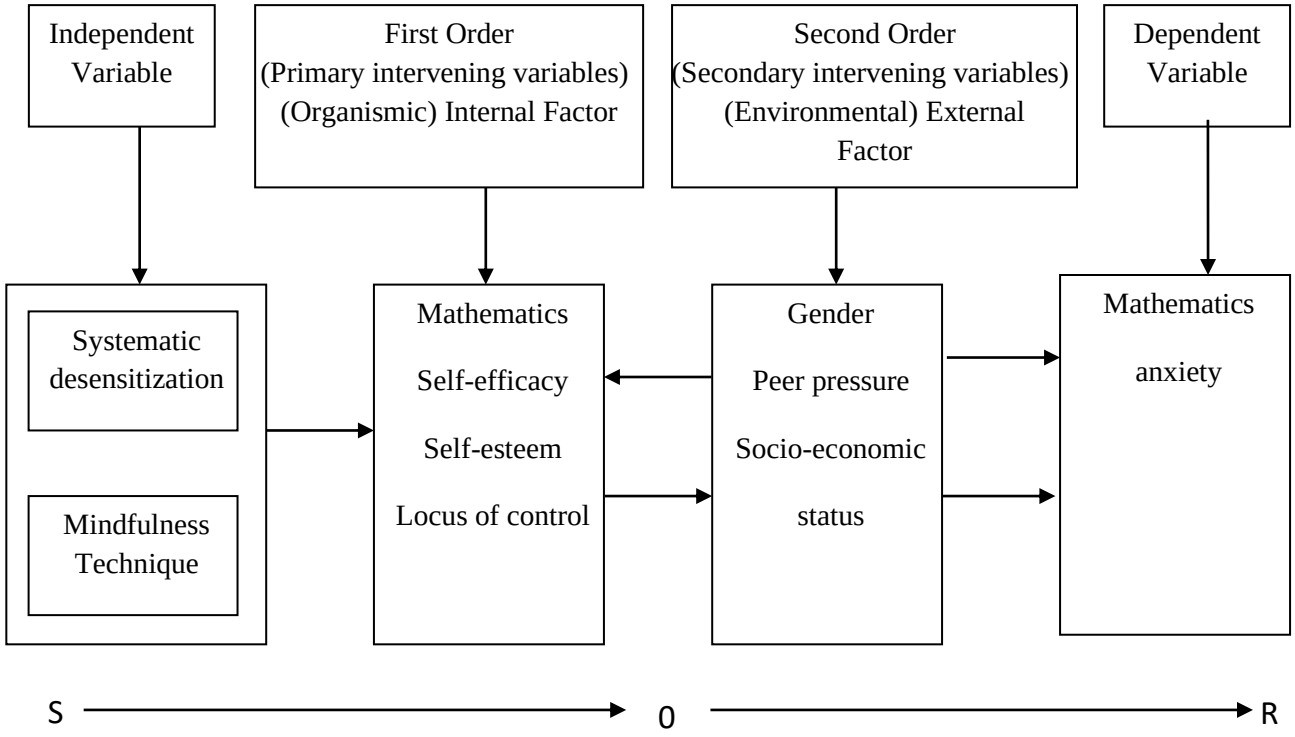
Students with high levels of self-efficacy and self-concept tend to have lower levels of academic anxiety. Students who are higher achievers tend to have higher levels of self-efficacy. When students do well academically, they tend to feel better about themselves (Ahmed et al., 2012; Lee, 2009; Kim et al., 2012). Low Mathematics self-efficacy at an early age can lead to increased math anxiety when older. Students who failed had a higher level of anxiety. The study was limited because of time. Researchers

would have liked to track the students' Mathematics self- efficacy and Mathematics anxiety over many years and different settings (Ahmed et al, 2011).

A study by Lee (2009) explored the relationship between Mathematics self-concept, math self-efficacy, and Mathematics anxiety. The differences between levels in different countries were explored as well. Researchers analyzed data from 41 different countries for differences in the relationship between Mathematics self-concept, self-efficacy, and anxiety. Researchers also wanted to find out the overall differences between levels of self-concept, self-efficacy, and anxiety. Data from the Program for International Student Assessment (PISA) in 2003 was analyzed for this study. The sample size was quite large. 250,000 students participated in PISA. All students were 15 years old. Participants in the study used a scale-response to answer questions about Mathematics self-concept, self-efficacy, and anxiety. Results were varied in different countries. In North America and Western Europe, students who scored well in Mathematics tended to have higher Mathematics self- efficacy and lower Mathematics anxiety. In several Asian countries, students who scored well in Mathematics tended to have low Mathematics - efficacy and higher Mathematics anxiety. Results of the PISA Mathematics assessment show an overall high negative correlation between Mathematics scores and Mathematics anxiety (-0.65). Students who score well tend to have lower levels of Mathematics anxiety.

Conceptual Framework

THE CONCEPTUAL MODEL FOR THE STUDY



In this study a conceptual framework model is developed around the interventions with a view to reducing Mathematics anxiety among secondary school students. From the conceptual model, Systematic Desensitization and Mindfulness Technique are the two treatments. These treatments are termed the independent variables in the conceptual model as they are the variables that are manipulated by the researcher in order to determine their effects on the dependent variable, which is Mathematics anxiety. The intervening variables are of two kinds, the primary and the secondary intervening variables. The primary intervening variables are the organismic or internal variables that are associated internally with the individual participants in the study. These include gender, and Mathematics self-efficacy.

CHAPTER THREE
METHODOLOGY

This chapter presents the procedures used in conducting the study. It covers the following: Design, Population, Sample and Sampling procedure, Instrumentation, Procedure and Data analysis.

3.1 Design

This study employed a pretest-posttest control group experimental design with a 3x2x3 factorial matrix. The three (3) refers to the treatment groups which comprised two experimental groups (Systematic Desensitization and Mindfulness Technique) and a control group. These are labelled as A_1 and A_2 (treatment groups) and A_3 (control group). The three treatment group made up the rows. The first major column is for gender of the participants varying at two levels of Male and Female and labelled B_1 and B_2, while the other major column is for Mathematics self-efficacy, separated into low, moderate and high. These are labelled C_1, C_2 and C_3. The two experimental and control groups were pre-tested before commencement of the training sessions. However, only the treatment groups (Systematic Desensitization and Mindfulness Techniques) were taken through the therapeutic sessions as related to this research.

Table 1: 3x2x3 Factorial Matrix for the management of Mathematics Anxiety

Treatment	Gender					
	Male (B_1)			Female (B_2)		
	Mathematics self-efficacy			Mathematics self-efficacy		
	High C_1	Moderate C_2	Low C_3	High C_1	Moderate C_2	Low C_3
Systematic Desensitization (A1)	3	3	7	5	11	6
Mindfulness Technique (A2)	0	12	2	1	18	3
Control Group (A3)	3	3	7	5	11	6

3.2 Population

The population of this study comprised all Secondary School Students in Ibadan metropolis. The participants were made up of the secondary school II students in the five Local government areas of Ibadan metropolis.

3.3 Sample and Sampling technique

The study adopted multistage random sampling technique in selecting the sample. There are five (5) local government areas in Ibadan metropolis. The simple random sampling technique was used to select three local governments out of the five and the same technique was employed to select one school from each of the three local governments. The participants of the study were randomly chosen from the senior secondary II students in the three schools. The final sample of the study comprised One hundred and three (103) secondary school students who were randomly distributed to the three groups i.e. the two experimental groups and the control group.

3.4 Inclusion criteria

The following determined participants' eligibility:

1. Participants were students of public junior secondary school students II in Lagelu Local Government area, Ibadan.
2. Only those who scored above average on the screening instrument were considered.
3. They were willing to agree to terms of the training sessions – punctuality, partaking in group activities, maintaining consistency and carrying out given assignments.
4. Their parents consented to their participation in the study.

3.5 Instrumentation

Three instruments were used to collect data for this study. They are:

1. Betz Mathematics Anxiety Scale

The Anxiety Scale developed by Betz (1978) was meant to assess students' level of Mathematics anxiety. The items of the instrument include statements on the factors to which students attribute their predicaments in Mathematics. It was a 14-item scale with response format ranging from Strongly Agree = 5 to Strongly Disagree = 1. Participants made to tick the option that best describes their Mathematics Anxiety level. The scores on the items are to be added to give a total maximum score of 70 and a minimum score of 14. A score above average reveals that the participants' Mathematics Anxiety is high, while a score below the norm reveals low anxiety. The items comprise both positively and negatively worded statements. Typical items on the instrument are "*I cannot explain what actually accounts for my difficulty in Mathematics"* and *"I lose concentration in Mathematics class".*The psychometric property of the instrument was established through a pilot study on a sample of 50 students. The Cronbach Coefficient observed was 0.89 and internal consistency of the instrument ranges between 0.49 and 0.81. The scale was further adapted to be compliant with the culture of the participants. The scale was used to measure the criterion (dependent) variable of the study i.e Mathematics anxiety.

2. Mathematics Self-Efficacy Scale

The Mathematics self-efficacy Scale (Betz and Hackett, 1983) was adapted for the measurement of Mathematics self-efficacy in this study. The version adapted by the researcher was specifically designed for use in the Nigerian Secondary Schools students. It covers such areas as: problem-solving; performance accomplishment; verbal persuasion and other areas of Mathematical abilities. The scale has two sections A and B. while section A seeks information on the personal data of the participant like gender, age, class etc, section B contains 16 items on the participant's belief in their capabilities to tackle issues that are related to Mathematics. The response anchor and scoring format of the instrument are as follows: Strongly Agree = 5, Agree = 4, Not sure = 3, Disagree = 2 and Strongly Disagree = 1. The points that were scored on all items were summed up to give participant's score on the scale. Sample of the items on the scale are: *"When Mathematics exercises are hard I don't give up or study only the easy parts"* and *"I am*

confident enough to talk on Mathematics issue". Scores on the scale ranged between 16 (minimum) and 80 (maximum). A score above 48 indicated high Mathematics self-efficacy and score below the norm indicated low Mathematics self-efficacy. The researcher established the psychometric property of the instrument with a pilot study on a sample of 50 students. The Cronbach Coefficient Alpha of 0.81 was observed with internal consistency ranging between 0.48 and 0.73. The scale was used to measure Mathematics self-efficacy as one of the moderating variables of the study. It was used to categorise the participants into high, moderate and low Mathematics self-efficacy. The participants who scored between 15-35 were considered as having low Mathematics self-efficacy, those who scored between 36-56 were considered as having moderate Mathematics self-efficacy while those who scored between 57-75 were considered as having high Mathematics self-efficacy,

3. Woods Mathematics Anxiety Scale

The scale was developed by Woods (2006) to measure the extent of anxiety suffered by students whenever they are to engage in solving Mathematical issues. It comprises 10 items that tap information on Mathematics anxiety and the participants respond by indicating their level of agreement with each of the items using the response anchor: Strongly Agree = 5, Agree = 4, Not sure = 3, Disagree = 2 and Strongly Disagree = 1. Examples of the items in the scale are: *"I become physically agitated when I have to go to Mathematics class"* and *"I tend to lose my concentration in Mathematics class".* The minimum score attainable by each respondent is 10 while the maximum score is 50. All the items of the scale are negatively worded, so high score indicates high level of Mathematics anxiety and low score means low level of Mathematics anxiety. The psychometric properties of the instrument were ensured through a pilot test using a sample of 50 students. The Cronbach Coefficient Alpha of 0.74 was observed with internal consistency ranging between 0.51 and 0.78. The scale was used for screening purpose so as to get the participants for the study.

3.6 Control of Extraneous Variables

Extraneous variables are those factors or attributes that may affect the outcome of the experimental study aside from the intervention strategies employed. The researcher guided against effects of extraneous variables by engaging in the following;

a. appropriate randomisation of participants into the two intervention groups and control group.
b. strict adherence to the 3x2x3 factorial matrix
c. the utilisation of the statistical technique of ANCOVA

3.7 Procedure

A formal introduction letter was collected from the Head of Department of Counseling and Human Development Studies introducing the researcher to the principals of the three schools selected as sample of this study. Ethical approval was collected from Ministry of Education, Secretariat, Ibadan for permission to carry out experimental research in the selected schools in the state. Permission to carry out this research was also obtained from the principals of the three selected schools.

Preliminary visit was made to the schools in order to familiarise the researcher with the participants and solicit their willingness to participate in the study. The length of time that the treatment would take will be discussed. The students were screened using Woods Mathematics anxiety scale in order to arrive at those whose scores fall above 50% and were chosen for the intervention to partake in the treatments.

Two research assistants, who themselves are Doctoral students were be recruited to work with the researcher. These assistants were in-charge of making sure that participants sign in at the beginning of each session and sign out at the end. They also assisted in distributing research instruments as and when due for administration. Three schools were involved in the study and each of the randomly selected schools was a centre for each of the three groups. School A was for the first experimental group, school B was for the second experimental group and school C was for the control group. This interactive session was in five stages: introduction and orientation, selection of participants, pre-test of the research instruments to get an initial evaluation of the

participants, therapeutic treatments and a post treatment evaluation of all the participants at the end of the eighth weeks.

3.8 Data Analysis

Analysis of covariance (ANCOVA) is the major statistical tools that was employed for data analysis in this study. ANCOVA was used to determine the effectiveness of the intervention strategies in managing the dependent variable (Mathematics Anxiety). The Scheffe Post-hoc Analysis was used in this study to determine the directions of differences and effects identified.

CHAPTER FOUR

RESULTS

In this chapter, the statistical results of this study are presented and interpreted, revealing the outcome of the study. The outcome of the study further determined the acceptance or rejection of the stated hypotheses.

Hypothesis One: There will be no significant main effect of treatment on Mathematics anxiety among secondary school students.

Table 4.1: Summary of ANCOVA showing the main effect of Treatment, Gender and Mathematics Self-Efficacy on Mathematics anxiety among secondary school students.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8859.864[a]	17	521.168	5.151	.000	.507
Intercept	1980.414	1	1980.414	19.573	.000	.187
PRETEST	1758.860	1	1758.860	17.384	.000	.170
Main Effect Treatment	753.097	2	376.549	3.722	.028	.081
Gender	.274	1	.274	.003	.959	.000
Math Self efficacy	973.706	2	486.853	4.812	.010	.102
2-way Interaction Treatment * Gender	105.183	2	52.592	.520	.597	.012
Treatment*Math efficacy	1652.098	4	413.024	4.082	.004	.161
Gender * Math efficacy	133.786	2	66.893	.661	.519	.015
3-way Interaction: Treatment * Gender * Math self-efficacy	505.119	3	168.373	1.664	.181	.055
Error	8600.253	85	101.179			
Total	200836.000	103				
Corrected Total	17460.117	102				

a. R Squared = .507 (Adjusted R Squared = .409)

Table 4.1 above shows a significant main effect of treatment in the management of Mathematics anxiety among secondary school students ($F_{2,85} = 3.772$; $P < 0.05$, $\tilde{\eta} = 0.081$). This means that there is significant difference in the post treatment means of Mathematics anxiety among secondary school students that participated in the Systematic Desensitization therapy (SDT), Mindfulness Skill Training (MST) and the control. Hence hypothesis one was not confirmed statistically.

For further clarification on the margin of difference in the level of Mathematics anxiety of the treatment groups and the control group, the Scheffe Post-Hoc Pair wise comparison of the adjusted mean was computed and table 4.2 presents the result in a tabular form as follows:

Table 4.2: The significant differences in Mathematics anxiety among various treatment groups and the control group based on Scheffe Post-Hoc Pair wise analysis

TREATMENT GROUPS	N	Subset for alpha = 0.05	
		1	2
Mindfulness Training (MT)	35	36.2857	
Systematic Desensitization Therapy(SDT)	36	42.2778	
Control	32		48.5625
Sig.		.133	.109

The results from Table 4.2 showed that the MT is most effective treatment followed by SDT and finally followed by control group. And the MT treatment is superior to SDT and the control group. The SDT treatment is superior to control group and control is the least in managing Mathematics anxiety among secondary school students.

Hypothesis Two: There is no significant main effect of gender on Mathematics anxiety among secondary school students.

Table 4.1 shows that gender has no significant effect in the management of Mathematics anxiety among secondary school students ($F_{1,85} = 0.003$; $P > 0.050$, $\tilde{\eta} = 0.000$. This means that there is no significant main effect of gender in managing Mathematics anxiety among secondary school students. This implies that there is no significant difference in the level of Mathematics anxiety of the participants based on the gender. Hence hypothesis two was statistically confirmed.

Hypothesis Three: There is no significant main effect of Mathematics self-efficacy in the management of Mathematics anxiety among secondary school students.

Table 4.1 shows that Mathematics self-efficacy has significant effect in the management of Mathematics anxiety among secondary school students ($F_{2,85} = 4.812$; $P < 0.050$, $\tilde{\eta} = 0.102$. This means that there is significant main effect of Mathematics self-efficacy on Mathematics anxiety among secondary school students. This means that levels Mathematics anxiety of the participants differs significantly based on their levels of Mathematics Self-efficacy. Hence hypothesis two was not statistically confirmed.

To find the degree of significance among the mathematics self-efficacy level table 4.3 is presented. Table 4.3 is presented showing the Scheffe Post-Hoc test in reducing Mathematics anxiety among secondary school students.

Table 4.3: The significant differences in Mathematics anxiety among the participants based on their levels of Mathematics Self-efficacy

MATHEMATTICS SELF-EFFICACY	N	Subset for alpha =0.05	
		1	2
High Mathematics Self-Efficacy Level	15	32.3333	
Moderate Mathematics Self-Efficacy level	56		43.5000
Low Mathematics Self-Efficacy Level	32		44.5313
Sig.		1.000	.957

Hypothesis Four: There will be no significant interaction effect of treatment and gender on Mathematics anxiety among secondary school students.

Table 4.1 shows that interaction effect of treatment and gender has no significant effect in managing Mathematics anxiety among secondary school students ($F_{2,75}$ = 0.520; P > 0.050, ñ = 0.012. This means that there is no significant interaction effect of treatment and gender in the management Mathematics anxiety among secondary school students. Hence hypothesis four was statistically confirmed.

Hypothesis Five: There will be no significant interaction effect of treatment and Mathematics self-efficacy on Mathematics anxiety among secondary school students.

Table 4.1 shows the interaction effect of treatment and Mathematics self-efficacy has significant effect in the management of Mathematics anxiety among secondary school students($F_{4,85}$ = 4.082; P < 0.050, ñ = 0.161. Hence hypothesis five was statistically not confirmed. This means that there is significant interaction effect of treatment and Mathematics self-efficacy in managing Mathematics anxiety among secondary school students.

Hypothesis six: There will be no significant interaction effect of gender and Mathematics self-efficacy on Mathematics anxiety among secondary school students.

Table 4.1 shows that interaction effect of gender and Mathematics self-efficacy has no significant effect in the management of Mathematics anxiety among secondary school students ($F_{2,85}$ = 0.661; P > 0.05, ñ = 0.015. This means that there is no 2 way significant interaction effect of gender and Mathematics self-efficacy in managing Mathematics anxiety among secondary school students. Hence hypothesis six was statistically confirmed.

Hypothesis seven: There will be no significant interaction effect of treatment, gender and Mathematics self-efficacy on Mathematics anxiety among secondary school students.

Table 4.1 shows that 3 way interaction effect of treatment, gender and Mathematics self-efficacy has no significant effect in managing Mathematics anxiety among secondary school students ($F_{3,85}$ = 1.664; P > 0.050, ñ = 0.055. This means that there is no significant interaction effects of treatment, gender and Mathematics self-efficacy in

managing Mathematics anxiety among secondary school students. Hence hypothesis seven was statistically confirmed.

4.2 Summary of the Findings

The summary of the findings is stated as follows:

1. Effect of treatment was significant on Mathematics anxiety of secondary school students.
2. Gender had no significant effect on Mathematics anxiety of secondary school students.
3. Mathematics Self-efficacy had a significant effect on Mathematics anxiety of secondary school students.
4. The interaction effect of treatment and gender was not significant on Mathematics anxiety of secondary school students.
5. The interaction effect of treatment and Mathematics Self-efficacy was significant on Mathematics anxiety of secondary school students.
6. The interaction effect of gender and Mathematics Self-efficacy was not significant on Mathematics anxiety of secondary school students.
7. The interaction effect of Treatment, gender and Mathematics Self-Efficacy was not significant on Mathematics anxiety of secondary school students.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter presents a logical explanation on the findings of this study backed up with previous empirical findings. The discussion of the findings is based on the seven hypotheses earlier generated and tested by the researcher. Logical conclusions and recommendations are also provided.

