A COMPARATIVE STUDY OF MALE AND FEMALE STUDENTS ACHIEVEMENT IN ALGEBRA AMONG SENIOR SECONDARY SCHOOLS IN BOSSO LOCAL GOVERNMENT AREA, NIGER STATE

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ABSTRACT

The study compared the achievement of male and female in algebra among senior secondary school students in Bosso Local Government Area, Niger State. The major objectives of the study were to: Find out the difference in the achievement of male and female students in algebra in senior secondary school Mathematics and, determine the difference in ability level (high, moderate and low) of male and female students in algebra in senior secondary school Mathematics. Cross-sectional survey research design was adopted for the study. The population of the study comprised of 5671 students of senior secondary school two (SS 2) out of which a sample size of three hundred and seventy-four students (374) both male and female were drawn from three (3) different senior secondary schools, using simple random sampling technique. Mathematics Achievement Test (MAT) was the instrument used to obtain the relevant data. Experts in Mathematics Education validated the instrument. The reliability index of the instrument (MAT) was established at 0.75 using the Split Half Method of establishing reliability. The descriptive statistics of mean, standard deviation, and percentage were used to answer the research questions while independent t-test was used to test the hypothesis at 0.05 level of significance. The results of the analysis revealed that, there is a significant difference in both the achievement scores and ability level of male and female students in Algebra in favor of the females. It was recommended among others that, Mathematics teaching and evaluation strategies should be gender bias-free. This way, males and females will tend to see themselves as equal, capable of competing and collaborating in classroom activities.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Nigeria is aware of the need to become technologically and scientifically self-reliant. Therefore, attention has to be drawn to Mathematics as the language of science. National Policy on Education (FRN) (2006 p.1) states that "there will be equal educational opportunities for all". It was discovered that, the female's gender that forms about 48% of the Nigerian population census (2006) was not found in the school. This was due to societal pressure on females such as early marriages, dropping out of girls from schooling by other factors.

Bandele (2015) revealed that "the differences in students" achievements are always attributed to environmental or process variables. This is in line with section 18 sub sections 1 and 3 of the Nigerian constitution which guarantees education as a right for every Nigerian child". In realization of the importance of Mathematics, science and technology, the NPE stipulates that "Education will be used as an instrument for scientific, technological and cultural development of the society''.

Oladunni (2015) opined that "there was no significant difference between achievement of males and females in mathematics". Mukhtar and Iliyasu (2013) were on the view that "in most Mathematics and mathematics related fields, there tend to be more males than females. For instance, looking at the ancient Mathematicians including; Pythagoras, Thales, Euclid and Pascal, all of them were men''. However, one begins to ask questions on the possible causes of such imbalances between males and females. Could it be that female's brains are weaker than those of males?

According to Balsser (2013) "girls and boys start equal in Mathematics and science achievement in school, they appear to do equally well in both subjects in elementary

schools. Then some girls begin to lose interest in Mathematics and science around the age of twelve. These girls then drop out from Mathematics Classes often forever closing the door on many career opportunities''. This shows that female's students performed less than their counterparts, males. However, student's achievement in Algebra is not dependent on sex difference and this leads to continue verification and study on males and females' achievement in Mathematics. Hence, the current study will investigate the comparative study between males and females' achievement in algebra in senior secondary school Mathematics.

1.2 Statement of the Problem

Gender difference in mathematics education like geographical differences has historically been prevalent in almost all societies and in different aspects of learning. Female students felt that they cannot compete with their counterpart male students in learning Mathematics rendering their Mathematical abilities lower compared to their male counterparts. However, the gender differences in Mathematics lead to our females becoming backward, unsuccessful personnel in the area of science and technology and however, this claim tends to differ in the case of female students who were brought up in urban areas using methods other than the conventional method such as laboratory instruction strategy and computer simulation. Environment and teaching methods tend to be determinants of Mathematical abilities of students. Students in urban areas tend to have higher Mathematical and problem-solving abilities.

There is need to encourage females not to fear Mathematics in their lives and make it simple for them to become self-reliant, self-esteem, take care of their family and equated with wider knowledge in science and technology. In fact, the present study was "A comparative study on students' achievement in Algebra on Gender and ability level (High,

moderate and low) in Mathematics of senior secondary school in Bosso Local Government Area, Minna, Niger State''.

1.3 Aims and Objectives of the study

Specifically, the study was intended to:

1. Find out the difference in the achievement of male and female students in algebra in senior secondary schools' Mathematics.
2. Determine the difference in ability level (high, moderate and low) of male and female students in algebra in senior secondary school's Mathematics.

1.4 Research Questions

The research questions of this study are:

1. What is the difference in the mean achievement scores of male and female students in algebra in senior secondary schools' Mathematics?
2. What is the difference between the ability level (high, moderate and low) of male and female students' achievement in algebra in senior secondary schools' Mathematics?

1.5 Research Hypothesis

Ho_1: There is no significant difference between the mean achievement scores of male and female students in algebra in senior secondary schools' Mathematics.

Ho_2: There is no significant difference between the ability level (high, moderate and low) of male and female students' achievement in algebra in senior secondary schools' Mathematics.

1.6 Scope of the Study

This study focuses on all senior secondary schools students in Bosso Local Government Area of Niger State.

1.7 Significance of the Study

This research work will be significant in the following ways:

Teachers: This study will enable the teachers to carry everybody (students) along whether male or female by encouraging them to help them bring out the best in them.

Government: This research work will also be beneficial to the government in the sense that, it will enable the Government to place supervision teams in all the schools so as to monitor the teachers on how they carry out their jobs or duties.

Students: The students on the other hand will through this work be made known that, they can all do it, and that no gender is better than the other. Thereby putting aside their low self esteem.

Educational Researchers: Finally, the study will contribute immensely to the body of existing literature and knowledge to this field of study and will serve as the basis for further research.

1.8 Operational Definition of Terms

Gender: The biological sex of an individual usually male or female.

Ability Level: The recorded level of accomplishment an individual's reach. It can be high, moderate or low.

Mathematical ability: Cognitive definitions are used when relating to this construct from a theoretical perspective; Mathematical ability can then be defined as the ability to obtain, process, and retain mathematical information.

Academic achievement: Academic achievement is the extent to which a student, teacher or institution has attained their short term educational goals.

Algebra: A branch of Mathematics that deals with using letters to represent numbers.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

Literature search indicates that students' achievement both male and female generally have been very encouraging. It is in this sense that still educational gap in Mathematics exists among male and female students.

Many people do not know that Mathematics is more than what is taught at school, and different from what most people think it is. The students have a wrong image of Mathematics- that Mathematics is many formulae to learn, without knowing why; Mathematics is a never changing, not lively subject; something for nerds and loners, and thus, maybe, also something for boys and men and not for girls and women. Gender is a set of characteristics distinguishing between male and female, particularly in the cases of men and women. Depending on the context, the discriminating characteristics vary from sex to social role to gender identity. Gender differences in Mathematics achievement and ability has remained a source of concern as scientists seek to address the under-representation of women at the highest levels of Mathematics, physical sciences and engineering (Asante, 2010).

However, tremendous number of studies has been made on gender disparities and other academic achievement, but here are relatively few studies in Mathematics achievement in Nigeria. Few still in Niger state at large.

2.1.1 Male and Female Students' Achievement in Mathematics

In review, many educational activities have shown that male's achievement better in different aspects of learning and other life Endeavour. Research have been conducted from various field and recorded as saying males attended schools/institutions and even perform better than their female counterparts.

National summary of primary and post primary school statistics (2005-2014) has shown that more males attended schools than that of females. And, also this may lead to female students to become backward in studying Mathematics as the "key necessary in locking a majority of important career opportunities available for our most intelligent and academically able students" (Rekdal 2014).

Ike (2016) commenting on the poor achievement of candidates in the 1976 West African School Certificate Examination observed that out of the 92,000 candidates who sat for the examination, 21,000 offered Science subject and only 30% qualified for the statement of result. He further expressed his dissatisfaction in the general achievement particularly in Science and Mathematics. However, he failed to indicate some of the possible factors that might be responsible for that enrolment of males being higher than females in WAEC technical subjects 1986 – 1988. His analysis has shown that out of 24,226 students, males students were 22,385 and 1,841 students were females. Rukayyatu in Komolofe (1996) revealed that from (1987 – 1988), 1, 770,783 students were males and 807,711 students were females sat for WAEC Science and Mathematics. However, this analysis shows that males participated in Science and Mathematics more than females. Also, enrolment in Asico Kauran Namoda from (2005 - 2006) the collage graduated students out of 286 students 225 students were male while only 61 students were females. National Youth Service Corps Deployment from (2005-2014), the total Corps was 951,402 members, but 540,611 were males while 410,791 were females, this analysis indicates that still, males are far educationally than their females' counterparts.

