

**MATHEMATICS ANXIETY AS A PREDICTOR OF
ACADEMIC PERFORMANCE AMONG SCIENCE EDUCATION STUDENTS OF
FEDERAL UNIVERSITY OF TECHNOLOGY MINNA**

BY

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ABSTRACT

This study examined Mathematics anxiety as a predictor of academic performance among science Education students of Federal University of Technology Minna. Descriptive survey research design was adopted for the study. The population for the study consists four hundred and seventy-three (473) of all students in Science Education department in the school of Science and Technology Education (SSTE) Federal university of Technology, Minna. One hundred and fifty students (150) randomly selected from 100level, 200level and 300level science Education students formed the sample of the study. Questionnaire was the research instrument developed by the researcher and administered during the study. The instrument was subjected to content and face validities by two lecturers in Science Education. The research questions were answered using statistical tools of Mean(x) and Standard Deviation (S.D.). The findings revealed there is impact of Mathematics Anxiety on the Academic Performance of Science Students in mathematics. It was recommended among others that changing attitude about mathematics will require support from parent, teachers and society. If negative attitudes towards mathematics are not well managed, students' performance in colleges and career choices will be limited.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Mathematics is a universal, utilitarian subject that is needed for everyone in their life. It is an integral part of the curriculum throughout the countries in the world. It is interdisciplinary language and tool that is considered as one of the fundamentals in the formal educational system (Roy, 2011). Roy further stated that mathematics is the study of quantity, structure, space and change. It is as a human endeavor encompasses the mathematics of measurement time, distance and different system of distance measurement that developed throughout the world. Mathematics is a science about well-defined objects and notions which can be analyzed and transformed in different ways using ‘mathematical reasoning’ to obtain conclusions about which we are certain (OECD, 2018). It is an essential requirement in every field of intellectual endeavor and human development to cope with the challenges of life (Ihechukwu &Ugwuegbulam, 2016).

Mathematics is a subject that determines individuals’ functionality in any given society. Mathematics can be defined as the science of numbers and space and the language of science and technology. It is an essential requirement in every field of intellectual endeavor and human development to cope with the challenges of life. It can also be seen as the queen and servant of the school subjects since it cuts across the school curriculum (Martins, 2013). Fajemidagba *et al.* (2012), sees mathematics as a core subject and tool for the development of any science-based discipline which includes; technologyc astronomy, graphics, industry and analytical reasoning in daily living. According to Onwuachu and Nwakonobi (2016).

Mathematics is the foundation on which the whole essence of living revolves and the platform for scientific and technological innovations. Mathematics is much more than a collection of definitions, theories and proofs. It is a richly woven fabric of connections that involves visualizing, imagining, manipulating, analyzing, abstracting and associating ideas Gbolagade, *et al.* (2013). Mathematics encourages the habit of self-reliance and assists learners to think and solve their problems themselves (Adedayo; 2017).

The relevance of mathematics cuts across all works of life and cannot be overemphasized. The technological, scientific and economic breakthrough of any nation depends on their level of mathematics education. Mathematics helps a man to give exact interpretation to his ideas and conclusions. It is the numerical and calculation part of man's life and knowledge. It plays a predominant role in our everyday life and it has become an indispensable factor for the progress of our present day world (Roochi, & Makarfi (2016), noted that mathematics has played an important role in the development of society from the pre-historic era to the present and its role is more significant than ever before and still be more significant in the future. The great recognition given to mathematics as a result of its contribution to the development of the society is expected to translate to a satisfactory students' performance in the subject but, the reverse is the case in Nigerian Society. Elekwa (2010) remarked that students exhibit non-chalant attitude towards mathematics, even when they know that they need it to forge ahead in their studies and in life. Such students who have already conditioned their minds that mathematics is a difficult subject are usually not serious in the learning of mathematics and therefore perform poorly in mathematics tests and examinations (Ihendinihu; 2013). Tshabalala and Ncube (2013) in Sa'ad, Adamu and Sadiq (2014) pointed that shortage of well trained teachers, inadequate of teaching facilities, lack of funds to purchase necessary equipment, poor quality of textbooks,

large classes, poorly motivated teachers, lack of laboratories and libraries, poorly coordinated supervisory activities, interference of the school system by the civil services, incessant transfer of teachers and principals, automatic promotion of pupils, the negative role of public examinations on the teaching-learning process and inequality in education opportunities all hamper the smooth acquisition of mathematics knowledge. Also one of the greatest causes of poor performance in mathematics among secondary schools students in mathematics is phobia.

Okigbo (2010) citing Aprebo indicated that phobia is an academic sickness whose virus has not yet been fully diagnosed for an effective treatment in the class and the symptoms of this phobia are usually expressed on the faces of mathematics students in their classes. Sloan (2015) observed the construct as related to personality characteristics, negative attitudes towards mathematics, mathematics avoidance, poor mathematics background, poor teaching behaviour, achievement levels, lack of confidence and negative experiences in school. Olaniyan et al (2015) pointed out that mathematics phobia is regarded as mathematics weakness in students that deals with psychological dimension of learning. Tillfors (2014) defined phobia as learned emotional responses and it causes frequent severe and intense anxiety.

There are so many factors that influence students' performance aside from teachers' factors, and psychological factors within motivation and ability. Mathematics anxiety is seen to be as factor affecting low student academic performance (Kumar & Karimi, 2010). At the same time, Xu (2014) defined mathematics anxiety as a feeling of tension, dislikes, frustration and fear. It is a disabling condition on students' struggles in Mathematics.

General test anxiety or mathematics anxiety seems to induce some kind of facilitating or impeding effects on engagement in mathematical tasks and mathematics achievement, which

therefore needs some intervention. There are cognitive factors as well as affective factors such as motivation, mathematics self-efficacy and mathematics anxiety that contribute to the difficulty or ease students experience in doing mathematics tests or courses and perform mathematics-related tasks. The moderating or suppressing roles of these factors on engagement in mathematics and mathematics achievement need to be understood well in order to ameliorate their influence in students' learning and achievement of mathematics. Science and engineering students are expected to have mathematical knowledge and reasoning skills in order to deal with analytical and statistical tasks of their senior year courses as well as their job duties in the world of work. Therefore, this study is designed to evaluate mathematics anxiety as a predictor of academic performance among mathematics education students in science Education department of federal university of Technology Minna.

1.2 Statement of the Problem

The essence of this study is to examine the poor performances of students in Mathematics despite the efforts of parents and teachers and the fact that other researchers have carried out studies to ameliorate this situation. When students fail mathematics, they become frustrated. Students that would have been admitted into the university and become gainfully employed and useful to themselves and their parents and the nation at large may become dropout so the trend is quite alarming that some victims end up in petty trading or small scale business. Their options regarding careers choice are reduced, thus eroding the country's resource base in science and technology and a colossal loss in terms of financial investments.

In addition, dropouts later constitute problems to the society since they are not qualified to be gainfully employed. and Mathematics being a core subject in getting admission into higher

institutions of learning especially for science related courses, there is a need to identify test anxious Mathematics students so as to help them reduce their anxiety in mathematics. The aim of this research is to investigate the rate of anxiety level among science Education students in Federal University of Technology, Minna.

1.3 Aim and Objectives of the Study

The main aim of this research is to determine the mathematics anxiety as a predictor of academic performance among science Education students of Federal university of technology Minna, Niger State of Nigeria. This would be achieved through the following objectives which include to;

1. Investigate the relationship between mathematics anxiety and performance of science Education students of Federal University of Technology, Minna.
2. Establish the difference in academic performance of students at different anxiety levels.
3. Determine the difference in the mean anxiety level in mathematics among male and female Science Education students of Federal University of Technology, Minna.

1.4 Research Questions

The following Research questions were raised.

1. What is the relationship between Mathematics Anxiety and science Education department students performance in Federal University of Technology, Minna?
2. Is there any difference between mathematics anxiety level and academic performance of science education students in Federal University of Technology, Minna?

3. Is there any difference in the mean anxiety levels in mathematics among male and female science Education students of Federal University of Technology, Minna?

1.5 Significance of the Study

The Significance of the study will be of benefit to;

Educate the science Education students, teacher, curriculum planner and the general public on mathematics anxiety as the predictor of academic performance among Science Education Students of Federal University of Technology, Minna. This research will be a contribution to the body of literature in the area of the effect of personality trait on student's academic performance, thereby constituting the empirical literature for future research in the subject area.

This study is also important to other researchers in other disciplines such as physics and chemistry education as a reference on studies concerning mathematics anxiety and students' academic performance. It is the sincere hope of the researcher that by going through this work, it will encourage Mathematics teachers to help their students well in terms of Mathematics anxiety.