5.1 Discussion of findings

This study examined the effect of Mindfulness Technique and Systematic Desensitization in the management of Mathematics Anxiety among secondary school students. To this effect, ANCOVA as a statistical tool was used to analyse the data collected and the findings are discussed below:

Hypothesis One: There is no significant main effect of treatment on Mathematics Anxiety among secondary school students.

The above stated hypothesis was rejected because the result in table 4.1 clearly showed that there was a significant main effect of treatment on the management of Mathematics Anxiety among secondary school students. By implication, both Mindfulness Technique and Systematic Desensitization were effective in the management of Mathematics Anxiety among secondary school students.

The finding lends credence to the assertion made by Head and Gross (2008) that SD is one of the most empirically supported therapy methods available, especially for treating anxiety. The result corroborates Egbochuku (1998), Egbochuku and Obodo (2005),Otta and Ogazie (2014), Azuji, Nwokolo and Anyamene (2015) who found SD effective in reducing anxiety and test phobia among secondary school adolescents in Nigeria. It is also in consonance with Abood and Abumelhim (2015) who found SD effective in reducing anxiety among learners in Jordan. SD is a method that has been consistently proven to be effective in the treatment of anxiety and phobias. Their result

showed that systematic desensitization has a positive effect both at the posttreatment and follow-up stages. A similar result was also obtained by Ventis et al. (2001) who found out a reduction in students fear of spider using systematic desensitization technique among College of William and Mary, Williamsburg. In other words, mindfulness may help students manage existing Mathematics anxiety and decrease its deleterious effects, and it is only later that Mathematics anxiety itself is reduced.

The finding also supports Gillingham (1977) which reported systematic desensitization as one of the successful treatment procedures for Mathematics anxiety. Similarly, Zettle (2003) confirmed the effectiveness of systematic desensitization on management of Mathematics anxiety among students. Additionally, Higbee and Thomas (1990) reported the effectiveness of the combination of the three techniques of systematic desensitization, relaxation technique, and meta cognition in the reduction of Mathematics anxiety among College students. Suinn and Richardson (1971) found that there is a significant progress in Mathematics anxious university students treated by traditional systematic desensitization. Also, Ventis, Higbee, and Murdock (2001) established the effectiveness of systematic desensitization on fear reduction using humorous hierarchy scenes without relaxation.

In the same vein, Davidson and Levitov (1999) found the positive use of relaxation and visualizations which are components of systematic dissensitisation in the management of Mathematics anxiety. Antoni (2003) reported the significant effect of systematic desensitization (SD) on reduction of Mathematics anxiety of anxious students in the college. Azuji, et al. (2015) found that systematic desensitization (SD) is effective in reducing Mathematics anxiety among secondary school adolescents in Nigeria. Abood and Abumelhim (2015) reported the efficacy of Systematic Desensitization (SD) on management of Mathematics anxiety among adolescents.

Najihah Akeb-urai et.al (2020) also reported the effectiveness of systematic desensitization treatment on the management of Mathematics anxiety among year one college students. Osenweugwor et al. (2018) found that Systematic Desensitization (SD) is one the techniques effective in reducing the anxiety status of undergraduates in a Nigerian University. Obodo (2006) finding revealed that Systematic Desensitisation (SD) was effective in the reduction of Mathematics anxiety of students. Kingston et al.

(2014) found systematic desensitization as an effective intervention in reducing Mathematics anxiety among University students. Ernest-Ehibudu Ijeoma et al. (2017) established the effectiveness application of systematic desensitization in the management of mathophobia (that is, Mathematics anxiety) among secondary school students.

Similarly, the finding is in line with Brunyé et al. (2013) who found that Mindfulness Technique was largely effective in the management of Mathematics anxiety among High school students. Park et al. (2014) also reported that Mindfulness Technique is effective in the management of Mathematics anxiety. Furthermore, Weger et al. (2012) established the effectiveness of Mindfulness Technique in the remediation of Mathematics anxiety among students. The finding also supports Bellinger et al. (2015) which reported that mindfulness technique was found to directly and positively affect Mathematics anxiety of students. Quinnell, et al. (2013) found that Mindfulness Technique was found to be effective in the management of Mathematics anxiety among College students. Wisner and Starzec (2015) established the significant effect of Mindfulness Technique on the management of Mathematics anxiety among University students.

Niss, (2012) found a positive and significant effect of mindfulness training on Mathematics anxiety in high school students. This suggested that mindfulness was helpful in reducing the levels of anxiety among the students. In the same vein, Senay, et al., (2012) established the effectiveness of using nonjudgmental awareness to fight anxiety. Sohrabi, et al. (2013) found that mindfulness sessions do decrease exam anxiety. Harpin et al. (2016) also found that mindfulness training was effective in the reduction of Mathematics anxiety among highly anxious students. Black and Fernando (2013) reported the effectiveness of mindfulness based Technique in the management of Mathematics anxiety among high school students. Bellinger, et al (2015) reported that mindfulness training is effective in solving anxiety problems among students. Also, Rhoads & Healy, (2013) established the positive effect of Mindfulness based Technique in the reduction of Mathematics. Hindman (2013) confirmed the effectiveness of Mindful Stress Management programs on anxiety.

Nadine Yildiz (2018) also reported the effectiveness of mindfulness technique as one of the most effective interventions in managing Mathematics anxiety among students.

Hannah Rosholt et al (2021) confirmed the effectiveness of mindfulness technique in solving anxiety problems, analyzing how mindfulness practice impacts students' behavior, emotional well-being, and cognitive functioning. On the contrary, Paterniti (2007) found no significant effect of Mindfulness Technique in the management of anxiety.

The plausible explanation of this finding is that the main tenets of Systematic desensitization is decreasing one's level of anxiety or fear very gently and gradually and it is not concerned with the unconscious sources of the problem or with repressed conflicts. It also made the participants to realise that they have learned an ineffective behaviour (the phobia), and which must be unlearnt. The therapy aimed at and successfully removed the fear response of Mathematics anxiety and substituted it with a relaxation response to the conditional stimulus gradually using counter conditioning. It was largely effective because relaxation and anxiety cannot exist simultaneously. Since the participants could relax comfortably in anxiety-provoking imagination, they would feel less anxious whenever they faced Mathematics related tasks. Once this fear was reduced or eliminated, then Mathematics anxiety of the students is bound to reduce considerably.

In the same vein, Mindfulness is a purposeful and non judgmental consciousness of what is obtainable or experienced at the present moment. The major aim of Mindfulness Technique is to increase adolescents' awareness and knowledge of their status, including their academic status, and make an individual aware that he is weak in a particular course. This awareness must have helped the participants to practice and, consequently, master further the areas which cause anxiety and subsequently get over the problem in terms of reduced Mathematics anxiety. It also improves the ability to self-regulate attention and direct it towards an experience. Also, mindfulness results in reduced rumination and thereby, reducing the anxiety and negative mood.

Hypothesis Two: There is no significant main effect of gender on the management of Mathematics Anxiety among secondary school students

The hypothesis stated above was accepted because the result in table 4.1 clearly portrayed that there was no significant main effect of gender on Mathematics Anxiety among secondary school students. By implication, gender difference has no significant impact on Mathematics Anxiety among secondary school students.

The finding corroborates Malinsky, et al. (2006) that there is no significant difference in the Mathematics anxiety experience in either gender, though females exhibit more math anxiety in secondary school and college. Similar to this result is Else-Quest et al., (2010) which reported no significant difference in Mathematics anxiety levels in males and females. Also, Zettle & Houghton, (1998) found that Mathematics anxiety measures do not differ significantly for females and males. In the same vein, Haynes, et al. (2004) reported no significant differences in Mathematics anxiety levels in male and female college students. Marsh and Tapia, (2002); Elenchothy, (2007); Mohamed and Tarmizi, (2010) revealed that that there is no significant difference in Mathematics anxiety between male and female students. Spelke, (2005) found that both genders show approximately the same level of Mathematics anxiety

The finding however contradicts several others. For instance, Khatoon & Mahmood, (2010) reported a significant relationship between Mathematics anxiety and gender among college students with the female experiencing more anxiety. Also, Woodward (2004) found that there exists a gender differences in Mathematics anxiety levels of male and female students. Wigfield and Meece (1988) found that there is a significant relationship between gender and Mathematics anxiety among students. Other researchers also established that females have significantly higher levels Mathematics anxiety than males (Tuan and Salleh, 2001; Woodard, 2004; Yüksel-Şahin, 2008; Karimi and Venkatesan, 2009). Yüksel-Şahin (2008) reported a significant relationship between gender and Mathematics anxiety of secondary school students in Turkey.

Similarly, Jakobsson et al., (2013) found significant difference between in Mathematics anxiety among male and female students. Grills-Traquechel et al, (2012) found a significant difference in Mathematics anxiety based on gender. Devine et al., (2012) reported a significant gender difference in Mathematics anxiety of students.

Dowker et al., (2012); Wu et al., (2012); Harari et al., (2013) reported that there is gender differences in Mathematics anxiety of students. Also, Beilock et al., (2010) reported general differences in anxiety between males and females. McClure et al., (2011) found that gender is one of the correlates of Mathematics anxiety of students at adolescence stage. Finally, Chapman et al., (2007) reported a significant relationship between gender and Mathematics anxiety with the females showing higher levels of anxiety than males

The probable reason for this finding is that both boys and girls are exposed to the same pattern of teaching, reward and punishment system in school and whatever treatments or services given to the boys are always extended to their female counterparts. So, there is the tendency that the level of Mathematics anxiety of the boys may not differ significantly from that of the girls.

Hypothesis Three: There is no significant main effect of Mathematics self-efficacy on Mathematics Anxiety among secondary school students.

Hypothesis three was rejected because there was a significant main effect of Mathematics self-efficacy on Mathematics Anxiety among secondary school students. This simply means that there was a significant difference in the level Mathematics anxiety among secondary school students based on their level of Mathematics self-efficacy.

The finding is in line with that of Ahmed, Minnaert, Kuyper, & van der Werf, (2012) that established a reciprocal relationship between self-efficacy and anxiety in Mathematics in students. Lower level of self-efficacy correlates significantly with higher level of anxiety in Mathematics. Also, Jameson and Fusco (2014) reported that learners with lower levels of self-efficacy are found to have higher levels of mathematics anxiety at the college level. Similarly, McMullan et al. (2012) found a statistically significant but negative relationship between Mathematics self-efficacy and Mathematics anxiety. Kurbanoglu (2011) found that Mathematics anxiety was negatively related to Mathematics self-efficacy. Also, Akin & Kurbanoglu, (2011) reported that the relationship between Mathematics self-efficacy and Mathematics anxiety is negative and significant.

The finding is also in line with Ayotola & Adedeji, (2009) who established a strong connection between high levels of Mathematics self-efficacy and lower level of Mathematics anxiety. It was established that Mathematics self-efficacy correlates negatively with Mathematics anxiety. Ahmed, et al, (2011) found a significant relationship between level self-efficacy of students and lower level of Mathematics anxiety as higher self- efficacy correlated with lower levels of anxiety. Lee (2009) found that there is significant and inverse relationship between Mathematics self-efficacy and Mathematics anxiety among students. Lastly, Kim et al., (2012) found that low Mathematics self- efficacy at an early age can lead to increased Mathematics anxiety when older. Students who failed had a higher level of anxiety.

This finding may be as a result of the established fact that students with high self-efficacy perceive themselves as being able or having confidence to perform any given task. They see obstacles not as problems to run away from but as challenges to be surmounted and they are able to stabilise their systems when faced with Mathematics tasks not minding what it takes. A strong sense of efficacy enhances human accomplishments and adjustment to challenging situations. Being able to manage anxiety is determined by their efficacy to mobilise cognitive resources and the cause of action needed to exercise control over given circumstances.

Hypothesis Four: There is no significant interaction effect of treatment and gender on the management of Mathematics Anxiety among secondary school students.

The hypothesis stated above was accepted because there was no significant interactive effect of treatment and gender on the management of Mathematics Anxiety among secondary school students. This simply means that gender did not significantly moderate the effect of treatment on Mathematics Anxiety among secondary school students. It is also an indication that the treatments were effective irrespective of gender of the participants.

This result agrees with earlier findings by (Ifeanyi, Nwokolo and Anyamene, 2015); (Egbochuku and Obodo (2005), who also found no significant interaction effect of treatment and gender on the management of test anxiety of students. The study further agrees with the reports of other studies like Egbochuku and Igbineweka (2014) in which they found that Sex had no significant effect on the reduction of test anxiety of students.

This finding is also in line with (Dowker et al., 2012) who found no significant interaction effects of gender and some other variables on the treatment of Mathematics anxiety of students. Boys were not significantly better than girls in in terms of their levels of anxiety after the completion of the intervention. On the contrary, the finding contradicts, Hyde, (2005) who found significant interaction effect of treatment and gender on Mathematics anxiety of students that are exposed to an intervention programme.

The reason why the study found no significant interaction effect of treatment and gender on Mathematics anxiety may be because of the fact that both male and the female participants were given equal treatment and chance during the treatment process and gender did not have effect on Mathematics anxiety. It is only logical that its interaction with the treatment may not produce a significant effect on Mathematics anxiety of the participants.

Hypothesis five: There is no significant interaction effect of treatment and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students. The above stated null hypothesis was not supported since there was a significant interactive effect of treatment and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students. This simply means that Mathematics self-efficacy moderated the effect of the treatment on the Mathematics Anxiety among secondary school students.

This finding is in accordance with previous research of Costa et al., (2001) that self-efficacy moderated the effect of treatment on students who suffer Mathematics anxiety. Similarly, (McLean et al., 2011) reported that self-efficacy has been shown as a mediating factor in ameliorating academic related problems.

The plausible reason for this finding may be because the two treatments or interventions require the participants to carry out certain activities on their own and it is only those who are highly efficacious i.e. believe in their own capacities or abilities that can perform the given tasks better than those with low efficacy. People with low self-efficacy are more likely to lessen their efforts or give up altogether, while those with high self-efficacy try harder to master challenges. Hence, those with high efficacy were able to

benefit more positively in terms of reduced level of Mathematics anxiety than others with low self-efficacy.

Hypothesis Six: There is no significant interaction effect of gender and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students.

The result in table 4.1 showed that there is no significant interactive effect of gender and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students. Therefore, the null hypothesis is accepted. This finding contradicts Park and French, (2013) that gender and self-efficacy have interaction effects on the management of Mathematics anxiety among college students. In the same vein, Dowker et al., (2012) found that gender and self-efficacy are strong determinants of the way the participants respond to treatment on Mathematics anxiety. High self-efficacy simply means having more confidence in overcoming challenges that would be faced in college and it is no respecter of gender (Ramos-Sanchez & Nichols, 2007).

The non interactive effect found between gender and self-efficacy could be explained since from this study gender did not have significant effect on Mathematics anxiety, it may not make any contribution to its interaction with self-efficacy. This could be due to the fact that acknowledgement and understanding of components of self efficacy are critical to management of Mathematics anxiety and these are not gender specific. Also, there could be other moderators outside this study that could affect Mathematics anxiety and which are not gender biased.

Hypothesis Seven: There is no significant three-way interaction effect of treatment, gender and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students.

This hypothesis was accepted because there was no significant interactive effect of treatment, gender and Mathematics self-efficacy on management of Mathematics Anxiety among secondary school students. This finding contradicts Hindman (2013) who established the interaction effects of treatment, gender and Mathematics self-efficacy on management of Mathematics Anxiety among students. It is also not in line with Nadine

Yildiz (2018) that established a 3 way interaction effect of treatment, gender and self-efficacy on the reduction of Mathematics anxiety among college students.

A possible explanation of this finding could be that though the students are in the same type of school and the same level and are faced with common school challenges in when faced with Mathematics task, their level of coping with the challenges differ considerably from one participant to another. These students irrespective of the gender and their level of self-efficacy are also exposed to similar experiences in school and the study but their level of self-efficacy also differ as confirmed earlier in this study. This scenario may account for the non significant interaction effect of gender, self-efficacy and treatment on Mathematics of the students.

5.2 Conclusion

This study was designed to examine the effectiveness of Systematic desensitization and Mindfulness Technique in the management of Mathematics anxiety among secondary school students. Gender and Mathematics self-efficacy were the moderating variables. To this effect the selected participants had to undergo some training, the required data was collected and analyzed, revealing the outcome of the study. Based on the findings of this study, the following conclusions are made;

Systematic desensitization and Mindfulness Technique were effective in the management of Mathematics anxiety among secondary school students. By implication, a proper application of the principles underlying these psychological interventions should produce a similar result. However, Mindfulness Technique was more potent in the management of Mathematics anxiety among secondary school students. This study further discovered that gender had no significant main effect in managing Mathematics anxiety of the students but main effect of Mathematics self-efficacy on Mathematics anxiety of the participating students was established.

The results clearly showed that Mathematics self-efficacy of the students moderated the relationship between the two treatments in their effect on Mathematics anxiety. It could be averred that low Mathematics efficacy could increase anxiety in the subject and decrease their performance in the subject. Students with higher levels of

Mathematics efficacy set higher goals, apply more effort, persist longer in the face of difficulty in the subject and are more likely to cope better.

5.3 Suggestions for further studies

The following suggestions are made based on the findings of the study:

It is suggested that future researches should be carried out on Mathematics anxiety among secondary school students and other intervention strategies that can be used to remediate or manage it among the students. However, it is suggested that such studies should be extended to other states and zones of the country, so that generalization can be made. This study was limited only to public secondary schools, but it can be replicated in private secondary schools to examine whether or not there are significant differences in levels of Mathematics anxiety based on the type of the schools. Furthermore, a number of variables (demographic, psychological and social) should be examined in relation to Mathematics anxiety among the students.

5.3 Contributions to Knowledge

This study has been able to contribute to knowledge in the following areas:

- The outcome of the study has been able to demonstrate the effectiveness of Systematic desensitization and Mindfulness Technique in the management of Mathematics anxiety among secondary school students.
- The study has thus demonstrated the relevance of these psychological interventions in helping students manage this problem that has been affecting the performance of the students in the core subject.
- It has also provided empirical data to assist educational psychologists and other stakeholders in the educational sector in finding a way out of the long standing problem of Mathematics anxiety.
- This study has added to the existing literature on the effectiveness of Systematic desensitization and Mindfulness Technique in the management of Mathematics anxiety among secondary school students.

- This study has filled a research gap which sought for the need to adopt some psychological intervention to solve the problem of Mathematics anxiety which has had negative effects on performance of the students.
- The extensive literature reviewed in this study better explains the relationship that exists between and among gender, Mathematics self-efficacy and Mathematics anxiety.

5.4 Recommendations

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

1. The treatment strategies reviewed in this study are recommended for use by educational psychologists, guidance counsellors, teachers and principals of secondary schools.
2. Mathematics teachers at the secondary school level should work towards demystification of Mathematics so that the phobia which students have for the subject will drastically reduced.
3. The students should always find a means to practice relaxation technique whenever they are faced with Mathematics task as if has been established as one of the ways to manage anxiety.
4. The parents should always provide necessary materials like textbooks, graph books, mathematical sets e.t.c that are needed by the students in order to reduce the fear they have for Mathematics
5. The school management should work towards boosting the self-efficacy of the students so that they will be more confident to tackle problems in Mathematics instead of exhibiting fear for it..
6. Counselling psychologists in secondary schools should be allowed to perfom their professional duties of problem solving and help students in building their efficacy in Mathematics since Mathematics self-efficacy was found to correlate significantly with Mathematics anxiety..

REFERENCES

Adams, C. 2001. Overcoming Mathematics anxiety. *Mathematical Intelligencer, 23*(1), 49-50.

Adelson J. 1979. Adolescence and the generation gap. Psychology Today, 33ff.

Adeyinka, T., and Mutula, S. 2010. A proposed model for evaluating the success of WebCT course content management system. Computers in Human Behaviour, 26(6), 1795.

Agnew R. 1997. Stability and change in crime over the life course: A strain theory explanation. In T. P. Thornberry (Ed.), Developmental theories of crime and delinquency (pp. 101-132). New Brunswick, NJ: Transaction.

