STUDENTS' PERFORMANCE IN MATHEMATICS CUURRICULUM CONTENTS OF THE JUNIOR SECONDARY SCHOOL IN ADAMAWA STATE

BY

KADALA, JACOB TSUWI

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DECLARATION

I hereby declared that, this thesis has been written by me and that it is a record of my own research work. It has not been presented in any previous application for a higher degree. All quotations are indicated by quotation marks or indentation and the source of information are specifically acknowledge by means of references.

22/07/2005

CERTIFICATION

This thesis entitled: "A Study of Students' performance in mathematics curriculum content of the Junior Secondary School Students in Adamawa State" by Kadala Jacob Tsuwi meets the regulations governing the award of the degree of Masters in Education (Mathematics Education) of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

DR. C. BOLAJI
CHAIRMAN, SUPERVISORY COMMITTEE

02-08-99
DATE

DR. I.O. INEKWE
MEMBER SUPERVISORY COMMITTEE

2/8/99
DATE

DR. M. MUSA
SECTIONAL HEAD OF MATHEMATICS EDUCATION

2/8/99
DATE

DR. B. A. SAWA
HEAD OF EDUCATION

14. 09. 1999
DATE

PROF. S. B. OJO
DEAN OF POSTGRADUATE

04/04/03
DATE

DEDICATION

This research work is dedicated to my parents, Late Mallam Kadala Tsuwi and Madam Esther Naidanga Tsuwi who saw the need for my future education.

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ABSTRACT

This study investigated the mathematical performance of Junior Secondary III Students in the various Curriculum content areas of the Junior Secondary School mathematics Curriculum. It also investigated students' areas of difficulties in each of the four broad content areas. Four major hypotheses were formulated and tested.

A sample of 360 Junior Secondary III Students were drawn from 24 Junior Secondary School in Adamawa State. The were tested with an attainment test developed by the researcher. In order to test the hypotheses analysis of variances, T-test for independent samples and Scheffe's test were employed. The level of significance was at 0.05. The general performance of the JSS III students in this investigation has shown the JSS students demonstrated low performance across the various components of the JSSMC as only 41 (11.4% of the sample) could score the minimum pass mark of (40%).

Some of the findings of this study showed that, there were significant differences in the various curriculum content and the basic mathematical abilities between boys and girls, urban and rural JSS students. The results also indicated that students performed better in number and numeration while algebraic processes geometry and mensuration were least understood by the JSS III students.

Based on the findings some recommendations were made to reduce the students low mathematical performance and their levels.

1. Mathematics teachers have to present mathematics tasks with materials familiar with the learners drawn from their environment and relevant to Science and Technology. Teachers also have to explore the construction of activities, which will engender and sustain learners' level of participation in mathematics classroom.

2. Teachers should pay great attention to the topics, which were identified as causing difficulties to most of the students. They should try to see that the students in the teaching and learning processes properly understood difficult concepts and symbols.

3. Research of this kind should be extended to the SSSMC to find out students greater difficulties in the subject. This will provide a clear picture of the areas of difficulties that need a special attention by both teachers students, also provide bases on how those areas could be tackled effectively.

4. Further research of this kind should be conducted in a wider scale in two or more states. Results from this wider scale can reveal more than what this study has done and also can be of vital use to the curriculum designers, teachers of mathematics as well as the students.

5. A similar research should be conducted in another environment to compare with the present study in question.

DEFINITION OF TERMS

In order to provide a proper direction and meaningful discussion for this study, the key terms which will most often be used and which may slightly differ in meaning from the usual usage, are hereby defined and explained.

1. Diagnostic mathematics achievement test - Mathematics test specifically set for the purpose of this study.

2. Deficit - Low ability in mathematics in the various content areas and at difficult level of performing mathematics task.

3. Deficit Measurement - Refers to the learner. That is self-referencing where he is compared to himself.

4. Diagnostic Test - An evaluation instrument designed to assess an individuals specific strength and weaknesses.

5. Evaluation - Is the determination of information for use in judging the worth of a programme, procedure or objectives.

