EFFECT OF ABACUS AND SHAPES ON PRIMARY PUPILS' MATHEMATICS ACHIEVEMENT IN MINNA METROPOLIS.

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2015/1/58800BT

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A PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL TECHNOLOGY, SCHOOL OF SCIENCE TECHNOLOGY EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BARCHELOR OF TECHNOLOGY B TECH IN EDUCATION TECHNOLOGY

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ABSTRACT

The aim of this study is to investigate the effect of abacus and shapes on primary pupils' mathematics achievement in Minna metropolis. A quasi experimental research design was adopted. The population for the study consists of all Primary I students in Minna metropolis. The target population of Primary I student of Kuyanbana School in Minna. A total student's sample of 53 consisting of 27 males and 26 females. All schools offer courses in counting and basic calculation with particular reference to measurement, which is relevant to this study. The findings of the study revealed that there was significant difference in the post-test in the achievement of students taught Mathematics using shapes & abacus and those taught with conventional method. The outcome of the result shows that there is statistical significant different between the mean achievement score of students taught using shapes & abacus and those taught using conventional method, with the p-value (0.02) < 0.05. the findings emanated of the study that there no significant difference in the achievement scores of male and female students taught Mathematics using shapes & abacus. Hence, the use of the shapes & abacus is not gender bias. with p-value of 0.89, therefore the null hypothesis which is no significant difference in mean achievement score of male and female students taught using shapes & abacus was not rejected. Hence, there was no statistical significant different between male and female students' achievement score when expose to shapes & abacus. Based on the findings of the study the following recommendation was made. The Ministry of Education should encourage the use of shapes & abacus in teaching Mathematics in primary School. School Authority and teachers should be enlightened on the importance of shapes & abacus in teaching. The students should also be enlightened on the importance of shapes & abacus for learning.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Mathematics is a science of magnitude and number that is very useful virtually in all subject areas. This is because all fields of studies are dependent on it for problem solving and prediction of outcomes. Competency in mathematics learning is vital to any individual and nation in domestic and business deals, scientific discoveries, technological breakthrough, problem-solving and decision making in different situations in life. The importance of Mathematics made it a core subject in both primary schools (FRN, 2013).

Mathematics is a discipline of long standing. It is an indispensable tool for people to live, work, and study. Mathematics can help people process data, perform calculations, reason and prove, and mathematical models can effectively describe natural and social phenomena. Mathematics provided language, ideas, and methods for other science, which is the basis for the development of major technology, while it plays a unique role in improving human reasoning, abstractness, imagination, and creativity. Mathematics is a culture of humanity and the content, idea, method and language of mathematics are important part of modern civilization (Odili, 2015).

The basic starting point of mathematics course in compulsory education stage is to promote students to develop comprehensively, continuously and harmoniously. It should not only consider the characteristics of mathematics, but also follow the psychological rules of students learning mathematics. It emphasizes that teachers should start from students' existing life experience, and let students experience the process of abstracting practical problems into mathematical models, explaining and applying. In

this way, students not only gain an understanding of mathematics, but also make progress and development in thinking ability, emotional attitude and values.

The children's rational judgment and decision-making ability are formed from early childhood through various mathematical activities, so mathematics education in early childhood is very important. In order to develop children's mathematical attitudes and abilities, teachers should use teaching aids in their teaching, which makes children understand mathematics more intuitively and easily.

The importance of instructional materials in teaching and learning cannot be overemphasized. A lot of studies have been done to show the indispensable role of instructional materials in teaching mathematics in particular. Awe and Ajayi (2013) opined that availability and adequancy of teaching/learning resources promote the effectiveness of schools as these are basic things that can trigger good academic performance in students. These materials can be used to encourage, promote and facilities teaching and learning of mathematics. Atul and Varsha (2018) also observed that, of all the problems plaguing education in Nigeria, the most intractable is the dearth of relevant instructional resources. Atul and Varsha further stressed that teacher depended mostly on textbook and chalkboard as instructional materials while other relevant instructional materials such as charts, mathematical sets, plane shapes, measuring tapes, meter rule, slides and projector were sparingly used. Puebla (2015) observed that the instructional materials available in schools are grossly inadequate. The most available instructional materials are textbooks and chalkboards, which are not efficient for teaching and learning process. Abacus and shapes are the best teaching aid to cultivate children's mathematical attitude and abilities.

Abacus is a method of digital calculation using abacus. It is hailed as China's fifth largest invention and has been included in China's national intangible cultural heritage list. United Nations Education Scientific and Cultural Organization (UNESCO) believes that intangible cultural heritage brings a sense of identity and history to the owner community, which is the key to ensuring cultural diversity and human creativity. In October 2003, the 32nd Session of the UNESCO Conference adopted the Convention for the Safeguarding of the Intangible Cultural Heritage, which called for the protection of oral traditions and expressions, performing arts, social practices, ceremonies, festivals, traditional crafts as well as knowledge and practice of nature and the universe. Through experiments, some scholars observed the characteristics of activation of brain functional areas after abacus training, and concluded that abacus training has an important impact on children's mental calculation.

Similarly, the display of shapes have proven to be a resource teaching for primary school learning counting of number as well Achievement in maths is one of the key requirements for success in school and future outcomes (Frye *et al.*, 2013). Maths skills are reportedly in high demand in the labour market. Internationally, although Nigeria maths performance in ranked above the average, low-achieving pupils in Nigeria are performing below that of many of the other low-performing countries (FME, 2014).. Many children who struggle with maths in their early years find it difficult to learn and appreciate maths in later years (Jordan, Kaplan, & Hanich, 2002; Morgan, Valentine, 2012; Farkas, Hillemeier & Maczuga, 2016). Once anxiety sets in, learning maths becomes even more difficult because there will be multiple issues to deal with, including pupils' self-confidence, self-esteem, academic self-concept, and attitude towards maths.

Abacus and any other instructional aid were developed by takes on many elements of Numbers Count, Building Blocks, and Pre-K Mathematics, where pupils progress through a series of developmental levels or graded objectives using a sequence of instructions. These are designed to support early maths learning for children struggling in maths. Previous studies (e.g., Clements & Sarama, 2012; Puebla, 2015) have suggested that knowledge of children's developmental progressions and the use of appropriate teaching strategies to help them move along those progressions are important in developing children's maths concepts (e.g., reciting number sequences and place values). MC also has a number of characteristics of effective tutoring identified in the research literature, such as the use of manipulatives (e.g., dienes, Numicons1, counters, beads, and number lines) in developing maths concepts (Fuchs *et al.,* 2015). In accordance with accepted thinking about the effective use of manipulatives (Cope, 2015). MC is practised within a planned and structured programme. Therefore, the study intent to find out the effect of use abacus and shape on primary pupils' mathematics achievement.

1.2 Statement of the Problem

The nature of learning related with memory particularly in children has given much importance in the formal education. Mathematics is a learning associated with memory. While teaching mathematics, an external agent can assist in the formation of declaration memory from procedural memory to an extent (Fuchs *et al.*, 2015).

Today in the World, using instructional aid as an external agent extensively practiced to teach learn mathematics for children. Studies have shown that the use of instructional aid like abacus and shapes not only increases the ability of pupils in performing mathematics calculation, but also develops memory consistently (Valentine, 2012).

Learning is by means of stimulus transmission from one synapse to another synapse resulting in synaptic plasticity of brain.

Numbers Count and basic calculation drew much of its pedagogical rationale from What Works for Children with Mathematical Difficulties (Dowker, 2004) and is modelled after the literacy programme providing various instructional aid. The use of Abacus and shapes help to coordinate visual; auditory inputs they have better Short Term Memory compared to non-abacus learners.

In the last decade, several programmes have been developed to assist pupil with maths learning, in England and worldwide. The 2008 Williams review of primary maths teaching specifically identified the Numbers Count (NC) programme as a promising approach to supporting children in learning maths (Williams, 2008). Maths Counts (MC), the programme considered in this paper, is developed from the NC programme.

Despite the importance attached to mathematics, the performance of the subject in Counting and Basic Calculation for primary pupils has been average and this a pose serious concern for educationist and researchers to looking into various instructional aid that will enhance pupils in Mathematics (Apondi, 2015; Jerrim & Shure, 2016), as mathematics is the foundation of all knowledge of science. One of the intervention measures to help improve mathematics achievement in the county can be the use of instructional materials during teaching and learning of mathematics. This study therefore sought to establish the effect of abacus and shapes on primary pupils' mathematics achievement in Minna metropolis

1.3 Aim and Objectives of the Study

The aim of this study is to investigate the effect of abacus and shapes on primary pupils' mathematics achievement in Minna metropolis.

The specific objectives of the study are to:

1. determine the difference between the mean achievement scores of pupils taught counting and basic calculation using abacus and shapes and those taught without the instructional materials.
2. Find out the differences in the mean achievement scores of male and female pupils taught counting and basic calculation using abacus and shapes.

1.4 Research Questions

The following research questions guided the study:

1. What are the difference between the mean achievement scores of pupils taught counting and basic calculation using abacus and shapes and those taught without the instructional aid?
2. What are the differences in the mean achievement scores of male and female pupils taught counting and basic calculation using abacus and shapes.?

1.5 Research Hypotheses

The following null hypotheses wa tested at 0.05 level of significance in order to provide focus to this study.

1. There is no significant difference between the mean achievement scores of pupils taught counting and basic calculation using abacus and shapes and those taught without the instructional aid.

2. There is no significant difference between the mean achievements scores of male and female pupils taught counting and basic calculation using abacus and shapes.

1.6 Significance of the Study

The study was expected to be of immense benefits to the following stakeholders; pupils, teachers, curriculum planners, author and researchers.

The finding of the study will help to strengthen the application of abacus and shapes demonstration in teaching and learning in Mathematics as the findings will exposed the significance importance of using instructional material to enhance academic achievement of pupil in primary schools

The findings of this study could enhance pupils participation in science activities that will increase their acquisition of multiple intelligences, retention and achievement in Mathematics. It could also help students to spend their leisure wisely by engaging in activities that pertains to Mathematics, thereby improving the functionality of Mathematics.