Ahmed, W., Minnaert, A., Kuyper, H., and van der Werf, G. 2012. Reciprocal relationships between Mathematics self-concept and Mathematics anxiety. *Learning and* 70 *Individual Differences, 22*(3), 385-389. doi:10.1016/j.lindif.2011.12.004

Akin, A., and Kurbanoglu, I. N. 2011. The relationships between Mathematics anxiety, Mathematics attitudes, and self-efficacy: A structural equation model. *Studia Psychologica, 53*(3), 263. oi:10.2190/ec.39.1.d

Akinsola, M.K. 2002. In-service Elementary Teachers' Mathematics Anxiety and Its Relationship to Teachers' Attitude Towards The Studying and Teaching of Mathematics. *Nigerian Journal of Applied Psychology.* Volume 7 Number 1, Page 189-202

Albrecht, N. J., Albrecht, P.M., and Cohen, M. 2012. Mindfully Teaching in the Classroom: a Literature Review. Australian Journal of Teacher Education, 37(12), 1-14. Doi: 10.14221/ajte.2012v37n12.2

Alexander, L., and Martray, C. 1989. The Development of an Abbreviated Version of the Mathematics Anxiety Rating Scale. 2. Measurement and Evaluation in Counseling and Development, 22, 143-150. 3.

American School Counselor Association. 2005. *The ASCA national model: A framework for comprehensive school counseling programs,* (2nd ed.). Alexandria, VA: Author.

Antoni, M. H. 2003. Rational thought replacement. Washington, D. C: APA. [2] Ashcraft, M. H. (2002). Mathematics anxiety: personal, educational and cognitive consequences. Current Directions in Psychological Science, 11, 181-185.

Arem, C.A., 2003. Conquering Mathematics Anxiety. 2nd Edn., Brooks/Cole-Thomson Learning, Pacific Grove, ISBN-10: 0534386342, pp: 193.

Aremu Ayotola et al. (2009) Procedia Social and Behavioural Sciences 1 *953–957* 957

Aristotle 1941. Ethica nicomachea, W. D. Ross, Trans. In R. McKeon (Ed.), The basic works of Aristotle. New York: Random House.

Ashcraft, M 2002 Mathematics Anxiety: Personal, Educational, and Cognitive Consequences. Current Directions in Psychological Science. Vol.11, Number 5, October 2002.

Ashcraft, M. H., and Faust, M. W. 1994. Mathematics anxiety and mental arithmetic performance: An exploratory investigation, Cognition and Emotion, 8: 97–125.

Ashcraft, M. H., and Kirk, E. P. 2001. The relationships among working memory, Mathematics anxiety, and performance. *Journal of Experimental Psychology: General*, *130*(2), 224–237. http://doi.org/10.1037//0096-3445.130.2.224

Ashcraft, M. H., and Krause, J. A. 2007. Working memory, Mathematics performance, and Mathematics anxiety. Psychonomic Bulletin and Review, 14, 243-248. doi:10.3758/BF03194059

Ashcraft, M. H., and Moore, A. M. 2009. Mathematics anxiety and the affective drop in performance. *Journal of Psychoeducational Assess- ment, 27,* 197-205. doi:10.1177/0734282908330580

Ashcraft, M. H., and Moore, A. M. 2009. Mathematics anxiety and the affective drop in performance. Journal of Psychoeducational Assessment, 27(3), 197–205. doi: 10.1177/0734282908330580

Ashcraft, M. H., and Ridley, K. S. 2005. Mathematics anxiety and its cognitive consequences. In J. I. D. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 315–330). New York: Psychology Press.

Baer, R. A. 2003. Mindfulness training as a clinical intervention: A conceptual and empirical review. Clinical psychology: Science and practice, 10(2), 125-143.

Baer, R.A., Smith, G. T., Hopkins, J., Krietemeyer, J., and Toney, L. 2006. Using Self-Report Assessment Methods to Explore Facets of Mindfulness. Assessment, 13 (1), 27-45.

Baloğlu, M. 2003. Individual differences in statistics anxiety among college students. *Personality and Individual Differences, 34*(5), 855-865.

Baloglu,M. 1999.A comparison of Mathematics anxiety and statistics anxiety in relation to general anxiety. *Inf. Anal.* 85, 1–30.

Bandalos, D. L., Yates, K., and Thorndike-Christ, T. 1995. Effects of Mathematics self-concept, perceived self-efficacy, and attributions for failure and success on test anxiety. *Journal of Educational Psychology,* 87, 611–623

Bandura, A. 1977. Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review,84*(2),191-215.

Bandura, A. 1986. *Social foundations of thought and action: A social cognitive theory*, Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. 1991. *Social Cognitive Theory of Self-regulation.* Organizational Behaviour and Human Decision Processes, 50, 248-287. http://dx.doi.org/10.1016/0749-5978(91)90022-

Bandura, A. 1994. Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behaviour*. (pp. 71 - 81). New York: Academic Press. Retrieved from http://www.des.emory.edu/mfp/BanEncy.html

Bandura, A. 1997, *Self-Efficacy: the Exercise of Control*, Freeman, New York

Bandura, A. 2004. *Swimming against the mainstream: The early years from chilly tributary to transformative mainstream.* Behaviour and Research Therapy 42, 613- 630. Retrieved from http://www.des.emory.edu/mfp/Bandura2004BRT.pdf

Bandura, A. 2005. Guide for constructing self-efficacy scales. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents*. Greenwich, CT: Information Age Publishing. Retrieved December 1, 2005, from http://www.emory.edu/EDUCATION/mfp/SEff-uide2005Revised.html

Bandura, A., and D. Cervone. 1983. Self-evaluative and self-efficacy mechanisms governing motivational effects of goal systems. Journal of Personality and Social Psychology 45, no. 5: 1017□28.

Bandura, A., and Locke, E. A. 2003. Negative Self-Efficacy and Goal Effects Revisited. *Journal of Applied Psychology, 88*(1), 87 – 99.

Barbeite, F. G. and Weiss, E. M. 2004. Computer self-efficacy and anxiety scales for an internet sample: testing measurement equivalence of existing measures and development of new scales. *Computers in Human Behaviour, 20*, 1–15.

Barlow, D. H. 2008. *Clinical handbook of psychological disorders. A step-by-step treatment manual*. (4th ed.). London: The Guilford Press.

Barrett, P. M., Dadds, M. R., and Rapee, R. M. 1996. Family treatment of childhood anxiety: A controlled trial. *Journal of Consulting and Clinical Psychology, 64*, 333-342.

Beasley, T. M., Long, J. D., and Natali, M. 2001. A confirmatory factor analysis of the Mathematics Anxiety Scale for Children. *Measurement and Evaluation in Counseling and Development, 34*(1), 14-26.

Beilock, S. L., Guderson, E. A., Ramirez, G., and Levine, S. C. 2010. Female teachers' Mathematics anxiety affects girls‟ Mathematics achievement. *Proceedings on the National Academy of Sciences, 107*, 1860-1863. doi: 10.1073/pnas.0910967107

Bellinger, D., DeCaro, M., and Ralston, P. 2015. Mindfulness, anxiety, and high-stakes Mathematics performance in the laboratory and classroom. Consciousness and Cognition, 37, 123-132.

Ben-Zeev, T., Duncan, S., and Forbes, C. 2005. Stereotypes and Mathematics performance. In J. I. D. Campbell (Ed.), *Handbook of Mathematical cognition* (pp. 235-249). New York: Psychology Press.

Bergen-Cico, D., Possemato, K., and Cheon, S. 2013. Examining the efficacy of a brief mindfulness-based stress reduction (brief MBSR) program on psychological health. Journal of American College Health, 61(6), 348-360.

Berggren, N., and Derakhshan, N. 2013. Attentional control deficits in anxiety: why you see them and why you don't. *Biol. Psychol.* 92, 440–446. doi: 10.1016/j.biopsycho.2012.03.007

Berman, J. S., Miller, R. C., and Massman, P. J. 1985. Cognitive therapy versus systematic desensitization: Is one treatment superior. Psychology Bulletin, 97(3), 451-461.

Betz N. E., and Hackett, G. 1983. The relationship of Mathematics self-efficacy expectations to the selection of science-based college majors. Journal of Vocational Behavior, 23: 329-345.

Betz, N. 1978. Prevalence, distribution, and correlates of Mathematics anxiety in college students. *J. Couns. Psychol.* 25, 441–548. doi: 10.1037/0022-0167.25.5.441

Betz, N. and Hackett, G. 1983. The relationship of Mathematics self-efficacy expectations to the selection of science based college majors. *Journal of Vocational Psychology, 23*(3), 329-345.

Black, D. S., and Fernando, R. 2013. Mindfulness training and classroom behavior among lower-income and ethnic minority elementary school children. Journal of Child and Family Studies,23 (7), 1242-1246. doi:10.1007/s10826-013-9784-4

Boekaerts, M. 2011. What have we learned about the social context-student engagement link? *Teachers College Record*, *113*(2), 375-393.

Brigman, G., and Campbell, C. 2003. Helping students improve academic achievement and school success behaviour. *Professional School Counseling*, *7*(2), 91-98.

Bronfenbrenner U. 1977. Toward an experimental psychology of human development. American Psychologist, 32, 513-531.

Bronfenbrenner U. 1979. The ecology of human development. Cambridge, MA: Harvard University Press.

Brooks, J. G., and Brooks, M. G. 1999. *In search of understanding: The case for constructivist classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.

Brooks-Gunn J, Graber JA, Paikoff RL. 1994. Studying links between hormones and negative affect: Models and measures. Journal of Research on Adolescence, 4, 469-486.

Brown, D., and Trusty, J. 2005. School counselors, comprehensive school counseling programs, and academic achievement: Are school counselors promising more than they can deliver? *Professional School Counseling, 9*, 1-8.

Brown, M., Brown, P., and Bibby, T. 2008. "I would rather die": reasons given by 16-year-olds for not continuing their study of Mathematics. *Res. Mathematics. Educ.* 10, 3–18. doi: 10.1080/14794800801915814

Brown, S. D., and Lent, R. W. 2006. Preparing adolescents to make career decisions: A social cognitive perspective. In F. Pajares and T. Urdan (Eds.), *Adolescence and education, Vol. 5: Self-efficacy beliefs of adolescents* (pp. 201-223). Greenwich. CT: Information Age.

Brunyé, Mahoney, Giles, Rapp, Taylor, and Kanarek. 2013. Learning to relax: Evaluating four brief interventions for overcoming the negative emotions accompanying Mathematics anxiety. Learning and Individual Differences, 27, 1-7.

Buchanan CM, Eccles J, Becker J. 1992. Are adolescents the victims of raging hormones? Evidence for activational effects of hormones on moods and behavior at adolescence. Psychological Bulletin, 111, 62-107.

Buchler, R. K. 2013. Anxiety-reducing strategies in the classroom (Doctoral dissertation). Western Michigan University. Retrieved from ProQuest Dissertations and Theses database

Burrill, G. 1997. The NCTM standards: Eight years later. *School Science and Mathematics, 97*, 335- 339.

Bursal, M., and Paznokas, L. 2006. Mathematics anxiety and preservice elementary teachers' confidence to teach Mathematics and science. *School Science and Mathematics, 106*(4), 173-180.

Bursal, M., and Paznokas, L.2006. Mathematics anxiety and pre-School Science and Mathematics, 106, 173-79.

Butler, R. 1998. Determinants of help seeking: Relations between perceived reasons for classroom help-avoidance and help-seeking behaviours in an experimental context. Journal of Educational Psychology, 90, 630-643. 20

Carey, E., Hill, F., Devine, A., and Szucs, D. 2016. The chicken or the egg? The direction of the relationship between Mathematics anxiety and Mathematics performance. Mini Review, 6, 1987. doi:10.3389/fpsyg.2015.01987

Carver, C. S., and Scheier, M. F. 1990. Origins and functions of positive and negative affect: A control-process view. Psychological Review, 97, 19-35.

Cassidy, S. and Eachus, P. 2002. Developing the computer user self-efficacy (CUSE) scale: investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research, 26*(2), 133–153.

Cates,G.L.,andRhymer,K.N.2003.Examining the relationship between Mathematics anxiety and Mathematics performance: an instructional hierarchy perspective. *J. Behav.Educ.* 12, 23–34.doi:10.1023/A:1022318321416

Cawelti, G. 2003. Lessons from research that changed education. *Educational Leadership, 60*(5), 18-21. Retrieved from http://vnweb.hwwilsonweb.com/ hww/results/external_link_maincontentframe.jhtml?_DARGS=/hww/results/resul ts common.jhtml.

Cervone, D., and Pervin, L. A. 2008. Personality theory and reseach 10th Ed. USA: Wiley and Sons Inc.

Chalfant A, Rapee R, Carroll L. 2006. Treating anxiety disorders in children with high functioning autism spectrum disorders: A controlled trial. Journal of Autism and Developmental Disorders; 37:1842-1857

Chambless, D. L., and Hollon, S. D. 1998. Defining empirically supported treatments. *Journal of Consulting and Clinical Psychology, 66*, 7–19.

Chambless, D. L., and Ollendick, T. H. 2001. Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology, 52*, 685–716.

Chang, M-M. 2007. Enhancing web-based language learning through self-monitoring. *Journal of Computer Assisted Learning*, *23*(3), 187-196. doi:10.1111/j.1365-2729.2006.00203.x

Chapman, B. P., Duberstein, P. R., Sörensen, S., and Lyness, J. M. 2007. Gender differences in five factor model personality traits in an elderly cohort: extension of robust and surprising findings to an older generation. *Pers. Individ. Dif.* 43, 1594–1603. doi: 10.1016/j.paid.2007.04.028

Cheema, J. R., and Kitsantas, A. 2013. Influences of disciplinary classroom climate on high school student self-efficacy and Mathematics achievement: A look at gender and racial-ethnic differences. *International Journal of Science and Mathematics Education*, *12*, 1261-1279.

Chen, P. 2003. Exploring the accuracy and predictability of the self-efficacy beliefs of seventh-grade Mathematics students. *Learning and Individual Differences, 14*, 79-92. 13 *Han, Mark, Yu, and Zeng*

Chen, P., and B. Zimmerman. 2007. A cross-national comparison study on the accuracy of self-efficacy beliefs of middle-school Mathematics students. Journal of Experimental Education 75, no. 3: 221□44.

Chiou, W., and Wan, C. 2007. The dynamic change of self-efficacy in information searching on the Internet: influence of valence of experience and prior self-efficacy. The Journal of Psychology, 141(6), 589.

Chipman,S.,Krantz,D.,andSilver,R.1992.Mathematics anxiety and science careers among able college women. *Psychol.Sci.* 3, 292–296.doi:10.1111/j.1467-9280.1992.tb00675.x

Cohen, J., Deblinger, E., Mannarino, A., and Steer, R. 2004. A multi-site randomized Controlled trial for children with suxual abuse-related PTSD symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 393-402.

Coleman J. and Hendry LB. 1999 The Nature of Adolescence, London: Routledge.

Coleman JC. 1978. Current Contradictions in Adolescent Theory. Journal of Youth and Adolescence, 7, 1-11

Compeau, D. R. and Higgins, C. A. 1995. Computer self-efficacy: development of a measure and initial test. *MIS Quarterly*, *19*(2), 189–211.

Connell, J.P., and Wellborn, J.G. 1991. Competence, autonomy, and relatedness: A motivational analysis of self-system processes. In M.R.

Cormier, S., and Nurius, P. O. 2003. Interview and change strategies for helpers: fundamental skills and cognitive behavioral intervention (5th ed.). Pacific Grove, CA: Brooks/Cole.

Costa, P. T., Terracciano, A., and McCrae, R. R. 2001. Gender differences in personality traits across cultures: robust and surprising findings. *J. Pers. Soc. Psychol.* 81, 322–331. doi: 10.1037/0022-3514.81.2.322

Costello, E., Lawler, M. 2014. An Exploratory Study of the Effects of Mindfulness on Perceived Levels of Stress among School-Children from Lower Socioeconomic Backgrounds. The International Journal of Emotional Education, 6, 21-39.

Crowley C, Crowley D, Clodfelter C 1986 Effects of self-coping cognitive treatment for test anxiety. Journal of Counseling Psychology 33(1): 84-86.64.

Cunliffe Miranda, A., Webb, L., Brigman, G., and Peloso, P. 2007. Student Success Skills: A promising program to close the academic achievement gap for African American and Latino students. *Professional School Counseling, 10*, 490-497.

Dadds, M. R., Holland, D. E., Laurens, K. R., Mullins, M., Barrett, P. M., and Spence, S. H. 1999. Early intervention and prevention of anxiety disorders in children: Results at 2 year follow-up. *Journal of Consulting and Clinical Psychology, 67,* 145-150.

Darling-Hammond, L. 2004. From "Separate but Equal" to "No Child Left Behind": The collision of new standards and old inequities. In D. Meier and G. Wood (Eds.), *Many children left behind* (pp. 3-32). Boston: Beacon Press.

DeBellis, V. A., and Goldin, G. A. 2006. Affect and meta-affect in mathematical problem solving: A representational perspective. *Educational Studies in Mathematics, 63*(2), 131-147.

Deci, E., and Ryan, R. 2000. The "what" and "why" of goal pursuits: Human needs and the self-determination of behaviour. Psychological Inquiry, 11, 227–268.

Dennis, K., Daly, C., and Provost, S. C. 2003. Prevalence, contributing factors, and management strategies for test and Mathematics s anxiety in first-year psychology students. *Australian Journal of Psychology, Supplement, 55,* 176.

Denton, P., Madden, J., Roberts, M., and Rowe, P. 2008. Students' response to traditional and computer-assisted formative feedback: A comparative case study. British journal of educational technology, 39(3), 486-500.

Devine, A., Fawcett, K., Szűcs, D., and Dowker, A. 2012. Gender differences in Mathematics anxiety and the relation to Mathematics performance while controlling for test anxiety. *Behavioural and Brain Functions, 8,* 1-9. doi:10.1186/1744-9081-8-33

Dew, K. H., and Galassi, J. P. 1983. Mathematics anxiety: Some basic issues. Journal of Counseling Psychology, 30(3), 443–446. http://dx.doi.org/10.1037/0022-0167.30.3.443.

Dobkin, P. L., and Zhao, Q. 2011. Increased mindfulness – the active component of the mindfulness-based stress reduction program? Complementary Therapies in Clinical Practice, 17, 22-27

Donner, L. 1970. Automated group desensitization a follow-up report. Behav. Res. and Therapy, 8, 241-247.

Douvan E, Adelson J. 1966 The adolescent experience. New York: Wiley.

Dowker, A., Bennett, K., and Smith, L. 2012. Attitudes to Mathematics in primary school children. *Child Dev. Res.* 2012:124939. doi: 10.1155/2012/124939

Dreger, R. M., and Aiken, L. R. 1957. The identification of number anxiety in a college population. *Journal of Educational Psychology, 48,* 344-351.

Dubasa JS, Millerc K, Petersen AC. 2003. The study of adolescence during the 20th century. History of the Family, 8, 375-397

Dykeman, B. F. 1994. The effects of motivational orientation, self- efficacy, and feedback condition on test anxiety. *Journal of instruc- tional psychology, 21,* 114-120.

Eccles, J. S., Jacobs, J. E., and Harold, R. D. 1990. Gender role stereotypes, expectancy effects, and parents' socialization of gender differences. *Journal of Social Issues, 46,* 183-201. doi:10.1111/j.1540-4560.1990.tb01929.x

Effandi Zakaria et al. 2012 American Journal of Applied Sciences 9 (11) 1828-1832 Science Publications

Elenchothy, D., 2007. Kebimbangan matematik dan hubungannya dengan pencapaian pelajar tingkatan empat di daerah Klang. M.Sc Thesis, Universiti Putra Malaysia.

Else-Quest, N., Hyde, J. S., and Linn, M. 2010. Cross-national patterns of gender differences in Mathematics: a meta-analysis. *Psychol. Bull.* 136 103–127. doi: 10.1037/a0018053

Engels, G. I., Garnefsky, N., and Diekstra, R. F. W. 1993. Efficacy of rational-emotive therapy: A quantitative analysis. *Journal of Consulting and Clinical Psychology, 61,* 1083–1091.

Erikson EH. 1968. Identity: Youth and crisis. New York: Norton.

Eysenck, M. W., and Calvo, M. G. 1992. Anxiety and performance: The processing efficiency theory. Cognition and Emotion, 6: 409– 434.

Eysenck,M.W.,andCalvo,M.G.1992.Anxietyandperformance:theprocessing efficiency theory. *Cogn. Emot.* 6, 409–434.doi:10.1080/02699939208409696

Farmer, E. M. Z., Burns, B., Phillips, S. D., Angold, A., and Costello, J. E. 2003. Pathways into and through mental health services for children and adolescents. *Psychiatric Services, 54,* 60-66.