Benbow and Stanley's (2012) study of adolescents in the study of mathematically precious youth (SMPY) concluded that males significant out-performed females on the college Boards scholastic aptitude test in Mathematical part (SAT-m). More recent studies concerning gender different in quantitative performance are mixed. Man reported that

gender gap is narrowing (Brophy, 2015, Freidman, 2017, Marsh, 2017, Hoys and Slate, 2013), while others reported not only that males consistently out-perform females at the highest end of the Mathematics ability continuously.

Muhammad, et al (2009) in Familokum, (2013), in his comparative studies of the academic achievement in Mathematics and chemistry students of the two Federal Government College in Kano State showed that boys were higher achiever in both subjects than girls of the same school. However, the uniformity or otherwise of the environment in which the study was carried out was not highlighted.

Nwagwu, (2017) in his studies of sex difference in Mathematics achievement and attitude in secondary schools in Kogi State, took a cross section data of 400 random sample comprising of 200 males and 200 females of final year student of nine secondary schools in Kogi State. He obtained information on Mathematics achievement and attitude toward learning of Mathematics and determining the level of significance between the difference of mean of the score of the males and the females in an achievement test as well as attitude test. He concluded that males performed better than females.

Gender differences in Mathematics teaching, learning and achievement have also been explained on the basis of gender differences in cognition and brain lateralization (Fennema & Leder, 2016).

Moir (2011) in her book titled: “Brain Sex” argues that there is sample genetic that the brain of men and women are formed differently in the womb and therefore they have difference and aptitudes. They process information in different ways, which results in different perception priorities and behaviors. She was indeed unable to explain how the difference in achievement of males at all level of education system is much better than that of females.

In a similar argument, Paechter (2014) argues that male and female students do experience the world in different ways. Firstly, they are differently positioned in society. The second is their different learning styles and how they perceive and process reality. These researchers emphasize that most Mathematics classroom discourse is organized to accommodate male learning patterns, hence their high achievement in Mathematics. Mutemeri and Mugweni (2015) argue that the idea that Mathematics is for boys may result in low motivation in girls and could widen the gender gap in Mathematics achievement in favor of boys.

Cole (2014**)** revealed that some of the difference in performance and careers of boys and girls. They used report from the science monitoring group London of the assessment of performance unit (APU) to show the significance difference in Mathematical concepts where boys found to consistently performed better than girls. The result shows that boys have greater opportunity of accumulating a working knowledge of machines and of gaining an early familiarity with electricity (in school physics and Mathematics) in which girls performances are weaker than boys.

Tahir (2011), Nigeria performance on Mathematics achievement test by gender showed that males achieve higher than their female counterparts. The results showed a mean percent score of 34.18 with a standard deviation of 17.13 for females.

Suleman (2013) in his study of effect of gender on students' achievement in physics towards nation building revealed that: "male students achieved significantly better than female (at 0.05 levels). It is obvious from the findings of his study that students' gender is crucial to their achievement in physics.

Ikeatuneye, (2016) revealed that : there are two aptitudes in which more or less consistent sex difference has been observed about puberty and thereafter, they are in science and mathematics. He maintained that it is widely accepted by educationists, teachers and

learners then that, there are sex difference in various scientific aptitudes for example verbal, numerical abstract among others. These findings were observed that the observable sex different in aptitude and attainment in science and Mathematics generally in favor of males were real and not artificial.

Parseley, (2014) surveying the evidence of sex difference in problems solving mathematics suggested that in both intellectual and perception situations, men tend to be more analytical than women and therefore should do better in science and Mathematics. Girls performed very less than that of boys in tasks requiring mathematical concepts, Milis (2013).

Blosser (2010) revealed that girls and boys stands of equal in mathematics and science achievement in schools, they appear to do equally well in both subjects in elementary school, the same girls around the age of twelve drop out of Mathematics classes, often forever closing the doors of many careers opportunities.

Honigefeld and Dunn (2013) in their study titled: "differences of performance of males and females' learning" found that their subjects who were from different countries (Bermuda, Brunei, Hungary, New Zealand, and Sweden), differed in their preferences for learning styles, according to their gender types. It was found that females were more self-motivated, persistent and responsible than males, whereas males were more kinesthetic and peer oriented.

Boaler (2015) is of the view that the different learning goals of girls and boys leave girls at a disadvantage in competitive environments. Boys and girls preferred a mathematics curriculum that enabled them to work at their own pace as their reasoning was different. Girls value experiences that allow them to think and develop their own ideas, as their aim is to gain understanding. Boys, on the other hand, emphasize speed and accuracy and see these as indicators of success. Boys are able to function well in a competitive environment of textbook based mathematics learning.

Lynn, *et al* (2011) investigated the difference between 469 females' and 169 males' undergraduate students at the university of Ulster in their general knowledge of the following domains: history of science, general science, politics, sports, history, classical music, arts, literature, geography, medicine, games, discovery and exploration, biology, firm, fashion, finance, and popular music. Their results showed that there were significant difference between men and women in 5 out of 17 domains investigated in their study.

Women obtained less than men did in current affairs, physical health and recreation, art and science whereas women had a higher mean in only the family domain. Differences found between the two genders according to the researchers were attributed to differences in men's and women's interest.

In Benet study (2016) revealed that females tend to estimate their intelligence lower than males did. And when asked to rate their parents' IQ, both males and females rated their fathers' IQ both higher than their mothers. Consistent with Benet's findings, when students who enrolled at high institution in Britain and Singapore were asked to rate their intelligence, males rated their intelligence higher than females did, but when their intelligence was psychometrically measured by using Raven's test of intelligence, (Farnham and Fong 2010), females scored higher than males. Therefore, these findings show that females had less confidence in their intelligence than that of the males.

Maccoby and Jacklin (2015) have shown that on the average, girls have a greater verbal ability than boys. Perhaps, the girls should have an advantage in verbal aptitude as distinct from practical Mathematics or Scientific. However, in his study, it was concluded that their verbal abilities cannot prevent them from performing better in Science, therefore unjustified.

Leder, (2014) in an attempt to explain some of the possible causes of sex differences in Mathematics achievers, drew a conclusion that events though contribute to Mathematics

achievement, they are other possible factors such as the hypothesis that favor females than males inherit a gene for qualitative reasoning, stereotyping of Mathematics as whole domain. There are also speculations that females lack encouragement from parent and peers and that there is lack of clearly perceived vocational plan which include the use of Mathematics for females. The speculation at this juncture was not verified.

The wastage rate among females at all levels of education is higher comparatively, the societal pressure on females such as early marriage distraction of girls from schooling by other extraneous factor and above all, the consideration of females' education as secondary to that of males' in some societies and certain inhibitive religious practices contribute in no small way into their wastage rates.

Similarly, it was discovered that societal, parental and teacher attitudes to girls, with regards to Science, Technology and Mathematics Education is inhibitive. But his studies failed to indicate those negative attitudes shown to girls which make their education inhibitive.

In reviewing some educational problems in Nigeria, the Federal Government (2006) observed among other things, that one of the defects in Education in Nigeria was inadequate exposure of secondary students to essentially Science subjects which Mathematics is included.

Tsauri (2016) opines that, because of the way which women make money in areas other than Science, Technology and Mathematics related fields, they tend to stay away from Science, Technology and Mathematics education which is the main concern of the study. His view or suggestion however was not enough to account for women less participation in Mathematics, Science and Technology.

2.1.2 Comparison of Male and Female Students in Mathematics Achievement

Clearly, many reasons or evidences have shown that females achieved less than their male counterparts.

Durojaye, Ajie, and Aiyebusi, (2015) stated that: Science, Technology and Engineering are crucial for nation's Scientific and Technology development, but there is low involvement of females in these fields. They added that one major obstacle to females involvement in Science, Technology and Engineering was the relative achievement of female students in Mathematics, since a good knowledge in mathematics is a fundamental pre-requisites in pursuing career activities in these fields. It is however reported that, males performed better in Science, Technology, Engineering and Mathematics, while women are mostly found in Humanities and Social Science.

Shernnan, J.A (2013) called mathematics the critical filter which bows female from the higher paying more prestigious occupation. As Rakdal (2014) printed "mathematics is a major key necessary in unlocking a majority of important career opportunities available for our most intelligent and academically able students''.

Amara (2012) during the common wealth Africa Regional Workshop organize on gender stereotyping in Science, Technology and Mathematics education revealed certain reasons or factors which lead to low enrolment of females in Mathematics and other related fields. Among the factors was: early marriage, societal and religious factors, among others.

Jeje and Olajoke (2016) international journal of research in education in their study on Mathematics attitude of male and female students in senior secondary school in Ikole Local Government, Ekiti state. The research was concluded that, male students have more positive attitude in Mathematics than their female counterparts.

However, therefore, vocational education should have a bearing on the environment such as teaching agriculture in rural areas. He further stated that the teaching of Science,

Technology in relation to the environment at both primary and post primary levels will enable the females who are currently found predominantly in liberal arts to take advantage of the Federal Science Policy of 60:40 ration of arts discipline in the Universities and go for more Science courses.