Teachers will consider student's backgrounds before actual classroom teaching to know if the students have basic concepts in particular unit of study in mathematics. Then teachers can be in a position to reduce the rate of anxiety among students. The study will also help future researchers (postgraduate or institutions') to come out with findings on mathematics anxiety and academic performance among students at all levels.

1.6 Scope of the Study

This study is limited to 100 level to 300 level 2019/2020 academic session Science Education Students in Science Education Department School of Science and Technology Education in Federal University of Technology, Minna. Because 400 level students are on teaching practices and 500 level students are busy with their research works.

1.7 Operational Definition of Terms

Students: Science Education students of Federal University of Technology, Minna.

Mathematics: Can be defined as a science of Numbers and Space and the language of Science and Technology.

Anxiety: An unpleasant state of mental uneasiness, nervousness, apprehension and obsession.

Mathematics anxiety: Is a feeling of tension, apprehension, or fear that interferes with performanc

CHAPTER TWO

REVIEW OF LITERATURE

2.0 Introduction

This chapter review relevant literature relevant to the study. It consists conceptual framework, theoretical framework, Related Empirical studies and summary of Related Literature Review.

2.1. Conceptual Framework

Mathematics anxiety has been described as experiencing feelings of panic and helplessness when asked to solve a mathematical task or problem (Tobias & Weissbrod,2013). Psychological as well as physiological symptoms may appear when feeling anxious about mathematics (Chang & Beilock, 2016). Mathematics anxiety is known as a common problem in primary school level, secondary school level as well as tertiary education (Ashcraft & Moore, *et al* (2018) and, therefore, has received considerable attention as a researched topic among educational scientists (Dowker, Sarkar, & Looi, 2016; Hoffman, 2010; Jansen *et al.*, 2013).

According to Bursal & Paznokas (2016), mathematics anxiety as “state of discomfort that occurs in response to situations involving mathematical tasks that are threatening to self-esteem and the panic, helplessness, paralysis, and mental disorganization arising among some people when they are required to solve a mathematical problem. Oxford & Vordick (2016) added that mathematics anxiety as a disabling condition when students struggle with mathematics. This condition is a specific and real fear of mathematics that causes students to have obsessive urge to avoid mathematics completely. The declining performance in Mathematics by students in all levels has gained increasing attention over the past three decades. This has been the concern of Mathematics educators worldwide. They complain of students’ problem ranging from poor

arithmetic and algebraic manipulation skills to lack of valuable geometric evaluation. In educational setting, Mathematics ranks very close to the lowest among the eight subject areas in the college curriculum. Many students have even chosen their college major on the basis of how little Mathematics is required for the degree (Stubblefield, 2016). Mathematics certainly means many things to many people (Marzita binti Puteh, 2013). Mathematicians and Mathematics teachers observe that Mathematics generates so much intensity of feelings. Its adherents speak of joy, excitement, satisfaction and finally mastering the problem. Yet, for the majority, Mathematics remains an object of mystery. To some students, the mere mention of the word Mathematics can cause anxiety and trigger unusual behavior, known as Mathematics Anxiety, which Mathematics teachers consider as one of the factors that hinders Mathematics learning (Tobias, 2016)

Kumara (2015) defined mathematics anxiety as a feeling of intense frustration or helplessness about one's ability to solve mathematics and an emotional relation to mathematics. According to Fulya (2018), it is a multidimensional structure and is knotted with the notion of fear, worry and tenseness. Mathematics anxiety affects mathematics related task and typically occurs during the classroom instruction whether working on classwork, homework, or in group discussion involving finding solution to mathematics problems. Understanding the material during class is critical, but taking a mathematics test can trigger even higher levels of mathematics anxiety resulting in a student forgetting everything they learned about a certain mathematical topic. according to Bower (2017), by about age 12, students who feel threatened by mathematics start to avoid mathematics courses, do poorly in the few mathematics classes they do take, and earn low scores on mathematics-achievement tests.

2.1.1. Types of Mathematics anxiety

Mathematics phobia is classified into two types as general and specific arithmophobia or numerophobia. General arithmophobia is the fear of all numbers that can seriously affect the ability of the students to do mathematics. This limits both educational and professional opportunities. Specific arithmophobia is the fear of some specific numbers that some people may be affected by this phobia. This type of phobia is usually rooted by superstition or religious phobias. The specific phobia is less serious than general arithmophobia. The best example of specific phobia is a fear of the 13 number, it is known as triskaidekaphobia. This fear has been linked to early Christians, and the number 13 appears in like in the west, hotels are prone to omitting the number 4 out of their floors and room numbers, and corporations have even followed suit, the serial numbers of Canon cameras do not include the number 4, and Samsung phones no longer use model codes with 4 either. Many people of all over the world fear with numbers. Some might fear from one number and other fears from another number considering their culture, religion, place of birth and region. Country like Nepal, India, Bhutan and Myanmar, people who follows Hindu religion, they consider the numbers 0, 1, 8, 10, 12, 19 and 28 as unlucky numbers, bad luck or evil spirits and so on. These numbers are called oudenophobia, henophobia, octophobia, decaphobia, dodecaphobia, enneadecaphobia and eikosiophobia respectively, therefore they fear such numbers. In contrary to the above, especially the people from Nepal and India assume the number 7 as the lucky number and they like to choose this number and they do not fear. In China, the number 8 and multiples of 8 are considered as the luckiest number and they believe that the number brings wealth and good luck. Similarly, Chinese young people in slang word use 520 as the symbol of conveying love (I love you) to their best friend. However, especially in Nepal and India, people used 420 to convey as

the bad character. Thus, due to different religious and cultural superstition, people surrounding these places may have different understanding about the number. The understanding may be positive or negative depending on their religious and cultural superstitions. Such irrational beliefs about number create fear to each and every learner.

2.1.2 Nature of Mathematics Anxiety

Mathematics anxiety describes the states of mind developed through personal experience, and individual emotional responses to these experiences. Negative feelings towards learning mathematics arise as a consequence of a range of encounters relating to the way mathematics is presented, taught and learnt by individuals (Green & Allerton, 2019). According to (Sheffield and Hunt 2017), mathematics anxiety in many ways is easy to describe and define. It is the feelings of anxiety that some individuals experience when facing mathematical problems. Like other form of anxiety, students may feel their heart beat more quickly or strongly, they may believe they are not capable of completing mathematical problems, or they may avoid attempting mathematics courses. Mathematics anxiety is known as a disabling condition when students struggle with mathematics. This condition is a specific and real fear of mathematics that causes students to have an obsessive urge to avoid mathematics completely (Oxford & Vordick, 2016). Mathematics anxiety can occur in all levels of education from Primary school to Higher education, and once established, can persist in life, interfering with every day activities involving numeracy and further learning of mathematics. Mathematics anxiety usually comes from negative experiences in working with teachers, tutors, classmates, parents or siblings (Yenilmez, Girginer, & Uzun, 2017).

Many students who suffer from mathematics anxiety have little confidence in their ability to do mathematics and tend to take the minimum number of required mathematics courses, greatly

limiting their career choice options. This is unfortunate especially as society becomes more reliant on mathematical literacy (Scarpello, 2015). Barnes (2016) stated that mathematics anxiety could be caused by a number of things: unpleasant past experiences with mathematics in the classroom, parent conveying the message to their children that mathematics is boring and useless, or from the attitudes of the teachers themselves. Mathematics anxiety is a problem for many college students, not only those in developmental mathematics courses. If a technique is found to facilitate the alleviation of mathematics anxiety for students through improved pedagogies, information, and resources, it could remedy students' mathematics anxiety while helping them acquire the necessary mathematics skills required for degree completion (Johnson, 2017)

2.1.3. Causes of Mathematics Anxiety

Mathematics anxiety can be caused by several different factors. For instance, unpleasant teaching and assessment strategies for students, like time testing (Ashcraft & Moore, 2016) and assigning mathematics as punishment (Oberlin, 2012), that are still widely in use in all school levels, may influence the spread of mathematics anxiety. Although mathematics anxiety may have been appearing relatively early in life, it has been shown that there are possibilities to reduce mathematics anxiety in all levels of schooling (Hembree, 2015). Appropriate mathematics-related instruction and teacher's enthusiasm toward mathematics are important in the development of mathematics anxiety of students (Jackson & Leffingwell, 2013), reduction of pre-service teachers' own mathematics anxiety is crucial and it could be helpful in reducing the students' mathematics anxiety (Gresham, 2017). Applying more active learning (such as group work) may also reduce anxiety (Cooper, Downing, & Brownell, 2018).