Faust, M. W. 1992. Analysis of physiological reactivity in Mathematics anxiety. Unpublished Doctorial Dissertation. Bowling Green State University, Bowling Green, Ohio.

Faust, M. W., Ashcraft, M. H., and Fleck, D. E. 1996. Mathematics anxiety effects in simple and complex addition. Mathematical Cognition, 2: 25–62.

Feingold, A. 1994. Gender differences in personality: a meta-analysis. *Psychol. Bull.* 116, 429–456. doi: 10.1037/0033-2909.116.3.429

Finlayson, M. 2014. Addressing Mathematics anxiety in the classroom. *Improving Schools*, *17*(1), 99-115. doi:10.1177/1365480214521457

Flook, L., Goldberg, S. B., Pinger, L., Bonus, K., and Davidson, R. J. 2013. Mindfulness for teachers: A pilot study to assess effects on stress, burnout, and teaching efficacy. Mind, Brain, and Education, 7(3), 182-195.

Foong, P. Y. 1987. Anxiety and Mathematics performance in female secondary school students in Singapore. *Asia Pacific Journal of Education*, *8*(2), 22-31.

Foss, D. H., and Hadfield, O. D. 1993. A successful clinic for the reduction of Mathematics anxiety among college students. College Student Journal, 27, 157-165.

Freeling, N. M., and Shemberg, K. M. 1970. The alleviation of test anxiety by systematic desensitization. Behaviour Reseach and Therapy, 8, 293-299.

Freeman D. 1983. Margaret Mead and Samoa: The making and unmaking of anthropological myth. Cambridge, MA: Harvard University Press.

Freud A. 1958. Adolescence. Psychoanalytic Study of the Child, 13, 255-278.

Freud A. 1968. Adolescence. In A. E. Winter, & D. Angus (Eds.), Adolescence: Contemporary studies (pp. 13-24). New York: American Book.

Frost, L. A., Hyde, J. S., and Fennema, E. 1994. Gender, Mathematics performance, and Mathematics-related attitudes and affect: a meta-analytic synthesis. *International Journal of Educational Research, 21*, 373-386.

Furner, J. M. 1996. Mathematics teachers' beliefs about using the National Council of Teachers of Mathematics Standards and the relationship of these beliefs to students' anxiety toward Mathematics. Unpublished doctoral dissertation. University of Alabama..

Furner, J. M., and Duffy, M. L. 2002. Equity for all students in the new millennium: Disabling Mathematics anxiety. Intervention in School and Clinic, 38(2), 67–74. Retrieved from http://search.proquest.com/docview/62213336?accountid¼13013

Gast, D. L., and Ledford, J. 2010. Multiple baseline and multiple probe designs. In D. L. Gast (Ed.), Single subject research methodology in behavioral sciences (pp. 129–165). New York, NY: Routledge

Glomb, T. M., Duffy, M. K., Bono, J. E., and Yang, T. 2011. Mindfulness at work. Research in Personnel and Human Resources Management, 30, 115–157.

Godbey, C. 1997. *Mathematics anxiety and the underprepared student.* Retrieved from http://files.eric.ed.gov/fulltext/ED426734.pdf

Goetz, T., Bieg, M., Lüdtke, O., Pekrun, R., and Hall, N. C. 2013. Do girls really experience more anxiety in Mathematics? *Psychological Science, 24*(10), 2079-2087. doi:10.1177/0956797613486989

Goldfried, M. R. 1971. Systematic desensitization as training in self-control. Journal of Consulting and Clinical Psychology, 37, 228-235.

Greene, J. A., Bolick, C. M., and Robertson, J. 2010. Fostering historical knowledge and thinking skills using hypermedia learning environments: The role of self-regulated learning. Computers and education, 54(1), 230-243. doi: DOI: 10.1016/j.compedu.2009.08.006

Gregor, A. 2005. Examination anxiety. Live with it, control it or make it work for you? *School Psychology International, 26*(5), 617-635.

Greig A, Mackay T. 2005. Asperger's syndrome and cognitive behaviour therapy: New applications for educational psychologists. Educational and Child Psychology;22:4-15

Hackett, G. 1985. The role of Mathematics self-efficacy in the choice of Mathematics related majors of college women and men. A path analysis. Journal of Counselling Psychology, 32, 47-56.

Hackett, G., and Betz, N. E. 1981. A self-efficacy approach to the career development of women. *Journal of Vocational Behaviour*, 18, 326-339.

Hackett, G., and Betz, N. E. 1989. An exploration of the Mathematics self-efficacy/Mathematics performance correspondence. *Journal for Research in Mathematics Education*, *20*, 261-273 Retrieved from http://www.nctm.org/publications/toc. aspx?jrnl=jrme

Hadfield O.D, McNeil K. 1994. The relationship between Myers-Briggs personality type and Mathematics anxiety among pre-service elementary teachers. J Instruct Psychology;21:375–84.

Hadwin, A. and Oshige, M. 2011. Self-regulation, coregulation, and socially shared regulation: exploring perspectives of social in self-regulated learning theory. *Teachers College Record, 113*(2), 240-264.

Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. 2014. Multivariate Data Analysis 7th Ed. New York City, US: Pearson Education Limited.

Hall G. S. 1904. Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education,

Hall G. S. 1904. Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education, vols. 1 and 2. New York: Appleton.

Hannula, M. 2006. Motivation in Mathematics: Goals reflected in emotions. *Educational Studies in Mathematics*, 63, 165–178.

Harari, R.R.,Vukovic, R.K.,and Bailey, S.P. 2013). Mathematics anxiety in young children: an exploratory study. *J. Exp. Educ.* 81, 538–555.doi: 10.1080/00220973.2012.727888

Hareli, S., and Hess, U. 2008. The role of causal attribution in hurt feelings and related social emotions elicited in reaction to other's feedback about failure. Cognition and emotion, 22(5), 862-880.

Harper, N. W., and Daane, C. J. 1998. Causes and reduction of Mathematics anxiety in pre service elementary teachers. *Action in Teacher Education, 19*(4), 29-38.

Harpin, S. B., Rossi, A., Kim, A. K., and Swanson, L. M. 2016. Behavioral impacts of a mindfulness pilot intervention for elementary school students. Education,137 (2), 149-156.

Haynes, A.F., Mullins, A.G. and Stein, B.S. 2004. Differential models for Mathematics anxiety in male and female college students. *Sociological Spectrum,* 24, 295-318. Educational futures Abo Hamza, Helal Vol.5 (2) June 2013 Mathematics Anxiety e-journal of the British Education Studies Association 73 © BESA 2013 ISSN: 1758-2199

Hembree R. 1998. Correlates, causes, effects and treatment of test anxiety. Rev Educ Res. 58(1):47-77. 12.

Hembree, R. (1990). The nature, effects and relief of Mathematics anxiety. Journal for Research in Mathematics Education, 21, 33-46.

Hembree, R. 1988. Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research, 58*(1), 47-77.

Hembree, R. 1990. "The nature, effects, and relief of Mathematics anxiety", *Journal of Research in Mathematics Education,* 21, pp. 33-46.

Higbee, J. L., and Thomas, P. V. 1990. Affective and cognitive factors related to Mathematics achievement. Journal of Development Education, 23, 8-23.

Higbee, J. L., and Thomas, P. V. 1999. Affective and cognitive factors related to Mathematics achievement. *Journal of Developmental Education, 23*, 8–24.

Hindman, R. 2013. A comparison of mindfulness-based programs for stress in university students (Unpublished doctoral dissertation). The Catholic University of America, Washington, D.C., USA.

Hodapp, V., and Benson, J. 1997. The multidimensionality of test anxiety: A test of different models. *Anxiety, Stress and Coping, 10,* 219-245. doi:10.1080/10615809708249302

Hodges, H. L. 1983. Learning styles: Rx for mathophobia. *Arithmetic Teacher, 30*(7), 17-20. Retrieved from http://www.jstor.org.myaccess.library.utoronto.ca/stable/41190643

Hoffman, B. 2010. "I think I can, but I'm afraid to try": The role of self-efficacy beliefs and Mathematics anxiety in Mathematics problem-solving efficiency. *Learning and Individual Differences, 20,* 276-283.

Hoffman, B. 2010. "I think I can, but I'm afraid to try": The role of self-efficacy beliefs and Mathematics anxiety in Mathematics problem solving efficiency. *Learning and Individual Differences,* 20, 276-283. 562

Holroyd, K. A. 1976. Cognition and desensitization in the group treatment of test anxiety. Journal of consulting and clinical psychology, 6, 991–1001.

Hopko, D. R. 2003. Confirmatory factor analysis of the Mathematics anxiety rating scale– revised. *Educational and Psychological Measurement, 63,* 336-353. doi: 10.1177/0013164402251041

Hopko, D. R., Mahadevan, R., Bare, R. L., and Hunt, M. K. 2003. The abbreviated Mathematics anxiety scale (AMAS) construction, validity, and reliability. Assessment, 10(2), 178–182. http://dx.doi.org/10.1177/1073191103010002008.

Hu, H. 2007. Effects of SRL strategy training on learners' achievement, motivation and strategy use in a web-enhanced instructional environment. *Dissertation Abstracts International,* (UMI No. AAT 3301559).

Hughes, P. T. 2016. The relationship of Mathematics anxiety, Mathematics belief, and instructional practices of elementary school teachers.(Middle and Secondary Dissertation).Retrieved fromhttp://scholarworks.gsu.edu/mse_diss/21.

Hyde, J. S. 2005. The gender similarities hypothesis. *Am. Psychol.* 60, 581–592. doi: 10.1037/0003-066X.60.6.58

Jackson, C. D., and Leffingwell, R. J. 1999. The role of instructors in creating Mathematics anxiety in students from kindergarten through college. The Mathematics Teacher, 92(7), 583-586.

Jain, S., Shapiro, S. L., Swaninck, S., Roesch, S. C., Mills, P. J., and Belli, I. 2007. A randomized controlled trial of mindfulness meditation versus relaxation training: Effects on distress, positive states of mind, rumination and distraction. Annals of Behavioral Medicine, 33, 11-21.

Jakobsson, N., Levin, M., and Kotsadam, A. 2013. Gender and overconfidence: effects of context, gendered stereotypes and peer group. *Adv. Appl. Sociol.* 3, 137–141. doi: 10.4236/aasoci.2013.32018

Jameson, M. M., and Fusco, B. R. 2014. Mathematic anxiety, Mathematics self-concept, and Mathematics self-efficacy in adult learners compared to traditional undergraduate students. *Adult Education Quarterly*. doi:10.1177/0741713614541461

Jarvela, S., and Jarvenoja, H. 2011. Socially constructed self-regulated learning and motivation regulation in collaborative learning groups. Teachers College Record, 113(2), 350-374.

Johnston-Wilder, S., Lee, C., Garton, E., Brindley, J. 2014. Developing teaching for Mathematical resilience in further education. 7th International Conference of Education, Research and Innovation, ICERI2014, Seville (SPAIN), 17th - 19th of November, 2014.

Kabat-Zinn, J. 1994. Wherever you go, there you are: Mindfulness meditation in everyday ife. Hyperion. doi:10.1080/00220671.2017.1396438 Kabat-Zinn, J. (1994). Mindfulness meditation for everyday life. New York: Hyperion.

Kabiri, M. and Kiamanesh, A. R. 2004. The role of self-efficacy, anxiety, attitudes and previous Mathematics achievement in students' Mathematics performance. In *Proceedings of the Third International Biennial SELF Research Conference*, Available at http://www.self.ox.ac.uk/Conferences/2004_Kabiri_Kiamenesh.pdf (last accessed on September 15th 2010)

Kamenetz, A. 2020. The Pandemic Has Researchers Worried About Teen

Kandel DB, & Lesser GS. 1972. Youth in two worlds. San Francisco: Jossey-Bass.

Kargar, M., Tarmizi, R. A., and Bayat, S. 2010. Relationship between thinking, Mathematics anxiety and Mathematics attitudes among university students. *Procedia Social and Behavioural Sciences, 8,* 537-542.

Karimi A. and Venkatesan S. 2009. Cognitive Behavioural Group Therapy in Mathematics Anxiety. *Journal of the Indian Academy of Applied Psychology, 35(2),* 299-303. Retrieved from: http://medind.nic.in/jak/t09/i2/jakt09i2p299.pdf

Kazelskis, R., Reeves, C., Kersh, M., Bailey, G., Cole, K., Larmon, M., Hall, L., and Holliday, D. C. 2000. Mathematics anxiety and test anxiety: Separate constructs? *Journal of Experimental Education, 68,* 137–146.

Kendall, P.C. 1994. Treating anxiety disorders in youth: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 62*, 100-110.

Khatoon, T. and Mahmood, S. 2010. Mathematics anxiety among secondary school students in India and its relationship to achievement in Mathematics. *European Journal of Social Sciences,*16 (1), 75-86.

Kiamanesh, A., Hejazi, E., and Esfahani, Z. 2005. *The role of Mathematics self-efficacy,* Mathematics *self-concept, perceived usefulness of Mathematics and Mathematics anxiety in Mathematics achievement.* Tehran, Iran: Teacher Training University. Retrieved from http://self.uws.edu.au/Conferences/2004_Kiamanesh_Hejazi_Esfahani.pdf

Klassen, R. M., and Usher, E. L. 2010. Self-efficacy in educational settings: Recent research and emerging directions. In T. C. Urdan and S. A. Karabenick (Eds.), *ADVANCES IN MOTIVATION AND ACHIEVEMENT: Vol. 16A. The decade ahead: Theoretical perspectives on motivation and achievement* (pp. 1-33). Bingley, UK: Emerald

Klinger, C.M. 2011. Connectivism – A new paradigm for the Mathematics s anxiety challenge? Adults Learning

Kohn,J.,Richtmann,V.,Rauscher,L.,Kucian,K.,Käser,T.,Grond,U.,etal.2013. Das Mathematics angst interview (MAI):erste psychometric chegüte kriterien. *Lernenund Lernstörungen* 2, 177–189.doi:10.1024/2235-0977/a000040

Koops W, Zuckerman M. 2003 Introduction: A historical developmental approach to adolescence. History of the Family, 8, 345-354

Kostaridi-Efklidi, A. 2008. *Metacognitive processes and self-regulation* (3rd ed.). Athens: Ellinika Grammata.

Krinzinger, H., Kaufmann, L., and Willmes, K.2009. Mathematics anxiety and Mathematics ability in early primary school years. *J. Psychoeduc.Assess.* 27, 206–225.doi: 10.1177/0734282908330583

Larson, H. A., El Ramahi, M. K., Conn, S. R., Estes, L. A., and Ghibellini, A. B. 2010. Reducing test anxiety among third grade students through the implementation of relaxation techniques. Journal of School Counseling, 8(19), 1-19.

Larson. L. M; Piersel, W.C, Imao, A. K; Allen, S. J. 1990. Significant Predictors of Problem Solving appraisal. Journal of Counseling Psychology, 37, 482-490.

Laursen B, Coy KC, & Collins WA. 1998. Reconsidering changes in parent-child conflict across adolescence: A meta-analysis. Child Development, 69, 817-832.

Lazarus, A. 1961. Group therapy of phobie disorders by systematic desensitization. Journal of Abnormal and Soeial Psyehology, 63,504-510.

Leder, G. C., and Forgasz, H. J. 2002. Measuring Mathematical beliefs and their impact on the learning of Mathematics. In G. C. Leder, E. Pehkonen, and G. Törner

(Eds.), *Beliefs: A Hidden Variable in Mathematics Education?* (pp. 95-114). Dordrecht: Kluwer Academic Publishers.

Lee, J. 2009. Universals and specifics of Mathematics self-concept, Mathematics self-efficacy, and Mathematics anxiety across 41 PISA 2003 participating countries. *Learn. Individ. Dif.* 19, 355–365. doi: 10.1016/j.lindif.2008.10.009

Lent, R. W., Lopez, F. G., and Bieschke, K. J. 1993. Predicting Mathematics-related choice and success behaviours: Test of an expanded social cognitive model. *Journal of Vocational Behaviour*, 42, 223-236.

Lent, R.W., and Hackett, G. 1987. Career self-efficacy: Empirical status and future directions. *Journal of Vocational Behaviour, 30,* 347-382.

Lent, R.W., Lopez, F.G. and Bieschke, K.J. 1991. Mathematics self-efficacy: sources and relation to science – based career choice. Journal of Counselling Psychology, 38, 424 – 430.

Liebert, R. M., and Morris, L. W. 1967. Cognitive and emotional components of test anxiety: a distinction and some initial data. *Psychol. Rep.* 20, 975–978.

Liu, X., and Koirala, H. 2009. The effect of Mathematics self-efficacy on Mathematics achievement of high School students. Northeastern Educational Research Association (NERA) Annual Conference, University of Connecticut. Retrieved 14 September 2015 fromhttp://digitalcommons.uconn.edu/nera 2009/30.

Luo, W., Hogan, D., Tan, L. S., Kaur, B., Ng, P. T., and Chan, M. 2014. Self-construal and students' Mathematics self-concept, anxiety and achievement: An examination of achievement goals as mediators. Asian Journal of Social Psychology, 17, 184-195. doi:10.1111/ajsp.12058

Lyons, I. M., and Beilock, S. L. 2011. Mathematics anxiety: Separating the Mathematics from the anxiety. *Cerebral Cortex, 22,* 2102-2110. doi:10.1093/cercor/bhr289

Lyons, L. C., and Woods, P. J. 1991. The efficacy of rational-emotive therapy: A quantitative review of the outcome research. *Clinical Psychology Review, 11*, 357–369.

Lyons,I. M., and Beilock, S. L.2012.When Mathematics hurts: Mathematics anxiety predicts pain network activation in anticipation of doing Mathematics. *PLoSONE* 7:e48076.doi: 10.1371/journal.pone.0048076

Ma, X. 1999. A meta-analysis of the relationship between anxiety toward Mathematics and achievement in Mathematics. *J. Res.* Mathematics. *Educ*. 30, 520–540. doi: 10.2307/749772

Ma, X., and Xu, J. 2003. The casual ordering of Mathematics anxiety and Mathematics achievement a longitudinal panel analysis. *Journal of Adolescence, 27*(2), 165-179.

Ma, X., and Xu, J. 2004. Determining the causal ordering between attitude toward Mathematics and achievement in Mathematics. *American Journal of Education, 110*, 256-280.

Ma, X., and Xu, J. 2004. The causal ordering of Mathematics anxiety and Mathematics achievement: a longitudinal panel analysis. *Journal of Adolescence, 27,* 165-179.

Malboeuf-Hurtubise, C., Lacourse, E., Taylor, G., Joussemet, M., and Ben Amor, L. 2017. A Mindfulness-Based Intervention Pilot Feasiblility Study for Elementary School Students with Severe Learning Difficulties: effects on internalized and externalized symptoms from an emotional regulation perspective. Journal of Evidence-Based Complementary and Alternative Medicine. 22(3) 473-481 doi: 10.1177/2156587216683886

Malinsky, M., Ross, A., Pannells, T., and McJunkin, M. 2006. Mathematics anxiety in preservice elementary school teachers. *Education, 127*, 274-279. Retrieved from http://eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=trueand_andERICExt Search_SearchValue_0=EJ765826andERICExtSearch_SearchType_0=noandaccno= EJ765826

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

Maloney, E. A., Waechter, S., Risko, E. F., and Fugelsang, J. A. 2012. Reducing the sex difference in Mathematics anxiety: The role of spatial pro- cessing ability. *Learning and Individual Differences, 22,* 380-384. doi:10.1016/j.lindif.2012.01.001

Maloney, E. A.,Ansari,D., and Fugelsang, J. A.2011.The effect of Mathematics anxiety on the processing of numerical magnitude. *Q. J.Exp.Psychol.(Hove).* 64, 10–16. doi:10.1080/17470218.2010.533278

Manigault, S. 1997. *The book for Mathematics empowerment*. Stafford, VA: Godosan.

Manstead, A. S. R., and Van-Eekelen, S. A. M. 1998. Distinguishing between perceived behavioural control and self-efficacy in the domain of academic intentions and behaviours. *Journal of Applied Social Psychology, 28,* 1375-1392. doi:10.1111/j.1559-1816.1998.tb01682.x

Marat, D. 2005. Assessing Mathematics self-efficacy of diverse students from secondary schools in Auckland: Implications for academic achievement. *Issues in*

Educational Research, 15. Retrieved from http://education.curtin.edu/au/iier/iier15/marat.html.

Marcia JE. 1980 Identity in adolescence. In J. Adelson (Ed.), Handbook of adolescent psychology (pp.159-187). New York: Wiley.