For the teachers, the study will enable them to understand that even though the traditional science instructions save time in terms of content coverage, it has also contributed to the myriad of misconception. It is hoped that the findings of this study would help the teachers to know the efficacy of instructional model in teaching and learning, so as to be able to apply it to their daily teaching in other to improve pupils achievement. It will also help teachers to present their teaching in a manner that would accommodate student's diverse teaching style and stimulate the functions of the left and right brain hemisphere.

The findings may likewise help to modify the nature of teacher's interaction with the pupils, which will in turn help to create the spirit of inquiry among the pupils. In

addition, teachers in all subjects may be willing to try out some multiple intelligence techniques in their classroom if they see positive results from the study.

Furthermore, the study would help curriculum planners to appreciate the need to accommodate learning styles and activities that stimulate the brain hemispheric functions in designing the school curriculum. The findings of this study will enable them to have some basis for encouraging their teachers to try multiple intelligences in their classrooms, and it can enable them to implement a multiple intelligence-based curriculum.

To other researchers, the findings of this study will help them to build their literature and it will serve as a guide to their study.

1.7 Scope of the Study

The scope is restricted to Primary School Minna metropolis, Niger State. The class that will be used for this study is Primary 1 Mathematics students from two (3) co – educational schools in Minna metropolis of Niger State. Co – educational schools will be used because the researcher wants to find out if instructional material would have any influence on the academic performance in Mathematics based on their gender. The choice of Primary 1 students was considered most appropriate because they would have been exposed to some basic concept of numerals. The topic to be treated is restricted to concept of counting and basic calculation. The variable scope of this study are:- teaching with instructional material and without instructional material. While the dependent variable is achievement, and the moderating variable is gender. The experimental fieldwork is proposed to last for four (4) weeks.

1.8 Basic Assumption of the Study

The basic assumptions of the study are as follows:

i. The school authorities are yet to realize the relationship between Mathematics failure and teaching method.

ii. The Mathematics teachers are not aware that instructional model is an essential aspect that should not be ignored.

iii. The students had never been taught using instructional model.

1.9 Operational Definition of Terms

Abacus: is abacus, also called a counting frame, is a calculating tool for teaching primary school pupil counting and basic calculation.

Achievement: this refers to student doing well academically, obtaining good grades or excellent performance in Mathematics.

Counting: this refers to the process of determine/identifying and reciting of number of a finite set of objects.

Mathematics: Mathematics is the study of quantity, structure, space. includes the study of such topics as quantity (number theory), structure (algebra), space (geometry), and change (mathematical analysis.

Shape: is refers to the pictorial representation number in other to aid teaching ang learning for primary school pupils.

CHAPTER TWO

2.0 LITERATURE REVIEW

The review of relevant literature is organized under the following sub-headings:

Conceptual Framework

The Role and Importance of Mathematics

Concept of Aversion in Mathematics Teaching

Aversion Caused by Parents

Aversion Caused by Peer Group

Aversion Caused by Teachers

Effect of Aversion on Learning Mathematics in Secondary Schools

Methods of Teaching Mathematics in Secondary Schools

Models and Modeling in Secondary School Mathematics Learning

Academic Achievement in Mathematics

Concept of Gender and Academic Achievement

Theoretical Framework

Constructivism and Learning

Learning Theories on Instructional Materials

Model Development in Mathematics Learning

Related Empirical Studies

Summary Literature Review

2.1 Conceptual Framework

2.1.1 The Role and Importance of Mathematics

Mathematics is a very important subject in any society (Salman, 2015). There can be no question about the importance of mathematics both in general and specific education. The need for mathematics increases because of technological advancement.

Mathematics is among the core subjects at both Junior and Senior Secondary School levels of our educational system. According to National Policy on Education (F.R.N., 2014) "the core subjects are the basic subjects which will enable students to offer arts and sciences in higher education". International Association for Evaluation of Educational Achievement (I.A.E.E.A, 2018), has associated the learning of mathematics with basic preparation for adult life. Similarly, the Nigerian nation recognizes this association between mathematics and preparation for adult life when the (F.R.N. 2014) included the inculcation of permanent and functional numeracy as one of the general objectives of primary education.

Mathematics, according to Eniayeju (2015) is not only a Language of the Sciences; it is also the essential nutrients for thought, logic, reasoning and therefore, progress. Science is the foundation of technology and technology is the bedrock of modern development. Therefore, mathematics is the foundation of science, technology and modern development. For any nation to survive and develop, it has to improve its technology, which can be achieved through effective teaching and learning of Mathematics in the schools.

The application of Mathematics spans almost the entire ramifications of human endeavours. On account of this, Skemp (2016) observed that the application of Mathematics to the bottlenecks of natural science, of technology and of commerce is a powerful weapon that has gained enough ground. It serves as a solid metal tool which man employs in dealing with his physical environment. In the area of technology, for

instance, the design and construction of physical and structural projects received a tremendous support of elaborate Mathematical principle and method.

Skemp (2016) further stated that mathematical methods have strongly penetrated many fields of knowledge, changing them both in substance and power and have actually brought new disciplines into being or existence. Skemp went further to say that Mathematics is currently playing a dominant role in physics, Computer Science, Engineering, Economics and Chemistry. The layman‟s idea of Mathematics has been that it is the abstract study of quantity alone. But from the above point of view, it is apparent that apart from the theoretical and abstract treatment of quantity, mathematics encompasses the use of the knowledge gained in solving real life predicaments. It constitutes a language which gives an exact and accurate way of representing certain ideas and relationships which exist in physical phenomenon or systems.

In support of the above, Obioma (2016) expressed that learners of the subject should be able to discover the extensive applicability of the subject in other subject areas like Physics, Chemistry, and Sociology etc. Obioma further stated that mathematics helps to generate and sustain curiosity motives of learners and to develop academic skepticism. In the same vein, Fakuade (2017) writing on mathematics as a service subject stated that the choice of science subject at certain level is very much related to ability in mathematics. This is because proficiency in mathematics is of basic importance to the study of Physics, Chemistry, and Integrated Science etc. and in understanding elementary principles of science subject generally.

Nwichi (2011) said that mathematics, being one of the cultural components of any society have played diverse roles in both human developments and material developments like textile industries, engineering, food processing, housing, motor production, prediction, designing etc. Nwichi finally stated that mathematics has

affected changes for the better. In support of this, Iwuoha (2017) in his paper titled "mathematics in everyday life" presented at the academic staff seminar of Alvan Ikoku College of Education, Oweri maintained that:

"If there were no mathematics there would be no salary, no speed limit, no measurement, no time, no building, no buying and selling, no houses, no education, we cannot quantify the amount and size of food we eat, the doctors cannot prescribe the doses of medicine, the banks will fold-up, all scientific institutions will cease to function and indeed life will come to a stand-still (Rahaman, 2012)

In relation to the above, Arnold (1990) stated that the role of mathematics in physics is conspicuously seen. The essential ingredient of inductive reasoning is deduction. Deduction is familiar to us in the various processes of mathematics which are used extensively in physics without which we should not be able to progress very far. Mathematics may be regarded as a highly organized form of reasoning employing certain agreed-upon symbols and conventions to the aim of partly improving on the reasoning powers with which we are endowed by nature.

One can conclude that mathematics has an important role to play in a wide range of applications, so long as we are realistic about what it cannot do, as well as what it can do. But the issue is on how to motivate students at their early stages to develop interest and increase their performance in this important school subject. One aspect of this could be the innovation in instructional methodology to enhance achievement.

2.1.2 Concept of aversion in Mathematics teaching

Aversion as defined in the American Heritage Dictionary (2015), in ask.com is the withdrawal of ones attention from what he/she should do through divers‟ opinion that may arise from peers, parents or teacher due to the fact that they are deficiency in those area. Bing.Com (2010) explained aversion as a strong feeling of dislike of somebody or

something that goes along with hatred, loathing, distaste and antipathy. Houghton Mifflin. All rights reservedInhttp://www.ask.com (2015), took aversion to be a fixed, intense dislike; repugnance or the avoidance of a thing, situation, or behavior because it has been associated with an unpleasant or painful stimulus. It is also an act of turning away or averting. Lassa (2014) took Aversion to be an acquired behavior that prevents one from perceiving concepts in such a way that they may be applied in solving novel problems; that it reduces the efficiency and efficacy of any instruction. That, any factor that stands between an instruction and concept assimilation by a student, constitutes aversion, and must be diagnosed and treated quickly before handling any other thing, if effective learning must take place. Adetula (2015), view aversion to be problem and attitude emanated from parents towards their children. Student, because the father, mother or peer group are deficient in mathematics may develop hatred for it. Some parents, as a result of their inability to study mathematics, some as a result of not being able to have better job opportunities or latter end up in classroom may discourage their child. It goes beyond that as earlier explained in chapter one. It has so many branches of activities you can think off. Mbakwem and Mkpa (2013), referred to mathematics as a discipline that encourages curiosity, promote critical reasoning and active participation of learner. These objectives require instructional strategies that are activity base.

Audu (2014), In his presidential address said, in the era of technology quest and high attainment in modernization, no nation can allow his teaming population to shy away from mathematically related sciences. Rahaman (2012), in his support said that technology improves learning process. Adamu (2011), took information technology as a useful delivery vehicle, to the right person, at the right manner and in the right place. Audu (2010), pointed out that information technological development is hinged on

strong mathematics foundation. It is therefore not contend-able, that mathematics and mathematics sciences are indispensable. Badmus (2012) said that the effective and attitudinal variables that have been found to predict mathematics related behavior includes confidence in learning mathematics, Badmus (2015) explained the need to pass to the students the willingness to apply scientific habits to a wide range of social content which includes multidimensional perspective about sciences and its relationship to other field of studies. Eniayeju, (2015), emphasize on the nation's expectation of science's contribution to life. She further suggests the need to link between science literacy and national economy. Cooney (2012) in agreement said that it should also be between quality of life and social emancipation. Harbor-Peters (2011), said that science is embedded in, and influenced by the society and culture because science knowledge is socially constructed. Etuk (2015) believed that the level of scientific cultural belief of students was scientifically high inspite (sic) the scientific knowledge they acquire at their level of education. For this reason, Ali (2010) suggests that the focus of scientific literacy should be on utilization of scientific knowledge for the benefit of the individuals

Odili (2015), explained learning to be a change of human disposal or capability that can be retained which is not ascribable to the process of growth, but can be described as the development of new knowledge, skills or attributes as individual undergoing learning interact with information and the environment such as the learning strategies or methods, the media and the physical facilities. Udoh (2012) said that self estimated mathematics ability is found to be highly correlated with mathematics aversion and mathematics performance. That mathematics confidence and mathematics aversion have been found to be highly interdependent.