6. Psychometric Test - Those "Pen and Pencil" tests designed to measure cognitive levels or development of individuals.

CHAPTER ONE

1.0 THE PROBLEM

1.1 Introduction

The low mathematics achievement of secondary school students has become a chronic problem that has badly bothered teachers, parents, the government, educationist and others concerned with education in this country. Some mathematics educators (Carpenter, 1980; Lassa, 1986; Ale, 1991) have made a number of systematic efforts to find out the causes of deterioration and have suggested remedies thereof.

Mathematics is a fundamental discipline of science. It therefore dictates the principles, provides the numeric and quantitative percepts on which scientific paradigms are formulated and theoretically proven (Obioma, 1996). Thus, Mathematical concepts, principles and generalisations are tools for explaining scientific phenomena in secondary education. Thus attempts are being made to enable the secondary school mathematics learners acquire the relevant mathematics skills for the study of science and technology which the country is aspiring for.

The Junior Secondary School mathematics Curriculum contains four broad topic areas namely: Number and Numeration, Algebraic process, Geometry and mensuration and Everyday statistics. Number/Numeration includes; the number systems, fractions and decimals factorisation, proportion and approximation. Algebraic processes treat mathematics statements, simple equations and variations. Geometry/Mensuration deal with basic properties and simple mensuration on 2-dimensional and 3-dimensional shapes, properties of angles, scales and elementary trigonometrical ratios. Every day statistics start with data collection techniques and graphs of frequency tables, mean, median, mode and elementary ideas of probability.

An examination of the national policy on education (Revised, 1981) indicates that educational assessment and evaluation are liberalised by basing them in whole or in part on continuous assessment of the progress of the individual. Thus, one of the important areas of education that has received emphasis throughout the policy is evaluation, particularly the comprehensive and cumulative nature of the continuous assessment.

The adaptation of continuous assessment of learners in Nigeria (Federal Republic of Nigeria (FRN) 1977; Federal Ministry of Education (FME) 1980 and the proposal by Wali, 1984) to introduce the system in Colleges of Education amplify further the need to gear evaluation towards diagnostic purposes. Continuous assessment in the junior Secondary School provides cumulative data on the learners as the basis for guidance in school. This would mean that if continuous assessment is to achieve its aims in the Junior Secondary School, there ought to be diagnostic data on the learners as a basis for remedying any observed deficiency in the mathematics curriculum. It is this background that mainly motivated the researcher to investigate the issues under study.

Assessment of students' performance with a view of determining the attainment of the set objectives is one of the main components of any well designed educational curriculum. This can be accomplished with the aid of standardised test developed by experts and administered to the students that have completed a good course of study. The result obtained from such assessment gives the information on whether the curriculum objectives are achieved or not.

The results of previous studies on performance of students in mathematics in both Junior Secondary School and Senior Secondary School Certificate Examination are generally low (Adetula,1990; and Abakpa,1993).The performance of Nigeria learners in the JSSMC is abysmal. Junior Secondary and Senior School examination results are indices to support these low attainments. Students performance in internal examinations in mathematics is very low (Obioma,1996).

The Junior Secondary School Mathematics Curriculum is in the eighth year of use in Adamawa state. The performance of the JSS students in mathematics for over half a decade now have been very poor (Ministry of Education Ycla,1996),which was also echoed at the March 1996 National Conference/workshop on the application of Science for National development organised by the Federal Polytechnic,Mubi (Akogun,1996).

1.2 Statement of the problem

Since mathematics is compulsory for all students in the secondary schools in Nigeria, there is the need for greater attention to be given to it both by teachers and students, particularly at the Junior Secondary level. As the National policy on Education (1981) clearly indicates, one of the main goals of the Junior Secondary school mathematics curriculum is the acquisition of basic mathematical skills. This is to enable the students cope with the senior secondary school and vocational centres.