Mathematics phobia can occur due to different causes. As concluded by Ihechukwu, & Ugwuegbulam (2016), lack of different aspects related to teaching learning like: good teacher-student relationship, use of students-centered/innovative approach of teaching, counseling, positive attitude towards mathematics, improved mathematics curriculum, breaking down topics into units, application of ICTs in teaching mathematics and so on. Can cause mathematics phobia. According to Foley, et al., (2017), mathematics anxiety is learned not from personal experience but from parents and teachers. As reported by Foley and colleagues, a study done in India found out that, parents with high mathematics anxiety unintentionally convey the idea that mathematics is difficult and anxious while helping their children's homework. In the same way, the study done in America found out that the level of mathematics anxiety depends on their teacher. The children read the subtle body cues of their elders to determine whether mathematics is something to fear or to feel good about. The students who get nervous on any occasion in the case of mathematics are caused by mathematics phobia. Thus mathematics phobia is mainly caused by the test and examination (due to the pressure to perform well), people (individual, parents, teachers and peers) due to individual low proficiency, parents' concept of difficulty, teacher poor knowledge delivery and peers negative feeling toward mathematics and nature of mathematics (due to abstract nature and not to relate all aspects in real life). Mathematics anxiety is caused by poor test grades, inability (or unwillingness) to complete difficult assignments, negative predispositions of parents, and even the mathematics teacher. Teachers and parents that are afraid of mathematics pass that on to their students and children (Furner & Berman, 2019). It could be very difficult for students to like mathematics when their parents did not do well in mathematics themselves, and thus do not understand it or do not think it is important. Students could see their parents as having a job and doing well without a great love for mathematics and

think that they will be successful without an appreciation of mathematics as well. The following points may be the causes of mathematics phobia:

- i. Weak teaching method and weak mathematics background
- ii. Teachers' aggressive, stressful and irritating characteristics
- iii. Inability to solve mathematics problems
- iv. Bad relationships between a teacher and a student
- v. Inability to solve too much home assignment
- vi. Not to understand mathematics in class
- vii. Unable to solve mathematical tasks
- viii. Use of abusive words by teacher
- ix. Negative attitude towards mathematics
- x. Not able to solve mathematics problem in time
- xi. Not to be child-friendly teaching environment
- xii. Mathematics learning difficulty (dyscalculia)
- xiii. Community Influence (negative perception)
- xiv. Low self esteem
- xv. Lack of analogies

2.1.4. Symptoms of Mathematics anxiety

Mathematics Anxiety is a feeling of anxiety that appears due to the fears of solving different mathematical problems. Some people call mathematics phobia as a tension, panic, helplessness, and mental disorganization. The feeling of phobia in long term can have a negative impact on health of the person and also lose the desire to learn the subject further. Hence, any types of phobia should be eliminated at the very beginning stage not to evolve into more serious problems. In the same way, mathematics phobia has the following symptoms

4. Try to avoid numbers
5. Getting confused and disorganized
6. Apparent choking sensation
7. Anxiety, depression, and panic
8. Fear of doing anything else
9. Sweating, trembling or getting hot flushes
10. Problems with breathing
11. Breathing rapidly and tightness in the chest
12. Nausea, headache and fainting
13. Unable to express ones' thoughts clearly
14. Immediate desire to leave classroom
15. Get detached from reality

16. Shows avoidance behavior

17. Getting nervous and stressed when assigned to solve mathematical problems

Skips classes and irrational thinking (Khing, 2016)

2.1.5. Way to Overcome Mathematics Anxiety

It is fair to say that mathematics is not everyone's favorite subject. Some students have the feelings of tension and anxiety or fear toward mathematics. Such negative feeling towards mathematics suffers them day by day and it can be difficult to shift from a mindset of failure to a more positive attitude. Different research shows that if teachers as well as the parents' deal with the mathematics phobic student in time by different way to shift into positive mindset, it is not impossible. So many students may have suffered from mathematics phobia due to the result of several negative experiences and perception in the past. It can be overcome by controlling anxiety, improving mathematics skills and developing positive attitude towards mathematics. The following steps are the main way forward from mathematics phobia and perhaps find a way to view mathematics in a more positive light.

- i. Reinforce the child's sense of intelligence and skill in mathematics learning
- ii. Create a supportive environment for learning mathematics
- iii. Encourage the child to tackle in mathematics
- iv. Explain the child about positive uses of mathematics
- v. Familiarize the child into mathematics teaching aids
- vi. Make mathematics teaching fun with games and puzzles

- vii. Avoid to compare the child's abilities to others
- viii. Increase the use of instructional materials in teaching
- ix. Use of innovative and contemporary teaching approaches
- x. Develop and maintain close student-teacher relationship
- xi. Motivate students to treat mathematics positively
- xii. Provide access of reference material
- xiii. Use of modern facilities, devices, and tools
- xiv. Use of ICT in teaching learning situation
- xv) Make enough and effective practice of mathematics (Ihendinihu, 2013)

2.1.6. Teacher's Role in Reducing Mathematics Anxiety

The teacher can help his students overcome mathematics anxiety. The mathematics teacher needs to be excited about teaching mathematics and he must believe that there is a reason for his students to learn the mathematics. If the teacher is not motivated to teach the subject, then one cannot expect his students to be motivated to learn. It has been shown that students tend to internalize their instructor's interest in and enthusiasm for teaching mathematics (Jackson & Leffingwell, 2020). If the teacher is not happy about teaching mathematics or does not enjoy being with students in the classroom, then students are less likely to be motivated to learn the material. The teacher needs to be able to put himself in his students' shoes and remember what it was like to struggle with understanding new concepts (Schwartz, 2019). The teacher needs to understand that it takes time for students to master concepts. Therefore, the teacher must have

patience. The teacher also should never give up trying to help his students succeed. Teacher needs to give specific examples and applications of mathematics. The teacher should review basic mathematics skills with his students. Students need to be able to do the basics before they can move on to more complicated problems. Learning mathematics is a building block process. Each step builds on another one. It is imperative when teaching mathematics that the teacher progresses from simple problems to complex ones, Thus, Mathematics is a language on its own. It is full of definitions, vocabulary, symbols and notations that students must know in order to succeed in mathematics. Therefore, the teacher needs to make sure that his students can read and speak the language. The students also need to have support systems in mathematics, whether this comes from their parents at home or with other students at school, also they need to have people they can go to when they are having difficulty who will help them look at the problem through a different view point and encourage them not to give up on the problem. Cooperative learning is one way students can get this support. Sometimes other students can explain concepts in a manner that their peers will understand and be able to relate to, especially if there is a student who had trouble understanding it. In this case, the teacher needs to be sure that the students are explaining the concepts correctly. The teacher should also try to reduce test anxiety by helping students develop their test-taking skills. Along with this, the teacher needs to be aware of some of the warning signs that panic about mathematics is about to set in.

2.1.7 Academic Performance

Students' academic performance and graduation rates have been the area of interest for higher education institutions. Investigation of factors related to the academic performance of university students become a topic of growing interest in higher educational circle. Many recent studies were carried out to explore factors that affecting university students' academic performance.

Hanson (2019) reported that student performance is affected by different factors such as learning abilities, gender and race. Simmons, *et al.* (2018) concluded that family income level, attending full time, receiving grant aid and completing advanced level classes in high school having statistically significant effects on college persistence among first generation college students.

Garton, *et al.* (2016) carried out a study with freshmen college students to evaluate the efficiency of student learning style and other university admission variable in predicting student academic performance and retention. Act composite score, high school class rank high school core GPA, and learning style were used as predictors. Results showed that core GPA and Act score were best predictors for predicting academic performance of first year of college. Mckenzie and Schweitzer (2013) conducted a prospective study to explore the psychosocial, cognitive, and demographic predictors of academic performance of first year Australian university students. Results demonstrate that previous academic performance was identified most significant predictors of university performance. Integration into university, self-efficacy, and employment responsibilities were also predictors of university performance. Hijazi and Naqvi (2016) conducted a study to find out the factors which affecting college students' performance. In this study researcher mainly focus to explore the factors that associated with performance of students in intermediate examination. This study concludes that attitude towards attendance in classes, time allocation for studies, parents level of income, mother's age and mother's education were main factors that affect performance of students of private colleges.