Badmus (2012) Opined that the most important predictors of mathematics achievement when preparation (i.e. persistence in mathematics courses and election of future course of mathematics) are controlled by attitudes towards mathematics. Oganwu (2011) said that the meaning of individual learning is coupled with their life experience and contexts that are constructed by the learner not by teacher. The issue at hand is how to change the attitude of students and to attract their interest towards the practicing of mathematics.

Harbor-peter (2011), conducted several studies, on students‟ attitude and interest towards mathematical science subjects, and concluded that, students manifested negative attitude towards mathematics and positive attitude towards what they called modern science teaching. Obioma (2012), explained that students do not find the study of physics boring like that of mathematics. Odili (2015), opinioned that, students‟ attitudes and interest are directly influenced by the personal quality of their teachers and the nature of classroom climate created.

Harbor-Peters (2011), observed students‟ attitude to mathematical sciences and said, that students developed negative attitudes to mathematical sciences, which they attributed to the students‟ misconception of sciences. Ale and Adetula (2015), explained that, negative attitude inhabited students‟ understanding of the content of mathematics. Obodo (2008), said that students with positive attitude are more likely to study mathematics because they enjoys or like it. Because, he gets satisfied with acquiring mathematics ideas, he finds mathematics activities very rewarding. That student may likely work diligently and effectively on a task that they are genuinely interested in. Bature (2013), suggests the need to give students the right opportunity. That if aversion must be eradicated, positive attitude must be built in student been the learner.

2.1.3 Sources of mathematics aversion in Primary School

Leka (2014), said that, every running has a cause, every cause has an effect. No sickness without a symptom. The symptoms of mathematics aversion among student can be seeing from the following sources like: - Parents, peer group and teachers.

2.1.3.1 Aversion caused by parents

Badmus (2015), said that parents exhibits an attitude towards mathematics which they transferred to their children and the children consciously or unconsciously emulate such attitudes and carry them to school. Some of those attitudes that can lead to aversion include: -

Aggression: - According to Adido (2012), parents transferring value and aspiration or indoctrination to their children, with the notion that mathematics is difficult or that it is not useful to them with respect to the cause they are going to read. The student will use that as an avenue to start developing negative dispositions to mathematics which is known as Secondary socialization.

Lack of interest: -Hartly & tynjala (2011), said many parents may not be interested in mathematics and kept announcing their past failures to their children which may lead them to disliking the subject because their parents failed it in their time.

Lack of benefit: - Effiong & Effiom (2015), pointed out that Some, because of the little knowledge of the benefit they see in the subject, force their children to read other subject they think can give easier money, forgetting that the foundation of those subjects are from mathematics. As Harbor-Peters (2011), rightly said, this experience provides by parents modifies students values, emotions, interest and attitudes towards mathematics.

2.1.3.2 Aversion caused by peer group

Bature (2013), said that the most widely held belief is that peer group creates aversion among themselves when they discover that certain task is given them tough time. They like to discourage others from doing it; generate fear among themselves as explained by Aja (2011), that peer groups placed a low value on academic achievements. In his explanation, he said that secondary school children, like specific fields in life. Thus Ibok (2012), said that about 25% of the students like to be athletes; the reason as viewed by Umoh (2015), was that athletics bring glory and consequent rewards of increase status to all students. Lindblom et at (2015), said that what this means in effect, is that peer groups have a tendency of influencing their member group from practicing mathematics to other social concern. Such diversions render almost whatever planed for the students ineffective Ntekim (2015). Akpan (2012), said, many students come to school for the first time with a very high aspiration and do record relatively good results in their early year. Peer group aversion makes them become less academically in succeeding years. As viewed by Audu (2010), the purpose of peer groups may not directly be to affect achievement, instead as pointed out, are form of similar ambition that when formed such peer groups will strive to develop the ambitions that brought them together. When the factor that brought them together are academically oriented, like doing homework, attending classes and also in the habit of keeping late in the library, the influence reinforce one another towards the maintenance of the goals that brought them together through helping one another. Fatius (2011), said their coming together may mean to help one another in the area of their difficulties. That working together as a team make them feel happy in achieving academic goals that brought them together, that they even try to be competing at times among themselves. These are some

of the common features of peer group that are very helpful toward better school learning.

2.1.3.3 Aversion Caused by Teachers

Esu (2012), stated that researches have shown that teachers' attitude towards mathematics generate aversion in student, by not capturing their attitude towards the subject. Most mathematics teachers‟ behavior deviated from the expected normal behavior of teachers. Some mathematics teachers exhibit very strong queer character that scared many students away from mathematics. Some of the attitudes exhibited by them are:-

Creating an impression to students that mathematics is difficult and not everybody practice it, except for those with exceptional qualities like themselves teaching the subject. Some extreme neurotic behavior exhibited by some teachers either in the classroom or outside the classroom.

Some behave like mad person which may create another notion in students that mathematics teachers are mad people. This could be as a result of their mode of dressing, not combing their hairs and are hot tempered "not being patient".

Proving to be very fast when teaching forgetting that they need to carry the students along in their teaching. Not create time for the work they gave their students and could not also work mathematics in different ways for students to adapt to any of the convenient method. Not given adequate corrections to mathematics assignments and failure to do correction of the assignment given to their student.

Ukeje (2015) said that, "If a medical Doctor makes a mistake a patient may die. If an engineer makes a mistake a bridge or physical structure may collapse, if a lawyer makes a mistake somebody may lose his liberty; but a mistake from teacher makes generations unborn suffer the consequences. By implications of this statement, the mistakes of

members of the other professional are overt and transient while the mistakes of a teacher are more debilitating and devastating to the future generation. Aromolaran (2014), Noted that special needs of Education, is education towards meeting the needs of the learners, so that they can develop to their optimum level and live a meaningful contributive life in the community. In this Obani (2010), said that the need to consider, recognized and respond to, is the diverse needs of the learners.

Makarfi (2011), confirmed, that teachers attitude to mathematics contribute to effective and inefficient teaching and learning of mathematics. Sambo (2015), maintained that teachers exert a lot of influence on good or poor performance of students in mathematics. Uyenuge (2013), opined that the attitude of students towards mathematics some time result from teacher's attitude towards mathematics.

Badmus (2012) said that teachers are the significant figures to all students. The way they copy what he says and what he shows, can build and destroy the character of the students. That the way teachers of mathematics address their students either formally or informally matters to them. That when a teacher is professionally relating to students, he is capable of stimulating and motivate them to learn effectively. Fatiu (2010), said that the situation is worsened by the fact that teachers themselves tend to have a very low esteem of themselves and the teaching profession. That is why, Ali (2011), emphasized on the training and retraining of teachers. Eniayeju (2015), said teachers should be trained to enable them recognize the opportunities and challenges that student might face along the line. Alhassan (2010) pointed out that, lack of adequate training; make it difficult for them to impart the appropriate educational goals to the students. Adetula (2011), confirmed that the difficulties encountered by the teachers in teaching mathematics, depend on the level of professional training. Ojaleye (2015), maintained

the need to keep abreast the quality of mathematics teacher with the development of new trends in information technology.

2.1.4 Effect of aversion on learning mathematics in primary schools

There seems to be some relationship between the general aversion and mathematics aversion. Ukeje (2015), pointed out, that mathematics aversion exists among many individuals who do not ordinarily suffer from any order tension. Hence even though mathematics aversion is related to other types of aversion, many people who are not generally anxious are anxious about mathematics. Effiong (2012), found out that aversion tends to draw the personal ability to discriminate and to interfere with the learner of new materials more than with the learning of more familiar materials.

According to Anekwe (2015), there are two main types of mathematics problems; Mechanical and word problems. Mechanical problems are computational in nature which involves students knowing how to compute using mathematical operations, while word problems require problem solving ability. She then explained that the state of aversion has been found to impair problem solving ability.

Harbor-Peter (2015), states that aversion is a normal human emotion which is necessary for human development, that a moderate amount of it is necessary to spur multi-nation. However, this contradicts the evidence of Harbor-Peters (2011), who state that a negative relationship exists between aversion and mathematics achievement, such that high achievement is related to low aversion level. In a few studies, researchers have attempted to experimentally ascertain whether high aversion impairs less performance. However, according to Obodo (2008), aversion influences performance on affective measures more than on cognitive test. Oganwu (2013), found Mathematics aversion to be strongly related to mathematics confidence, also, Bello (2011) reported that student with high mathematics confidence tend to be low in mathematics aversion and vice-

versa, with confidence being a positive manifestation and aversion a negative manifestation.

Adetula (2009) in their study on confidence and mathematics achievement found that student who scored above the mean of a standardized test were grouped into those with high confidence and those with low confidence. In a study by Ukeje (2015), he said that those students with high confidence approach their teachers of mathematics and work more frequently than those with low confidence. It was also found that high confidence students tend to have higher cognitive level of interaction with the teachers than those with low confidence. And in the class examination, it was also found that high confidence student performed better than the low confidence students. In a cognitive modification programme for reduction of test aversion, Harbor-Peters (2011), noted that the cognitive modification programme significantly reduced the aversion level and increased correspondingly the academic performance of college students. Although in a similar research with regards to cognitive modification referred to as positive retraining, Liverpool (2012) said that," positive retraining and natural instruction had no significant impact on the mathematics anxious student". Thus the result suggests while positive retraining may have emotional input, it is ineffective in improving the mathematics test performance of highly anxious students. It can then be concluded that though cognitive modification can reduce aversion and hence improve achievement in mathematics, there is a need to, in addition to cognitive modification, add or use instructional method which is suitable to the level of aversion in students so as to improve their performance and effectively reduce their aversion.