The major concern of the present study therefore is to investigate areas where the

Junior Secondary three students have difficulties in mathematics. Thus, the study will investigate:

i) Whether the low performance of Junior Secondary three students be attributed to poor acquisition level of basic mathematical knowledge and abilities in number and numeration, algebraic processes, geometry and mensuration and everyday statistics.

ii) Are there deficiencies in students knowledge, skills and problem solving which result to poor performance?

iii) Does sex act as a predictor of Junior Secondary School mathematics deficiencies?

iv)Does school location in urban and rural act as a predictor of the Junior Secondary School mathematics performance?

v) Is students' performance in mathematics related to their inabilities to handle word problems.

vi) In which of the four mathematics content areas of the Junior Secondary School mathematics curriculum do students have high, moderate and low inadequacy performing mathematics tasks.

1.3 Hypotheses

For the purpose of answering the research questions above, the researcher has advanced the following Null-hypotheses to be tested.

i) There are no significant differences in mean performance among the Junior Secondary three students in mathematics in various content areas, namely: number and numeration, algebraic process, geometry and mensuration and every day statistics.

II) There is no significant interaction effect between performance and gender in JSS III students and their mathematical performance in mathematics content areas.

iii) There is no significant difference in the mathematical mean performance between the Urban and Rural Junior Secondary School Students.

iv) There are no significant differences in mean performance in each of the three basic mathematical abilities, knowledge, skills and problem solving among the Junior Secondary three mathematics learners.

1.4 Purpose of the study

It is a common practice that teachers of mathematics usually evaluate students' work and allocate marks only without making attempts to find in which area(s) the students often make mistake(s) in the process of solving mathematical problems. This practice does not provide the opportunity for arranging remedial work to those students who were found to have common difficulties in the process of solving problem. This practice has contributed to the consistently low performance in the subject by the students over the years.

Therefore the main purpose of this study in specific terms are as follows:

i) To study the performance of the Junior Secondary three students in mathematics in Various content areas and the complex level of performance in mathematical tasks by the students.

ii) To find out which content areas the Junior Secondary three students appear to be highly deficient and least deficient in performing mathematics tasks.

iii) To determine if students performance in a particular content area is related to those in other content areas in the Junior Secondary three mathematics curriculum.

iv) To make a comparative analysis of the performance of mathematics learners between Urban and Rural Junior Secondary level and determined certain underlying factors which can account for these deficiencies.

v) To assess the level of the Junior Secondary School students' performance in the three basic mathematical abilities knowledge, skills and problem-solving.

vi) To find out gender differences in the performance among the Junior Secondary three tudents in each of the various components of school mathematics curriculum.

vii) To suggest measures for rectifying the situations. However, it should be noted at this point that, the comparison is from

Category to category and not from item to item within the categories

1.5 Justification of the study

One of the national goals for secondary education is to equip student to live effectively in a modern age of science and technology (National policy on Education, 1981). This goal can hardly be achieved if the science students are lacking the basic mathematical skills in solving mathematical problems. Therefore, it is hoped to improve this situation and make it possible for the students to achieve the goal. The findings of this study would be useful to the classroom teachers in putting more emphasis on the areas identified while teaching. Remedial classes could also be designed on the common areas identified for the fresh students entering Senior Secondary one. This will help to remove their low performance in mathematics and provide a solid foundation for the subsequent topics in the school mathematics curriculum contents. It will also provide a basis for the successful take up of science and technology which the country is aspiring for.

Since there is a break between the Junior and Senior Secondary Schools which is of course distinct as stated in the National Policy on Education (revised, 1981), there is then the need for assessing the students level of performance across the component of school mathematics curriculum. This will enable the authorities concerned to make decision for proper placement of students to the type of senior secondary school that suits the needs of an individual.

It is quite logical especially in areas like mathematics in the Junior Secondary School to evaluate the performance of the learners through diagnostic evaluation so that individual student will be properly placed in the right type of Senior Secondary school that will suit his ability. It is quite clear from the national Policy on Education (1981) that after the three years of Junior Secondary Schools students will be placed for technical, commercial, academic Senior Secondary Schools and other fields of education. It is therefore very important to measure the level of performance of the Junior Secondary mathematics learners across the component of mathematics content areas, majorly because some of these areas need more mathematics than others.