Marlow, B. A., and Page, M. L. 2005. *Creating and sustaining the constructivist classroom* (2nd ed.). Thousand Oaks, CA: Corwin Press.

Marsh GE, Tapia M. 2002. Feeling good about Mathematics: Are there sex differences? Proceedings of the Annual Meeting of the Mid-South Educational Research Association; 6-8 Nov; Chattanooga, TN; p. 1–12.

May, D. and Glynn, S. M. 2008. *A Mathematics self-efficacy questionnaire for college students*. Paper presented at the Conference on Research in Undergraduate Mathematics Education, Mathematics Association of America, San Diego. Available at http://mathed.asu.edu/crume2008/Proceedings/May%20SHORT.pdf (last accessed on September 15th 2010).

Maynard, B. R., Solis, M. R., and Miller, V. L. 2015. Protocol: Mindfulness-based interventions for improving academic achievement, behavior and socio-emotional functioning of primary and secondary students: A systematic review. The Campbell Collaboration, 13, 1-47.

McCaslin, M. and Burross, H.L. 2011. Research on individual differences within a sociocultural perspective: co-regulation and adaptive learning. *Teachers College Record, 113*(2), 325-349.

McLean, C. P., Asnaani, A., Litz, B. T., and Hofmann, S. G. 2011. Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. *J. Psychiatr. Res.* 45, 1027–1035. doi: 10.1016/j.jpsychires.2011.03.006

McMullan, M., Jones, R., and Lea, S. 2012. Mathematics anxiety, self-efficacy, and ability in British undergraduate nursing students. *Research in Nursing and Health, 35*(2), 178-186. doi:10.1002/nur.21460

McNally Keehn RH, Lincoln AJ, Brown MZ, et al 2013. The Coping Cat Program for Children with Anxiety and Autism Spectrum Disorder: A Pilot Randomized Controlled Trial. Journal of Autism Developmental Disorders ; 43:57–67

Mead M. 1928. Coming of age in Samoa. New York: New American Library.

Meece, J. L., Wigfield, A., and Eccles, J. S. 1990. Predictors of Mathematics anxiety and its consequences for young adolescents' course enrollment intentions and performances in Mathematics. *Journal of Educational Psychology*, 82, 60-70.

Mendelson, T., Greenberg, M. T., Dariotis, J. K., Gould, L. F., Rhoades, B. L., and Leaf, P. J. 2010. Feasibility and preliminary outcomes of a school-based mindfulness

intervention for urban youth. Journal of Abnormal Child Psychology, 38(7), 985-994. doi: 10.1007/s10802-010-9418-x.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., et al. 2000. *Manual for the patterns of adaptive learning scales: PALS* [manual]. Ann Arbor: University of Michigan. Retrieved from http://www.umich.edu/~pals/PALS%202000_V12Word97.pdf

Miller, H., and Bichsel, J. 2004. Anxiety, working memory, gender, and Mathematics performance. *Personality and Individual Differences, 37*(3), 591-606.

Miller, T. 2009. Formative computer-based assessment in higher education: the effectiveness of feedback in supporting student learning. Assessment and Evaluation in Higher Education, 34(2), 181-192.

Milman DH. 1979. Minimal brain dysfunction in childhood. Outcome in late adolescence and early adult years. Journal of Clinical Psychiatry, 40, 371-380.

Mohamed SH, Tarmizi RA 2010. Anxiety in Mathematics learning among secondary school learners: A comparative study between Tanzania and Malaysia. Proc. Soc. Behav. Sci;8:498–504.

Mohamed, S.H. and R.A. Tarmizi, 2010. Anxiety in Mathematics learning among secondary school learners: A comparative study between Tanzania and Malaysia. Proc. Soc. Behav. Sci., 8: 498-504. DOI: 10.1016/j.sbspro.2010.12.068

Montemayor R. 1983. Parents and adolescents in conflict: All families some of the time and some families most of the time. J. Early Adoles. 3: 83-103.

Moos, D. C., and Azevedo, R. 2008. Monitoring, planning, and self-efficacy during learning with hypermedia: The impact of conceptual scaffolds. Computers in Human Behaviour, 24(4), 1686-1706. doi: DOI: 10.1016/j.chb.2007.07.001

Morris, L. W., Davis, M. A., and Hutchings, C. H. 1981. Cognitive and emotional components of anxiety: Literature review and a revised worry-emotionality scale. *Journal of Educational Psychology, 73*, 541-555.

Morris, L. W., Davis, M. A., and Hutchings, C. H. 1981. Cognitive and emotional 126 Intellectual DIscourse, Vol 28, No 1, 2020

Nawas, M. M., Fishman, S. T., and Pucel, J. C. 1970. A standardized desensitization program applicable to group and individual treatments. Behav. Res. and Therapy 8, 49-56.

NCTM. 2000. Principles and standards for school Mathematics. Retrieved from http://standards.nctm.org/document/chapter3/index.htm

Newby-Fraser, E., and Schlebusch, L. 1998. Social support, self-ef- ficacy and assertiveness as mediators of student stress. *Journal of human behaviour, 34,* 61-69.

Newstead, K. 1998. Aspects of children's Mathematics anxiety. *Educational Studies in Mathematics, 36(*1), 53-71. http://dx.doi.org/10.1023/A:1003177809664

Niss, L. 2012. Brief mindfulness intervention on Mathematics test anxiety and examination scores in a high school population (Unpublished undergraduate honors thesis). University of Colorado, Boulder, Colorado, USA.

Nunez-Pena, M. I., Suarez-Pellicioni, M., and Bono, R. 2013. Effects of Mathematics anxiety on student success in higher education. *International Journal of Educational Research 58*, 36-43. Retrieved from http://dx.doi.org/10.1016/j.ijer.2012.12.004

OECD 2013."Mathematicsself-beliefsandparticipationinMathematics-related activities,"in *PISA2012Results:ReadytoLearn(VolumeIII),Students' Engagement,DriveandSelf-Beliefs* (Paris:OECDPublishing),87–112.doi: 10.1787/9789264201170

Offer D, & Offer J. 1975. From teenage to young manhood: A psychological study. New York: Basic Books.

Offer D. 1969. The psychological world of the teenager. New York: Basic Books.

Okoiye, O. E., and Falaye, A., 2011. Effectiveness of cognitive and group behaviour therapies in managing examination anxiety among academically at-risk-secondary school students in Ibadan Oyo State Nigeria. *Journal of Research in Education and Society* 2:2.

Olson, A. T. and Gillingham, D. E. 1980. Systematic desensitization of Mathematics anxiety among preservice elementary teachers. Alberta Journal of Educational Research, 26(2), 120 - 127. 23.

Otta, F.E., and Ogazie, C.A. 2014. Effects of systematic desensitization and study Behaviour Techniques on the Reduction of Test Phobia among In-School Adolescents in Abia State. World Journal of Educational Research Vol. 1, No. 3, August 2014, pp. 1-7. [15]

Owens, M.,Stevenson,J.,Hadwin,J.A. and Norgate,R. 2012.Anxiety and depression in academic performance :an exploration of the mediating factors of worry and working memory. *Sch.Psychol.Int.* 33, 433–449.doi: 10.1177/0143034311427433

Ozkul, A. 2001. Using information technology to enhance assessment of learning: automating preparation of course examination materials and student feedback, from http://www.osra.org/itlpj/ozkulspring2009.pdf

Pajares 2002. Overview of social cognitive theory and of self-efficacy. Retreived from http://www.emory.edu/EDUCATION/mfp/eff.html

Pajares, F. 2006. Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 339-367). Greenwich, Connecticut: Information Age Publishing.

Pajares, F., and Kranzler, J. 1995. Self-efficacy beliefs and general mental ability in mathematical problem-solving. Contemporary Educational Psychology, 20, 426–443.

Pajares, F., and Kranzler, J. 1995. Self-Efficacy beliefs and general mental ability in mathematical problem solving. Contemporary Educational Psychology, 20: 426-443.

Pajares, F., and Kranzler, J. 1997. An exploratory factor analysis of the Mathematics self-efficacy scale revised (MSES-R). *Measurement and Evaluation in Counseling and Development*, 29(4), 215-228. Retrieved from the ERIC database.

Pajares, F., and M.D. Miller. 1997. Mathematics self-efficacy and Mathematical problem solving: Implications of using different forms of assessment. Journal of Experimental Education 65, no. 3: 213□28.

Pajares, F., and Miller, M. 1994. Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*, 193-203. http://dx.doi.org/10.1037/0022-0663.86.2.193

Pajares, F., and Miller, M. D. 1994. The role of self-efficacy and self-concept beliefs in mathematical problem-solving: A path analysis. Journal of Educational Psychology, 86: 193-203.

Pajares, F., and Miller, M. D. 1995. Mathematics self-efficacy and Mathematic outcomes: The need for specificity of assessment. Journal of Counseling Psychology, 42, 190–198.

Pange, J. 2007. Is e-Learning offering a new learning model? The case study of a Greek University. *Open education*, vol. 3, no. 2.

Park G, Baek KJ, Chung SI. 2007 Academic motivation, academic stress, and perceptions of academic performance in medical students. Korean J Med Educ.; 19(1):59-71. 19.

Park, D., Ramirez, G., and Beilock, S. L. 2014. The role of expressive writing in Mathematics anxiety. Journal of Experimental Psychology: Applied, 20(2), 103-111. https://doi.org/10.1037/xap0000013

Park, G. P., and French, B. F. 2013. Gender differences in the foreign language classroom anxiety scale. *System* 41, 462–471. doi: 10.1016/j.system.2013.04.001

Paterniti, A. 2007. A pilot study comparing the efficacy of a mindfulness-based program to a skills-training program in the treatment of test anxiety (Doctoral Dissertation). Long Island University, Brooklyn, New York, USA.

Pekrun, R. 2006. The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review*, *18*(4), 315-341.

Pekrun, R., Elliot, A. J., and Maier, M. A. 2009. Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology*, *101*, 115–135.

Pèrez-Garín, D., Park G, Baek KJ, Chung S.I. 2007. Academic motivation, academic stress, and perceptions of academic performance in medical students. Korean J Med Educ.; 19(1):59-71. 19.

Perry, A. B. 2004. Decreasing Mathematics anxiety in college students. *College Student Journal*, 38(*2*), 321–324.

Perry, A.B. 2004. Decreasing Mathematics anxiety in college students. College Student Journal, 38(2), 19-20. [16]

Petersen AC, Taylor B. 1980. The biological approach to adolescence: Biological change and psychological adaptation. In J. Adelson (Ed.), Handbook of adolescent psychology (pp. 117-155). New York: John Wiley and Sons.

Petersen AC. 1985. Pubertal development as a cause of disturbance: Myths, realities, and unanswered questions. Genetic, Social, and General Psychology Monographs, 111, 205-232.

Phan, H., and Walker, R. 2000a. The Predicting and Mediational Role of Mathematics Self-efficacy: A Path Analysis. Sydney 2000 Papers and Abstracts.

Phan, H., and Walker, R. 2000b. Mathematics Self-efficacy in Primary Schools: Evidence of a Hierarchical Structure. Paper Presented at the Inaugural International Self-Concept Conference. Self- Research Centre, 5th-6th October.

Piaget, J. 1950. The psychology of intelligence. London: Routledge & Kegan Paul.

Piaget, J. 1971. *Biology and knowledge: An essay on the relation between organic regulations and cognitive processes*. Chicago: University of Chicago Press.

Piaget, J., and Inhelder, B. 1969. *The psychology of the child* (H. Weaver, Trans.). New York: Basic Books.

Pietsch, J., R. Walker, and E. Chapman. 2003. The relationship among self-concept, self-efficacy, and performance in Mathematics during secondary school. Journal of Educational Psychology 95, no. 3: 589□603.

Pintrich, P .R. Smith, D. a. F., Garcia, TandMcKeachie, W.J. 1991.A manual for the use of motivated strategies for learning questionnaire (MSLQ). Ann Arbor, National Center for Research to Improve Postsecondary Teaching and Learning(NCRIPTAL).University of Michigan

Pintrich, P. R., Smith, D. A. F., Garcia, T., and McKeachie, W. J. 1991. *A manual for the use of the motivated strategies for learning questionnaire (MSLQ).* National center for research to improve postsecondary teaching and learning, University of Michigan, Ann Arbor, MI.

Pintrich, P. R., Smith, D., Garcia, T., and McKeachie, W. 1993. Predictive validity and reliability of the Motivated Strategies for Learning Questionnaire (MSLQ). Educ. Psychol. Meas. 53: 801–813.

Plato. 1953, 4th Ed.. Laws. (B. Jewett, trans.) The dialogues of Plato (Vol. 4). New York: Oxford University Press (Clarendon Press).

Pollard, C., Gupta, D., and Satzinger, J. 2010. Teaching systems development: a compelling case for integrating the SDLC with the ITSM lifecycle.(Software Development Life Cycle)(information technology service management)(Author abstract). Information systems management, 27(2), 113.

Preston, R. 2008. *Mathematics anxiety: Research and implications for middle school students and teachers*. Conference Proceedings of the Masters in Teaching Program 2006-2008, Olympia, Washington.

Punaro, L., and Reeve, R. 2012. Relationships between 9-year-olds' Mathematics and literacy worries and academic abilities. *Child Development Research*, doi:10.1155/2012/359089.

Puteh, M. 2002. *Factors associated with Mathematics anxiety*. Malaysia : Universiti Pendidikan Sultan Idris.

Puteh, M.,and Khalin, S.Z. 2016. Mathematics anxiety and its relationship with the achievement of secondary students in Malaysia. *International Journal of Social Science and Humanity, 2*(6).

Rahim, M., 2002. Kajian kerisauan matematik dikalangan pelajar-pelajar diploma di kolej yayasan melaka. M.Sc Thesis, Universiti Kebangsaan Malaysia.

Ramirez, G., Chang, H., Maloney, E. A., Levine, S. C., and Beilock, S. L. 2016. On the relationship between Mathematics anxiety and Mathematics achievement in early elementary school: The role of problem solving strategies. Journal of Experimental Child Psychology, 141, 83-100. doi:10.1016/j.jecp.2015.07.014

Ramirez, G., Gunderson, E. A., Levine, S. C., and Beilock, S. L. 2013. Math anxiety, working memory, and Mathematics achievement in early elementary school. Journal of Cognition and Development, 14, 187-202. doi:10.1080/15248372.2012.664593.

Randhawa, B. S. and Gupta, A. 2000. Cross-national gender differences in Mathematics achievement, attitude, and self-efficacy within a common intrinsic structure. *Canadian Journal of School Psychology, 15*(2), 51–66.

Rayner,V.,Pitsolantis,N., and Osana, H.2009.Mathematics anxiety in pre service teachers: Its relationship to their conceptual and procedural knowledge of fractions. *Mathematics .Educ.Res.J.* 21, 60–85.doi:10.1007/BF03217553

Reyero, M., and Tourón, J. 2003. *El desarrollo del talento: La aceleración como estrategia educativa* [The development of talent: Acceleration as an educational strategy]. A Coruña: Netbiblo.

Richardson, F. C., and Suinn, R. M. 1972. The Mathematics anxiety rating scale: Psychometric data. *Journal of Counseling Psychology, 19,* 551-554. doi:10.1037/h0033456

Richardson, F. C., and Suinn, R. M. 1972. The Mathematics Anxiety Rating Scale: Psychometrie data. Journal of Counseling Psyehology, 19, 551-554.

Robinson, M. D., and Clore, G. L. 2002. Belief and feeling: Evidence for an accessibility model of emotional self-report. Psychological Bulletin, 128(6), 934–960. http://dx doi.org/10.1037//0033-2909.128.6.934.

Romeo, G. 2004. Teaching, learning and Technology: Research, Reform, Realise the Potential. Paper presented at the *South Australia Australian Computers in Education Conference*. Adelaide, Australia.

Rotzer, S., Loenneker, T., Kucian, K., Martin, E., Klaver, P., and von Aster, M. 2009. Dysfunctional neural network of spatial working memory contributes to developmental dyscalculia. *Neuropsychologia, 47,* 2859-2865. doi:10.1016/j.neuropsychologia.2009.06.009

Rousseau JJ. 1763. Emile on education. London: Nourse & Vaillant (originally Emile ou de l'Education, 1762).

Rubinsten, O., and Tannock,R.2010.Mathematics anxiety in children with developmental dyscalculia. *Behav.BrainFunct.* 6, 46.doi:10.1186/1744-908 1-6-46

Ryan M., 2017. Implementation Of A Mindfulness-Based Intervention to reduce Test related Stress and Anxiety in third grade Students. The School of Education and Health Sciences of the University of Dayton, Dayton, Ohio

Saito, H., and Miwa, K. 2007. Construction of a learning environment supporting learners' reflection: A case of information seeking on the web, *Computers and Education, 49*(2), 214-229. doi:10.1016/j.compedu.2005.07.001

Salwani, T. and A. Salleh, 2001. Perkaitan antara kerisauan matematik dengan pencapaiannya disebuah institusi pengajian teknikal. M.Sc Thesis, Universiti Kebangsaan Malaysia.

Sartawi, A., Alsawaie, O., Dodeen, H., Tibi, S., and Alghazo, I. 2012. Predicting Mathematics achievement by motivation and self-efficacy across gender and achievement levels. *Interdisciplinary Journal of Teaching and Learning, 2*(2), 59-77.

Savin-Williams RC, & Berndt TJ. 1990. Friendship and peer relations. In S. S. Feldman, & G. R. Elliott (Eds.), At the threshold: The developing adolescent (pp. 277-307). Cambridge, MA: Harvard University.

Schlegel A, & Barry H, III. 1991. Adolescence: An anthropological inquiry. New York: Free Press.

Schneider, W. J. and Nevid, J. S. 1993. Overcoming Mathematics Anxiety: A Comparison of Stress Inoculation Training and Systematic Desensitization. Journal of College Student Development, 3(4), 283 - 288.

Schunk, D. H. 1985. Self-efficacy and classroom learning. Psychology in the Schools, 22(2), 208-223.

Schunk, D. H., and Mullen, C. A. 2012. Self-efficacy as an engaged learner. In S. L. Christenson, A. L. Reschly, and C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 219-235). New York: Springer Science.

Schunk, D. H., and Pajares, F. 2005. Competence beliefs in academic functioning. In A. J. Elliot and C. Dweck (Eds.), *Handbook of competence and motivation* (pp. 85-104). New York, NY: Guilford Press.

Schunk, D. H; 2001. Office of Educational Research and improvement (1992). NAEP trends in academic program. Washington. D. C.

Senay, I., Cetinkaya, M., and Usak, M. 2012. Accepting test-anxiety-related thoughts increases academic performance among undergraduate students. Psihologija, 45(4), 417-432.

Shaffer, J. B., and Galinsky, M. D. 1974. Model of group therapy and sensitivity training. New Jersey: Prentice-Hall, Inc.

Shiverick, S. M. 2012. Mindfulness and Mathematics Anxiety. The Effect of Mindfulness Practice on Mathematics Anxiety. University of Wisconsin-Platteville.

Sime, W. E., Ansorge, C. J., Olson, J., Parker, C., and Lukin, M. 1987. Coping with Mathematics anxiety: Stress management and academic performance. Journal of College Student Personnel, 28(5), 431437. Retrieved from https://eric.ed.gov/?id=EJ363230

Sink, C. A. 2005a. Comprehensive school counseling programs and academic achievement – A rejoinder to Brown and Trusty. *Professional School Counseling, 9*, 9-12.

Sink, C. A. 2005b. Fostering academic development and learning: Implications and recommendations for middle school counselors. *Professional School Counseling, 9*(2), 128-135.

Skemp, R.R. 1971. The Psychology of Learning Mathematics. Hardmondsworth, Penguin.

Sloan,T, Daane, C., and Giesen, J. 2002. Mathematics anxiety and learning styles: What is the relationship I elementary pre-service teachers? *School Science and Mathematics,* 84-87.

Small, S. R. 2006. Anxiety reduction: Expanding previous research on mandala coloring. The Undergraduate Journal of Psychology, 19, 15-21.

Sohrabi, R., Mohammadi, A., and Delavar, A. 2013. Role and effectiveness of mind fullness education on students examination anxiety. Procedia-Social and Behavioral Sciences, 84, 1639-1641.

Solar, E. 2013. An alternative approach to behavior interventions: Mindfulness-based stress reduction. Beyond Behavior, 22(2), 44-48. doi: 10.1177/107429561302200208

Spelke, E. S. 2005. Sex differences in intrinsic aptitude for Mathematics and science? *American Psychologist, 60,* 950-958.