Olokun (2017) in his comparative studies of male and female students in Science showed, the males performed better than females especially in items involving more application of concepts and principles. Therefore, the relationship here is crucial because applying the theories to prove certain claims is very vital in a Mathematics interpretation.

According to Smith and Walker (2011) "females perform better than males in the ninth year and eleventh year Mathematics examination, although, male students had superior performance over their female students in the tenth year Mathematics". Fennema (2010), Armstrong and Prince (2012) opines that "there are some numerous cognitive, societal, religious, educational and cultural factors that might have affected girls' performance in Mathematics based on the statistical and discovered that, males performances were relatively higher than that of female". (UBE 2001).

Murphy (2012) indicated that "if women are consistently falling behind men in student-test performance because they have not taken as many of the challenging courses available to them in high school; we are creating a cycle that is self perpetuating, and ultimate defeating". Therefore, females who did not go to Mathematics class will not have chance to become scientifically and technologically educated.

Odegbesan (2010) is of the opinion that some of the following factors are responsible for the different participation rates of male and female students in technical programme:

Socio-cultural factors segregates jobs into what men can do and these women can do, Female, prefer jobs that are less arduous than those in the technical fields, Male students are more interested in technical education courses than female students, Entry qualification

into technical courses required credit in Mathematics which female usually do not have in their SSCE results, Unjustified criticism from their male colleagues, Absence of female models and Negative attitude of female students themselves.

Blosser (2010) observes that a considerable proportion of girls in secondary school "play doom" in their Mathematics classes because of its inconsistency with their self-concepts. Poor self-esteem through interest is a major requirement for a good performance in any subject; female students lose interest in Mathematics due to decline in self-esteem (Schwartz 2012). Poor expectation of girls' performance as stated by Conner (2011), the following set of statement by a Mathematics and Science teacher reading out the result of this term's test is common among classes. Marries Kiarie, 37% you already wield during the test John Simiyu, 73% hey, my friend. This is not enough you must really work harder next term. This kind of scenario shows that, teachers generally have low expectation from girls' ability to perform in Mathematics and Science.

Muhammad, et al (2010), many teachers including female teachers, despite much lip service to equality of girls and boys, do not believe that girls have ability to perform well in Mathematics and Science. Among many women who succeeded in Mathematics and Science there is story believe that teachers actively discourage girls from studying these discipline.

Boys and girls have similar Mathematics and Science proficiency scores at age of 9, because, as the Mathematics proficiency of both females and males 9 year old has increased since the early 1970s, the gap in scores that previously favored girls has disappeared. Between 1973 and 1994, the average Mathematics proficiency of both 9 year old girls and boys increased (10 and 14 points, respectively). In 1994, there was no measurable difference in the Mathematics proficiency of female and male 9 year olds.

Loori and Ali (2015) in their comparative study between preference of males and females reported the difference in intelligence preference of males and females students learning English as a second language at higher institution in the United States of America. The study result indicated there were significance differences between males and females preferences in intelligence. Males preferred learning activities including logical and Mathematical intelligences, whereas females preferred learning activities involving inter personal intelligence.

2.1.3 Mathematical Ability Level and Achievement

Students' ability is the tendency to which students learn. There are high ability level, average ability level, and the low ability level. According to Witkin as cited in Adeyemo, (2010) ability level means the characteristic mode of functioning that an individual shows in intellectual activities in a highly consistent and persuasive way. The capacity of students to engage themselves meaningfully in any educational task which requires higher cognitive functioning depends on factors which include their academic potentiality. This could be tagged ability or level of academic attainment. In every educational classroom, there are students of different ability levels which are to be considered in teaching-learning situation. The high ability level, middle or average ability level and low ability level.

Mathematical ability level is the capacity to use or manipulate numbers effectively in clerical administrative, scientific and other areas of application of numbers. It is the ability to understand and work with numbers with ideas related to numbers. Tremblay, Gamer, and Heipel (2016) studying the impact of the sample variables, supported the hypothesis that mathematical ability level contributes to the prediction of achievement in statistics as suggested by Harlow, Burkholder, and Morrow (2012). Similarly, Oyekanmi (2017) in his work on mathematical ability level and gender as correlates of students' achievement found out that there is no significant interaction effect of gender and mathematical ability

level on students' achievement in physical geography. This implies that gender and numerical ability level do not jointly differentiate students' achievement in practical and physical geography achievement test.

The wide spread low achievement of students in secondary school mathematics can also be ascribed largely to how instructions on mathematics is presented to the students. According to Ale (2011) the paucity or scantiness of relevant mathematics textbooks stands a basic factor which affects the teaching and learning of mathematics in Nigerian secondary schools. In the Nigerian context, poor achievement in mathematics in secondary schools has assumed alarming proportions and caused a lot of concern for many years. This poor p achievement is as a result of many factors which includes self-concept, attitude, and mathematical ability.

Gender factor is very strong in learning and thus determines the interest and achievement and consequent career choice. It is interesting to note that while Jahun, and Momoh (2011) established that gender is significant in school mathematics achievement, other studies such as that of Aiyedum (2010) found no significant difference between males and females in school mathematics achievement.

2.2 Theoretical Framework

A theory is an explanation, idea or opinion based on thought, observation and reasoning which have been tested and confirmed as a general principle explaining a large number or related facts (Yamah, 2014). According to Alkali (2014), theories are ideas, facts and principles that can be best used to describe a given concept. On this note, this research work recognize the principles behind the Chinese maxim; "I hear and I forget, I see and I remember, I do and I understand." This explains that learners must be active not passive in any teaching situation to maximize learning. The underlying philosophy of this study is

based on the theories of cognitive science particularly that of John Dewey's theory of constructivism.

2.2.1 John Dewey theory of constructivism

Constructivism theory is about how we come to know what we know. It is founded that children, adolescents, and even adults construct or make meaning about the world around them based on the context of their existing knowledge (Llewellyn 2015), constructivism theory provides a framework through which the emergent ideas about teaching, learning and assessment can be unified (Young and Collins, 2013). According to this theory, the difficulties and challenges confronting classroom teachers is that the reform strategies in curriculum, instruction and assessment organized around the theory of "constructivism" are informed by different assumptions and about the nature of knowledge and about the human capacity to learn than are traditional classroom practices (Kim, 2015).

Constructivism is a psychological theory of knowledge which argues that human construct knowledge and meaning from their experiences. This theory lays emphasis on not accepting what you are told but your prior knowledge about what you are taught and your perceptions about it. Active involvement of students is emphasized in constructivism, hence knowledge gained lasts long in their memories. Emmanuel Kant further elaborated this idea by asserting that, human beings are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek 2012).

According to (Mahoney, 2014), students come into a classroom with their own experiences and a cognitive structure based on those experiences. These preconceived structures are valid, invalid or incomplete. The learners will reformulate his/her existing structures only if new information or experiences are connected to knowledge already in memory. Inferences, elaboration and relationship between old perceptions and new ideas must be

personally drawn by the student in order for the new idea to become an integrated useful part of his/her memory. Memorized facts or information that has not been connected with the learner's prior experiences will be quickly forgotten. In short, the learner must actively construct new information onto his/her existing mental framework for meaningful learning to occur. Inquiry teaching method is an activity based teaching method, which involves the students in the learning process, placing less emphasis on transmitting knowledge and more on developing students' science process skills. Based on this fact, it is assumed that inquiry teaching method which is an activity based method will aid better learning in chemistry. Vonglaserfeld (2010), pointed out that the responsibility of learning should reside increasingly with the learners where they are actively involved in the learning process-unlike previous educational view point where the responsibility rested with the instructor to teach. In a constructivist, the role of the teacher is to organize information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Teachers assist students in developing new insights and connecting them with their previous learning. Ideas are presented holistically as broad concepts and then broken down into parts. The activities are student-centred and students are encouraged to ask their own questions, carrying out their own experiments, make their own analogies and come to their own conclusions (Vonglaserfeld, 2010). Cognitive theorists believe the role of the teacher is to provide learners with the opportunities and incentives to learn, holding that among other things:

1. All learning, except for simple rote memorization, requires the learners to actively construct meaning.
2. Students' prior understandings and thoughts about a topic or concept before instruction exert a tremendous influence on what they learn during instruction.

3. The teacher's primary goal is to generate a change in the learner's cognitive structure or way of viewing and organizing the world and
4. Learning in co-operation with others is an important source of motivation, support, modeling, and coaching. (Feden, 2014).