It is hoped that this study would provide information for guidance and counselling for prospective mathematics teachers and students. It may also make useful contribution to the educational development. This is because the present effort is aimed at increasing cognitive achievement in mathematics by improving the teaching and learning of the subject.

1.6 Basic assumptions

The following assumptions are made in this study:

i) That a paper-pencil multiple-choice tests are appropriate means of assessing students' performance in mathematics component at the Junior Secondary three level.

ii) That all the subjects that will be used for this study possess all the pre-requisites knowledge of the attainment test prepared for this study.

1.7 Delimitation of the study

The following delimitation will be made upon this study.

i) This study is delimited to all the Junior Secondary three grade level in Adamawa State. The study focuses attention on performance of the Junior Secondary three mathematics learners in the various content areas and complex level of performance on mathematics tasks.

ii) Although there are various tests formats that could be utilised in the cognitive knowledge of the students at the Junior Secondary School levels, this study used multiple choice items or questions to evaluate students' mathematical ability at Junior secondary three.

iii) Any attempt to generalise the findings of this study most take into account the simple used and the situations obtained in the state at the time of this study. Thus, the results of this study can only apply directly to the Junior Secondary School students of Adamawa State. The contents of the Junior Secondary School mathematics curriculum were also studied.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

The objective of this research is to study the performance of Junior Secondary School students in the various content areas and at complex level of performing mathematics tasks in Adamawa State.

The purpose of this chapter is to review researches conducted in mathematics educations that are relevant to the present study. The chapter looks at the literature review which consist of ten major sections. Thus:

1. Studies on mathematics Achievement;
2. Learner Factor on mathematics Achievement;
3. Current Studies on Basic mathematics Skills;
4. Current studies on mathematics Content Areas;
5. Teacher Factor on mathematics Achievement;
6. Sex-differences and mathematics Achievement;
7. Effects of School Location on Mathematics Achievement;
8. Instructional Material Factor on Mathematics Achievement;
9. Review of previous Study on Junior Secondary School Mathematics Curriculum;
10. Summary.

2.2 Studies on mathematics achievement

We shall consider studies conducted on mathematics achievement as a form of evaluation. Evaluation from the point of view of classroom instruction is seen by Gronlund (1981) as a systematic process of determining the extent to which instructional objectives are achieved by pupils. This definition which assumes evaluation to be a systematic process implies that controlled observation of pupils is not considered. It also assumes that the instructional objectives have previously been determined. It is therefore difficult to judge clearly the nature and extend of pupil learning without determining the objectives for which we are evaluating. Evaluation is a comprehensive and inclusive assessment strategy of students' progress. It includes all types of assessment data such as past record achievement, range of mental ability scores, observations and students' ratings. It involves the use of quantitative and qualitative descriptions of data and then making value judgements concerning the worth of the data obtained.

According to Thorndike (Blair et al, 1963) "anything that exists can be measured: This brought a new dimension to educational development. "A good measurement techniques provides a solid foundation for a sound evaluation", (Lindergreen, 1976).

On the other hand when new curriculum programme has been developed, evaluation data enable us to determine the extent to which the new programme is effective in meeting the instructional objectives for which it is designed. Basically there are two types of curriculum evaluation viz: formative and summative evaluation; Scriven (1967) and Gronlund (1981).

Formative evaluation permits the assessment of students' achievement after a brief unit of instruction. The outcome of the formative evaluation is used to improve both the instructional methods and materials so that greater pupil learning, a more sound formulation and reformation of programme results (Dressell, 1976; Gronlund, 1981). Formative evaluation requires a more microscopic and diagnostic analysis of the content areas of the curriculum. The information obtained from this type of evaluation is used as feedback into the learning system so that subsequent activities for the learner can be determined. Here the analysis of students' error responses are appropriate and useful for evaluating the instructional strategies and materials (Wilson, 1971). This present study falls under this type of evaluation.