There are numerous factors which affect the academic performance and retention of students in higher education institutions. We discuss those important factors which we used in this study. The justification of the factors with existing literature is given below

2.1.8 Home Environment

Reviewed literature indicate that there is an awareness of the importance of the home environment or family on pupil's/students' academic performance. The home has a great influence on the students' psychological, emotional, social and economic state. In the view of Ajila and Olutola (2020), the state of the home affects the individual since the parents are the first socializing agents in an individual's life. This is because the family background and context of a child affect his reaction to life situations and his level of performance. Ichado (2019) stated that parent's constant disagreement affects children emotionally and this could lead to poor academic performance. Taylor *et al.*, (2020) showed that parenting style (nature and control) and parental involvement significantly predicted academic outcomes. In Sauda Arabia, Kritam, *et al.*, (2019), reported that the family financial support, encouragement and following up have positive impact on students' performance as measured by their GPA

2.1.9 Study Habits

Study habits of students may be relevant to the prediction of grades because it is possible that student's grades may be related to their study habits. That is students with poor study habit may obtain lower grades than those students with better study habits the importance of the relationship between grades, instructor ratings and study habits has not been determined Middleton (2018). Study skills and learning approaches include for example time management, using information resources taking class notes, communicating with teachers preparing for and taking examination, and several other learning strategies The research shows a significant correlation between such learning behavior and approaches and academic achievement i higher education Soares, *et al.*, (2019). Students who create their own study aids are spending time making them, whereas those who use others' study aids or not. It may also be that the process

of creating study aids helps the learner gain more meaningful knowledge through the process of synthesizing disparate pieces of information into new knowledge, as has been shown with note taking. wondered if students who used study aids made be others rather than making their own might be missing out on the benefits of time-on-task and concept mapping (Sleight & Mavis 2018).

2.1.10 Learning Skills

Recent research has considered student behavior and learning to be important factors in student's academic success and retention. Hattie, *et al.* (2016) conclude that if we aim to increase student's academic success in higher education institutions, we must focus on interventions directed towards learning strategies a fact which suggests the need to develop programs of this kind (Soares, *et al.*, (2018). The influence of learning strategies on academic achievement, on the other hand, has been much less widely investigated, in spite of its theoretical importance and prevalence in international reports (Martin, *et al.*, 2018). In 2019, Jere Brophy demonstrated that increased time spent on learning activities yields increased learning, provided that the teacher was competent and that the learning activities were effectively designed and implemented Another theory that guided us was concept mapping. Concept mapping is a method in which the learner links new knowledge to a framework of relevant concepts that the learner already knows. Ausubel (2019) maintained that this linking of new with existing knowledge was a key factor in successful learning and that it was the difference between meaningful learning and rote learning (Sleight & Mavis 2018).

2.1.10 Causes of Poor Academic Performance

1. Slothfulness
2. Improper timetable
 Inadequate study time
3. Financial constraint
4. Lack of study materials
5. Broken home
6. Doubt

2.1.11 Solutions to Poor Academic Performance

1. Government should be able to provide supports for students from a poor background like grants, scholarships, etc. This will assist students in this category to remain focus.
2. Teachers should be student focus rather than being content minded.
3. Parents should try to live in harmony at least for this sake of their child. This will help them to be psychologically stable.
4. Qualified teachers should be employed by schools for quality teaching.
5. Conducive environment for learning should be provided by schools.
6. Students should be ready to learn, attend class regularly, and be inquisitive in class.
7. Group reading among students should be encouraged.

2.2 Theoretical framework

In order to deal with the problems of anxiety and phobia in mathematics it is essential to know the theoretical background of developing anxiety and phobia. Here are the main theories and their implications to deal with the problem of mathematics phobia. There are many theoretical approaches to anxiety and phobia. None of them are complete in itself but each of the theory helps to understand different aspects of anxiety and phobia in mathematics. The theories along with their implications in relation to anxiety and phobia in mathematics have been discussed below.

2.2.1 Biological theories of anxiety

According to Biological theory mental disorders are caused by physiological factors. It states that there is a biological process associated with anxiety. Neuropsychologists have identified certain genetic factors that may play a role in the development of phobia. Eysenck (2014) suggested that individual differences in the experiences of anxiety may occur as a result of the inheritance of a particular genetic makeup. Seligman's (2013) theory of 'preparedness' in development of phobia suggests that as a result of evolutionary process man is biologically predisposed to develop fear due to conditioned of certain stimuli. Seligman believes this 'preparedness gene' may be passed on from generation to the next. Although the research is still in its early phase, it is known that certain medications that affect the brain chemistry are helpful in treating phobia. Most of these treatments are intended to help relieve anxiety by maintaining the level of chemical called serotonin. A serotonin level that is too high or too low can cause both depression and anxiety. Biological theories propose that individual differences should be given proper importance in dealing with and minimizing anxiety and phobia in mathematics. This theory also suggests that mathematics is not a natural stimulus for phobia, therefore, as a

preventive strategy of anxiety in mathematics one must guard against conditioning of learning mathematics which is neutral stimulus with the natural predisposed stimuli

This theory is related to the study topic because, Students perform differently and have unique attitude towards Mathematics.

2.2.2 Psychoanalytic Theory (Freudian Theory)

According to this theory all human anxiety originates from the complex interplay of the psychic forces of Id, Ego & Super-Ego. Id is the most primal and instinctive part of the mind and is the basis of stress, fear, anxiety, phobia etc. The role of supper-ego is to make value judgment of the task/behaviour, the individual performed. The ego is the rational moderator between Id and Super Ego. Tusk of Ego is to make a balance between the desire of Id and criticism of Super Ego. Phobia develops as a result of anxiety reactions of the Id that have been repressed by Ego. It indicates that the phobia that are showing at present are not the original subject of fear, rather there are some other sources generated by the desire of Id. Psychoanalytic treatment involves exploring the organization of the personality and reorganizing it in a way that addresses the deep conflicts. According to the principle of psychoanalysis, curing the phobia is only possible by rooting out and solving the original conflict. So, if a child is punished by the teacher for not doing mathematics-tasks then this free floating anxiety may be attached to mathematics. Not only the child but also some of his peers who have observed the punishment may be victim of mathematics anxiety.

This theory is related to the research work because it emphasized reasons why some Students fail Mathematics, and also state the negative impact of punishment.

2.2.3 Neo Freudian Theory

This theory is of view that human is largely a consequence of social influences. This theory regards that 'Primary anxiety' develops not in birth but later; as the child realizes that he depends upon his parents. Anxiety is aroused due to actual or potential frustration. If a child misbehaves, the parents might withdraw affection and support. This threat impels the child to conform to the parents' expectations but anxiety develops due to suppression. Child's anxiety increases due to over expectation of the parents which are beyond the ability level of the child. Most of the parents think that mathematics is the most important subject and the child must have to learn this for betterment of his future career. But anxiety develops in mathematics if the child failed to learn mathematics up to the expectation of his parents.

Neo Freudian theory is relevant to this research work because it gives a pointer to one of the likely cause of Mathematics anxiety. Social influences can make Students to hate Mathematics.

2.2.4 Behavioural Theory

Watson and Rayner (2013) demonstrated that anxiety can be acquired through a process of classical conditioning. Mower (2014) suggested a two factors theory for the development and maintenance of anxiety. Initially fear develops through classical conditioning and subsequently the person learns to reduce his fear by avoidance. This second kind of learning is called 'instrumental conditioning' and the response of avoidance is acquired and maintained because it reduces anxiety and therefore immediately reinforcing. Once avoidance becomes established as the means of coping with problems it is used repeatedly. Therefore, the anxiety may be generalized and the confidence of the individual decreases gradually. Therefore, according to this theory phobia develops due to stimulation generalization process. Stimulus plays an

important role while teaching mathematics. Fear of performing poor may lead to anxiety and gradually when it becomes tiger it turns to phobia, the irrational fear. So, teacher needs to be cautious about such stimulus generalization while teaching. If we check the fear when it is at classical condition level, then phobia can't be developed.

2.2.5 Cognitive Social Learning Theory

This theory lays importance of learning principle together with the role of individual thought and reasoning for the development of anxiety disorder. Bandura (2015) opined that fear and anxiety are learned. He mentioned four possible mechanisms for this learning.

- i.** Fear may be learned by classical conditioning
- ii.** Watching some others undergo discomfort, punishment, or pain as a consequence of their behaviour may create anxiety to others.
- iii.** Due to symbolic instruction anxiety may develop. Such as, if elders or teachers say to child that mathematics is a difficult subject then child may develop anxiety in mathematics.
- iv.** Due to symbolic logic a person may infer or deduce that something is dangerous, accordingly anxiety develops. If mathematics teacher is a dreadful and then students deduce that mathematics is a fearful subject.

This theory is relevant to the study in that anxiety can be learned by classical conditioning.