The constructivist theory of learning supports cognitive pedagogy, that humans have an innate sense of the world and this domain allows them to move from passive observers to active learners. Carlson (2013), supports a strong emphasis on identifying, building upon and modifying the existing knowledge (prior knowledge) students bring to classroom, rather than assuming they will automatically absorb and believe what they read in the textbook and are told in the classroom method which actively involves the students is what Constructivist emphasized in it teaching approach, hence knowledge gained lasts long in their memories, since human beings are not passive recipients of information. Traditional teachers are information givers and textbook guided classroom has failed to bring about the desired outcome of producing thinking students (Young and Collins, 2013). A much heralded alternative is to change the focus of the classroom from teacher dominated to student centred. Using a guided inquiry method based Constructivism is not accepting what you are told but your prior knowledge about what you are taught and your perception about it. Active involvement of students is emphasized in Constructivism, hence knowledge gained lasts long in their memories.

Yeager (2011), attested to the fact that 'one only knows something if one can explain it' Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek, 2012).

2.3 Empirical Studies

2.3.1 Trend of mathematical ability level of male and female students

Odual (2013) investigated the relationship between male and female senior secondary school students' mathematical ability level and performance level in mathematics in five (5) out of eight (8) local government areas in Bayelsa State Nigeria. This study adopted multi-stage sampling technique. Data were collected from a sample of 121 female students from rural and 141 female senior secondary school students from urban schools which were randomly selected using the simple random sampling method both at the Local Government, and at the school level. Two research questions and instruments were raised for the study. The instruments were Student Mathematical Ability Test (SMAT) with r = 0.68 and Mathematical Achievement Test (MAT) with r = 0.68 were established for the student Mathematics Performance Test. Simple linear correlation was used to analyzed the data collected at 0.05 alpha. Results showed that there was a positive significant relationship between mathematical ability and achievement in mathematics. Using multiple regression analysis showed that mathematical ability has a significant effect on achievement in mathematics with B = 0.386 and P < 0.05. Based on these findings, it was recommended that government should provide schools with facilities that will develop and sustain students' mathematical ability as it is a good predictor of students' achievement in mathematics.

2.3.2 Trend of academic achievement of male and female students

The empirical review also considered related works conducted by other researchers in the area of academic achievement of male and female students. Works by researchers like, Okafo and Egbon (2011), Kyei, Apam and Nokoe (2011), Olaewe (2012), Bitrus, Dominya, and Hannatu (2012) who studied and analysed gender and academic achievement in various geographical areas and in various fields of study were reviewed.

Academic achievement of male and female students in the Upper East Region of Ghana, Kyei, Apam and Nokoe (2011) conducted a study on gender differences among SHS students in mathematics examination. The purpose of the study was to examine whether differences existed between gender achievements in the mathematics field. The researchers employed the descriptive design in their study. Data was obtained using the stratified multistage sampling. The main tool for the collection of data was questionnaire and a sample size of 250 students was considered and chosen using the proportional allocation. The results of their work indicated that, out of 112 girls who were captured in the sampling, 73 of them representing 29.20% responded that male students performed better in mathematics examination. 39 out of the 112 girls, representing 15.6% stated that there existed differences in mathematics achievement of male and female students. 47.20% agreed that there is gender difference, and that the male students achieved better than their female counterparts. Although the researchers came up with a conclusion, their conclusion was based on the perceptions of people who gave mere opinion about the academic achievement of male and females. Also, the researchers didn't consider any test scores of the students but based only on the students' responses.

In another study in the Northern Region of Ghana, Olaewe (2012) investigated gender differential in academic achievement in mathematics among SHS students in the Tamale Metropolis of Northern Ghana. The researcher used the survey research design model on a target population of all SHS 3 students and Mathematics teachers in both public and private schools whereby 50 objective questions taken from the past WASSCE between 2007 and 2011 were personally administered on students by the researcher. Spearman rank correlation coefficient, multiple regression and Analysis of Variance were used to analyze data. Also, sample grades of students were collated from their WASSCE results from 2006 to 2011. It was revealed using the self-constructed 50 objective tests that, among the entire

SHS students the questions were administered to, the males performed better. This showed that the male students are better than the female students in terms of academic performance; however, just 50 objective tests made for the respondents to measure their academic performance, cannot be enough to show how best students perform in the subject. The study revealed that the male students were performing better than the female students in Mathematics. Although the result favored the male students outperforming the female, this result might have only been the case for the northern region of Ghana.

Bitrus et al (2012) researched on gender difference in academic performance in SSCE Mathematics subject among Senior High School students in Maiduguri Metropolis, Borno State, Nigeria. In their study, gender difference was examined retrospectively against academic performance, with a view to establishing a link between them.

Results of students' SSCE examination in Mathematics from 2006/2007 to 2009/2010 sessions were used for the study. The data collected was analysed in percentages, mean and independent sample t-test statistics. Before the computation of independent t-test statistic, student's grades were re-ordered and subjected to square root transformation.

The findings of the study indicated that for male students, the percentage high grade scored was B2 (92.9%), B3 (81.5%), C4 (67.2%) and C5 (73.4%), while the female percentage high grade scored was B2 (37.5%), B3 (35.7%), D7 (41.4%), and E8 (40.2%). The methodology used in this work is similar to the research method of this work, and the results obtained from comparing gender differences in Mathematics could yield a different result.

To examine the trend of male and female academic performance, Asigri et al. (2013), undertook a study of the achievement of boys and girls in Mathematics in some selected senior high schools in Cape Coast. The designs used in their research work was descriptive cross-sectional. The target populations were students in four selected senior high schools

who studied Mathematics where 160 students and 4 teachers were selected from each of the four schools using convenient random sampling, systematic random sampling, stratified random sampling and purposeful sampling technique. The researchers made use of the WASSCE results from 2007 to 2012. The researchers used compound bar chart in presenting the information from the data gathered from the WASSCE results of the male and female students in Mathematics over the stated period (2007-2012). They used the entry requirement of the standards of University in the country to categorize male students into Pass (A1-C6) and Fail (D7-F9). The researchers came out with informed findings that in 2012, male students recorded 95.7% pass whereas female students recorded 81.7%. In the year 2011, males recorded 91.1% pass whereas females recorded 77.4%. In 2009, male students recorded 93.3% pass and female students recorded 79.7% pass. In 2008, male students recorded 77.6% pass and female students recorded 60.9% pass.

In 2007, male students recorded 45.2% pass and female students recorded 60.3% pass. This means that in 2012, 2011, 2009 and 2008, the academic achievement of male students was better than that of female students whereas in 2007, female students performed better than males. In general, it seems male students performed better than female students but there is inconsistency with the trend of the achievement over the years. Their research concluded that differences exist but the difference is not significant to conclude that one gender was performing better than the other. Researchers presented results obtained from 2007-2012 on a compound bar chart but could have used the compound line graph since academic achievement in a subject is being measured over a period of time. The line graph is a more appropriate way of representing the data as compared to the bar chart used. The line graph also showed inconsistencies in the academic achievement over the years at a glance as compared to the bar chart.

In the study conducted by Bitrus *et al*. (2012), the findings of their study over a five year period indicated that, the male students consistently scored high grades in distinction and credit than female students from 2006-2010 sessions in Mathematics. This trend however contradicts with the trend established by Asigri *et al*. (2013). It could be derived from this that the population of the study can be the reason backing the differences in the findings. A strong case could then be argued that the trend might change when the content of subject is changed to Mathematics.

Concerning also the trend of achievement, Chukwugbo (2012) tried to find out gender and achievement in Mathematics education at FCE (T), Umunze Anambra State. The study analyzed representation and achievement of male and female Mathematics students in five academic sessions of 2000/2001, 2001/2002, 2002/2003, 2003/2004 and 2004/2005. Students' raw scores were used for the study. The population of the study was final year Mathematics students within the five sessions. The total population was six hundred (600) students and there was no sampling. Raw scores of students graded into distinction (D), credit (C), merit (M) and Pass (P) were used for data. The scores were authenticated by appropriate authorities of the college (the academic board and the examination and records office/unit). This study revealed that in the five academic sessions, females achieved better at distinction and credit level while males cluster more at merit and pass. The male students' representation is small. It was found that male students are near extinction in the programme. It was also found that female students achieved better than the males generally. It was concluded that if care is not taken to check the trend, males may go into extinction in the programme.

2.3.3 Significant difference in the Academic achievement of male and female students

To investigate statistically significant differences in male and female students' achievement, Okafo and Egbon (2011) researched on the academic achievement of male versus female Mathematics undergraduate students in Nigeria. The study was to compare the academic achievement of male and female students in the introductory Mathematical course. First year male and female mathematics undergraduate students of the University of Benin, Nigeria, who sat for Introductory Mathematics courses namely, Introduction to Mathematics I & II in 2004/2005 to 2007/2008 academic sessions were used for the study. The letter grades of A, B, C, D, E, and F were assigned weights of 5, 4, 3, 2, 1 and 0 respectively and used as a measure of academic achievement. The t-test statistics for differences between two independent samples was adopted for the study. The study revealed that the male students achieved better than the female students. It further showed a significant difference between the academic achievement of male and female students at 5% significant level for the test results for 2005/2006 (first semester course) session. Same students had no statistical differences in the second semester course that is the test result for 2005/2006 academic session. Their final results showed no significant differences in the academic achievement of the sexes. Having considered students from only one academic institution (University of Benin) in the country for the research, the findings can be attributed to only a small fraction of mathematics students in the country because each University sets its own questions to examine its students on a course. Their findings can therefore not be generalized for the country (Nigeria) as a whole.