Summative evaluation on the other hand is directed towards a much more general assessment of the degree to which the larger aims of institutions have been attained over the entire course or some substantial part of it (Bloom et al, 1971). Its main function is to appraise the overall effectiveness of a curriculum programme which helps in decision making for grading students. The data in this case are not intended to serve as a basis for modifying the procedures, but as a basis for selecting the most appropriate curriculum for school use, (Gronlund, 1981).

According to Lassa (1986) mathematics teachers should be concerned with the formative evaluation and its role in facilitating effective instruction. He suggested that teachers should have the full range of students' performance criteria, and interest in knowing how and why students have the answer they obtained whether correct or not. This implies that there is need to take into consideration the "thinking process of the students by examining each step of thinking and how students arrived at the correct answer.

Thus, evaluation is very important in education as it provides information on progress of the students and attainment of curriculum objectives. Kalejaiye (1982) stated that it helps the teacher to measure students' progress with the aim of taking appropriate decision and action in their educational carrier. This calls for careful construction and administration of the tests.

Many studies have been geared towards measurement of mathematics achievement and the factors that influence school mathematics achievement. This present research will explore the measurement of mathematics deficiencies and the factors that any observed deficiencies are predicted on, in the Adamawa State Junior Secondary three grade level. Even though there are yet no general distinctions between measurement of achievements and deficiencies in the context of instrumentation, achievement testing can be associated with population of learners or score cut-offs (Bejar, 1984). This characteristics of score cut-offs according to (Bejar,1984) distinguishes deficiency measurement especially that based on deficit measurement (Lesh,1979) from other kinds of achievement testing. Deficit measurement itself according to (Lesh,1979) refers to the learner, (that is self-referencing) where the learner is compared to himself.

According to Obioma (1982) deficiency in mathematics occurs in two major forms, namely horizontal deficiencies, which occurs as a result of discrepancy existing across the various components of the subjects. For example a learners' performance across various components of the school mathematics; Number/Numeration (NN), Algebraic Processes (AP), Geometry/Mensuration (GM), and everyday statistics (ES). Thus, horizontal discrepancy is a situation where achievement of the learner in a given content area is out of phase with achievement in the other areas. The other model (not to be used for this study) is a vertical discrepancy. The vertical discrepancy on the other hand refers to a situation when actual achievement lags behind expected achievement in a given content area. The two play significantly different roles in curriculum evaluation. Vertical discrepancy is used mainly to take care of intrinsic factors such as motivation, interest and general psychological readiness to learn. Horizontal discrepancy is very useful for optimising the learners performance no matter the component of the subject.

2.3 Learner factor on mathematics achievement

The introduction of the current Junior Secondary School mathematics Curriculum (JSSMC) at the post primary level in Nigeria was meant to inject into the Nigerian youths a thorough understanding of the basic and improved mathematical concepts and procedures as well as to emphasise their applications to the current practical situations (Federal Ministry of Education, 1980). The orientation is a necessary condition if mathematics is to make the desired impact on the overall socio-economic, technological and scientific developments of the nation.

However, the practical situation on the ground today does not seem to be as easy as that. A number of factors due to the learner have been found to account for this deplorable situation Paramount among them are the students' attitudes towards mathematics, anxiety level and psychological barriers (Ale, 1989).

It has been observed by some studies that on the average the attitudes of students towards not only mathematics but anything that has a strong connection to mathematics is negative (Ale, 1989; Jahun and Korau, 1991; Ali, 1984). The reasons for this negative attitudes according to them include lack of interest, principally because they do not see the value immediately, poor teaching method, teachers' negative attitudes and constant discouragement from peers and communities.

Closely related to the issue of students' negative attitudes towards mathematics is the high anxiety level they exhibit whenever they are exposed to mathematical learning situations. Because of their already negative attitudes towards mathematics they believe that the subject is abstract and very difficult to understand. The implication of this is that the ability to develop their mathematical curiosity and thinking potential to its optimal level is highly curtailed.