Stankov, L., Lee, J., Luo, W. S., and Hogan, D. J. 2012. Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety? Learning and Individual Differences, 22, 747-758. doi:10.1016/j.lindif.2012.05.013

Steffensmeier D, & Allan EA. 2000. Looking for patterns: Gender, age, and crime. In J. Sheley (Ed.), Criminology (pp. 85-127). Belmont, CA: Wadsworth.

Steinberg L. 1985. Adolescence. Knopf, New York.

Stuart, V. B. 2000. Mathematics curse or Mathematics anxiety? *Teaching Children Mathematics, 6,* 330-338.

Suinn, R. M. (1972). Mathematics Anxiety Rating Scale (MARS). Fort COllins, CO: Rocky Mountain Behavioral Science Institute.

Suinn, R. M. 1968. The desensitization of test anxiety by group and individual treatment. Behaviour Research and Therapy, 6, 385-387.

Suinn, R. M. and Winston, E. H. 2003. The mathematical anxiety rating scale. A brief version: Psychometric data. *Psychological reports*, 92(*1*), 167-173. DOI: 10.2466/pr0.2003.92.1.167.

Suinn, R. M., and Richardson, F. C. 1971. Anxiety management training: Nonspecific behavior therapy contra I. Behavior Therapy, 2, 498-519.

Suinn, R. M., Edle, C. A., and Spinelli, P. R. 1970. Accelerated massed desensitization: Innovation in short-term treatment. Behavior Therapy, 1, 303-311.

Suinn, R. M., Taylor, S., and Edwards, R. W. 1988. Suinn Mathematics anxiety rating scale for elementary school students (MARS-E): Psychometric and normative data. *Educational and Psychological Measurement, 48*, 979-986. doi:10.1177/0013164488484013

Suinn, R., and Edwards, R. 1982. The measurement of Mathematics anxiety: The Mathematics anxiety rating scale for adolescentsMARS-A. Journal of Clinical Psychology, 38(3), 576–580. doi: 10.1002/1097-4679(198207)38:3<576::

Sung Min, Ooi Yoon Phaik, Goh Tze Jui, et al. 2011. Effects of Cognitive-Behavioural Therapy on Anxiety in Children with Autism Spectrum Disorders: A Randomized Controlled Trial. Published online:10 June 2011 Springer Science+Business Media, LLC 2011

Susman EJ, Inoff-Germain G, Nottelmann ED, Loriaux DL, Cutler GB, Chrousos GP. 1987. Hormones, emotional disposition and aggressive attributes in young adolescents. Child Development, 58, 1114 – 1134

Taiwo, A.K. 2014. Effects of Numerical-Cognition and Emotional-Freedom Techniques on Mathematics Anxiety and Achievement among non-Science Secondary School Students with Pseudo-Dyscalculia in Ibadan. A PhD Thesis submitted to the department of Guidance and Counselling, Universsity of Ibadan, Ibadan, Nigeria.

Tanner JM. 1962. Growth at adolescence. Oxford: Blackwell Scientific Publications.

Tanner, H., and Jones, S. 2003. Self-efficacy in Mathematics and students' use of self-regulated learning strategies during assessment events. In N. A. Pateman, B. J. Doherty, and J. Zilliox (Eds.), *Proceedings of the 27th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 4, pp. 275-282). Honolulu, USA: PME.

Task Force On Promotion And Dissemination Of Psychological Procedures. (1995, Winter). Training in and dissemination of empirically validated psychological treatments: Report and recommendations. The Clinical Psychologist, 48, 3-23

Taylor, B. A., and Fraser, B. J. 2013. Relationships between learning environment and Mathematics anxiety. *Learning Environments Research*, *16*(2), 297–313. doi:10.1007/s10984-013-9134-x

Tobias, S. 1978. Managing Mathematics anxiety: A new look at an old problem. *Children Today, 7*(5), 36.

Trent, R. M. 1985. Hypnotherapeutic Restructuring and Systematic Desensitization as Treatment for Mathematics Anxiety. Paper Presented at The Annual Convention of the Southwestern Psychological Association, Austin, Texas.

Trujillo, K. M., and Hadfield, O. D. 1999. Tracing the roots of Mathematics anxiety through in-depth interviews with preservice elementary teachers. *College Student Journal, 33*(2), 219-232.

Tsai, M. 2009. The model of strategic e-learning: understanding and evaluating student e-learning from metacognitive Perspectives. Journal of Educational Technology and Society, 12(1), 34-48.

Turner, J. C., Midgley, C., Meyer, D. K., Gheen, M., Anderman, E. M., Kang, Y. et al. 2002. The classroom environment and students' reports of avoidance strategies in Mathematics: A multi method study. *Journal of Educational Psychology, 94,* 88-106. doi:10.1037/0022-0663.94.1.88

Underwood J., Baquley T., Banyard P., Coyne E., Farrington-Flint, L. Selwood, I. S. 2008. *Personalizing learning with technology*. Coventry Becta.

Usher, E. And Pajares, F. 2009 Sources of Self efficacy in Mathematics: A validation Study. Contempory Educational Psychology 34 (2009) 89-101

Uusimaki, L. and Nason, R. 2004. Causes underlying pre-service teachers‟ negative beliefs and anxieties about Mathematics. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, *4,* 369-376.

Van de Walle, J.A. 2004. *Elementary and middle school Mathematics: Teaching developmentally.* Boston, MS: Pearson Education.

Vaughn, S., and Bos, C. S. 2009. Strategies for Teaching Students with Learning and Behavior Problems. Upper Saddle River, NJ: Pearson Education, Inc.

Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. 2003. User acceptance of information technology: toward a unified view. Management Information Systems quarterly, 27(3), 425-478.

Ventis, W.L., Higbee, G., and Murdock, S.A. 2001. Using humor in systematic desensitization to reduce fear. The Journal of General Psychology, 128(2), 241-253.

Vygotsky, L. S. 1978. *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wadden, T. A., and Foster, G. D. 1992. Behavioral assesssment and treatment of markedly obese patients. In T.A.

Wang, M. C., and Lindvall, C. M. 1984. Individual differences and school learning environments. In E. W. Gordon (Ed.), *Review of research in education* (Vol. 11). Washington, DC: American Educational Research Association.

Wang, W, Parker, K., and Taylor, P. 2013. *Breadwinner moms*. Pew Research Center. Retrieved from http://www.pewsocialtrends.org/2013/05/29/breadwinner-moms/

Wang, Z., Lukowski, S. L., Hart, S. A., Lyons, I. M., Thompson, L. A., Kovas, Y., Petrill, S. A. (2015). Is Mathematics anxiety always bad for Mathematics learning? The role of Mathematics motivation. Psychological Science, 26, 1863-1876. doi:10.1177/0956797615602471

Waoungton, E., AUSTIN, S., and BITNER, J. 1992. The treatment of Mathematics anxiety and negative Mathematics self-concept in college students. College Student Joumal, 26, 61-65.

Webb, L. D., Brigman, G. A., and Campbell, C. 2005. Linking school counselors and student success: A replication of the student success skills approach targeting the academic social competence of students. *Professional School Counseling*, *8*(5), 407-413.

Weinstein, C., and Mayer, R. 1986. The Teaching of Learning Strategies. In MC Wittrock (Ed.), *Handbook of Research on Teaching* (3rd ed.). New York: Macmillan.

White SW, Ollendick T, Albano AM, et al 2012. Randomized Controlled Trial: Multimodal Anxiety and Social Skill Intervention for Adolescents with Autism Spectrum Disorder. Journal of Autism and Developmental Disorders (2012) published online

Wigfield A, Meece J. 1988. Mathematics anxiety in elementary and secondary school students. Journal of Educational Psychology; 80(2):210–16.

Williams, G. 2014. Optimistic problem-solving activity: enacting confidence, persistence and perseverance. ZDM. 46(3) pp. 407-422.

Williams, T., and K. Williams. 2010. Self-efficacy and performance in Mathematics: Reciprocal determinism in 33 nations. Journal of Educational Psychology 102, no. 2: 453□66.

Wolpe, J. 1958. Psychotherapy through reciprocal inhibition. Palo Alto, CA: Stanford University Press.

Wolpe, J. 1973. The practice of behavior therapy (2nd ed.). New York

Wolpe, J., and Lazarus, A. A. 1966. Behavior therapy techniques: A guide to the treatment of neuroses. Oxford: Pergamon Press.

Woodward, T. 2004. The effects of Mathematics anxiety on postsecondary developmental students as related to achievement, gender, and age. *Inquiry*, 9 (1).

Wu, S. S., Barth, M., Amin, H., Malcarne, V., and Menon, V. 2012. Mathematics anxiety in second and third graders and its relation to Mathematics achievement. Frontiers in Psychology, 3(162), 1–11. http://dx.doi.org/10.3389/fpsyg.2012.00162

Yakolev PI, Lecours AR. 1967. The myelogenetic cycles of regional maturation in the brain. In A. Minkowski (Ed.), Regional development of the brain in early life (pp.3-70). Oxford: Blackwell

Young, C. B., Wu, S. S., and Menon, V. 2012. The Neurodevelopmental Basis of Mathematics Anxiety. *Psychological Science*, *23*(5), 492–501. https://doi.org/10.1177/0956797611429134

Yüksel-Şahin, F. 2008. Mathematics anxiety among 4th and 5th grade Turkish elementary school students. International Electronic Journal of Mathematics Education, 3, 179–192.

Zeidan, F. 2015. The neurobiology of mindfulness meditation. In K. Brown, Creswell, J, and R. Ryan (eds), Handbook of Mindfulness: Theory, Research, and Practice, Guilford Press, New York. pp 171-189.

Zemore, R. 1975. Systematic desensitization as a method of teaching a general anxiety-reducing skill. Journal of consulting and clinical psychology 43(2), 157–61.

Zenner, C., Herrnleben-Kurz, S., and Walach, H. 2014. Mindfulness-Based Interventions in Schools- A Systematic Review and Meta-Analysis. Frontiers in Psychology. 5(603), 1-20. doi: 10.3389/fpsyg.2014.00603

Zettle, R. 0., and Hayes, S. C. 1986. Oysfunctional control by client verbal behavior: The context of reason-giving. The Analysis of Verbal Behavior, 4, 30-38.

Zettle, R. 0., and Raines, S. J. 2000. The relationship of trait and test anxiety witl1 Mathematics anxiety. College Student Journal, 34, 246-258.

Zettle, R. 0., and Rains, J. C. 1989. Group cognitive and contextual therapies in treatment of depression. Journal of Clinical Psychology, 45, 438-445.

Zettle, R. 2003. Acceptance and commitment therapy (ACT) vs. systematic desensitization in treatment of Mathematics anxiety. Psychological Record, 53, 197-215.

Zettle, R. O. 1990. Rule-governed behavior: A radical behavioral answer to the cognitive challenge. The Psychological Record, 40, 41-49.

Zettle, R.D. 2003. Acceptance and commitment therapy (ACT) vs. systematic desensitization in treatment of Mathematics anxiety. *The Psychological Record, 53*, 197-215.

Zettle, R. D., and Houghton, L. L. 1998. The relationship between Mathematics anxiety and social desirability as a function of gender. College Student Journal, 32, 81. Retrieved from http://connection. ebscohost.com/c/articles/490287/relationship-between-Mathematics-anxiety-social-desirability-asfunction-gender

Zimmerman, B. J. 1995. Self-efficacy and educational development. In A. Bandura, Self -efficacy in changing societies (pp. 202-231). Cambridge, UK: Cambridge UniversityPress.

Zimmerman, B. J. 2000. Self-efficacy: An essential motive to earn. Contemporary *Educational Psychology*, *25*, 82–91.

APPENDIX I

TREATMENT PACKAGE

Experimental Group 1 (Systematic Desensitization Technique)

Session 1

Topic: Introduction, Pre-test administration and explanation on the concept of Mathematics Anxiety

The purpose of this session is to administer the Mathematics Anxiety Scale so as to get the baseline data on the perception of the students on levels of anxiety before they embark on the training.

Activity

- The researcher warmly welcomed the participants to the programme. Participants were informed that they would be having 8 sessions of 45 minutes each for a period of eight weeks.
- The researcher explained the reason for the programme and the benefit that the participants stand to gain from the programme.
- He also explained the rules guiding the conduct of the programme and what was expected of the participants.
- Pre-test instruments were administered on the participants.
- The meaning of the concept of Mathematics anxiety, its causes and consequences are explained to the students

Mathematics anxiety is an intense emotional feeling of anxiety that people have about their ability to understand and do Mathematics. It is the feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations. It is also described as a person's negative affective reactions to situations that involve Mathematics, numbers, and calculations. These reactions range from mild to severe and could manifest through feelings of panic, discomfort, flurry, avoidance, fear of failure, a blank mind, and helplessness

Students who suffer from Mathematics anxiety feel that they are incapable of doing activities and classes involving Mathematics. Hence, their poor performance whenever it comes to performing Mathematics tasks. Such an experience can leave a student

believing he or she is deficient in Mathematics and this belief can actually result in poor performance, which serves as confirming evidence to the students.

Mathematics anxiety can be a disabling condition, causing humiliation, resentment, and even panic, students who experience mathematical problems have their mind go completely blank and feel they cannot do it. Mathematics anxiety could weaken an individual's state of mind and eventually progress to Mathematics avoidance and Mathematics phobia, resulting in low achievement in Mathematics which is the most severe consequence of Mathematics anxiety.

Closing remarks:

- The participants were commended for their cooperation
- They were also reminded of the time and venue for the next session.

Assignment

- State the reasons you think are responsible for the anxiety you have in Mathematics

Session 2

Topic: Introduction to Systematic Desensitization Technique

Objective: At the end of the session, the participants should be able to:

- Explain and practice the concept of Systematic Desensitization Technique
- Identify and understand the steps involved in Systematic Desensitization Technique

Activity

- The participants will be warmly welcomed by the researcher.
- The researcher reviewed and did a summary of all that transpired in the previous sessions.
- The researcher introduced the participants to Systematic Desensitization Technique and its steps:

Systematic Desensitization (SD) is a behavioural technique in which a person is gradually exposed to an anxiety-producing object, event or place while in some form of relaxation at the same time in order to reduce the symptoms of anxiety. It is an anxiety reduction technique used by mental health professionals in which an individual is repeatedly

exposed to a particular stressor in a controlled, nonthreatening environment until she is desensitized to it (Zettle, 2003).

Session 3

Topic: Construction of "Mathematics fear/anxiety hierarchy"

Objectives: The clients should be able to:

- Construct Mathematics hierarchy of fear/anxiety, correctly.

Step I: The researcher and the participants welcome one another. The researcher also leads participants to review the activities of last session. The researcher commends the participants for their cooperation.

Step II: The researcher explains to the participants that fears and anxiety about Mathematics have negative effects on their personal beliefs about their potentials to handle calculations in Mathematics. Therefore, the essence of today's session is to ensure they are able to identify, arrange and construct their fears concerning Mathematics.

Step III: The researcher asks the participants to identify various fears they have for Mathematics. The researcher asks them to arrange these fears in order of intensity, i.e. from the least fear to the highest. These can be arranged thus:

- fear of Mathematics on the timetable
- fear of Mathematics teacher's presence
- fear of figures
- fear of calculation, etc.

Step IV: The researcher tells the participants that this fear was worked on as arranged by the participants. The researcher also maintains that if the participants cooperate well and follow the therapy instruction, all these fears could gone and there would be a significant reduction in their level of Mathematics anxiety.

Step VI (Home Work): Write five (5) ways to overcome the fears you have about Mathematics?

Step VII: The participants will be appreciated and session will be terminated as well.

Session 4

Topic: Introduction and practice of Desensitization therapy

Objectives: The clients should be able to:

- Describe desensitization therapy
- State the steps involved in desensitization therapy
- Successfully practice relaxation techniques

Step I: The researcher and the participants welcome one another. The researcher also leads the participants to discuss the homework given to the participants. The researcher commends the participants for active participation and cooperation.

Step II: The researcher introduces the participants to the practice of desensitization technique thus:

Systematic desensitization, also known as graduated expose therapy is a type of behaviour therapy used in the field of psychology to help effectively overcome phobias and other anxiety disorders. The goal of this process is for the individual to learn how to cope with, and overcome the fear in each step of hierarchy. It is a behaviour modification therapy that involves the use of classical conditioning methods in relaxing an individual who is anxious. Systematic desensitization is based on a couple of simple principles. One principle is that an individual cannot experience anxiety while completely relaxed.

Thus, if a person can be shown how to reach a state of deep relaxation, he or she can be free from the tension that accompanies anxiety. A second and equally important principle is that when a person vividly visualizes a scene while completely relaxed, the mental image evokes some of the feelings of the real scene. In other words, the mind cannot distinguish a real experience from one that is vividly imagined (Gregor, 2005). For example, if one is suffering from Mathematics anxiety and on seeing self about to have a Mathematics class or take a Mathematics test, the person begins to feel the tensions that one feels when actually taking the lesson/test, and one can also learn to be relaxed while actually taking the lesson/test.

Step III: The researcher introduces the participants into the three steps involved in desensitization technique, thus:

1. The process of systematic desensitization occurs in three steps. The first step of systematic desensitization is the identification of an anxiety inducing stimulus hierarchy (This stage had been done earlier in session two).
2. The second step is the learning of relaxation or coping techniques.

3. The third step is to react towards and overcome situations in the established hierarchy of fears. That is pairing each anxiety provoking stimulus with relaxation and counter-conditioning skills.

Step IV: The researcher leads the participants on how to achieve the following relaxation techniques:

Relaxation Technique

The first step in the practice of systematic desensitization is learning to relax. If an individual is afraid of something, such an individual needs to learn to relax when faced with the anxiety provoking stimulus. Learn coping mechanism or incompatible response. This is necessary because it provides the client with a means of controlling their fear, rather than letting it increase to intolerable levels.

1. **Breathing exercises:** I. Inhale through your nose. When you inhale, stomach should expand; II. Hold your breath for 3 seconds; III. Exhale through your mouth. The client is advised to do the deep breathing exercise for at least 5 minutes.
2. **Progressive deep muscle relaxation:** In this exercise, the patient is asked to tighten his muscles and then loosen them gradually. This exercise can induce deep muscle relaxation in the patient.

Step V: The researcher gives room for questions from the participants; and responds to the questions promptly.

Step VI (Evaluation/Class Activity): The researcher asks participants questions, such as: What do you understand by desensitization technique? State the three steps involved in desensitization techniques? Practice the two relaxation techniques?

Step VII (Home Work): Pick any one of the anxiety provoking stimulus on the hierarchy of fear; and use any of the relaxation technique to address it?

Step VIII: The participants will be appreciated and the session will be terminated.

Session 5:

Topic: challenging dysfunctional thoughts that lead to Mathematics anxiety

Objectives: At the end of the session the participants should be able to:

- Use the meta-cognitve skills to challenge the dysfunctional thoughts that may cause Mathematics anxiety

Activities: The researcher

- Will welcome the participants
- Will review the last assignment with the participants
- Explain the three meta-cognitive skills that may cause Mathematics anxiety

Step I: The researcher explains the concept of metacognitive skills and its components.

The three meta-cognitive skills

Self-Talk: This is the silent conversations clients have with themselves about their past, present, and future capability to choose a course of action and do well in it. Self-talk can be either positive or negative and influences an individual's confidence mathematical activities. Positive self-talk can help individuals involved in activities involving Mathematics remain motivated, actively seek needed information, stay focused, think clearly about options, look for help when they need it, or follow-through with the actions needed to execute a plan of action. Negative self-talk can make clients less likely to boldly face activities involving Mathematics.

Self-Awareness: is a concept describing the ability of an individual to act as a spectator observing his or her own performance in Mathematics. This meta-cognitive function provides individuals the means to monitor negative self-talk, the need for more information, or emotional impact on a calculation task.

Monitoring and Control: As part of executive processing, the monitoring function provides an individual a way of knowing when to stop a task and move on to the next one, gather more information, or find help. The control function allows an individual to regulate his or her actions (e.g., set priorities; initiate, stop, or re-visit the various actions taken or control negative thoughts that may interfere with the process). The difference between these two regulatory processes is between "knowing" (the monitoring process) and "doing" (the control process)

Closing remarks:

- Participants will be reminded of their time and venue of the next session.

Session 6

Topic: Using desensitization techniques in boosting self-efficacy and reducing anxiety in aspect of Mathematics that has to do with equations.