Sam (2016) also in a bid to investigate gender differences in academic achievement of Mathematics students conducted a study in the Central Region of Ghana. The study adopted descriptive survey deign to enable the researcher determine the relationship

between male and female student's academic achievement in Mathematics. Data from the terminal reports of third year Mathematics students collected from the researcher-developed questionnaire was analysed using both descriptive and inferential statistics (t-test).

Findings of the study revealed that the mean and standard deviation of the achievement of male Mathematics students were M = 53.46 and SD = 22.36, which was higher than the mean and standard deviation of M = 52.00 and SD = 15.63 of the female Mathematics students. This indicates that male students perform significantly better than the female students in Mathematics. In addition to the terminal results obtained, teachers' views were also sought, and this might have led to subjectivity in their responses.

Again in the Cape Coast Metropolis, Awuku (2014) researched sex differences in Mathematics achievement based on 2011 and 2012 WASSCE Core Mathematics results in some selected senior high schools. The purpose of the study was to determine whether the achievement of male students in Core Mathematics differed in any significant way from their female counterparts, by using the descriptive sample survey design. The study sampled from all students who wrote the 2011 and 2012 WASSCE in Core Mathematics in Cape Coast, using random sampling method and obtained a sample size of 2487. Male students represented 48.89% (1216 out of 2487) and female students 51.11% (1276 out of 2487). The analysis of data was conducted using an independent sample t-test. An alpha level of 0.05 was chosen in the study in order to get a balance between type I and type II error. Where the p-value > 0.025, the difference was considered to be significant and where the p-value < 0.025, the difference was deemed significant.

The study found that male students in the mixed schools out performed female students in Core Mathematics in 2011 and 2012 WASSCE, whereas in these same years, female students in the single sex schools outperformed their male counterparts in single sex

schools in Core Mathematics. In general, the study found no significant difference between male and female students Core Mathematics achievement in 2011 and 2012 WASSCE results in the selected schools. Thus, there is a sex difference but the difference was not significant. The single sex schools chosen had an influence on the sample leading to female students having a greater percentage of the sample and this could influence the outcome of the findings. The two years studied cannot provide a general conclusion for the differences in achievement of male and female students.

2.4 Implication of the Review to the Study

2.4.1 Educational Implication

To achieve more quality, quantitative and equality in males and females achievement, teachers and students are expected to have adequate interaction in teaching and learning process. Teachers are to use appropriate instructional materials when teaching the facts and concepts. Also, students are expected to have respect for their teachers and ambition to learn with intention to bring development to the country. It also highlighted some factors responsible for lowering female students in learning Mathematics. It also shows various differences which due to the instructors/teachers attitudes towards Mathematics, the achievement of students from various zones discovered vary in learning Mathematics. But, to overcome such problem of imbalance between males and females is to treat them equally in the subject area.

2.4.2 Psychological Implication

Psychologically, the literature review showed both male and female students are expected to be taught the facts and concepts of Mathematics clearly and properly before administering test or any examination to them which will help in eliminating or reducing mass failure of males and females in both junior and senior secondary school Mathematics.

2.5 Summary of Literatures Reviewed

The related literature on male and female students was carefully discussed. Various experts in the field based on their perspectives/views and researches to compare male and female students achievement in the area of Mathematics among various institutions and other various life endeavors were brought and critically examined under the following subheadings: Male students' achievement in Mathematics, Female students' achievement in Mathematics, Implication of the review to the present study and Summary.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study employs a cross-sectional survey research design to obtain the relative achievement of male and female students in Algebra among senior secondary schools in Bosso Local Government Area of Niger State. A cross-sectional study is a study of research design in which data are collected from many different individuals at a single point in time or over a short period of time. Variables are observed without being influenced.

3.2 Population of the Study

The population of this study comprise of all students in senior secondary school two (SS 2) in Bosso Local Government Area, Niger State. Bosso Local Government Area has about twenty (20) secondary schools with a population of 5671 (SS 2) students both male and female according to Annual School Census Harmonized Report (2018/2019). However, because of the large population of the students in the Local Government Area, it would not be possible to cover conveniently by the researcher due to economic and accessibility reasons. Therefore, the researcher was then limited to only three (3) selected secondary schools within the Local Government Area.

3.3 Sample and Sampling Technique

The sample of this study consists a total number of three hundred and seventy-four students (374) both male and female randomly drawn from three (3) different senior secondary schools two (SS 2) in Bosso Local Government Area, Niger State. Slovin's sample population formula was used to obtain the sample size.

Simple random sampling technique was used by the researcher. This technique ensures that, every member of the sampled schools have equal chances of being selected as part of

the study sample. Here, the students were selected randomly based on their availability in the sampled schools. Also, gender was considered in the selection of the students to ensure that both genders (male & female) were well represented. Therefore, the students were randomly selected from each of the following selected senior secondary schools viz: Model Science College Tudun Fulani, Bosso Secondary School Minna, and Model Secondary School, FUT Minna.

3.4 Instrument for Data Collection

This research will use the Mathematics Achievement Test (MAT) to obtain the difference in achievement between male and female and ability levels of students in senior secondary school Mathematics (algebra). The Mathematics Achievement Test (MAT) was divided into two sections A and B respectively. Section A contained bio-data and section B contained a multiple choice questions which comprises of 20 questions.

3.5 Validity of the Instrument

To establish the validity of the instrument, experts in the field of Mathematics Education would be asked to independently evaluate the items. The experts accepted that the instrument were appropriate for the level they were meant for, and could measure what they were supposed to measure, and free of any ambiguity. Hence, the experts were satisfied with the facial and content validity of the instrument.

3.6 Reliability of the Instrument

To test the reliability of the instrument, a trial testing of the instrument would be carried out on a randomly selected five (5) male and five (5) female students making the total of ten (10) students which were not part of the sampled population but part of the targeted population. Also split-half method technique was employed in establishing the reliability co-efficient of 0.75 for the achievement test. Which proved that the instrument was reliable for use.

3.7 Method of Data Collection

The researcher went to the Faculty of Education, Federal University of Technology, Minna and collected the introduction letter. He also went to the selected schools and gave the letters to the respective principals of each school in order to have their maximum co-operation to obtain the information needed. These principals called their mathematics teachers and asked them to help and give the directives on how to administer the test without more constraints. The Mathematics teacher and the researcher went to the randomly selected classes and asked the students to give maximum co-operation during the lessons. The test was administered to the students (sample) under the supervision of the researcher and at least one permanent staff of each school. The students were expected to finish the test within forty-five minutes and were asked to keep the answer scripts on their desks after finishing the test. The scripts were collected by the researcher.

3.8 Method of Data Analysis

The data obtained was analyzed using mean, standard deviation, and percentage. Also, independent t-test was used for descriptive and inferential analysis.

3.9 Decision Rule

In the context of this research, the mathematical ability level of the students is considered low if the achievement in algebra is lower than or equal to 39%, also mathematical ability level of the students can be termed as moderate if the achievement in algebra is within the range of 40% to 69%; and finally, the mathematical ability level of the students can only be classified as high if the achievement of students in algebra is 70% above.

Mixed schools were selected to compare and contrast the achievement of both male and female students in algebra in senior secondary schools' Mathematics.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Answers to Research Questions

Research Question One: What is the difference in the mean achievement scores of male and female students in Algebra in senior secondary schools' Mathematics?

Table 4.1.1: Mean scores and S.D of male and female students in Algebra in senior secondary school Mathematics

Gender	No	Mean ($\bar{x}$)	S.D	Diff. in Mean
Male	187	37.22	18.18	5.29
Female	187	42.51	21.53	

Source: Field Survey, 2021

Table 4.1.1 above shows that, the male students had the mean score of 37.22 and standard deviation 18.18 while the female students had the mean score of 42.51 and standard deviation of 21.53. Therefore, female students achieved better with a mean difference of 5.29 in Algebra in senior secondary schools' Mathematics than their male counterparts.

Research Question Two: What is the difference between the ability level (high, moderate, and low) of male and female students' achievement in algebra in senior secondary schools' Mathematics?

Table 4.1.2a: Ability level of male students in Algebra

Ability levels	Intervals	No of students	Percent (%)
High	70 – 100	11	5.88
Moderate	40 – 69	68	36.36
Low	1 – 39	108	57.75

Source: Field Survey, 2021

Table 4.1.2a shows that the ability level of male students in Algebra in senior secondary schools' Mathematics for high is only 11 students with a percentage of 5.88, moderate with a total number of 68 students and a percentage of 36.36 and lastly low with the highest numbers of 108 students and percentage of 57.75. Therefore, the ability level of male students in Algebra is low.