2.1.5 Methods of teaching mathematics in primary schools

There are several methods of teaching which teacher of science subjects can use in the classroom to presents scientific facts, information, principles, skills or concepts to

students. Some of the methods include: demonstration which involve use of instruction material/model, discovery, discussion, project, laboratory, individualized, field trip and expository methods to mention but few.

Some of these methods which have their characteristic advantages and disadvantages as narrated by Onota (2007), are specific for some situations and categories of students, while others can generally be apply to all categories of students. For the purpose this study, the relevant teaching method amongst the above listed is use of instructional model and would be discussed below.

2.2.6 Models and modeling in secondary school mathematics learning

Harbor-Peters (2011), conceptualized models for mathematics teaching and learning as enriched devices which may be concrete or semi-concrete or abstract for use by teachers to make mathematics concepts clearer to learners. Harbor further stated that a model must possess a one-to-one correspondence relationship to the mathematical concept being illustrated, using the model. It must be simple and easy to use so that one does not use the teaching time for explaining the models. With that, graphical illustration would also serve as model in mathematical learning. In general, good models for teaching mathematical concepts are capable of providing concrete and realistic experiences, which will help a learner to discover facts or patterns. It creates curiosity and motivates the learners to explore mathematics in a relaxed mood.

With regard to Harbor Peters view on models as instructional materials in mathematics learning, Secondary school pupils would be motivated to develop interest in ratio learning when it is properly taught with graph sheet as a model.

Obodo (2008), viewed models as, “two or three-dimensional representatives of objects which students learn about in the class”. The use of models according to the Obodo, provides a mental of relating past experiences to a new situation. They employed and

provide concrete and realistic experiences from which learners can discover facts. The minds of the students will readily accept ideas that are illustrated by concrete example. The means that models give meaning to different concepts and relations in mathematic by associating them directly with physical objects. It was further explained that concept of the model is restricted to mean only those concrete devices used by mathematics teachers and students to demonstrate mathematical concepts. Models therefore, should represent the natural objects, they are meant to represent. Which model demostration approach can do in quadratic equation.

According to Bal (2013), mathematics models can be considered as a simplification or abstraction of a (complex) real world problem or situation into mathematical problem. It was further explained that mathematics problem can be solved using whatever known techniques to obtain a mathematical solution. This solution is then interpreted and translated into real term.

Gagne and Berliner, (2014), viewed a model as a visual or picture, which highlight the main idea of a variable in a process or system. Gagne further stated that the use of model as learning aids have two Secondary benefits. Firstly, models provide accurate and useful representations of knowledge that is needed when solving problems in some particular domain. Secondly, a model makes their process of understanding a domain of knowledge easier because it is visual expression of topic. It was found out that pupils who study with models may recall as much as 57% or more on questions concerning conceptual information than pupils who receive instruction without advantage of seeing and discussing models.

With the view of Gagne and Berliner, graphical-symbol communication will be a useful model in ratio learning, which will help Secondary school pupils to understand ratio-relationship visually, Alesandrini, (2012), came with his own idea similar in conclusion,

when he studied different pictorial-verbal strategies in learning from his research on the effectiveness of pictorial-verbal representation. From his own study, the learner draw their own conclusion that the act of building the model and running the simulation gives them a deeper understanding of the sensitivity of the cycle outside disturbances and reinforces the concepts underlying the model.

Ryder (2014), view model as myths and metaphor that helps us to make sense of our world. Whether it is derived from which or from serious research, model is a means of comprehending an otherwise in comprehensible problem. According to Ryder an instructional design model gives structure and meaning to an identity problem enabling the would be designer to negotiate her design with a resemblance of conscious understanding. Model helps us to visualize the problem, to break it down into discrete management units. Hence in ratio relationship, graphical-symbol model will reduce cognitive stress and increase visual idea, which will make ratio learning more realistic and for easy understanding. Ryder further stated that pupils who are engaged in the model building process must pull together science content, mathematics skills and logical problem solving. Skill manipulating materials, are also regarded (as concrete models) in mathematics learning.

Lesh (2014) suggested that concrete models can be effectively used as an intermediation between the real world and the mathematical world. He contended that such used world tend to promote problem-solving ability by providing a vehicle through which children can model real-world situations. The use of concrete model in this manner is thought to be more abstract than the actual situation yet less abstract than formal symbol. With Lesh's idea, graphical-symbol approach will model ratio relationship visually and graphically and make it to depart from traditional ratio learning.

Borne (2010), viewed concrete models as those objects that can be touched and moved by pupils to introduce and reinforce a mathematical concept. With Borne's view, graphical-symbol approach will reinforce mathematics learning.

Hartshrn (2011), suggested that manipulative materials are particularly useful in helping pupils move from concrete to abstract level. Teachers, however, must choose activities and concrete models carefully to support the introduction of abstract symbols.

Hedden (2016), divided the transition iconic level (the level between concrete and abstract) abstract levels in the following way:-

The semi concerted level is a representation of a real situation; pictures of the real items are used rather than the items themselves. The semi abstract level involves a symbolic representation of concrete item but the pictures do not look like the objects for which they stand.

Ang. Keng Cheng (2012), viewed mathematical modeling as a process of representing real world problems in mathematical term in an attempt to find solutions to the problems. Model-symbol communication will serve as modeling in ratio learning, it will be a process of real world problem in ratio relation and help the solution to graphical problem.

Mathematics Modeling Our World is founded on the principles that mathematics is a necessary tool for understanding the physical and social worlds in which we live. Mathematics Modeling Our World is a grade 9 – 12 curriculum, which included the Secondary six mathematics curriculum, in which pupils not only learn mathematics, they also learn to use mathematics, in solving their problems. MMOW support that pupils are taught to use a variety of resources to solve problems, and they learn to choose resources that meet the need of a particular solution.

With the view of Mathematic Modeling Our World, graphical-symbol communication will serve a variety resource to solve ratio problem that will meet the need of ratio solution.

English and Halford (2012), said that, modeling involves the establishment of links among representations of a mathematical concept and its relationship to other concepts. More importantly a model needs to externalize the links to the learner in ways that would help him or her to visualize them. Graphical symbol model will externalize the ratio relationship to the ways that would help them to visualize the relationship. Furthermore, English and Halford explained that modeling involves the deputation of the relations that are embedded in a scheme both graphical or concretely. The modeling process could also contribute to expansion of Networks of schemes that are associated with mathematical concepts resulting in deeper understanding. Modeling activities must also have an inbuilt flexibility to help children externalize constituents of a model. These activities need to be grounded within the experiences of children, including observation of concerts in real life contexts. Explanation would also reveal conjecture about other situations and solved problems. California (2009) symposium, pargarmon, view modeling as the use of a formal language (symbolic or grammatic) to present some knowledge short.

Pictorial -symbol communication will be used as a language to communicate quadratic equation ideas Pictorially and visually.

2.1.7 Academic achievement in mathematics

According to Oxford Advanced Learner‟s Dictionary, to achieve means to succeed in reaching a particular goal; status or standard especially by making an effort for a long time. Achievement is a noun. It means a thing that somebody has done successfully; especially using his/her own effort and skill. Achievement in this context refers to the

cognitive achievement of students that can be measured in terms of passes in mathematics test or examination that would be administered by the teacher or examination bodies. In line with this, Sofolahan in STAN (2011) states that when a learner accomplishes a task successfully, reaches a goal for learning experiences, the learner is said to have achieved something.

Recent research reports show that achievement in Mathematics has continued to be low. Salman (2014) states that students‟ performance in first leaving certificate mathematics examination has remained very low as many of the candidates scored zero or marks within zero range. In the same vein, Ezeamaenyi (2017) remarks that SUBEB Chief Examiner's Report on Mathematics portray poor performance. He goes further to state that WAEC (2014) in its report writes "very poorly, only thirty nine percent of all the students who sat for the examination in Mathematics succeeded"; furthermore FME (2016) observes that students still perform poorly in mathematics. These poor achievements of students in mathematics have been blamed on the teaching methods and strategies used in teaching the students by the teachers. Students are expected to be high achievers in Mathematics because of its importance. The researcher then feels that problem-solving Teaching method could be of much help.

2.1.7.1 Concept of gender and academic achievement

Gender refers to the varied socially and culturally constructed roles, qualities, behavior that are ascribed to women and men by different societies (UNICEF, 2012). Bassow (2014) defines gender as a psychological term describing behavior and attributes expected of individuals on the basis of being born either male or female. Keller (2011) says gender is a cultural construct developed by the society to distinguish the roles, behavior, mental and emotional characteristics between males and females. Sadiq (2013) says that sex is a physical distinction; gender is a social and cultural one. This

implies that roles and expectations of males and females are defined by societies and cultures.

2.2 Theoretical Framework

Deep structural changes are needed in the ways that societies manage their economic, social and environmental affairs. Hard choices are needed to move from talk to action to bring about changes among the developing nations. The theory is utilized in the creation of instructional environments. As it is with other field of leaning, discovery relies on the general theory of learning for the development of its instructional material. Since technology has recognized how we live, how we communicate, and how we teach, Fox (2015).

Theoretically, this research work on the effect of development of instructional model on mathematics achievement in secondary school students in Minna metropolis of Niger State is based on the theory of instructional model in learning. This theory is attributed to Bruner (2009) he viewed knowledge to be internalized by the learner through the process of accommodation and assimilation. That a child comes from a home and mingled with peer group that may not be interested in mathematics. When opportunity is given to them to construct things on their own, it may withdraw their averted mind. Fox (2015) believed that students construct their own reality or at least interpret it base on their perceptions and experience, so an individual's knowledge is a function of one's prior experiences, mental structures and beliefs that are used to interpret objective and events.