2.2.6 Cognitive Learning Theory

Cognitive theorists viewed that, it is not events which cause anxiety rather it is individual's interpretation of those events. Ellis (2014) proposed that the primary causes of human distress

are certain 'core irrational' beliefs. Ellis opined that individual is happiest when he is able to establish important life goal and purpose, and he actively pursues them. This theory suggests that faulty mathematics curriculum which lacks clear objectives i.e. which fails to set clear goal of learning mathematics before the child and faulty evaluation procedure which fails to make the child know how far he has proceeded towards and how far he is behind the goal, may make the child directionless and help to develop anxiety in mathematics. This theory also suggests that encouragement from the part of teachers and parents to the children in relation to the activities of mathematics may be effective for the betterment of performance and works as preventive agent of anxiety and phobia in mathematics.

Cognitive learning theory is relevant to this research because it suggests a possible solution to Mathematics phobia which is encouragement from teachers and parents to the children.

2.3 Empirical Studies

Rajendra (2020) seeks to investigate the disposition of mathematics phobia. It studies about the fear of mathematics, its causes, symptoms and ways to overcome regarding the school level students. Out of the root causes of mathematics phobia, curriculum structure, school facilities, instructional techniques, teachers' teaching performance, use of tools and technology and evaluation system are the main. In the same way, lack of proper incentives for mathematics teachers and the negative perception of the students and teachers about mathematics are also the important causes. The study has revealed that mathematics phobia exists among students, which are characterized into negative perception of the students towards mathematics and others too. The main causes of mathematics phobia include test and examination, individuals, teachers, parents, peers and the nature of mathematics. The only ways to overcome mathematics phobia, is the intensive efforts made by all the stakeholders.

Nwoke & Charles (2016) carried out a study to investigate the causes and solutions to mathematics phobia among secondary school students. The study was carried in Owerri North local Government of Imo State. The descriptive survey research design was adopted in carrying out the study. A sample of 110 mathematics teacher was selected for the study through random sampling technique. A researcher made 4-points liker type of questionnaire titled “Causes and Solutions of Mathematics Phobia (CSMP)” was used for data collection, it had reliability coefficient of 0.81 determined using the crounbach’s alpha formula. The generated data was analyzed using mean and standard deviation to answer research questions while the hypothesis was analyzed using chi-square(x2) and tested at 0.05 level of significance. The result of the study revealed among other factors, teacher method of teaching, relationship, use of abusive words on students as causes of mathematics phobia among students. Based on the result it was recommended that, mathematics teachers should be retrained periodically in order to have ideas of innovative approaches of teaching mathematics to avoid phobia.

Moslem,Mehdi & Bitu (2013) attempts to study the relationship between the mathematical anxiety among high school students and their self-esteem and teachers' personality characteristics. From among the high school students some 480 people were chose categorically in accordance with their characteristics and 60 mathematics teachers were also chosen through this method. The data were collected through the use of self-esteem questionnaire of Cooper Smith and Mathematics Anxiety Questionnaire and personality questionnaire by Neo. After data analysis, the following findings were concluded: There is negative significant relationship between the students, mathematical anxiety and their self-esteem. There is also a significant relationship between the students, mathematical anxiety and their teacher's personality characteristics. There is not significant relationship between the high school student

mathematics anxiety and their educational levels. There is a significant difference between the mathematical anxiety of moreover students majoring in humanities and natural science students and the students of physics and mathematics students. There is a significant difference between the mathematics anxiety of male and female students.

There is a significant difference between the mathematics anxiety of male and female students. The research is similar to this research work because it aimed at investigating the causes and impact of Mathematics anxiety. But, it's different from this research work in that it didn't relate Mathematics Anxiety to poor performance of students in Mathematics.

2.4 Summary of Related Literature

Whether mathematics is interesting or boring, it is widely used in the human life formally or informally. It is also the important part of the school level curriculum in the world. The school level students may have mathematics phobia due to different aspects like: teacher, parent, peer, senior, poor mathematics background, ineffective teaching methods, students' negative perceptions towards mathematics, abstract nature of mathematics and religious and cultural aspects etc. Teacher is the central part of teaching and learning. It is said that when a student likes a teacher, then there is greater probability of liking the subject he or she teaches. In any case, it is important to do possible intervention to eliminate the mathematics phobia among the students. However, it is important to eliminate the mathematics phobia of the students from the very beginning; otherwise, a simple mathematics Anxiety may gradually become a serious psychological problem. Mathematics Anxiety is a real problem that students and teachers are facing today.

All the authors whose works were reviewed have the same view about the causes and effects of mathematics anxiety in tertiary institution. They are identifiable physical objects which carry information that can promote learning. The study reviewed concept of mathematics anxiety, nature of mathematics and anxiety, causes of mathematics anxiety among students in tertiary institutions and also the effect on students' academic performance. Findings of the study also reviewed that mathematics anxiety is a real problem facing students, teachers, and parents. Students who have mathematics anxiety face real and long-lasting consequences. Thankfully, there are real methods that teachers and parents can use to help students overcome their mathematics anxiety. There are also ways of helping students realize their own mathematics anxiety and work toward overcoming it. A better understanding of mathematics anxiety is needed in order to help students overcome this problem. The more research is done, the more students, teachers, and parents will be able to work together to overcome this problem. As methods are found that help prevent and reduce mathematics anxiety, the ideas and information should be shared so others can benefit from it as well. Mathematics is an extremely important subject and it is vital that students succeed in it.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the procedure adopted for the study. The procedures are presented under the sub headings; Research design, population of the study, sample and sampling techniques, instrument for data collection, validity and reliability of the instrument, Method of data collection and Method of data Analysis

3.1 Research Design

The cross-sectional research design was adopted for the study. This is for the purpose of looking into Mathematics anxiety as a predictor of academic performance among science Education students of federal university of Technology Minna. The study will attempt to generalize the common characteristics of the sample study to the total population.

3.2 Population of the Study

The population for the study consists four hundred and seventy-three (473) which is the total number of all students in Science Education department in the school of Science and Technology Education (SSTE) Federal university of Technology, Minna.

3.3 Sample and Sampling Techniques

A sample of one hundred and fifty students (150) from science Education students was randomly selected from 100level, 200level and 300level students out of four hundred and seventy-three (473) as the total population. The levels are classified as A,

B and C as shown in the table 3.1 below

Table 3.1 Sample Size Table

GROUP	NUMBER
School A	42
School B	48
School C	60
TOT A L	150

3.4 Instrument for Data Collection

The instrument used for data collection is questionnaire. The questionnaire consists of 20-items instrument of 2 sub-groups (State anxiety and Trait anxiety) designed to elicit information about mathematics anxiety. The researcher uses 5 –point liker response format as Strongly Agree (SA), Agree(A), Undecided(U), Disagree(D) and Strongly Disagree with value of 5, 4, 3, 2 and 1 respectively having 3.0 has the mean.

3.5 Validity of the Research Instrument

Instrument was designed by the researcher and approved by the supervisor. The content of the instrument was validated by two lectures from the department.

3.6 Reliability of the Research Instrument

Reliability of the instrument (questionnaire) used in gathering the data for this research work has a Cronbachss alpha coefficient of 0.72.

3.7 Method of Data Collection

Letter of Introduction was collected from the Head of Department (HOD) Science education. The letter was used to obtain permission from the Head of department (HOD) Science education. The orientation was given to the respondents on how to fill the questionnaires by the researcher, the questionnaires were administered to three (3) different levels; 42 to 100 Level which constitute 28.0%, 48 to 200 level which constitute 32.0%, and 60 to 300 level with 40.0% of science Education Students of federal university of Technology Minna, and retrieved on the spot to avoid loss of data and ensure a reasonable number of questionnaires for analysis.

3.8 Method of Data Analysis

The data collected in the study were analyzed using descriptive statistics of Mean and Standard Deviation. The responses from the respondents were compared, classified to the number of items in the questionnaire for each research question.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Answer to Research Questions

Demographic Distribution of Respondents

Table4.1 Table showing the demographic data of respondents

S/no.	Item	Variables	Frequency	Percentage (%)
1.	Gender	Male	87	58.00%
		Female	63	42.00%
2.	Institution	FUT Minna (School of Science and Technology Education; Department of Science Education)	150	100%
3.	Level	100 Level	42	28.00%
		200 Level	48	32.00%
		300 Level	60	40.00%

Table 4.1 shows that majority of the student FUT Minna (School of Science and Technology Education; Department of Science Education) in the sampled are Male with 58.0% of the sample, while the remaining 42.0% are Female which constitute 63 students.