Table 4.1.2b: Ability level of female students in Algebra

Ability levels	Intervals	No of students	Percentages
High	70 – 100	25	13.37
Moderate	40 – 69	90	48.13
Low	1 – 39	72	38.50

Source: Field Survey, 2021

Table 4.1.2b shows that the ability level of female students in Algebra in senior secondary schools' Mathematics for high was 25 students with percentage of 13.37, moderate with the highest number of 90 students and percentage of 48.13, and low with a total number of 72 students and a percentage of 38.50. Therefore, the ability level of female students in Algebra is moderate.

4.2 Hypothesis Testing

Hypothesis One: There is no significant difference in the mean achievement score of male and female students in algebra in senior secondary schools' Mathematics.

Table 4.2.1: Summary of independent t-test of male and female students in algebra based on their mean Achievement score.

Gender	N	Mean	S.D	DF	t-value	p-value	Remark
Male	187	37.22	18.18	372	2.569	0.011	Significant
Female	187	42.51	21.53				

NS: Significant at $p < 0.05$

Table 4.2.1 above shows that, the male students had the mean score of 37.22 and standard deviation 18.18 while the female students had the mean score of 42.51 and standard deviation of 21.53, degree of freedom (df) of 372, t-value of 2.569 and p-value of 0.011. Since $p < 0.05$ therefore, there is significant difference between the mean achievement scores of male and female students in Algebra in senior secondary schools' Mathematics. Hence, the hypothesis is rejected.

Hypothesis Two: There is no significant difference between the ability level of male and female students' achievement in Algebra in senior secondary schools' Mathematics.

Table 4.2.2: Summary of independent t-test ability level for male and female in algebra in senior secondary schools' mathematics

Gender	N	Mean	S.D	DF	t-value	p-value	Remark
Male	187	37.22	18.18	372	2.569	0.011	Significant
Female	187	42.51	21.53				

NS: Significant at $p < 0.05$

Table 4.2.2 above shows that, the male students had the mean scores of 37.22 and standard deviation 18.18 while female students had the mean scores of 42.51 and standard deviation of 21.53, degree of freedom (df) of 372, t-value of 2.569 and p-value of 0.011 respectively. Since$p < 0.05$ therefore, there is significant difference between the ability levels of male and female students in Algebra in senior secondary schools' Mathematics. Hence, the hypothesis is rejected.

4.3 Discussion of Findings

This study was aimed to make a comparative analysis between the achievement of male and female students in Algebra in senior secondary schools' Mathematics. A mathematics achievement test (MAT) was administered to (374) sampled students that is, males and females from: Model Science College Tudun Fulani Minna, Bosso Secondary School,

Minna, and Model Secondary School, FUT Minna. The descriptive statistics of mean, standard deviation and percentage were used to answer the research questions. Thus, it was discovered from table 4.1.1 above that the female students achieved better than their male counterparts who are considered to have higher aptitude (i.e natural ability to acquire knowledge or skill) and tend to be more dependent in learning Mathematics than the female students while the female students tend to be independent, hence, the poor achievement of male students. Therefore, effective strategies should be adopted for better improvement and the notion that males are naturally gifted to do better in Mathematics than the female should be discarded.

The descriptive analysis of the students' ability levels as regarded to high, moderate and low in Algebra was carried out using the independent t-test. In the analysis, it was also discovered that there is significant difference between the ability level of male and female students in Algebra in senior secondary school Mathematics and hence, the hypothesis was rejected.

4.4 Summary of Findings

The major findings of this study are:-

1. There is significant difference among male and female students in learning Algebra in senior secondary schools Mathematics.
2. Some male students completely refused to attempt some questions due to phobia of Mathematics.
3. It was also discovered that some students could not finish at the stipulated time of forty-five minutes most especially students who did not understand the topics very well.
4. Some students did not have proper understanding of the topic taught to them by their teachers.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study investigated the achievement of male and female students in Algebra among senior secondary schools in Bosso Local Government Area of Niger State.

The research questions were answered and scored appropriately. The research showed that, females students have higher achievement in Algebra than their male counterparts and also that the ability of the female is higher than the ability level of the males.

5.2 Conclusion

It is evident from this study that students' achievements in Algebra are not dependent on gender. Both genders are capable of competing and collaborating in classroom activities. It must be stressed that this was a case study. Further research would need to be undertaken to examine the trends that emerged in this study in greater depth. A sounder approach would be to examine situational factors that may be influencing gender differences, for example, classroom cultures, teacher attitudes, parental attitudes and others.

Generally from this research study's result, it was concluded that there is significant difference between the achievement and the ability levels (high, moderate and low) of male and female students in Algebra in senior secondary school Mathematics in Bosso Local Government Area, Niger State.

5.3 Recommendations

Based on the research findings above, the researcher makes the following recommendations.

1. Mathematics teaching and evaluation strategies should be gender bias-free. This way, males and females will tend to see themselves as equal, capable of competing and collaborating in classroom activities.

2. Public enlightenment campaign should be intensified by the Government to dispel the notion that, Mathematics is not for female but, for male only.
3. Seminars and workshops can be organized where male students who excelled in Mathematics are invited as resource persons to talk about their experiences in Mathematics and science. They could share with the boys what challenge they faced, how they succeeded and benefited from Mathematics in their lives.
4. Teachers of Mathematics should therefore be encouraged to be gender-sensitive when teaching Mathematics.
5. There should be workshops and seminars to educate male students on how to overcome the fear of Mathematics.
6. Teachers and parents should properly encourage the male gender right from childhood to view Mathematics as very simple.
7. Special incentives in the form of scholarship should be given to male students who undertake and excel in mathematics courses as a way of encouragement in the area.

5.4 Contribution of Study to existing Knowledge.

The purpose of every research work is to ensure that, findings from such study contribute to the theory and practice of knowledge generally. Thus, the findings from this study revealed that, female students had better achievement scores and also that they have higher Mathematical ability level in Algebra than their male counterparts in senior secondary schools' Mathematics. It is hoped that this outcome will guide the educational policy makers in the formulation of educational policies that will improve the achievement of male gender in senior secondary schools' Mathematics.

Another important contribution of this research study to knowledge is that, its findings will be used as a source of literature by future researchers and scholars who may be conducting studies in related areas.

5.5 Limitations of the Study

Time factor was a major challenge in the course of this research work based on the fact that, the researcher had to combine the research work with his course work (study) at the same time. It was extremely difficult for the researcher to be shuffling from course work and the study. Also, the time allocated for filling of the questionnaires were not adequately adhered to because of other school activities.

Furthermore, the sample used for the study was not large enough to permit meaningful generalizations to other senior secondary school students in Niger State at large.

5.6 Suggestion for Further Study.

Since research in Education is a continuous task, the following have been suggested as areas to be studied by future researchers who may have interest in conducting studies on male and female students' achievement in algebra among senior secondary schools students in Mathematics.

This study was delimited to the comparative study of male and female students in algebra among senior secondary schools' students in Bosso Local Government of Area of Niger State. The researcher considers this to be too narrow and suggested that, future studies could be carried out in more senior secondary schools in Niger State and Nigeria at large.

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APPENDIX I

TEST BLUE PRINT

S/N	Content Dimension		Ability process Dimension		
			Lower Cognitive Process	Higher Cognitive Process	**Total**
		%	**60**	**40**	**100**
1	Simplification of Algebraic Expressions	25	3 (3,5,12)	2 (2,4)	5
2	Addition and Subtraction of Algebraic Fractions	20	2 (7,10)	2 (9,13)	4
3	Change of Subject Formula	30	3 (6,11,18)	3 (8,16,20)	6
4	Substitution in Formula	25	3 (1,15,17)	2 (14,19)	5
Total		**100**			**20**

APPENDIX II

MATHEMATICS ACHIEVEMENT TEST (MAT) FOR SENIOR SECONDARY SCHOOL (SS 2)

Time Allowed: 45 minutes

Dear Student,

I am researching on, A Comparative Study of Male and Female Students Achievement in Algebra Among Senior Secondary Schools in Bosso Local Government Area, Minna.

I will appreciate if you could complete the questionnaire as information obtained concerning this study will remain confidential.

Thank you.