Objectives: The client should be able to:

- Successfully use desensitization technique to enhance Mathematics self-efficacy in order to reduce anxiety in the area of equation

STEP I: The researcher welcomes the participants, while the participants also did that to each other. The researcher also leads the participants to discuss the homework given to the participants. The researcher also recommends the participants for active participation and cooperation.

Step II: The researcher informs the participants that in this session the focus is on how they can use techniques in desensitization to enhance their Mathematics self-efficacy.

Step III: The researcher leads the participants to practice techniques such as breathing exercise, progressive deep muscle skills and counter-conditioning, as learnt in session four.

Step IV: The researcher asks the participants to bring out the hierarchy which had been earlier done in session two. The researcher instructs the participants to imagine each step in the hierarchy and try to maintain calmness and reduce anxiety level using the relaxation and counter-conditioning skills. This process will be followed, while the researcher guides and corrects the participants as the desensitization process progresses.

Step V: The researcher then proceeds by asking the participants to consider this Mathematics calculation; and apply relaxation and counter-conditioning skills in addressing their self-belief and judgments about the equations:

i. $2x+3x=15$, find x?
ii. $5y-3=15$, what is the value of y?
iii. Find the value of "w" in this equation: $3w+20=35-2w$

Step VI: The researcher instructs the participants to redo the above till they are able to achieve positive evaluation of their personal abilities in solving the equations.

Step VII: The researcher then asks the participants if they can solve the equations, assuming they were taught by a Mathematics teacher. If the answer is in affirmation, then the therapy had been successful; if otherwise, the exercise will be repeated.

Step VIII: The researcher then proceeds to solve the Mathematics questions, while watching the reaction and attitudes of the participants to the lesson.

Step IX (Evaluation/Class Activity): The researcher asked participants to: i. apply desensitization technique assuming they see the following equation:

1. What is the value of 'p' in 16p+16=15p+16?
2. If x=2, what is the value of 'y' if 2y-x=3y-2x?

The participants are asked to solve the above equations, while the researcher pays attention to the attitude and fears such as: fore head-frowning, hand sweating, hand-shaking etc.

Step (Home Work): Look for equations in your Mathematics textbooks; notice and record your self-belief and evaluation about your ability to do them; apply desensitization techniques that you have learnt, while you record how you progress until you are able to achieve optimal level.

Step XI: The participants will be appreciated and the session will be terminated.

Session 7

Topic: Using desensitization techniques in boosting self-efficacy and reducing anxiety in aspects of Mathematics that has to do with ratio, rate, and statistics.

Objectives: The clients should be able to:

- Successfully use desensitization technique in enhancing Mathematics self-efficacy in order to reduce anxiety in the area of ratio, rate and statistics.

Step I: The researcher welcomes the participants, while the participants also do the same to each other. The researcher also leads the participants to discuss the homework given to the participants. The researcher commands the participants for active participation and cooperation.

Step II: The researcher informs the participants that in the session the focus is on how they can use techniques in desensitization to enhance their Mathematics self-efficacy, especially in the area of graph and distance.

Step III: The researcher leads the participants to practice techniques such as breathing exercise, progressive deep muscle skills and counter-conditioning, as learnt in the last session.

Step IV: The researcher asks the participants to bring out the hierarchy which had been earlier done in session two. The instructed the participants to imagine each step in the hierarchy and try to maintain calmness and reduces anxiety level using the relaxation and counter-conditioning skills. This process will be followed, while the researcher guides and corrects participants as the desensitization process progresses.

Step V: The researcher then proceeds by asking the participants to consider this Mathematics, and apply relaxation and counter-conditioning skills in addressing their self-belief and judgment about the equations:

i. If <ABC = 60, /AB/ = 4 and /BC/ = 3, what is /AC/?

ii. Josiah walked a distance of 12km to his school daily, what is the total distance covered by Josiah every week?

Step VI: The researcher instructs the participants to redo the above step till they are able to achieve positive evaluation of their personal abilities in solving the problems.

Step VII: The researcher then asks the participants if they can solve the equations, assuming they were taught by a Mathematics teacher. If the answer is in affirmation, then the therapy has been successful; otherwise, the activity will be repeated.

Step VIII: The researcher then proceeds to solve the Mathematics questions, while watching the reaction and attitudes of the participants to the lesson.

Step IX (Evaluation/Class Activity): The researcher asks participants to apply desensitization technique assuming they see the following problems:

i. If Adeola is twice as old as Mary, what is the age of Mary if Adeola will be 22year old in the next two year?

ii. The distance covered by an airplane from Lagos to Ibadan is 12km. If the airplane made another journey to Kaduna which is 250km away and come back to Lagos, how many km has the airplane covered?

The participants are asked to solve the above equations, while the researcher pays attention to the attitude and fear signals such as: fore-head frowning, hand sweating, hand-shaking, etc.

Step X (Home Work): Look for equations in your Mathematics textbook; notice and record your self-belief and evaluation about your ability to do them; apply desensitization techniques that you have learnt, while you record how you progress until you are able to achieve optimal level.

Step X: The participants will be appreciated and the session will be terminated.

Session 8:

Topic: Overall review, Post-Experiment Test Administration and Conclusion.

Objectives: At the end of the session, the participants should be able to:

- Summarize their experience based on what they have benefited from the various skills they have learnt since the commencement of the programme.
- Respond to the post-test instruments.

Activity

Step 1: The participants will be warmlys welcomed and the home work will be reviewed together with the researcher.

Step 2: This will be an interactive session between the researcher and the participants to ascertain the effect of the therapeutic programme. Activities of the previous sessions will be role-played to be sure they have attained positive experience via the intervention.

The participants will be administered post-test instruments. The researcher will then thank the participants for their co-operation while a token gift will be given to each one of them in appreciation of their participation in the training programme.

Closing remarks

- The researcher will commend the participants for their unrelenting cooperation.
- The participants will be encouraged to utilize effectively the skills they have acquired via the intervention programme.

Experimental group 2 (Mindfulness Technique)

Session 1

Topic: Introduction, Pre-test administration and explanation on the concept of Mathematics Anxiety

The purpose of this session is to administer the Mathematics Anxiety Scale so as to get the baseline data on the perception of the students on levels of anxiety before they embark on the training.

Activity

- The researcher warmly welcomed the participants to the programme. Participants were informed that they would be having 8 sessions of 45 minutes each for a period of eight weeks.
- The researcher explained the reason for the programme and the benefit that the participants stand to gain from the programme.
- He also explained the rules guiding the conduct of the programme and what was expected of the participants.
- Pre-test instruments were administered on the participants.
- The meaning of the concept of Mathematics anxiety, its causes and consequences are explained to the students

Mathematics anxiety is an intense emotional feeling of anxiety that people have about their ability to understand and do Mathematics. It is the feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations. It is also described as a person's negative affective reactions to situations that involve Mathematics, numbers, and calculations. These reactions range from mild to severe and could manifest through feelings of panic, discomfort, flurry, avoidance, fear of failure, a blank mind, and helplessness

Students who suffer from Mathematics anxiety feel that they are incapable of doing activities and classes involving Mathematics. Hence, their poor performance whenever it comes to performing Mathematics tasks. Such an experience can leave a student believing he or she is deficient in Mathematics and this belief can actually result in poor performance, which serves as confirming evidence to the students.

Mathematics anxiety can be a disabling condition, causing humiliation, resentment, and even panic, students who experience mathematical problems have their mind go completely blank and feel they cannot do it. Mathematics anxiety could weaken an individual's state of mind and eventually progress to Mathematics avoidance and Mathematics phobia, resulting in low achievement in Mathematics which is the most severe consequence of Mathematics anxiety.

Closing remarks:

- The participants were commended for their cooperation
- They were also reminded of the time and venue for the next session.

Assignment

- State the reasons you think are responsible for the anxiety you have in Mathematics

Session 2

Topic: Introduction to Mindfulness

Objective: At the end of the session, the participants should be able to:

- Explain the concept of mindfulness
- Explain the process involved in mindfulness technique

Activity

- The participants will be welcomed warmly
- The researcher will review the assignment with the participants
- The researcher will explain to the participants, the meaning and the process involved in the use of mindfulness technique

Step 1: I am here in your class to teach you about mindfulness, what it is, how it works, and to teach you mindfulness techniques.

"Mindfulness helps us recognize what is going on in the present moment. When we breathe in mindfully, we are aware of our in-breath. This is mindfulness of breathing. When we enjoy drinking, we drink with full awareness of the present moment, this is mindfulness of drinking. When we walk and become aware of every step we make, that is mindfulness of walking. Practicing mindfulness does not require that we go anywhere else. We can practice mindfulness in our room or on our way from one place to another.

We can do the same things we always do- walking, sitting, working, eating, and talking- except we do them with awareness of what we are doing.

Mindfulness is an energy that we can generate for ourselves. We can all breathe in and out mindfully. Every one of us has the capacity to be mindful, so it is not something strange. We all have a seed of mindfulness in us. If we keep practicing, that seed will grow strong, and any time we need it, the energy of mindfulness will be there for us." (Hanh, 2011, p. 15-16)

A five minute open discussion will be conducted for the students to tell their feelings on the intervention and how they feel before taking Mathematics class and examination.

Learning Outcome: Work with the class to teach mindfulness techniques which will help alleviate Mathematics related anxiety. These will be exercises that can be done when students are feeling anxious to help calm themselves, specifically before a Mathematics class or test.

Step 2: Meditation of breath: The researcher first demonstrates breathing to the students, noting how cool air enters their nose and warm air is exhaled. Have the students begin by counting "one" as they inhale and "one" as they exhale, then "two" inhale, "two" exhale, up to five times. Remind students not to force their breath but follow its natural rhythm. Remind the students to stay focused on breathing, and if their mind wonders to bring their focus back to breathing (Garland, 2014).

Learning Outcome: This intervention can be used as part of a student's routine before tackling Mathematics problem of taking a high stake test to develop and maintain a well-regulated nervous system.

Session 3

Topic: Sensory Exercises

Objective: At the end of the session, the participants should be able to:

- Explain the concept of mindful breaths
- Practice mindful breaths
- Explain the concept of Sensory meditation

Activity

- The participants will be welcomed warmly
- The researcher will review the week's activities with the participants
- The researcher will explain to the participants, the meaning and the process involved in the use of mindfulness technique
- The researcher will discuss the process of Sensory meditation

Step I: Sensory meditation: Three mindful breaths: "The first thing we are going to try is called "Three Mindful Breaths". Breathing is a great thing to start practicing mindfulness with, because you can't go anywhere without it! Find a comfortable sitting position. Sit so that you can easily and normally breathe through your nose. You just need to take your normal size breaths. You can close your eyes for this, or if you don't feel comfortable doing that, try doing what we call "soft eyes', which means to just look down at the floor without really focusing on anything. Bring your attention to your breath. You can focus on the breath at your nose, noticing how the air feels cool coming in and may be slightly warmer as it leaves your body. Or you can focus on your breath at your belly, feeling it rise and fall as the air enters and leaves your body. Stay focused, as best you can, on your breath. Just notice the air as it enters and leaves. If your mind wanders, that's okay. Simply bring your attention back to the in-breath and out-breath. Breathing in and breathing out. Your mind will naturally wander off and get lost in its thoughts. That's okay, it's just what minds do. Your job is to gently bring your attention back to your breath every time you notice your mind has wandered. Tell yourself "good job" for noticing, and then continue to watch your breath. Now I am going to ask you to take three normal breaths, and try and focus just on the breath for all three. Now gently start to take notice of what is happening around you. Notice your body where it touches the floor. Notice what is in the room around you. Notice what sounds you can hear. Now gently start to move your fingers and toes, and have a stretch, and let's have a talk about what we did." (Bowden, and Bowden, 2015)

Learning Outcome: The purpose of this exercise is to allow students to calm themselves when experiencing uncomfortable feelings, or unhelpful thoughts or fears before dealing with Mathematics questions or a high stakes test, allowing them to attend clearly to the present moment.

Step II: Attending the senses: The raisin meditation: Students are told to bring their attention to a raisin (or similar object), observing it carefully as if they had never seen one before. Tell students to pick up the raisin and feel its texture between their fingers and notice its colours. Inform them to be aware of any thoughts they might be having about the raisin. Note any thoughts or feelings of liking or disliking raisins if they come up while they are looking at it. Then lift the raisin to their nose and smell it for a while and finally, with awareness, bring it to their lips, being aware of their arm moving their hand to position it correctly and of their mouth salivating as the mind and body anticipate eating. Tell students to take the raisin into their mouth and chew it slowly, experiencing the actual taste of the raisin. Hold it in their mouth. When they feel ready to swallow, watch the impulse to swallow as it comes up (Kabat-Zinn, 1990).

Learning Outcome: This exercise is intended to introduce mindfulness while purposefully engaging all of the senses.

Step III: Sensory meditation: Melting:

"Method

1. Have the child focus on the top of their head and imagine that a pool of warm, syrupy liquid is sitting there.
2. Tell them to let the liquid slowly move down their head and face and over their shoulders.
3. Do they feel calmer? Where is it calmer? (They should notice relaxation in the face, neck, and shoulders.)
4. Repeat this a few times."

Now let's have a talk about what we did.

Learning Outcome: The goal of this exercise is to visualize what it is you want to happen and then make it happen. This can increase a student's ability to achieve their desired goal.

Session 4

Topic: Meditation Exercises

Objective: At the end of the session, the participants should be able to:

- Exercise deep relaxation when their world appears chaotic
- Learn how to release negative emotions

Activity

- The participants will be welcomed warmly
- The researcher will review last session's activities with the participants
- The researcher will explain to the participants, the process involved in visualization of meditation
- the researcher will discuss the visualization of meditation

Step I: Visualization meditation: Become a tree:

Method

"This script induces a feeling of "growing roots. "Tell the students to:

1. Take off your shoes.
2. Wiggle toes on the ground, feel your feet.
3. Feel the soles of your feet on the ground. (Do this for about 30 seconds.)
4. Now imagine that your feet have roots! Feel the little tiny roots popping out of the bottoms of your feet. (Do this for about 30 seconds.)
5. Imagine that these little roots are growing. They are one inch long and getting longer. (For little children, use your fingers or hands to show "this much".)
6. Now they are three inches long. Do you think they can grow down to one foot?
7. Now make roots longer yet. How long do they have to be before you feel stuck on the ground?
8. Feel how sturdy you are, just like a tree.
9. Now, lift up your feet and roots and walk a little. Keep those roots long. They can stretch and move with you, but don't let them shrink!
10. Let the child know that a sense of connection to the ground (or the earth) is a good thing."

(Garland, 2014)

Now let's have talk about what we did.

Learning Outcome: The purpose of this intervention is to focus on decreasing anxiety while enhancing the feeling of being grounded and releasing negative emotions.

Step II: Visualization meditation: Finding a safe haven: The researcher tells the students to, sit in a comfortable position, with their backs straight and shoulders relaxed, and then softly close their eyes. Allow the picture in their mind to become blank and to imagine a place they feel comfortable, safe and relaxed (example: a beach, their own bed). Imagine your image slowly appearing before you and becoming clearer, think of your place, and look to your left, what do you see? Look to your right, what is over there? Look closer. Breathe in. What do you smell? Walk around your place, look closer at certain things. Stay focused on your place. How are you feeling? If you lose focus, try to bring your focus back to your image. When you are ready, put your hand in front of your eyes, and then open your eyes. Slowly spread your fingers to allow light in, then slowly remove your hand. Now let's have a talk about what we did. (Hooker and Fodor, 2008)

Learning Outcome: The purpose of this meditation practice is to use visualization to encourage student's imagination, allowing them to focus their attention of the present moment on their breath and release their negative thoughts and feelings.

Session 5

Topic: Awareness

Objective: At the end of the session, the participants should be able to:

- be aware of what goes on in their surrounding
- demonstrate improved level of awareness

Activity

- The participants will be welcomed warmly
- The researcher will review last session's activities with the participants
- The researcher will explain to the participants, how to acquire increased level of awareness and how to make it count in reducing anxiety

Step I: Awareness of an object: Students will select an object to draw (clock, pencil, chair, etc.). They will be told to draw the object the best they can. Afterward, the students will be told to spend time looking at the object, paying close attention to small details. The students should draw the object again. The students should compare the two

drawings identifying the missing details from the first drawing. Discuss with the students what it was like to spend time really looking at the object that they might otherwise have never took the time to notice.

Learning Outcome: This technique is designed to draw student's attention to their surroundings by revealing what they are and what they are not aware of.

Step II: Awareness of movement: Students are told to move around the room as softly as they can, as if walking on egg shells. Students are told to be aware of each movement, feeling their thigh muscle lift their leg and move into the next position, feel their feet come off the floor and set back down, feel their hands and arms in space. Students are told to focus on their left leg for a few steps then focus on their right leg. Tell students if their thoughts begin to wonder away from their body they should remember what they were thinking about and return their attention to a part of their body (adapted from Fontana and Slack,1997)

Learning Outcome: The purpose of this exercise is for students to bring attention to their own body.

Step III: Increasing Awareness: Spider-Man: "One of Spider--Man's super powers was the ability to tune into his senses. Like a spider, he could hear very tiny noises. He was able to pay very close attention to the noises. When we pay very close attention, we are able to calm our mind and let go of all the noisy thoughts in our head that can be distracting. With practice, we can improve our focus and relax right now, right where we are.

Right now we are going to learn to activate our super powers to tune into our senses, just like Spider--Man. These are our Spider--Man Super Senses. What it takes is a little practice. Let's start with our sense of hearing. First close your eyes and place your hands on your knees. I am going to ring a bell. When you hear the bell, pay attention to the ring until you can no longer hear the ringing sound, place your hands together in your lap. (Repeat 3 times). Like Spiderman, we have activated your super power of ultra-hearing! Excellent work!

Next we are going to activate your super powers of ultra-seeing, touching, and smelling. I'm going to give each of you a piece of fabric. Hold your fabric gently in your hand. When I ring the bell, I want you to gently touch the fabric. Feel its texture beneath your

fingers. Pay attention to if the fabric is soft, rough, furry, or smooth. See what you can feel. Imagine, like Spiderman, your hands have the power to sense very carefully what the fabric feels like. As I ring the bell next, I want you to smell the fabric. Breathe in deeply with the fabric under your nose. See what the fabric's scent is. Is it sweet? Maybe it has very little smell at all? What do you smell? Now, finally, as I ring the bell, I want you to look very closely at the fabric. Pay attention to the lines on the fabric. What does it look like? Is it bumpy? Smooth? Soft looking? See what details you can notice in the fabric, what little shapes, what lines, what circles, if any. (Ring the bell a final time to signal the end of the activity).

The final activation of your Spiderman super power of ultra-senses, is to practice your sense of taste. We are going to practice by tasting, paying very close attention to what the candy tastes like (Using different foods with different textures and taste each week). Start by looking at the candy and noticing, using your super power sight, what the candy looks like. Turn the candy gently between your fingers, feeling what the candy feels like. Next, place the candy in your mouth. Allow the candy remain in your mouth, paying attention to how it feels on your tongue, how the juices in your mouth start to flow. Now slowly begin to chew the candy. See how slowly you can chew it. How does it taste? Sweet? Tart? Sour? Gently swallow the candy, paying attention to the taste that remains in your mouth after you swallow it.

Now you have activated all of your Spider-Man Super Senses! Remember that when you get very quiet and focus, your body and mind are able to relax and take a break from the day's busy activities. You have the power to activate your Spider--Man Super Senses whenever you want to calm down and focus for a moment." (Kids Relaxation, 2013)

Now let's have a talk about what we did.

Learning Outcome: The purpose of this technique is to increase students focus (Kids Relaxation, 2013).

Session 6

Topic: Being Present

Objective: At the end of the session, the participants should be able to:

- Explain the concept of being present
- demonstrate the skill of being present in Mathematics classes

Activity

- The participants will be welcomed warmly
- The researcher will review last session's activities with the participants
- The researcher will explain to the participants, what it means to be present and how "be present" in Mathematics class to in order to reduce Mathematics anxiety

Step I: Read What Does it Mean to be Present?

Learning Outcome: The purpose of this exercise is to teach paying attention in a particular way; on purpose, in the present moment, and nonjudgmentally" (Diorio, 2010)

Step II: The Attention of a Frog. "A frog is a remarkable creature. It is capable of enormous leaps, but it can also sit very, very still. Although it is aware of everything that happens in and around it, the frog tends not to react right away. The frog sits still and breathes, preserving its energy instead of getting carried away by all the ideas that keep popping into its head. The frog sits still, very still, while it breathes. Its frog tummy rises a bit and falls again. It rises and falls" (Snel, 2013).