2.3.1 Constructivism and learning

Fox (2015), state that knowledge is constructed from experience and learning is a personal interpretation of the world. It is an active process in that meaning is developed on the bases of experience and conceptual growth comes from negotiation of meaning,

the sharing of multiple perspectives and the changing of our internal representations comes through collaborative learning. Learning should be situated in realistic setting, testing should be integrated with the task and not in a separate activity.

Learner constructs their own knowledge. Students are encouraged to be creative in searching for the actual result. Nwosu (2015) stated that with the constructivist model of instruction, students redefine, recognize, elaborate and change their initial concepts through interaction within themselves and their environment.

2.3.2 Learning theories on instructional materials

Mathematics Instructional materials are animated or inanimate objects that assist the teacher in making mathematical concept skill more meaningful and understandable to the learner (Ashforth, 2011).

Piaget (2009) as an educational psychologists and child development in learning, in his own theory of learning stated that, "subjectivity of representation in child development is encouraging the use of concrete models in teaching and learning of mathematics from Secondary school level". Piaget further said that learning goes well from concrete to abstract. According to Jean proper use of concrete model could promote the broad goals alluded in mathematics learning. He made coherent rational for the use of concrete models in the learning of mathematics. Secondary school pupils who were mainly at age of concrete operational stage according Piagets need to learn more with instructional materials.

Brunner (2013) in his constructivist theory, stated that learning is an active process in which learner construct new ideas or concepts based on their current or past knowledge. Bruner who said that, "instructional materials are used to provide the meaning and organization to experiences and allow the individual to go beyond the information given". According to Bruner, the teacher should try and encourage pupils to construct

hypotheses, make decisions and discover principles by themselves. Bruner (2013) stated that, a theory of instruction should address the following aspects.

The most effective sequences in which to present materials

The ways in which a body of knowledge can be instructed so that is can be most readily grasped by the learner, i.e. through instructional materials.

Gagne (2014) in his theory on instructional material was particularly influenced in the training and the design of instructional materials in teaching and learning. According to Gagne (2010), "a variety of learning activities should enforce effective learning". Gagne further said that instructional designer should anticipate and accommodate alternate learning styles by systematically varying teaching and assessment methods to reach every pupil to achieve Gagne's theory instructional materials are to be used in mathematics teaching and learning.

A review of literature indicates that many people emphasize the importance of instructional materials in promoting meaningful mathematics instruction. The use of instructional materials is not new (Grossman, 2010). Grossman further points out that because of the importance of instructional materials in teaching and learning, educationists have been advised in 1885 to employ manipulative materials in teaching concepts in Mathematics.

Damisa (2007) stated that for a mathematics teacher to achieve his objective in the classroom, he must find other devices for the students to see, touch, hear and make use of these devices, but the time allocated to mathematics, may at times, obstruct the seeing and using of these devices provided. Balogun (2015), observed that failure by teachers to use appropriate instructional materials, poor teaching methods, such as lecture and direct information dissemination method, make pupils loose interest and thus perform poorly in mathematics.

Some psychologists have studied the effects of the manipulative materials on achievement, retention, attitude and transfer of mathematical concepts. Their findings led scholars, such as Jean Piaget, Jerome, Brunner, Gagne, to draw conclusions on the effect of instructional materials on pupils achievement in learning.

2.3.3 Model development in mathematics learning

Mega mathematics (2014), said that when mathematics talk about model they are mostly likely to be thinking of collection of picture and structure that you see in the illustration of this section. Sometimes, graphs are called networks, and a glance at pictures of them will show you why. Mega mathematics further added that graph could be seen as one of the mathematical objects, which make mathematics learning more transparent. Model-symbol will make quadratic equation learning learning transparent.

Graph game, (2014), show that a number is also a mathematical object that is probably the most familiar to everyone. Some other mathematical objects are knots maps and infinite state machine, linear graph and picture representation will make ratio learning more transparent. The idea of graphical-symbol approach will help pupils to make ratio relationship more transparent.

National Council of Teachers of Mathematics of American (NCTM) gave a recommendation which includes in their goals that pupils in grades 3 – 6 should be able to represent data using tables and graphs such as lines and pots bars graphs and line graphs, pie chat stem graphs (standard 5, p. 178), graphical-symbol approach will serve positively in ratio learning and the idea of linear graph should be introduced to make a very important point about this goal of (NTCM).

Van de Walle (2010), suggested that teachers should not “get overly anxious about the tedious details of graph construction”. According to Walle, teachers should take one or two approaches to graph construction. Pupils should either be encouraged to do their

best when creating their own graphs or that student should use technology and computer to generate exact graphs. Some types of graphs that should be taught include bar, stem and leaf plots and continuous data graphs. Van de Wall has been encouraging the use of graph in Secondary school mathematics learning. As he had been mentioned the other types of graphs used in Secondary school. Graphical-symbol approach in ratio learning will bring about the idea of line graph in Secondary school mathematics learning.

2.4 Related Empirical Studies

Okorie, Onuoha, Anayanwu and Ugochukwu (2012) researched on, "the extent of use of visual aids in the teaching of mathematics in Okigwe and Owerri Educational Zone in Imo State. The research was a descriptive survey research. The research was carried out in all the secondary schools in the two above-mentioned educational zones. 55 mathematics teachers were chosen in the schools and were used. 850 students were randomly selected from the secondary schools. The main instrument used for the data collection was questionnaire, seven research questions were tested, 5 hypotheses were made. Two sets of questionnaire were administered to the two groups of respondents by the researchers themselves. Pearson's moment correlation technique was used to compare the response. A correlation co-efficient of 0.81 was obtained. This was considered high enough. Chi-square was employed in data analysis. From the findings, it was concluded that visional aids are of immense important in teaching and learning of mathematics. They spaced the lessons and spread interest hence reducing boredom that is often necessitated due to the abstract nature of mathematics. Instructional material help to reduce verbalism and give a concrete touch to the teaching of mathematics. It is often said that seeing is believing. With instructional materials students are convincingly taught mathematical facts without necessarily imposing facts on them and hence forcing them to cram these facts. Learning thus becomes natural and active

participation of every member of the class is ensured. A combined effect of hearing seeing and doing will be enabling and ensuring retention. This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. but differ in instruc0tional approaches and as well as study population.

Emmanuel (2013), in worked on the, "Impact of the audio-visual aids in the teaching of mathematics". The research was deceptive survey. It was carried out in the secondary schools in Otukpo in Benue state. 6 schools were out of 10 schools in the area. Interview was used to collect data from mathematic

s teachers and students from the six schools. One hypothesis was tested, which stated, schools which employ more audio-visual aids in mathematics get better results in mathematics than those which employ fewer". Tables of percentages were used respectively for the presentation and analysis of the data obtained during the study. From findings, it implies that mean calculated was approximately 0.9. This implies that there is a strong positive linear relationship between dependent variable (x) and the independent variable (y) tested. This means that x increases, and also y increases. This means that when more audio visual aids are employed, in teaching and learning of mathematics, more students will pass therefore the hypothesis which employ more instructional materials in mathematics teaching, get better results holds. This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. But differ in instructional approaches and as well as study population.

Piaget and Diene (2016), stated that, in order to create a meaningful mode. After validating their model through, they used their model to test the effectiveness of model on pupils achievement in learning. This hands-on approach to constructing knowledge

about a system results in laboratory type setting and has been attributed to the words. According to them, proper and use of concrete models could be used to promote the broad goals alluded, in mathematics learning. Each of these men has made coherent rational for the use of concrete models in the learning of mathematics concepts. This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. but differ in instructional approaches and as well as study population.

Bruner *et al*. (2014) wrote "seeing is a decision making process". Post on his studies on the effect of concrete model and operation in pupils' achievement in a mathematics. His theoretical study was base on the works of Piaget, Brunner and Diene. The learning theories were based on the effect of concrete model and operation in pupils' achievement in mathematics. The men discussed based on their intellectual views on pupils' achievement mainly on concrete operations effect in mathematics learning. Based on that, concrete models were encouraged for pupils achievement. On the research of the role of concrete models in the learning of mathematical concepts. Given share number of studies Post (2013), cited some undertaken, it is perplexing to note that more is not known about the precise way in which concrete model effect the development mathematical concepts. Perhaps that largest contribution factor to this has been the lack of coordinated research efforts that have mapped out a priori and have designed individual investigation that would have provided coordinated answers to sets of related question rather, the past pattern of research has been that of large numbers individually conducted investigations and then postersion attempts to relate them in some fashion. This has not been particularly fruitful and has left many unanswered questions and hungers gaps in our knowledge. One obvious fact is that the study of models is a crucial need in the area of Secondary mathematics learning. Due to some

positive effects of these models on Secondary school mathematics learning some researchers has worked on its uses and effects. The most recent and comprehensive review of research on the use of concrete models was complied at the mathematics and science information references center at Ohio State university (ERIC) by Suydam and Higgins (2012). The result generally concluded that concrete models are effective in promoting pupils achievement but emphasizes the need for additional research. This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. But differ in instructional approaches and as well as study population.

Lowrie (2011), did a study in presentation and mathematics learning. The research was carried out to identify the effect of representation of mathematics concept by using models. Again Lowrie (2011) identified three categories of problem solving approaches to include visualizes, verbalizes, and both user and we as the role of imagery in problem solving. Lowrie (2011) found out that 42% of the participants solving the mathematical participants solved the mathematical problems using the visual technique. Umeron Ukaha, Chukwu (2010), in his study on mathematics modeling approaching to the task in teaching algebra among students. The research was carried out with quasi-experimental design to investigate the effectiveness of using geometric models in teaching algebraic expansions and factorization to junior secondary. A total number of sixty – (60) students were selected randomly and grouped into mathematics modeling approach (MMA) group and traditional method (TM) group for the study. TM was used as control over MMA, which the researcher set out test. Each group containing 30 students with equal males and females. The study was carried out in a mix school. The instrument used for the data collection was test. The test was organized in form of pre-test and post-test. The data were analyzed by use of (ANCOVA). Four research

questions were tested and analyzed. Their scores were organized under MMA and TM and analyzed. The analysis of the pre-test revealed that there was equivalence in the mathematical abilities of the experimental and control groups at the beginning of the experimental. It was also found that there were significant differences between their performances

- The mean performance of students taught using MMA and that of those taught using TM.
- The mean performance of boys taught using MMA and girls taught using MMA.
- The mean performers of girls taught using MMA and that of those taught using TM.