SECTION A: BIO-DATA INFORMATION

1. Gender: Male ( ) Female ( ) 25 above ( )

2. Age bracket: 15 – 20 years ( ) 20-25 years ( )

Section B

Instruction: Please, Choose the Correct Answers From The Options Lettered (a – d)

1. Given that $\frac{x}{a}+\frac{y}{b}=1$. Find x when $a=4,\ b=1$ and $y=-2$

(a) -12 (b) -4 (c) 12 (d) 4

2. Remove the bracket and simplify the equation $\frac{1}{2}(2u-8)-\frac{2}{3}(12u-3)$

(a) $7u-2$ (b) $-7u+2$ (c) $7u+2$ (d) $-7u-2$

3. Expand $(c+7)(c-7)$ and select the correct answer

(a) c^2-49 (b) c^2+49 (c)c^2+7 (d)c^2-7

4. Simplify $(f+g)^2+(f-2g)^2$

(a) $2f^2+fg+5g^2$(b) $2f^2+2fg-5g^2$(c) $2f-2fg+5g^2$(d) $2f^2-2fg+5g^2$

5. Remove the bracket and simplify $3x(2-x)-5(6+x-2x^2)$

(a) $7x^2-x+30$ (b) $7x^2+x-30$ (c) $7x^2-x-30$ (d) $7x^2+x+30$

6. Make x the subject of the formula in the equation below $ax+b=x$

(a) $\frac{-b}{a+1}$ (b) $\frac{b}{1-a}$ (c)$\frac{-b}{-1-a}$ (d) $\frac{b}{1+a}$

7. Express $\frac{4x}{9}+\frac{x}{9}$ as a single algebraic fraction

(a) $1\frac{x}{9}$ (b) $\frac{9}{5x}$ (c) $\frac{5}{9}$ (d) $\frac{5x}{9}$

8. Make T the subject of the formula given that, $A = P + \frac{PRT}{100}$.

(a) $\frac{100(A-P)}{PR}$ (b) $\frac{100(A+P)}{PR}$ (c) $\frac{100(P-A)}{PR}$ (d) $\frac{100(P+A)}{PR}$

9. Simplify $\frac{x-2}{x+2} - \frac{x-1}{x+3}$ to the lowest term

(a) $\frac{4}{(x+2)(x+3)}$ (b) $\frac{-4}{x^2+4x-1}$ (c) $\frac{-4}{(x+2)(x+3)}$ (d)$\frac{-4}{x^2-x+6}$

10. Express $\frac{3}{a} - \frac{2}{b}$ as a single algebraic fraction

(a) $\frac{3b+2a}{ab}$ (b) $\frac{3b+2a}{a}$ (c) $\frac{3b-3a}{4ab}$ (d) $\frac{3b-2a}{ab}$

11. Make b the subject of the formula from the equation $\frac{a}{x} + b = c$

(a) $b = \frac{c}{x} - \frac{a}{x}$ (b) $b = \frac{a-c}{x}$ (c) $b = \frac{c-a}{x}$ (d) $b = c - \frac{a}{x}$

12. Expand $(6 + y)(5 + x)$ and collect like terms if possible

(a) $30 + 5y + 6x + xy$ (b) $30 + 5y + 6x - xy$

(c) $30 - 5y - 6x - xy$ (d) $30 + 5y - 6x + xy$

13. Simplify $\frac{2x+1}{x} + \frac{3y-2}{y} - 5$

(a) $\frac{y+2x}{y}$ (b) $\frac{y-2x}{xy}$ (c) $\frac{x-2y}{xy}$ (d) $\frac{y+2x}{xy}$

14. If a wire L metres long is stretched tightly between two points at the same level d metres apart, the sag in the middle of the wire is s metres, where $s = \sqrt{\frac{3d(L-d)}{8}}$. Find the length L of the wire if $d = 16$ and$s = 0.6$.

(a) $16.06m$ (b) $16.0m$ (c) $16.04m$ (d) $15.06m$

15. If $I = \frac{PRT}{100}$. What is the value of T when $I = 5100$, $P = 34000$ and $R = 2\frac{1}{2}$

(a) 10 years (b) 8 years (c) 6 years (d) 12 years

16. Make h the subject given that $D = \sqrt{\frac{3h}{2}}$

(a) $\frac{D^2}{3}$ (b) $\frac{2D^2}{3}$ (c) $\frac{D^2}{2}$ (d) $\frac{3D^2}{2}$

17. The volume of a square based pyramid is given by $V = \frac{a^2h}{3}$, where h and a are the height and length of the pyramid. Find a when $V = 162$ and $h = 24$.

(a) $3\frac{1}{2}$ (b) $4\frac{1}{2}$ (c) $5\frac{1}{2}$ (d) $6\frac{1}{2}$

18. Make a the subject of the formula $a^2 = x$

(a) $a^2 = x^2$ (b) $a^2 = \sqrt{a}$ (c) $a = \sqrt{x}$ (d) $a = x^2$

19. The energy E possessed by an object of mass mkg travelling at a height hm with a velocity vm/s is given by $E = \frac{mv^2}{2} + mgh$. If the energy of a $20kg$ mass at a height of $15m$ is $4900\ joules$ and $g = 9.8$, how fast is the mass moving?

(a) $12m/s$ (b) $16m/s$ (c) $10m/s$ (d) $14m/s$

20. Make W the subject $L = \frac{Wh}{a(W+P)}$

(a) $\frac{LaP}{h+aP}$ (b) $\frac{LaP}{aL-h}$ (c) $\frac{LaP}{h-aL}$ (d) $\frac{LP}{h-aL}$

APPENDIX III

MATHEMATICS ACHIEVEMENT TEST (MAT) FOR SENIOR SECONDARY SCHOOL (SS 2)

MARKING SCHEME

Note: Each question carries 1 mark.

1. C
2. D
3. A
4. D
5. B
6. B
7. D
8. A
9. C
10. D
11. D
12. A
13. B
14. A
15. C
16. B
17. B
18. C
19. D
20. C

APPENDIX IV

RESEARCH INSTRUMENT VALIDATION FORM

Sir/Ma,

The candidate ABBA AROME with Admission Number 2017/3/64335BE is a student of the department. You are requested to make amends or inputs that will improve the quality of the instrument. Your professional expertise is expected to assist the researcher towards the award of the degree.

Thank you.

Head of Dept. Science Education
19 APR 2021
Fed. University of Tech. Minna

Dr. Rabiu M. Bello

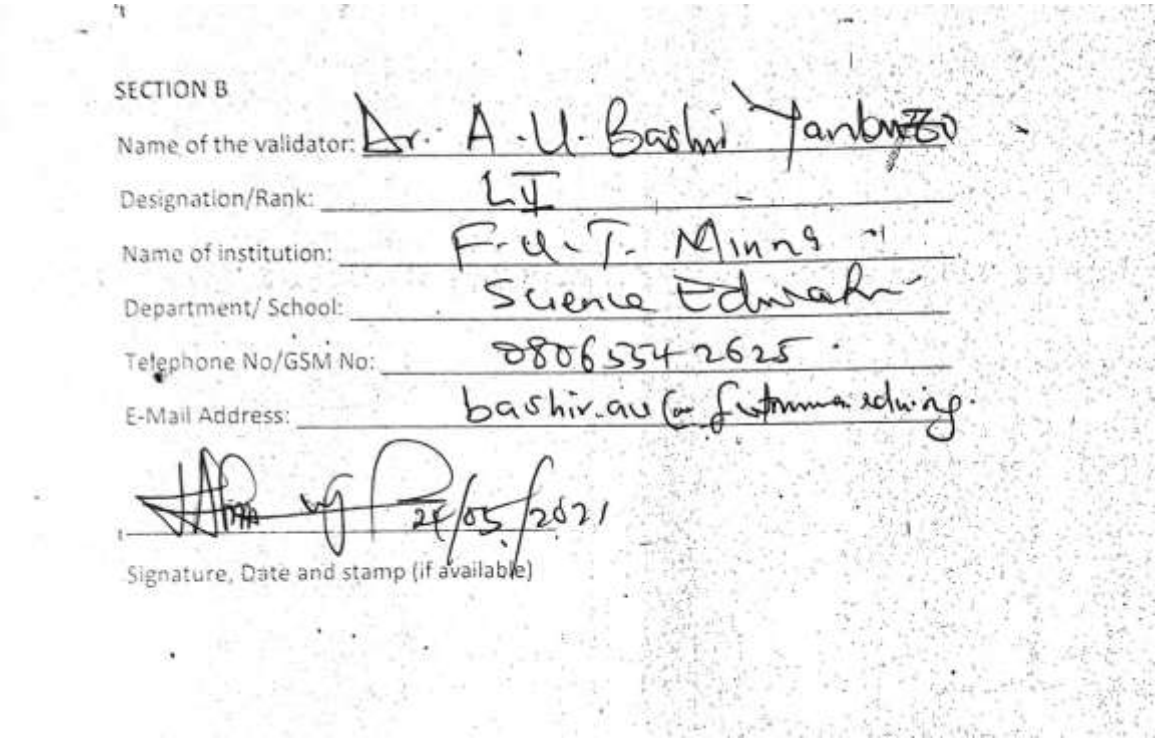
HOD (Signature, Date & Official stamp)

Title of the Research Instrument: MATHEMATICS PERFORMANCE TEST (MPT)

SECTION A

1. Appropriateness of the Research Instrument title: The title is appropriate but with slight change "Achievement" instead of performance.
2. Suggest amendment if not appropriate: Mathematics Achievement Test
3. Completeness of Bio-data Information: satisfactorily
4. Suggest inputs if incomplete: Okay
5. Suitability of items generated: Very Suitable.
6. Structure of the questionnaire/ test items generated: Okay
7. Structure of the instrument in line with the objectives of the study: satisfactory
8. Items coverage and distribution across constructs and domains measured: Okay
9. Appropriateness of the instrument in relation to the type of data to be collected: appropriate
10. What is the general overview and outlook of the instrument? The instrument is generally okay
11. Rate the Instrument between 1-10: 8

APPENDIX V



SECTION B

Name of the validator: Dr. A.U. Bashir Yanbaw

Designation/Rank: LT

Name of institution: F.U.T. Minna

Department/ School: Science Education

Telephone No/GSM No: 08065542625

E-Mail Address: bashir.au@futminna.edu.ng

25/05/2021

Signature, Date and stamp (if available)

APPENDIX VI

RESEARCH INSTRUMENT VALIDATION FORM

Sir/Ma,

The candidate ABBA AROME with Admission Number 2017/3/69335BE is a student of the department. You are requested to make amends or inputs that will improve the quality of the instrument. Your professional expertise is expected to assist the researcher towards the award of the degree.