"Anything a frog can do, you can do too. All you need is mi ndful attention. Attention to the breath. Attention and peace and quietness." (Snel, 2013).

1. Gently close your eyes. Listen to the sound in the room as it grows quiet.
2. Wait 15 Seconds.
3. Breathe normally. Feel your breath as you breathe in and out. You can feel it at the tip of your nose. You can feel your chest rise and fall. You can feel your belly move up and down. Just breath normally gently watch yourself breathe.
4. Wait a minute or so.
5. Feel your breath.
6. Every minute or so say, "are you daydreaming? We all daydream sometimes. Let the daydream go and pay attention to your breath."

Learning Outcome: The purpose of the exercise is to improve students concentration skills, which will help them remember things better, be less implosive, and have control over their inner world without repressing anything (Snel, 2013).

Step III: Your Personal Weather Report: Sit down comfortably somewhere, close or half close your eyes, and take some time to determine how you are feeling right now. What is the weather like inside you? Do you feel relaxed and sunny inside? Or does it feel rainy or overcast? Is there a storm raging, perhaps? What do you notice? Without really thinking about it too much, summon the weather report that best describes your feelings at the moment. Once you know how you are doing right now, just let it be just as it is….; there is no need to feel or do anything differently. You cannot change the weather outside either can you?

Stay close to this feeling for a while.

Direct your friendly and curious attention to the clouds, the clear sky or the storm that is brewing…this is how it is right now…; like the weather, you simply cannot change a mood. Later today the weather will be completely different again…but right now this is how things are. And that is absolutely fine. Moods change. They blow over. There is no need to take any action. What a relief." (Snel, 2013).

Learning Outcome: This technique can help a student understand their interior world. It will allow the student to acknowledge their mood and accept it. By not resisting their feelings, you teach the student to become aware of their feelings (Snel, 2013).

Session 7

TOPIC: Mind Jar:

Objective: At the end of the session, the participants should be able to:

- Explain the what is meant by "mind jar"
- demonstrate the usage of mind jar in reducing Mathematics anxiety

Activity

- The participants will be welcomed warmly
- The researcher will review last session's activities with the participants
- The researcher will explain to the participants, what is meant by mind jar and how it can be used in management of Mathematics anxiety

Step I: Creating the Mind Jar:

1. Fill a jar ¾ full of glycerin.
2. Add about one teaspoon of blue, green, or purple glitter.
3. Sprinkle in red or gold glitter.
4. Stir slowly.
5. Add one teaspoon of dish soap.
6. Place lid on jar then shake.

Learning Outcome: This is a calming technique which allows a student a quiet way to develop on the spot or long term regulation (Garland, 2014).

Step II: Using our mind Jar:

"The jar is like our mind, and the colors represent different things in our mind. When we wake up everything is pretty settled and we see clearly, like the glitter that is settled at the bottom of our jar. But pretty soon things start swirling around. Maybe we are running late, maybe we hear something scary, we might get to school and find out we have a test. It's only a few minutes into the school day but our thoughts and feelings start getting in our way. Here is one thing we can do to get settled and see clearly again. Shake your mind jar and be still. There is no way to rush being still, we can't push all the glitter to the bottom, we have to watch and wait. When things become clear, we will be able to see things as they are. Our thoughts and feeling are still in our mind, but they are no longer clouding our vision." (Willard, 2016)

Learning Outcome: Teach students to develop a relaxation practice using a visual focus to help calm them in times of stress.

Session 8:

Topic: Overall review, Post-Experiment Test Administration and Conclusion.

Objectives: At the end of the session, the participants should be able to:

- Summarize their experience based on what they have benefited from the various skills they have learnt since the commencement of the programme.
- Respond to the post-test instruments.

Activity

Step 1: The participants will be warmly welcomed and the home work will be reviewed together with the researcher.

Step 2: This will be an interactive session between the researcher and the participants to ascertain the effect of the therapeutic programme. Activities of the previous sessions will be role-played to be sure they have attained positive experience via the intervention.

The participants will be administered post-test instruments. The researcher will then thank the participants for their co-operation while a token gift will be given to each one of them in appreciation of their participation in the training programme.

Closing remarks

- The researcher will commend the participants for their unrelenting cooperation.
- The participants will be encouraged to utilize effectively the skills they have acquired via the intervention programme.

GROUP 3 (Control Group)

Session 1

Topic: Administration of pre-test instrument

Objective: To administer pre-test instruments to the participants.

Activity: The researcher will familiarize with the members of the group. The researcher will also explain to participants that the programme is mainly for research purpose only and that their support and co-operation is highly needed. The pre-test instruments will be administered on the participants after which they will be lectured on career decision making.

Closing remarks

- The researcher commended the participants for their time and effort.
- The participants were reminded of the time and venue of the next session.

Session 2

Topic – Administration of post-test instrument at the 10th week.

Objective: Administration of post-test instrument.

Activity: The post-test instrument will be administered after which the researcher will give some counselling talk on career decision making and will encourage the participants to seek any assistance concerning their career decision-making from the researcher whenever they need such. A token gift will be given to each person to show appreciation and thank them for their co-operation.

Closing remark

- The researcher commend the participants for their time and effort.

APPENDIX II

UNIVERSITY OF IBADAN

FACULTY OF EDUCATION

DEPARTMENT OF COUNSELLING AND HUMAN DEVELOPMENT STUDIES

Dear Respondent,

This questionnaire is designed basically for a research purpose. It seeks to know how you would react to these statements. All information provided would be treated confidentially. Please be honest as much as possible.

SECTION A

Background Information

1) Age: ……...

2) Gender: Male ( ) Female ( )

3) Religion: Christian ( ) Muslim ( ) Others (specify)……..

4) Class in school……

Betz and Hackett Mathematics Self-Efficacy Scale

Kindly respond by marking the response as it occurs to you using the format below:

Strongly Agree = SA, Agree = A, Disagree = D and Strongly Disagree = SD

NO	ITEM	SD	D	U	A	SA
1	When Mathematics exercises are hard I don‘t give up or study only the easy parts					
2	I work on Mathematics exercises even when I don't have to do so					
3	I work hard to earn a good grade in Mathematics even when I do not like the subject.					
4	I can plan my Mathematics school work.					
5	I finish Mathematics assignments by deadlines.					
6	I can study Mathematics when there are other interesting things to do.					
7	I can organize my school work					
8	I would feel confident to solve Mathematics problems.					
9	I can boldly discuss Mathematics problem with teacher					
10	I can willingly come out of the class to express myself on Mathematics matters					
11	I am confident enough to talk on Mathematics issue					
12	I think I can still compete with my mates on Mathematics					
13	If I am called many times, I will be willing to solve Mathematics problems even if I did not get the right answer.					
14	Even though I had Mathematics problem, I am not ready to submit to fate					
15	I won‘t be part of the students who always say Mathematics is difficult					

Betz Mathematics Anxiety Scale (PandP)

Kindly respond by marking the response as it occurs to you using the format below:

Strongly Agree = SA, Agree = A, Disagree = D and Strongly Disagree = SD

NO	ITEM	SD	D	U	A	SA
1	I cannot explain what actually accounts for my difficulty in Mathematics					
2	I don‘t believe in my ability to do well in Mathematics					
3	I only try to manage myself with somebody who knows better in class to pass Mathematics					
4	I hate to see Mathematics teacher in my class.					
5	I don‘t know how to follow Mathematics syllabus					
6	I lose concentration in Mathematics class					
7	I don‘t know how to focus on Mathematics problems					
8	I am always overwhelmed with fear when asked to solve Mathematics					
9	I feel jittery in Mathematics tests or examinations.					
10	My mind is not compatible with anything called Mathematics					
11	I feel emotionally down when it comes to solving of Mathematical problems					
12	I avoid Mathematics and any other subject related to it					
13	I always feel like skipping Mathematics classes.					
14	I don‘t know how to follow laid down rules in Mathematics					
15	I don‘t usually understand Mathematics instruction					
16	I am not capable of solving Mathematics					
17	I feel inferior finding myself among students who understand Mathematics better than me.					
18	I feel inferior with other subjects related to Mathematics.					

Woods Mathematics Anxiety Scale (S)

Kindly respond by marking the response as it occurs to you using the format below:

Strongly Agree = SA, Agree = A, Disagree = D and Strongly Disagree = SD

NO	ITEM	SD	D	U	A	SA
1	I become physically agitated when I have to go to Mathematics class.					
2	I am fearful about be asked go to the board in a Mathematics class.					
3	I am afraid to ask questions in Mathematics class.					
4	I am always worried about being called on in math class.					
5	I understand Mathematics now, but I worry that it's going to get really difficult soon.					
6	I tend to lose my concentration in Mathematics class					
7	I fear Mathematics tests more than any other kind					
8	I'm afraid I won't be able to keep up with the rest of the class.					
9	I don't know how to study for Mathematics tests					
10	It's clear to me in Mathematics class, but when I go home it's like I was never there					

APPENDIX III

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Sekinat Olayemi Salahudeen (ID: 10946309)
- **Institution Affiliation:** West African Bioethics Training Program (ID: 667)
- **Institution Email:** olayemisekinat1@gmail.com
- **Institution Unit:** Department of Counselling and Human Development Studies
- **Phone:** 08169052721

- **Curriculum Group:** Observational Research Protocols: An Introduction
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 47309604
- **Completion Date:** 08-Feb-2022
- **Expiration Date:** 08-Feb-2023
- **Minimum Passing:** 80
- **Reported Score*:** 92

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Introduction to Observational Research (ID: 20340)	08-Feb-2022	5/5 (100%)
Designing a Cross-Sectional Study (ID: 20341)	08-Feb-2022	5/5 (100%)
Designing an Observational Cohort Study (ID: 20342)	08-Feb-2022	4/5 (80%)
Designing a Case-Control Study (ID: 20343)	08-Feb-2022	5/5 (100%)
Putting Your Protocol Together (ID: 20344)	08-Feb-2022	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k9ab285ac-5f00-4bbc-ac3f-c6e9331bf17e-47309604

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Sekinat Olayemi Salahudeen (ID: 10946309)
- **Institution Affiliation:** West African Bioethics Training Program (ID: 667)
- **Institution Email:** olayemisekinat1@gmail.com
- **Institution Unit:** Department of Counselling and Human Development Studies
- **Phone:** 08169052721

- **Curriculum Group:** Observational Research Protocols: An Introduction
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 47309604
- **Report Date:** 08-Feb-2022
- **Current Score**:** 92

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Introduction to Observational Research (ID: 20340)	08-Feb-2022	5/5 (100%)
Designing a Cross-Sectional Study (ID: 20341)	08-Feb-2022	5/5 (100%)
Designing an Observational Cohort Study (ID: 20342)	08-Feb-2022	4/5 (80%)
Designing a Case-Control Study (ID: 20343)	08-Feb-2022	5/5 (100%)
Putting Your Protocol Together (ID: 20344)	08-Feb-2022	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k9ab285ac-5f00-4bbc-ac3f-c6e9331bf17e-47309604

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

CITI PROGRAM

Completion Date 08-Feb-2022
Expiration Date 08-Feb-2023
Record ID 47309604

This is to certify that:

Sekinat Olayemi Salahudeen

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Observational Research Protocols: An Introduction
(Curriculum Group)
Observational Research Protocols: An Introduction
(Course Learner Group)
1 - Basic Course
(Stage)

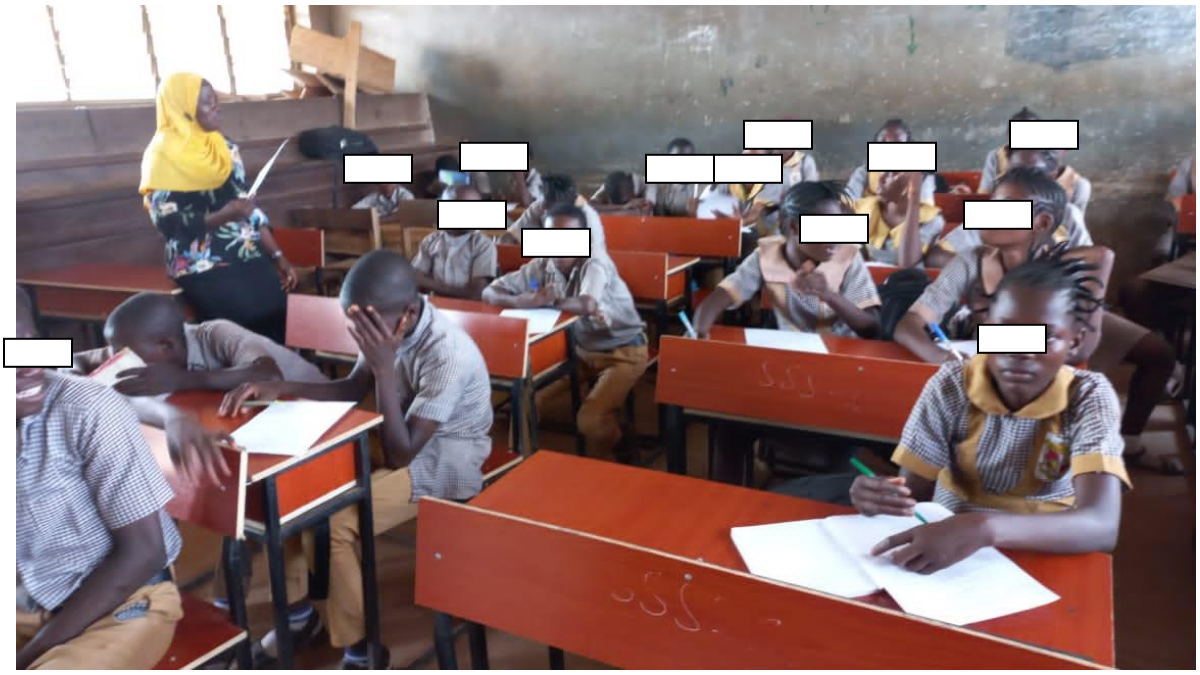
Under requirements set by:

West African Bioethics Training Program

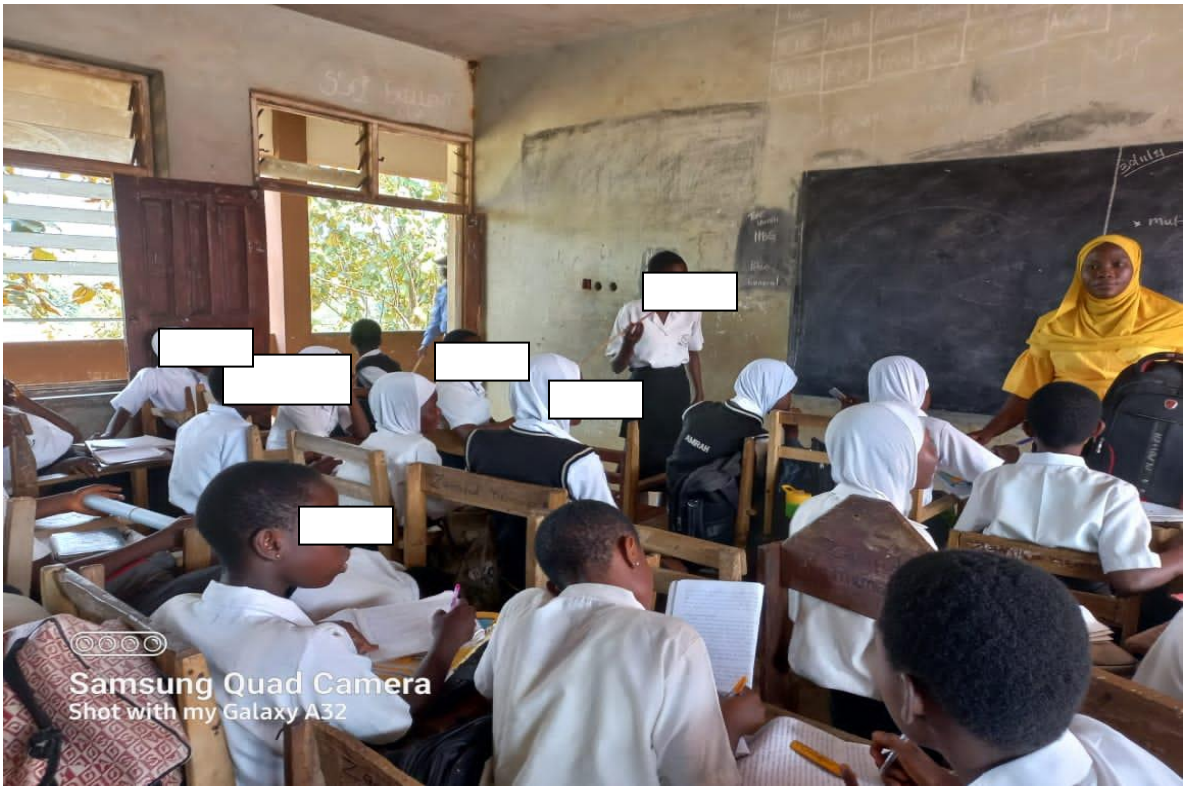
CITI
Collaborative Institutional Training Initiative

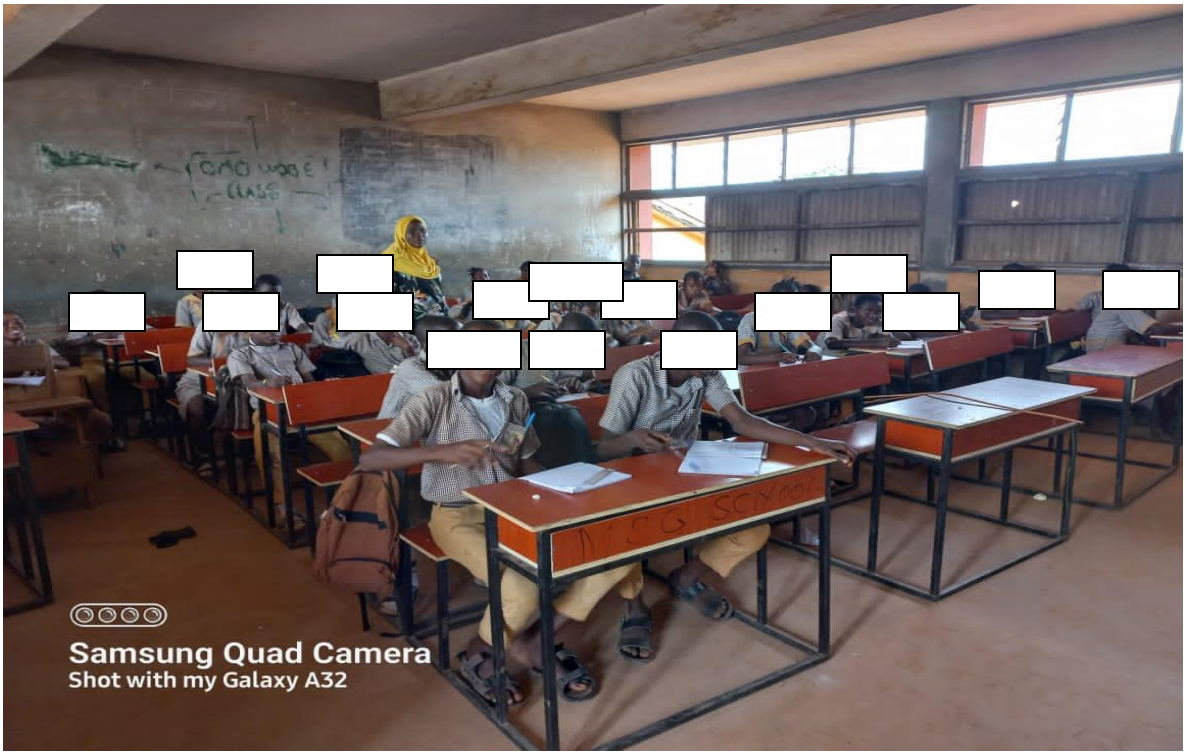
Verify at www.citiprogram.org/verify/?wc6a4c578-26b2-468b-8ecb-d79e971ff3bd-47309604

APPENDIX IV




2000 set
Samsung Quad Camera
Shot with my Galaxy A32


Samsung Quad Camera
Shot with my Galaxy A32


Samsung Quad Camera
Shot with my Galaxy A32


Samsung Quad Camera
Shot with my Galaxy A32


2D
ARTICLES
Peter Gregory
Government
MASS MEDIA
SS2
Zamfed
Friend
Samsung Quad Camera
Shot with my Galaxy A32


Samsung Quad Camera
Shot with my Galaxy A32


Samsung Quad Camera
Shot with my Galaxy A32