From the analysis the mean score of the students in the experimental group was 23.43 while that of those in the control group was 15.93. And since the mean score of those in experimental group was 15 – 93 and the mean score of those in experimental group was higher, the claim was that the Mathematics Modeling Approach (MMA) was better methods of teaching algebraic expansion and factorization than traditional or control method (TM or CM). This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. But differ in instructional approaches and as well as study population.

Diezmann (2011) reported that in order to develop the pupil's ability of using diagram as cognitive tools, teachers need to assess the quality of diagrams and provide them with the necessary support. The theoretical framework of Diesmans, (2011) research on "Assessing the research on representation of mathematical problems by using diagrams. Furthermore, matrices networks and hierarchies and range of that represent part-whole characteristics. Diezmann, Francis, Horley & Novice, (2014) were taken into account

of this study the aim of Diezmann's study was to explore how the quality of diagrams can be assessed using theoretical prototype, and specifically, how prototypes can be used to identify the different levels of performance. Diezmann's (2011) research was a case study of 12-year-old five pupils who were both from high and low achievers in mathematics as well as high and low performers in visual methods of solution. The instruction of twelve half-hour lesson addressed the four general purpose of diagrams generation and its use in novel problem-solving tens. Interviews were conducted before and after the instruction and along with the task related to the five "isomorphic problem". The levels of study-generated diagrams were criteria; level 0 was assigned when the diagram, level 1 was categorized for the plausible diagram but lacking on assigning the appropriate component of the structure, level 2 was assigned for the diagram which represented at least one but not one components of the structure, and level 3 was labeled for such diagram that represented all the components of the structure appropriately. This study is similar to the present study considering the subject matter which is achievement in Mathematics, like wise in terms methodology which is experimental research design. But differ in instructional approaches and as well as study population.

2.5 Summary Literature Review

The literature review so far has shown that the need of use of instructional model in teaching mathematics as many factor attributing to low achievement of senior secondary school has been reviewed. The review literature has revealed numerous factors affecting academic performance of examination. The concept of model development as instructional material need to enhance the achievement in Mathematics most especially in quadratic equation. The review theories also show the significance of model in Mathematics teaching and learning, which are the main drive for the study.

The empirical studies on teaching methods and academic achievement, were reviewed and there exist little or no in the research report/finding on the effect of quadratic equation instructional model on mathematics achievement. The present study sought to fill this gap by finding out the effect of quadratic equation instructional model on mathematics achievement in Minna metropolis of Niger State.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter is presented under the following sub-headings: research design, population of the study, samples and sampling Procedure, instrumentation, validity of instrument, reliability of instrument, pilot study, instrument administration, data collection procedure and data analysis.

3.2 Research Design

The study is quasi experimental with pretest, posttest test experimental and control groups. In the design, both the experimental and the control groups will be pre-tested to ensure group equivalence, thereafter exposed to treatment for 6 weeks and at the end of which post-test will be administered to determine students' achievement and two week later. The design is illustrated thus:

CG → O1 → LM → O2 → EG → O1 → ASIM → O2 → Where:

Label		Variable
CG	=	Control Group
EG	=	Experimental Group
O1	=	Pretest
O2	=	Post test
CM	=	Conventional Method
ASIM	=	Abacus & Shapes Instructional Material

3.3 Population of the Study

The population for this study will consists of all Primary I students in Kuyanban Primary Schools Minna. The total student's population consists of 53 consisting of 27

males and 26 females. All schools offer courses in counting and basic calculation with particular reference to measurement, which is relevant to this study.

3.4 Sample and Sampling Procedure

A random sampling technique will be used in this study to select the samples. According to Tuckman (2012) random sampling is a sampling procedure that assures that each element in a population has an equal chance of being selected. The researcher group the names of all the students in primary one into two intact classes for both control and experimental group that is by pulling out 15 student for each group. Hence, in this study, 2 intact classes have been randomly selected for the study.

Total numbers of 30 students will be pre-tested in order to ascertain their group equivalence. The sample groups known as the experimental group and control group. The experimental group will be exposed to counting and calculation using abacus and shapes while control group were taught the same concepts using conventional method.

3.5 Instrument for Data Collection

One instruments will used in this study for data collection namely Counting Achievement Test (CAT).

Counting Achievement Test (CAT)

The counting achievement test consisted of set of ten (10) multiple choice items designed to reveal the level of students understanding of the basic counting and calculations.

The Ten (10) multiple choice items consisted of five response option, one of which is the correct answer while the remaining four serve as distracters. The test items were in conformity with Bloom's taxonomy of the cognitive domain, i.e. knowledge, comprehension, application, analysis, synthesis and evaluation.

3.6 Validity of the Instruments

For the purpose of this study, experts in mathematics education and measurement will be used to carry out the validation of the instruments. The validators chosen include two experts in mathematics education in department of science education, Federal University of Technology, Minna and the teachers teaching the classes of the primary school of the affected school in Minna, Niger State.

3.7 Reliability of the Instrument

For the purpose of this study, a test retest form of reliability method of analysis using the spearson product moment correlation coefficient statistics will be used to determine the reliability of the counting achievement test (CAT) through pilot study. The same test will be administered on two different occasions at two weeks interval as recommended by Tuckman (2012) the scores from the two administrations will be correlated as an estimate of the reliability of the test Sambo (2015). A pilot study will be conducted in Kuyanbana Primary School for two weeks. Two classes of Nursery II Students will be randomly selected for the trial.

3.8 Method of Data Collection

The data will be collected using the Counting Achievement Test (CAT) will be used to generate two types of data viz:

Pre-Test Data (to ascertain their group equivalence)

Post- Test Data (to ascertain their achievement level)

The 2 types of data generated were then analyzed in relation to the research questions investigated.

3.9 Method of Data Analysis

Different statistics will be used to analyze the data collected. Descriptive statistics mainly mean, standard deviation and frequency will be calculated and inferential

statistics mainly t-test will be used to analyze the null hypotheses at $\rho \leq 0.05$ level of significance. Furthermore, the t-test will be chosen because it is the most appropriate statistical test for determining the significance of the difference between means when the number of subjects in the two groups being compared is about equal.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

The organization of data for the study was obtain from the instrument administered to the two groups. The control group is made of thirty - six (26) students, while the experimental group is made up of forty-four (24) students from in Kuyanbana Primary School Minna. The result was presented in table according to the analysis of the instrument administered to the two group.

4.1 Results

4.1.1 Pretest Result

Table 4.1 Mean and Standard Deviation of Pretest Score of Control and Experimental Groups

Variable	N	Pre-test Score $(\bar{x})$	SD	Post test Score $(\bar{x})$	**SD**	**Gain Score**
Experimental Group	24	21.70	3.84	35.36	3.62	13.66
Control Group	26	21.49	4.26	28.90	5.33	7.41

Table 4.1 above revealed that the students who were taught mathematics using shapes and Ababus has proportionately higher achievement than those who were taught using conventional method. The observed variability was reflected before and after the test but the proportionate increase among students who were taught using shapes and abacus is higher than that observed among students in the conventional method with mean gain score of 13.66 and 7.41. This imply that the use of shapes & abacus in the teaching of counting and basic Addition and Substraction has a relative edge over the use of conventional method.

Table 4.2 Mean Score Gain of Male and Female Students Taught Mathematics Using Shapes and Abacus

Variable	N	Pre-test Score ($\bar{x}$)	Post-test Score ($\bar{x}$)	Mean Gain Score	Gain Difference
Male	14	22.35	36.06	13.71	0.13
Female	10	20.78	34.36	13.58	

Table 4.2 shows the mean achievement score of male and female students taught mathematics using shapes and abacus, the outcome of the result shows that the mean gain score of 13.71 and 13.58 for male and female respectively. The gain difference in score of the male and female is 0.13. This implies that male perform better than female while taught using abacus and shapes.

4.1.2 Analysis of Research Hypotheses

H_{O1}: There is no significant difference in the mean achievement scores of students taught Mathematics using shapes & abacus those taught with conventional method.

Table 4.3: t-Test Analysis of mean achievement scores of students taught Mathematics using Abacus & Shapes and those taught with conventional method

Variable	N	Df	$\bar{x}$	SD	t-val	p-value	Decision
Experimental Group	24	38	35.36	3.62	2.68	0.02	S
Control Group	26		28.90	5.33			

*S = Significant

Table 4.2 shows the significant difference in the post-test gain scores in the performance of students taught Mathematics using abacus & shapes and those taught with conventional method. The outcome of the result shows that the means score of those students taught conventional method is 28.90, SD = 5.33, while those taught using

shapes & abacus is 35.36 and the SD=3.62, df = 38, with p-value of 0.02 which less than alpha significance level of 0.05 that is p-value 0.02 < 0.05. The null hypothesis is thereby rejected. Hence, that there is statistical significant different between the mean achievement score of students taught using shapes & abacus to conventional method.

H_{O2}: There is no significant difference between the mean achievements scores of male and female students taught mathematics using shapes & abacus

Table 4.4: t-Test Analysis of mean achievement scores of male and female taught Mathematics using shapes & abacus

Variable	N	Df	$\bar{x}$	SD	t-val	p-value	Decision
Male	14	22	36.06	3.04	1.36	0.89	NS
Female	10		34.36	4.21			

*NS = Not Significant

Table 4.4 shows the t- test analysis for no significant difference in the post-test gain scores in the achievement of male and female students taught Mathematics using shapes & abacus. The outcome of the result shows that the male means score is 36.06 and the SD=3.04, df = 22, while the female mean scores of those taught without materials is 34.36, SD = 4.21, with p-value of 0.89, therefore the null hypothesis which is no significant difference in mean achievement score of male and female students taught using shapes & abacus was not rejected. Hence, there was no statistical significant different between male and female students' achievement score when expose to shapes & abacus.