Thank you.

Head of Dept. Science Education
19 APR 2021
Fed. University of Tech. Minna

Dr. Rabiu M. Bello

HOD (Signature, Date & Official stamp)

Title of the Research Instrument: MATHEMATICS ACHIEVEMENT TEST (MAT)

SECTION A

1. Appropriateness of the Research Instrument title: Appropriate
2. Suggest amendment if not appropriate: There was no title of the research project attached.
3. Completeness of Bio-data Information: satisfactory
4. Suggest inputs if incomplete
5. Suitability of items generated Suitable.
6. Structure of the questionnaire/ test items generated well structured
7. Structure of the instrument in line with the objectives of the study.
   Need to restructured the Instrument to be in line.
8. Items coverage and distribution across constructs and domains measured
   Covered to an extent
9. Appropriateness of the instrument in relation to the type of data to be collected
   Appropriate.
10. What is the general overview and outlook of the instrument?
    The Instrument should be in line with the State objectives.
11. Rate the Instrument between 1-10 (7)

APPENDIX VII

SECTION B

Name of the validator: Dr (Mrs) R. M. Gimba

Designation/Rank: Associate Professor

Name of institution: FUT Minna

Department/ School: Science Education

Telephone No/GSM No: 08032853603

E-Mail Address: ramatugimba@futminna.edu.ng

10/05/2021

Signature, Date and stamp (if available)

APPENDIX VIII

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT SCIENCE EDUCATION

Vice Chancellor: **PROF. ABDULLAHI BALA, Ph.D Fssn**
Head of Department: **DR. RABIU M. BELLO PhD, MSTAN**

Federal University of Technology
P.M.B. 65,
Minna, Niger State.
Nigeria.

Date:

Model Science College
Tudun Fulani, Bosso, Minna

Name: ABBA ARSHE

Matriculation No: 2017/3/69335BE

TO WHOM IT MAY CONCERN

The student/ Candidate whose particulars appear on the form is carrying out his/her final year project work.

Please, kindly assist him/her in whatever way possible towards completing this research work.

Thank you in anticipation of your full cooperation.

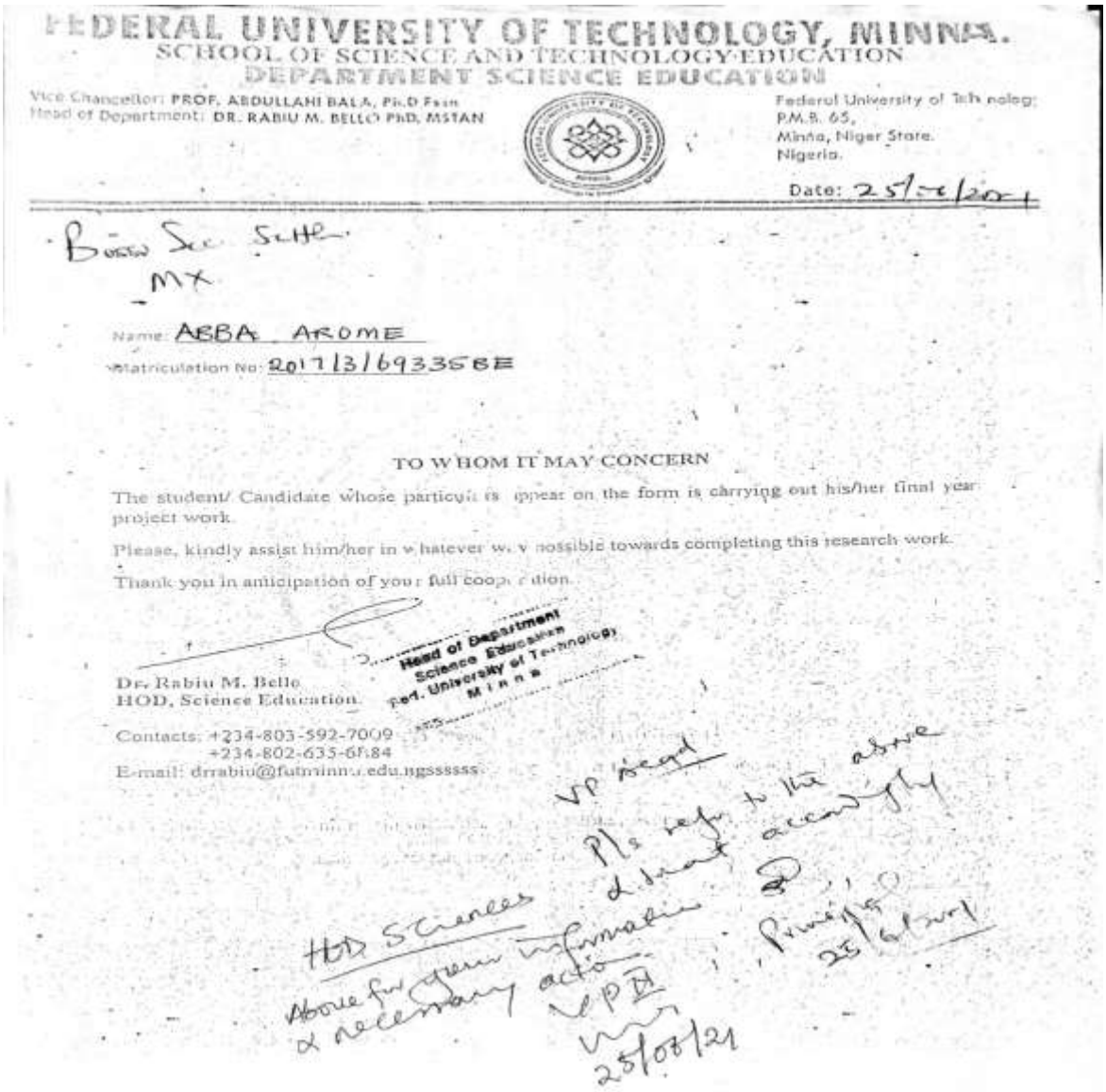
02 AUG 2021

Dr. Rabiu M. Bello
HOD, Science Education
Federal University of Tech. Minna

Contacts: +234-803-592-7009
+234-802-635-6884
E-mail: drrabiu@futminna.edu.ngsssss

Administrator
Model Science College
Tudun Fulani Bosso, Minna
Date

APPENDIX IX



FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT SCIENCE EDUCATION

Vice Chancellor: PROF. ABDULLAHI BALA, Ph.D Fssn
Head of Department: DR. RABIU M. BELLO PhD, MSTAN

Federal University of Technology
P.M.B. 65,
Minna, Niger State.
Nigeria.

Date: 25/08/2021

Biol Sc Sch.
MX

Name: ABBA AROME
Matriculation No: 2017/3/69335BE

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The student/ Candidate whose particulars appear on the form is carrying out his/her final year project work.

Please, kindly assist him/her in whatever way possible towards completing this research work.

Thank you in anticipation of your full cooperation.

Head of Department
Science Education
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Minna

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VP Acad
Pls refer to the above & treat accordingly
HOD Sciences
Above for your information & necessary action.
VP II
25/08/21
Principal
25/8/2021

APPENDIX X

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT SCIENCE EDUCATION

Vice Chancellor: PROF. ABDULLAHI BALA, Ph.D Fssn
Head of Department: DR. RABIU M. BELLO PhD, MSTAN

Federal University of Technology
P.M.B. 65,
Minna, Niger State.
Nigeria.

FUT MINNA
MODEL SEC. SCH.

Date:

Name: ABBA AROME

Matriculation No: 2017/3/69335BE

TO WHOM IT MAY CONCERN

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Thank you in anticipation of your full cooperation.

Head of Dept. Science Education
28 JUN 2021
Fed. University of Tech. Minna

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