Table 4. 2: Table showing the Distribution of the Respondents Academic Performance

Current CGPA	Frequency	Percentage (%)
1. First Class	17	11.33%
2. Second Class Upper	53	35.33%
3. Second Class Lower	61	40.67%
4. Third Class	12	8.00%
5. Pass	07	4.67%
Total	150	100.00

Source: Researcher's Field Survey (2021)

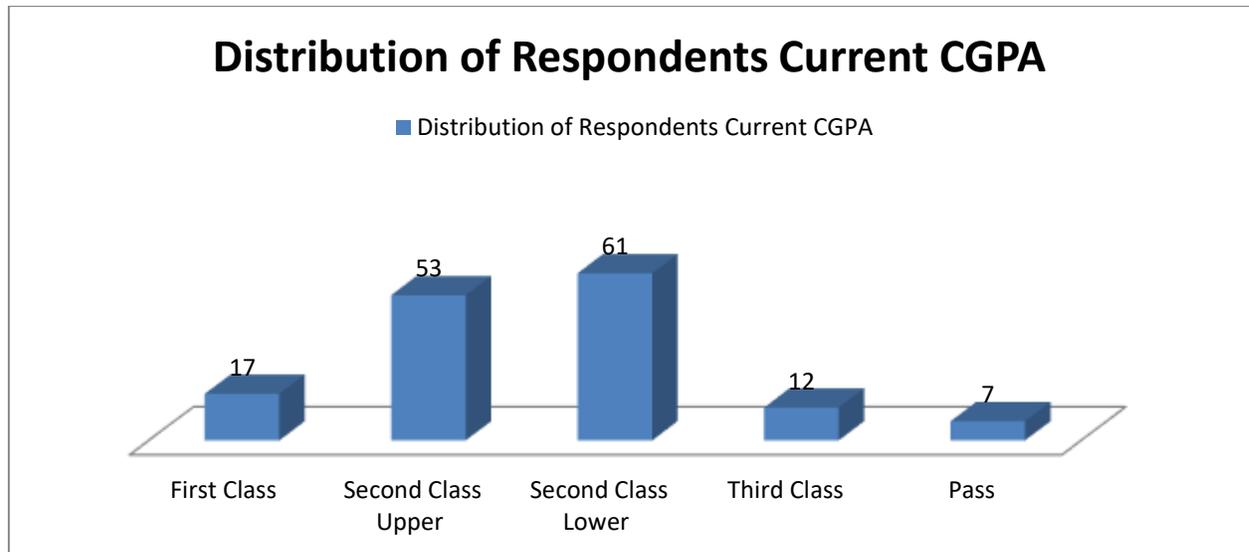


Figure 4.1 and the above bar chart show the Distribution of the Respondents Academic Performance. The table shows that 11.33% (17 of 150) of the respondents are First Class students, 35.33% (53 of 150) are Second Class Upper, 40.67% (61 of 150) Second Class Lower, 8% (12 of 150) are Third Class, and the remaining 4.67% (7 of 4.67) are pass in their CGPA. This shows that the preponderance of respondents is Second Class Grade Students.

Table 4.3 Correlation Analysis of Students' Current CGPA and Mathematics Anxiety

		Correlations	
		Mathematics Anxiety	Students' Current CGPA
Mathematics Anxiety	Pearson Correlation	1	.695**
	Sig. (2-tailed)		.000
	N	150	150
Students' Current CGPA	Pearson Correlation	.695**	1
	Sig. (2-tailed)	.000	
	N	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4.3 above shows the Correlation Analysis of Students' Current CGPA and Mathematics Anxiety. The Pearson Correlation Coefficient (r) = 0.695 implies a strong positive correlation between the Students' Current CGPA and Mathematics Anxiety. The Coefficient of Determination (R^2) = 0.483 implies that 48% of students' current CGPA can be explain by the level of Anxiety while the remaining 52% can be explained by other factors due to variations not considered in this study. The p-value = 0.000 been less that 0.05 (level of significant) shows that Mathematics Anxiety greatly influence the performance of Science Education students of Federal University of Technology Minna.

Table 4. 4 Mean respondents of Mathematics anxiety a predictor of academic performance among science Education Students of Federal university of Technology Minna

N₁ = 42; N₂ = 48; N₃ = 60; Strongly Agree (S.A), Agree (A), Undecided (UD) Disagree (D), Strongly Disagree (S.D).

S/N	ITEM	\bar{X}_1	\bar{X}_2	\bar{X}_3	\bar{X}_T	Remark
<u>State Anxiety</u>						
1.	I feel stressed up when listening to lecturers in mathematics class	4.30	3.99	2.63	3.64	Agreed
2.	I feel embarrassed enough to ask question in my class	3.64	3.33	2.51	3.16	Agreed
3.	I get tense up when preparing for a test	4.21	3.90	3.00	3.70	Agreed
4.	I get nervous when asking questions in class.	4.02	3.71	3.00	3.58	Agreed
5.	I feel unsecured when taking a test.	4.02	3.71	2.80	3.51	Agreed
6.	I feel that I will not be able to do well in courses that involves mathematics in future	2.13	2.82	1.91	2.29	Disagreed
7.	I feel discouraged in mathematics class	3.92	3.61	2.77	3.43	Agreed
8.	I feel nervous because of the harshness and strictness of my mathematics teacher	2.86	1.55	2.80	2.40	Disagreed
9.	I get tense up over the time allocated to mathematics per day	4.02	3.71	2.63	3.45	Agreed
10.	My inability to solve mathematical problems results to mathematics anxiety	4.02	3.71	2.54	3.42	Agreed
11.	My negative attitude towards mathematics results to mathematics anxiety	3.77	3.46	2.69	3.31	Agreed
<u>Trait Anxiety</u>						
12.	My worry is I will not be able to use mathematics knowledge in my future career when needed	3.86	3.55	2.54	3.32	Agreed
13.	My worry is that I will not be able to complete all the assignment in mathematics	3.81	3.50	2.89	3.40	Agreed

14.	My worry is that I will not be able to get a good grade in mathematics	3.62	3.31	3.00	3.31	Agreed
15.	My feeling is that I will not be able to do well in future course involves mathematics	2.18	2.87	1.51	2.19	Disagreed
16.	I feel limited career choices available in mathematics in the society causes mathematics anxiety	3.53	3.22	2.34	3.03	Agreed
17.	I am always afraid whenever the course contents are been released at the beginning of the semester	3.47	3.16	2.46	3.03	Agreed
18.	I am always afraid over Mathematics assignments	2.12	2.81	1.77	2.23	Disagreed
19.	I perceive that mathematics is abstract and does not really have a direct or obvious application	4.02	3.71	2.54	3.42	Agreed
20.	I am always afraid whenever I write mathematics examination	3.78	3.47	3.15	3.47	Agreed
Grand Mean		3.57	3.36	2.57	3.16	

Key: \bar{X}_1 = Mean of 100 Level Science Education Students; \bar{X}_2 = Mean of 200 Level Science Education Students; \bar{X}_3 = Mean of 300 Level Science Education Students; \bar{X}_T = Average of Mean of 100, 200, 300 Level Science Education Students, obtained by $\left(\frac{X_1+X_2+X_3}{3}\right)$; N_1 = Number of 100 Level Science Education Students; N_2 = Number of 200 Level Science Education Students; N_3 = 300 Level Science Education Students; ($\bar{X}_T \geq 2.50$ agreed otherwise disagree)

The result presented in Table 4.4 above revealed that the respondents (Students of Science Education Department) agreed with items 1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 16, 17, 19 and 20 as an indicator for Mathematics anxiety to be a predictor of academic performance among science Education Students of Federal university of Technology Minna while they disagreed with items 6, 8, 15, and 18 as an indicator for Mathematics anxiety to be a predictor of academic performance among science Education Students of Federal university of Technology Minna.

The grand mean values for 100, 200, and 300 Level are 3.57, 3.36, and 2.57 respectively; having the greatest of them to be 3.57 indicates that 100 Level experience mathematics anxiety compare to the other levels considered.

The average grand mean which result to 3.16 implies that there is impact of Mathematics Anxiety on the Academic Performance of Science Students in mathematics.

4.3 Discussion of Findings

The finding showed that majority of the student (FUT Minna (School of Science and Technology Education; Department of Science Education)) in the sampled are male with 58.00% of the sample, while the remaining 42.00% are female which constitute 63 students. The questionnaire was administered to three (3) different levels; 42 to 100L which constitute 28.00%, 48 to 200L which constitutes 32.00%, and 60 to 300L with 40.00%.

The first research question that sought to find out whether science Education students in Federal University of Technology, Minna experience mathematics anxiety was answered in table 4 which reveals that the grand mean values for 100, 200, and 300 Level are 3.57, 3.36, and 2.57 respectively; having the greatest of them to be 3.57 indicates that 100 Level experience mathematics anxiety compare to the other levels considered. The average grand mean which result to 3.16 implies that there is impact of Mathematics Anxiety on the Academic Performance. This is in accordance with the research of Oxford & Vordick, (2006) which stated mathematics anxiety as a problem to many people. It can occur in all levels of education from primary school to higher education, and once established, can persist in life, interfering with everyday activities involving numeracy and further learning in mathematics.