4.2 Discussion of Result

The analysis of research hypothesis revealed that experimental group (shapes & abacus) did better than the control group (conventional method), although there is no difference in achievement of male and female students in the experimental group that where taught using shapes & abacus, the following are findings of the study in detailed.

The findings of the study revealed that there was significant difference in the post-test in the achievement of students taught Mathematics using shapes & abacus and those taught with conventional method. The outcome of the result shows that there is statistical significant different between the mean achievement score of students taught using shapes & abacus and those taught using conventional method, with the p-value (0.02) < 0.05. This shows that the use of shapes & abacus improves the students understanding of mathematics more than the students taught using the conventional method.

The findings emanated from the study also disclosed that there is no statistical significant difference between male and female students' achievement score on exposure to shape & abacus, that is the performance of students expose to shapes & abacus is not based on gender. This in line with the finding of (Okereke, 2006), the author investigated the effects of constructivists' instructional approach on students' achievement in basic mathematical concepts in Mathematics. The findings of the study revealed that gender does not influence academic performance in mathematics.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the findings of the study, on the shapes & abacus learning instruction on the academic achievement of concept of counting and basic addition & subtraction by primary school students. it could be concluded that shapes & abacus helps to improve the achievement of student. The study further highlighted the positive influence of shapes & abacus on academic achievement of student in Mathematics.

From the findings of the study it could be concluded that there is significant difference in the academic achievement of students taught Mathematics using shapes & abacus and those taught with conventional method. Hence, shapes & abacus improves the academic achievement of the study than the conventional method.

It could also be concluded from the findings emanated of the study that there no significant difference in the achievement scores of male and female students taught Mathematics using shapes & abacus. Hence, the use of the shapes & abacus is not gender bias.

5.2 Recommendations

Based on the findings of the study the following recommendation were made:

1. The Ministry of Education should encourage the use of shapes & abacus in teaching Mathematics in primary School.
2. School Authority and teachers should be enlighten on the importance of shapes & abacus in teaching.
3. The students should also be enlighten on the importance of shapes & abacus for learning.

5.3 Suggestion for Further Study

Based on the findings of the study the following are suggested for further research:

1. Assessment of factors affecting the adoption shapes & abacus among teachers and students in primary school in Minna metropolis.
2. Influence of instructional model learning instruction on the academic achievement and retention of student mathematics students' shapes & abacus

3. 5.4 Contribution to the Knowledge

1. The study serves as an insight to the adoption of the use of shapes & abacus in the teaching / learning of Mathematics in Niger State.
2. The study also adds up to the already exiting literatures in the implementation of shapes & abacus learning facilities in the teaching and learning of Mathematics

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APPENDIX A

LESSON PLAN
CONTROL GROUP

LESSON ONE
CLASS: PRY I
SUBJECT: MATHEMATICS
TOPIC: ADDITION AND SUBTRACTION OF NUMBERS
(i) SUB-TOPIC: ADDITION OF NUMBERS
TIME: 8:00 – 8:40
DURATION: 40 MINUTES
AVERAGE AGE OF STUDENTS: 6 YEARS
BEAHVIOURAL OBJECTIVES: By the end of the lesson student should be able to:
(ii) Outline the steps involved in addition and subtraction of number
(iii) Use of techniques to solve addition and subtraction of number
ENTRY BEHAVIOUR: The students have learnt how to count numbers 1 – 500.
INSTRUCTIONAL MATERIAL: Chalkboard/Marker

Content Development	Strategies	Teaching Activities	Student Activity
Introduction	Questioning	The teacher introduces the topic by asking the student questions based on the previous knowledge, on counting numbers.	Student attempt to answer the questions
Overview on completing the square method	Explanation and illustration	Addition of numbers is being explaining to the student by writing them on the chalkboard.	The student listens and follow up with teachers. And ensure they conform with the stated facts.
Apply the method	Illustration	Teacher write example on chalkboard 1 + 5 =	The students follows the steps as illustrated by the teacher and the application of completing the square

		The teacher ask the student to count 1 and 5, then count it together to give 6.	method.
Apply the method	Illustration	Teacher write example on chalkboard T U 1 5 +5 1 6 6 The teacher ask the student to count 1 and 5, then count it together to give 6. The teacher ask the student to count 5 and 1, then count it together to give 6.	The students follows the steps as illustrated by the teacher and the application of completing the square method.
Evaluation	Questioning	The teacher gives the student s the following class work to do 14 + 75 = T U 1 4 +7 5 _____	The student attempt to answer the class work
Summary and Conclusion	Explanation	The teacher revises topic and marks the students' class work	

Assignment: Solve

T U
1 4
+7 5

LESSON PLAN
CONTROL GROUP

LESSON TWO
CLASS: PRY I
SUBJECT: MATHEMATICS
TOPIC: ADDITION AND SUBTRACTION OF NUMBERS
(iv) SUB-TOPIC: SUBTRACTION OF NUMBERS
TIME: 8:00 – 8:40
DURATION: 40 MINUTES
AVERAGE AGE OF STUDENTS: 6 YEARS
BEAHVIOURAL OBJECTIVES: By the end of the lesson student should be able to:
(v) Outline the steps involved in addition and subtraction of number
(vi) Use of techniques to solve addition and subtraction of number

ENTRY BEHAVIOUR: The students have learnt how to solve linear equations, perfect square, factorization method of solving quadratic equations.

INSTRUCTIONAL MATERIAL: Chalkboard/Marker

Content Development	Strategies	Teaching Activities	Student Activity
Introduction	Questioning	The teacher introduces the topic by asking the student questions based on the previous knowledge, on addition of numbers.	Student attempt to answer the questions
Overview on completing the square method	Explanation and illustration	Subtraction of numbers is being explaining to the student by writing them on the chalkboard.	The student listens and follow up with teachers. And ensure they conform with the stated facts.
Apply the method	Illustration	Teacher write example on	The students follows the steps as

		chalkboard 5 - 1 = The teacher ask the student to count 5 and take away 1 We have 4	illustrated by the teacher and the application of completing the square method.
Apply the method	Illustration	Teacher write example on chalkboard T U 7 5 -5 1 2 4 The teacher ask the student to count 5 then 5, then count it together to give 6. The teacher ask the student to count 5 and 1, then count it together to give 6.	The students follows the steps as illustrated by the teacher and the application of completing the square method.
Evaluation	Questioning	The teacher gives the student s the following class work to do 14 + 75 = T U 1 4 -7 5 _____	The student attempt to answer the class work
Summary and Conclusion	Explanation	The teacher revises topic and marks the students' class work	

Assignment: Solve

T U

7 5
-7 2
_____

LESSON PLAN
EXPERIMENTAL GROUP

LESSON ONE
CLASS: PRY I
SUBJECT: MATHEMATICS
TOPIC: ADDITION AND SUBTRACTION OF NUMBERS
(vii) SUB-TOPIC: ADDITION OF NUMBERS
TIME: 8:00 – 8:40
DURATION: 40 MINUTES
AVERAGE AGE OF STUDENTS: 6 YEARS
BEAHVIOURAL OBJECTIVES: By the end of the lesson student should be able to:
(viii) Outline the steps involved in addition and subtraction of number
(ix) Use of techniques to solve addition and subtraction of number
ENTRY BEHAVIOUR: The students have learnt how to count numbers 1 – 500.
INSTRUCTIONAL MATERIAL: Chalkboard/Marker

Content Development	Strategies	Teaching Activities	Student Activity
Introduction	Questioning	The teacher introduces the topic by asking the student questions based on the previous knowledge, on counting numbers.	Student attempt to answer the questions
Overview on completing the square method	Explanation and illustration	Addition of numbers is being explaining to the student by writing them on the chalkboard.	The student listens and follow up with teachers. And ensure they conform with the stated facts.
Apply the method	Illustration	Teacher write example on chalkboard	The students follows the steps as illustrated by the teacher and the

		1 + 5 = The teacher ask the student to count 1 and 5, then count it together to give 6.	application of completing the square method.
Apply the method	Illustration	Teacher write example on chalkboard T U 2 5 +5 1 6 6 The teacher ask the student to count 1 and 5, then count it together to give 6. The teacher ask the student to count 5 and 1, then count it together to give 6.	The students follows the steps as illustrated by the teacher and the application of completing the square method.
Evaluation	Questioning	The teacher gives the student s the following class work to do 14 + 75 = T U 1 4 +7 5 _____	The student attempt to answer the class work
Summary and Conclusion	Explanation	The teacher revises topic and marks the students' class work	

Assignment: Solve

T U

1 4

+7 5

LESSON PLAN
EXPERIMENTAL GROUP

LESSON TWO
CLASS: PRY I
SUBJECT: MATHEMATICS
TOPIC: ADDITION AND SUBTRACTION OF NUMBERS
(x) SUB-TOPIC: SUBTRACTION OF NUMBERS
TIME: 8:00 – 8:40
DURATION: 40 MINUTES
AVERAGE AGE OF STUDENTS: 6 YEARS
BEAHVIOURAL OBJECTIVES: By the end of the lesson student should be able to:
(xi) Outline the steps involved in addition and subtraction of number
(xii) Use of techniques to solve addition and subtraction of number

ENTRY BEHAVIOUR: The students have learnt how to solve linear equations, perfect square, factorization method of solving quadratic equations.

INSTRUCTIONAL MATERIAL: Chalkboard/Marker, Shapes of Number, Abacus

Content Development	Strategies	Teaching Activities	Student Activity
Introduction	Questioning	The teacher introduces the topic by asking the student questions based on the previous knowledge, on addition of numbers.	Student attempt to answer the questions
Overview on completing the square method	Explanation and illustration	Subtraction of numbers is being explaining to the student by writing them on the chalkboard.	The student listens and follow up with teachers. And ensure they conform with the stated facts.