The second research question was answered from the data on table 3 which the Pearson Correlation Coefficient (r) = 0.695 implies a strong positive correlation between the Students' Current CGPA and Mathematics Anxiety. The Coefficient of Determination (R^2) = 0.483 implies that 48% of students' current CGPA can be explain by the level of Anxiety while the remaining 52% can be explained by other factors due to variations not considered in this study. The p-value = 0.000 been less that 0.05 (level of significant) shows that Mathematics Anxiety greatly influence the performance of FUT Minna students. This agrees with Ashcraft, (2012) stated that achievement in mathematics was dependent on the cognitive styles and attitudes towards the subject. It is also in line with Hijazi and Naqvi (2016), who opined that attitude towards attending class, time allocation and parent's income all of which are predictors of anxiety, influences performance.

The third study objective sought to Determine the mean level of Mathematics anxiety as a predictor of academic performance among science Education Students of Federal university of Technology Minna was answered from the result in table 4 which revealed that the respondents (Students of Science Education Department) agreed with items 1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 16, 17, 19 and 20 as an indicator for Mathematics anxiety to be a predictor of academic performance among science Education Students of Federal university of Technology Minna while they disagreed with items 6, 8, 15, and 18 as an indicator for Mathematics anxiety to be a predictor of academic performance among science Education Students of Federal university of Technology Minna. The grand mean values for 100, 200, and 300 Level are 3.57, 3.36, and 2.57 respectively; having the greatest of them to be 3.57 indicates that 100 Level experience mathematics anxiety compare to the other levels considered. The average grand mean which

result to 3.16 implies that there is impact of Mathematics Anxiety on the Academic Performance of Science Students in mathematics.

In view of the above result, it can be said that mathematics anxiety can be overcome to its lowest level if students in secondary schools and higher institution are given the necessary steps in other to deal with the perturbations.

4.4 Summary of Findings

The overall purpose of this quantitative study was to determine if there was a relationship between mathematics anxiety and mathematics performance. The researcher was interested in finding out the barriers standing in the way of learning mathematics at tertiary institution. A questionnaire measuring mathematics anxiety was used to determine the level at which tertiary institution students felt about mathematics and multiple test choice were used to test the performance of the student. Findings show that the grand mean values for 100, 200, and 300 Level are 3.57, 3.36, and 2.57 respectively; having the greatest of them to be 3.57 indicates that 100 Level experience mathematics anxiety compare to the other levels considered. Also that the average grand mean which result to 3.16 implies that there is impact of Mathematics Anxiety on the Academic Performance. The Pearson Correlation Coefficient (r) = 0.695 implies a strong positive correlation between the Students' Current CGPA and Mathematics Anxiety. The p -value = 0.000 been less than 0.05 (level of significant) shows that Mathematics Anxiety greatly influence the performance of FUT Minna students. All these aligned to that low mathematics anxiety students scored higher on mathematics performance and high mathematics anxiety students scored lower on mathematics performance.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

It is concluded from the Study that students who expressed Mathematics anxiety interfered with Mathematics performance. Students with high levels of Mathematics Anxiety took fewer courses in high school and college. As an individual in the educational profession, opening the doors of success for students in mathematics is important and imperative. Mathematics anxiety has never been a topic of discussion in schools. Being a parent of a teenager who struggles with Mathematics is a helpless feeling. Schools need to explore research around this topic and open their mind to the notion that teachers, parents, government, and classroom environments are partially responsible for developing Mathematics anxiety in the youth of tomorrow

5.2 Recommendations

The findings of this study suggest the following recommendations for future research:

- i. Mathematics educators need to recognize the causes of mathematics anxiety. Educators can become more informed about the effects of mathematics anxiety by reading related literature and attending workshops and conferences on the topic.
- ii. Students should be able to realize that interest to learn mathematics greatly influence their performance in mathematics.
- iii. Changing attitude about mathematics will require support from parent, teachers and society. If negative attitudes are not change, students' performance, college and career choices will be limited.

- iv. Mathematics anxiety is a reality for many students; educators should be knowledgeable about its causes and provide supportive learning communities that assist students in overcoming it.
- v. Organize remedial classes for the low achievers in mathematics
- vi. The use of relevant teaching aids to augment the teacher's verbal exposition

5.3 Contribution to Knowledge

The findings of this research will add to the existing research done by other researchers on the relationship between mathematics anxiety and student's academic performance.

5.4 Limitation of the study

The study is limited to mathematics anxiety as a predictor of Students academic performance in science Education in FUT Minna. The study seeks to investigate the relationship between mathematics anxiety and Students academic performance in science Education in FUT Minna. Mathematics anxiety may not be the only predictor of Students academic performance in science Education, but this study is specifically limited to mathematics anxiety. Also, the study didn't investigate gender issues in mathematics anxiety

5.5 Suggestions for further studies

The following areas need to be studied in relation to Mathematics anxiety;

- i. Gender differences in mathematics anxiety and the impact on Students academic performance
- ii. Causes of gender differences in mathematics anxiety
- iii. Strategies for reducing mathematics anxiety among Students
- iv. Psychological perspectives of mathematics phobia.

REFERENCES

- Adedayo, O. (2017). Mathematics phobia, diagnosis and prescription. National Mathematical Centre 1st Annual Lecture, Abuja.
- Ajila, C. & Olutola, A. (2020). Impact of parents' socioeconomic status on university students' Academic performance, Indiana University of Pennsylvania, Indiana.
- Amazigo, J.C. (2016). Mathematics Phobia Diagnosis and Prescription. National Mathematical Centre First Annual Lecture, Abuja, July
- Ashcraft, M. H. & Moore, A. M. (2014). Mathematics anxiety and the affective drop in performance. *Journal of Psycho educational Assessment*, 27(3), 197-205
- Ashcraft, M. H. (2012). Mathematics anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science*, 11(5) 181-185.
- Bandura, A. (2014). Principle of Behaviour Modification, New York: Holt, Rinehart and Winston.
- Barnes, A. (2016). Investigating the causes of Mathematics anxiety in the high school classroom. In L.P. McCoy (Ed.), Proceedings of Studies in Teaching 2006 Research Digest (pp.13-18). NC: Winston-Salem.
- Bower (2017). Mathematics fears subtract from memory, learning. Science news <https://doi.org/10.2307/3981545>
- Bursal, M., & Paznokas, L. (2016). Mathematics anxiety and preservice elementary teachers' confidence to teach mathematics and science. *School Science and Mathematics*, 106(4), 173-180.
- Chang, H., & Beilock, S. L. (2016). The math anxiety-math performance link and its relation to individual and environmental factors: A review of current behavioral and psychophysiological research. *Current Opinion in Behavioral Sciences*, 10, 33-38.
- Cooper, K. M., & Brownell, S. E. (2018). Student anxiety and fear of negative evaluation in active learning science classrooms. *Active learning in college science: The case for evidence-based practice*, 909-925.
- Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years? *Frontiers in psychology*, 7, 508.
- Elekwa, U.C.C. (2010). Effects of collaborative teaching/learning Strategies on the Mathematics achievement of senior secondary school students in Abia State of Nigeria. Unpublished PhD Thesis, Faculty of Education, University of Port Harcourt.
- Ellis, A. (2014). Why rational emotive behavior therapy is the most comprehensive and effective form of behavior therapy. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, 22(2), 85–92.

- Eysenck, H. J. (2014). The biological basis of intelligence. Human abilities in cultural context, 87-1
- Fajemidagba, M., Salman, M., & Ayinla, O. (2012). Effect of teachers' instructional strategy pattern on senior secondary school students' performance in mathematics word problems in Ondo, Nigeria. *Journal of Education and Practice*, 3(7), 62-78. Diss. BUSE, 2016.APA
- Foley, A. E., Herts, J. B., Borgonovi, Guerriero, S., Levine, S. C., & Beilock, S. L. (2017). The math anxiety-performance link: A global phenomenon. *Current Directions in Psychological Science*, 26, 52-58.
- Fulya, Y.S. (2018). Mathematics anxiety among 4th and 5th grade Turkish elementary school students. *International Electronic Journal of mathematics Education*. 2(3), 180-189. Retrieved, September 1, 2009, from <http://www.iejme.com/032008/d3.pdf>
- Furner, J.M., & Berman, B.T. (2019). Confidence in their ability to mathematics: The need to eradicate mathematics anxiety so our future students can successfully compete in a high-tech globally competitive world. Florida Atlantic University and Contra Costa County Office of Education, California. http://people.exeter.ac.uk/PERnest/pome18/furner_math_anxiety_2.htm
- Garton, B.L., & Dyer, B.O (2016). High School Students' Examination Performance in Various Academic Disciplines. Oxford, England.
- Gbolagade, A.M., Wahead, A.A. & Sangoniyi, S.O. (2013). Demystifying Mathematics phobia in schools for transforming Nigeria in attaining Vision 20:2020. *International Journal of Academic Research in Business and Social Studies* 3(2) 188-196.
- Green, S., & Allerton, M, (2019). Mathematics anxiety among primary QTS students. In L. Bills (Ed), *Proceedings of the British society for Research in Learning Mathematics* (pp. 43 – 37). Lancaster: St Martin's College <http://www.bsrlm.org.uk/IPs/ip19-2/BSRLM-IP-19-2-8.pdf>
- Gresham, G. (2017). Preservice to inservice: Does mathematics anxiety change with teaching experience? *Journal of Teacher Education*, 69(1), 90-107
- Hanson (2019). Research forum: Affect in education.
- Hijazi & Naqvi (2016). A National Bureau of Economic Research (NBER) - A Report *Spring 2001*. Efficiency and Equity in Education. <http://www.wfu.edu/education/gradtea/forum06/proceedings06.pdf>
- Ichado, S. M. (2019). Impact of broken home on academic performance of secondary school students in English language. *Journal of Research in Counseling Psychology*. 4(1), 84 - 87.9.
- Ihechukwu, N. B. & Ugwuegbulam, O. C. (2016). Causes and solutions of mathematics phobia among secondary school students. *Research on Humanities and Social Sciences*.

- Ihendinihu, U. C. (2013). Enhancing mathematics achievement of secondary school students using mastery learning approach. *Journal of Emerging Trends in Educational Research Policy Studies (JETERAPS)* 4(6), 848-854
- Ihendinihu, U.C. (2013). Enhancing mathematics achievement of secondary school students using mastery learning approach. *Journal of Emerging Trends in Educational Research Policy Studies (JETERAPS)* 4(6), 848-854
- influences. *Nord Journal of Psychiatry (Taylor & Francis)* 58(4)
- Jackson, C. & Leffingwell, R. (2013). The role of instructors in creating mathematics anxiety in students from kindergarten through college. *Mathematics Teacher*, 92(7), 583-587. (ERIC Document Reproduction Service No. ED 431 628)
- Jackson, C. D., & Leffingwell, R. J. (2020). The role of instruction in creating math anxiety in students from kindergarten through college. *The Mathematics Teacher*, 92, 583-586. Retrieved from: http://vnweb.hwwilsonweb.com/hww/results/results_single_fulltextjhtml;hwwilsonid=0ESUS41QJTA5HQA3DIKSFGGADUNGIIV0
- Johnson, S.B. (2017). A study of mathematics anxiety in developmental courses in a Texas Community College. Unpublished Doctor of Philosophy thesis, The University of Texas, Austin. <http://www.lib.utexas.edu/etd/d/2003/johnsonsb036/johnsonsb036.pdf>
- Karimi and Venkatesan (2019). A study on Mathematics Anxiety.
- Khing, B. (2016). Dyscalculia: Its types, symptoms, causal factors, and remedial programs. *Learning Community*, 7(3): 217-229.
- Kumar V., Vulinovic, F., Lohmann, K. & Park, J. (2015). Expression of RCK2 MAPKAP (MAPK-activated protein kinase) rescues yeast cells sensitivity to osmotic stress. *Microb Cell Fact* 14:85
- Kumar, V., & Karimi, A. (2010). Mathematics Anxiety, Mathematics Performance and overall academic Performance in High school Students. *Journal of the Indian Academy of Applied Psychology*, 36(1), 147-150.
- Martins, D.B. (2013). Race, racial projects, and mathematics education. *Journal for Research in Mathematics Research on Humanities and Social Sciences* www.iiste.org ISSN (Paper)2224-5766 ISSN (Online)2225-0484 (Online) Vol.6, No.20, 2016
- Marzita, P. (2013). Qualitative Research approach towards factors associated with Mathematics anxiety. Idris Education University, Malaysia. Retrieved, January 22, 2011 from [://www.mes3learning.aav.dk/Projets/Puteh.pdj](http://www.mes3learning.aav.dk/Projets/Puteh.pdj).
- Mckenzie, K., Schweitzer R. (2013). Who succeeds at University? Factors predicting academic performance in first year Australian university students. <https://doi.org/10.1080/07924360120043621>
- Mower, O. H. (2014). On the Dual Nature of Learning: A Reinterpretation of ‘conditioning’ and ‘problem solving’, *Harvard Educational Review*, 17

- Nwoke, B. I., & Ugwuegbulam, C. N. (2016). Causes and solutions of mathematics phobia among secondary school students. *Research on Humanities and Social Sciences*, 6(20), 105-110.
- OECD (2018). PISA 2021 Mathematics framework. OECD Publishing. Pisa2021- maths.oecd.org
- Okigbo, E.C. (2010). Comparative effectiveness of mathematical game and instructional analogy as advance
- Olaniyan, M. O. & Salman, M.F. (2015). Causes of mathematics phobia among senior school students: Empirical evidence from Nigeria. *The African Symposium* 15(1), 50-56. Organizers on students' achievement and interest in mathematics. Unpublished Doctoral Dissertation, Nnamdi Azikwe University, Awka, Nigeria *Education* 44(1), 316-333.
- Oxford, J., & Vordick, T. (2016). Mathematics anxiety at Tarleton State University: An empirical report. Tarleton State University.
- Perry, A. (2014). Decreasing math anxiety in college students. *College Student Journal*, 38, 321-324. Retrieved from <http://web.ebscohost.com/login.lnx.lib.usm.edu/ehost/detail?vid=5&hid=11&sid=ab3a330d-b3da-4e2f-861f-c130b78c104c%40sessionmgr10&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#db=aph&AN=14098770>
- Roochi, & Markafi (2016) Role of Mathematics in the Development of Society. <https://www.neat.nic.in>
- Roy, A. (2011). *The enigma of creation and destruction*. Bloomington, IN: Author House.
- Sa'ad, T.U., Adamu, A. & Sadiq, A.M. (2014). The causes of poor performance in mathematics among public senior secondary school student in Azare Metropolis of Bauchi State, Nigeria. *IOSR Journal of Research & Method in Education* 4(6), 32-40.
- Scarpello, G.V. (2015). *The Effect of Mathematics Anxiety on the Course and Career Choice of High School Vocational-technical Education Students*. Unpublished Doctor of Philosophy thesis, Drexel University.
- Schwartz, (2019). *Assessment: A Framework for Teachers*. London: Nelson INFERS. Publishing House.
- Seligman, M. E. (2013). Phobias and preparedness. *Behavior therapy*, 2(3), 307-320.
- Sheffield, D. & Hunt, T. (2017). How does anxiety influence methods performance and what can we do about it? *MSOR Connections*, 6 (4) 19-23.
- Simmons, E., Stein M., Defife J. (2018). Factors influencing Academic Performance among Chilean Primary Students. Mimeo. Santiago Social and Cultural rights Orodho.
- Sleight, D. A. & Mavis, B.E. (2018). Study Skills and Academic Performance among Second-Year students in Problem-Based Learning.

- Sloan, L. (2015). Who tweets in the United Kingdom? Profiling the Twitter population using the British social attitudes survey 2015. *Social Media+ Society*, 3(1), 2056305117698981.
- Soares, C. N., Bernicio, N. F., Catherine L. (2019). Depression during menopausal transition: a review of treatment strategies and pathophysiological correlates.
- Solan, T. (2012). Mathematics anxiety and learning styles: What is the relationship in elementary pre-service
- Stubblefield, L. (2016). Mathematics anxiety among GED recipients in four-year institutions. *Journal of Mathematics Science & Mathematics Education*, 1, 19-23.
- Tillfors, M. (2014). Why do some individuals develop social phobia? A review with emphasis on the neurobiological
- Tobias, S., and Weissbrod, C. (2013). Anxiety and mathematics: An update. *Harvard Educational Review*, 50(1): 63-70.
- Watson, J. B.& Rayner, R. (2013). Conditioned emotional reactions, *Journal of Experimental psychology*, 3-3.CES.
- Xu, J., (2014). The Casual Ordering of Mathematics Anxiety and Mathematics Achievement: A Longitudinal Pane/Analysis. *J. Adolescence*, 27: 165-179.
- Yenilmez, Girginer, &
- Uzun, (2017). The relationship between mathematics anxiety and family support, frequency of the anxiety, factors decreasing and increasing the test anxiety.