Apply the method	Illustration	Teacher write example on chalkboard 5 - 1 = The teacher ask the student to count 5 and take away 1 We have 4	The students follows the steps as illustrated by the teacher and the application of completing the square method.
Apply the method	Illustration	Teacher write example on chalkboard T U 8 5 -5 1 2 4 The teacher ask the student to count 5 then 5, then count it together to give 6. The teacher ask the student to count 5 and 1, then count it together to give 6.	The students follows the steps as illustrated by the teacher and the application of completing the square method.
Evaluation	Questioning	The teacher gives the student s the following class work to do 14 + 75 = T U 1 4 -7 5 _____	The student attempt to answer the class work
Summary and Conclusion	Explanation	The teacher revises topic and marks the students' class work	

Assignment: Solve

T	U
7	5
-7	2

QUESTIONS

Instructions: Add the following

1. 4 + 6 = ☐

(a) 14 (b) 10 (c) 12 (d) 8

2. 9 + 7 = ☐

(a) 17 (b) 15 (c) 16 (d) 18

3. 10 + 6 = ☐

(a) 17 (b) 15 (c) 16 (d) 18

4. 15 + 7 = ☐

(a) 15 (b) 19 (c) 22 (d) 20

5. 11 + 4 = ☐

(a) 17 (b) 15 (c) 16 (d) 18

6.

T	U
7	5
+ 7	2

(a) 147 (b) 1198 (c) 148 (d) 149

7.

T	U
1	4
+7	2

(a) 86 (b) 87 (c) 88 (d) 89

8.

T	U
3	0
+5	9

(a) 85 (b) 87 (c) 89 (d) 91

9.

T	U
1	5
+ 1	2

(a) 17 (b) 27 (c) 37 (d) 47

10.

T	U
4	1
+7	1

(a) 77 (b) 112 (c) 119 (d) 110

Instructions: Subtract the following

1. 7 - 6 = ☐

(a) 1 (b) 2 (c) 3 (d) 4

2. 9 - 7 = ☐

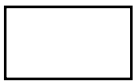
(a) 1 (b) 2 (c) 3 (d) 4

3. 10 - 6 = ☐

(a) 1 (b) 2 (c) 3 (d) 4

4. 15 - 7 = ☐

(a) 5 (b) 6 (c) 7 (d) 8

5. 11 - 3 = 

(a) 8 (b) 9 (c) 10 (d) 11

6.
	T	U
	7	5
-	7	2

(a) 3 (b) 4 (c) 5 (d) 6

7.
	T	U
	8	4
-	7	2

(a) 11 (b) 12 (c) 13 (d) 14

8.
	T	U
	7	9
-	5	9

(a) 1 (b) 2 (c) 3 (d) 4

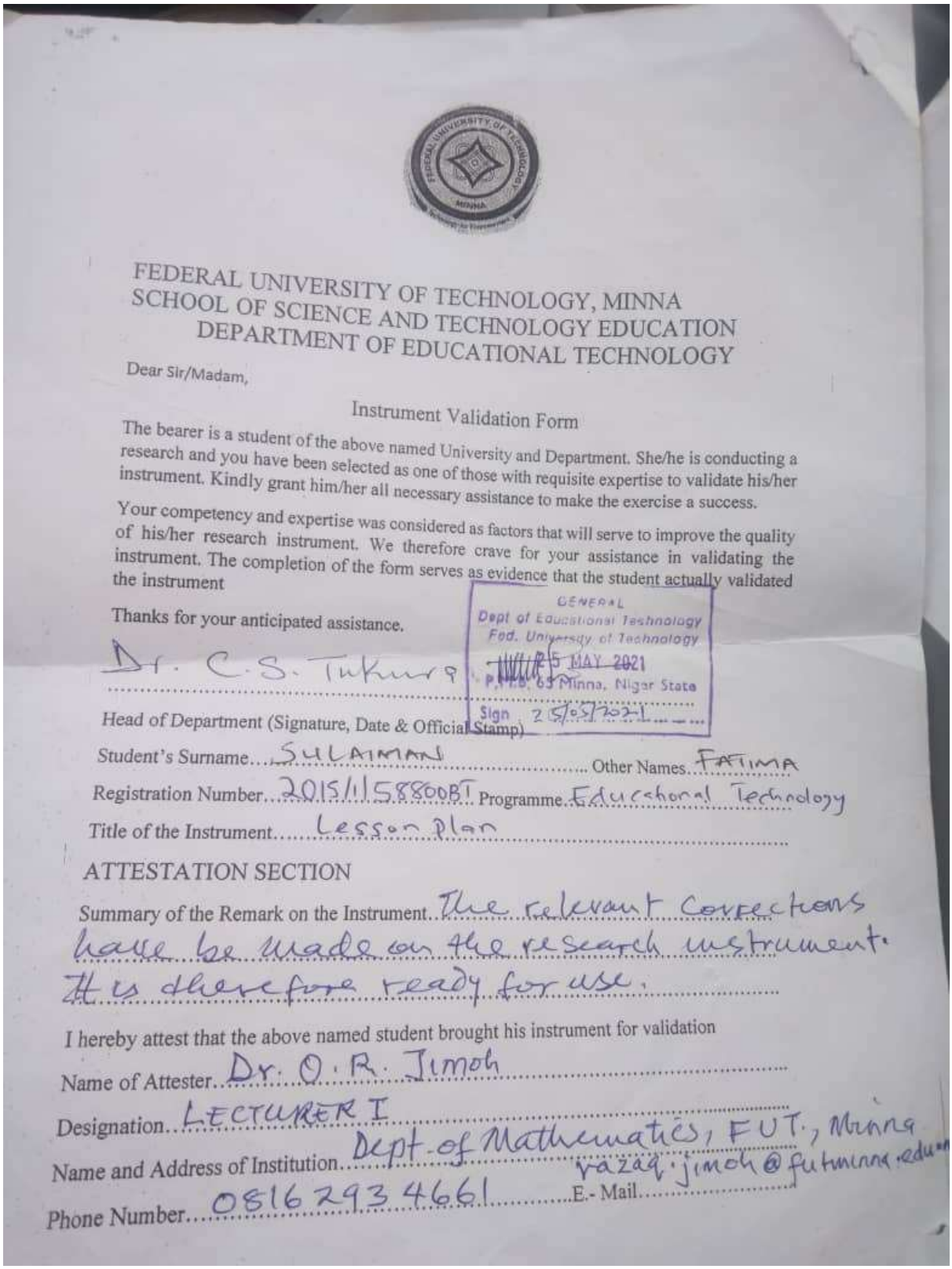
9.
	T	U
	1	5
-	1	2

(a) 1 (b) 2 (c) 3 (d) 4

10.
	T	U
	8	5
-	1	3

(a) 32 (b) 52 (c) 72(d) 92

VALIDATION FORM



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

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.

GENERAL
Dept of Educational Technology
Fed. University of Technology
P.M.B. 65 Minna, Niger State
15 MAY 2021
Sign

Dr. C.S. Tukura
Head of Department (Signature, Date & Official Stamp) 25/05/2021

Student's Surname... SULAIMAN ..... Other Names... FATIMA

Registration Number... 2015/1158800BT Programme... Educational Technology

Title of the Instrument... Lesson Plan

ATTESTATION SECTION

Summary of the Remark on the Instrument... The relevant corrections have be made on the research instrument. It is therefore ready for use.

I hereby attest that the above named student brought his instrument for validation

Name of Attester... Dr. O. R. Jimoh

Designation... LECTURER I

Name and Address of Institution... Dept of Mathematics, FUT, Minna

Phone Number... 08162934661 ..... E.- Mail... razaq.jimoh@futminna.edu.ng

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for..... Appropriate
2. Clarity and simplicity for the level of the language used..... Satisfactorily
3. Suability for the level of the targeted audience..... Suitable
4. The extent in which the items cover the topic it meant to cover..... Okay
5. The structuring of the Questionnaire..... Satisfactorily
6. Others (grammatical errors, spelling errors and others..... Minimal
7. General overview of the Instrument..... Generally the Instrument is okay

Suggestions for improving the quality of the Instrument

1. ..... NIL
2. The Lesson Plan of Experimental group need to
3. ..... include use of ABACUS
4. .....
5. .....

Name of Validator..... Dr. Bashir A. U. Yankuzo

Area of Specialization..... Mathematics Education

Name of Institution..... F.C.E.T. Minna Designation..... Lecturer

Signature..... Date..... 15/06/2021

Thank You

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

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.

GENERAL
Dept of Educational Technology
Fed. University of Technology
25 MAY 2021
P.M.B. 65 Minna, Niger State
Sign

Dr. C.S. Tukuro

Head of Department (Signature, Date & Official Stamp) 25/05/2021

Student's Surname... SULAIMAN Other Names... FATIMA

Registration Number... 2015/1/58800ET Programme... Educational Technology

Title of the Instrument... lesson plan

ATTESTATION SECTION

Summary of the Remark on the Instrument... The Instrument is okay after slight adjustment from the lesson plan of experimental group.

I hereby attest that the above named student brought his instrument for validation

Name of Attester... Dr. A.U Bashir Tankuzo.

Designation... Lect

Name and Address of Institution... F.U.T Minna (Sci. Edu Dept).

Phone Number... 08065542625 E.- Mail... bashir.au@futminna.edu.ng

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for......Appropriate
2. Clarity and simplicity for the level of the language used......Satisfactorily
3. Suability for the level of the targeted audience......Suitable
4. The extent in which the items cover the topic it meant to cover......
5. The structuring of the Questionnaire......Satisfactorily
6. Others (grammatical errors, spelling errors and others......Minimal
7. General overview of the Instrument......Generally the Instrument is okay.

Suggestions for improving the quality of the Instrument

1. ......
2. ......
3. ......
4. ......
5. ......

Name of Validator......Dr. Bashir A. U. Yankuzo
Area of Specialization......Mathematics Education
Name of Institution......F.C.E.T. Minna
Signature...... Designation......
Date......15/06/2021

Thank You