A lot of students have built psychological barriers that mathematics is not for them and that they can never do it. (Ale, 1989). This psychological barrier is accounted for by a combination of all the reasons discussed above. The implication of this is that mathematics teachers have to explore the construction of activities which will engender and sustain learners' level of participation in mathematics classroom, this will increase the interests of learners and therefore change their attitudes in a positive direction. This is why the present research considered the learners' factor on mathematics achievement relevant in this review.

2.4 Current studies on basic mathematical skills

The National Policy on Education (NPE) was revised in 1981 and this led to evolution of new mathematics curricular whose major objectives according to Obioma (1978) are to afford the learner the opportunity of:

i) developing originality, creativity and curiosity in the learner;

ii) acquiring manipulative skills;

iii) discovering and appreciating the beauty and elegance of mathematics skills;

iv) demonstrating the applicability of mathematics skills in the various field to real life;

v) curriculum of the JSSMC.

These objectives are supposed to satisfy two major aspirations namely:

a) personal aspiration - to help learners solve every-day problems of adult life;

b) vocational aspiration - to give the foundation upon which range of specialised skills can be built.

Hence in designing any curriculum therefore, the curriculum planners have a set of objectives to be achieved at the end of the course of study. The main goal considered in the teaching and learning of mathematics is the development of mathematical concepts, skills and application (Abakpa, 1993).

Considering the National Policy on Education (1981) especially with respect to mathematics curriculum planners, the objectives were clearly stated in the mathematics curriculum along with the necessary activities that will guide both teachers and students to achieve the objectives. Thus, acquisition of skills and its application to real life and in abstract situation is paramount in learning of mathematics.

The development of skills has long been considered the cardinal objective of teaching mathematics at all grade levels, (Sobel, 1970). The shift of emphasis to acquisition of skills may be as a result of declining standardised scores obtained from the advisory panel on the scholastic Aptitude Test Score (1977). According to Carpenter et al, (1980) low scores obtained by students created the suspicion that the students were not adequately prepared in basic mathematical skills and the contents.

The present junior Secondary School mathematics curriculum is popularly referred to as the "basic mathematics". This curriculum is aimed at providing every Nigerian student, who completed Junior Secondary School programmes the basic mathematical knowledge and skills that enables him/her cope with the societal needs.

Basic mathematics skills are what a learner can do or should be able to do in solving mathematical problems, (Suydam and Desert, (1980). Rising (1975) summed up the definition of basic mathematics skills as "mathematics related abilities that should be attained in order to function as a citizen". This implies that the students should be able to demonstrate abilities to find solutions to both textbook and non-textbook problems to enable them cope with their societal obligations.

Basic mathematics skills according to Suydam and Desert (1980) are characterised by proficiency (accuracy) and efficiency (speed); that is competency of the child is measured in terms of accuracy and ability to work within the reasonable limit. Thus, time even though it has weakness, it is very good factor in evaluation of skills. This is why standard examinations are usually timed.

One of the objectives of the National Policy on Education (1981) is to give the child opportunities for developing manipulative skills (including basic mathematics skills) that will enable him/her to function effectively in the society within the limits of his/her capacity. The basic mathematics skills as stated in the Junior Secondary School mathematics curriculum include: computation, problem solving, approximation and estimation, presenting result in a reasonable form, geometrical knowledge, measurement (such as time, weight, capacity, temperature, distance, areas and volumes) with the appropriate units, reading and interpretation of graphs and tables, statistics and probability, to predict events and everyday arithmetic. All these skills are applicable to the Junior Secondary School mathematics curriculum.

It is also relevant to discuss the following basic mathematical abilities for the purpose of this study. This is because the present aim of educational curriculum of the country is to develop scientific and technological advancement. Thus: (1) knowledge; (2) skills and (3) problem-solving; are not left out in this review.

2.4.1 Knowledge

According to Bloom's Taxonomy of Educational Objectives (Bloom 1956), knowledge represents the lowest level of learning outcomes in the cognitive domain. In mathematics, a test of knowledge consists of students' ability to recognise geometrical shapes, recall basic terms, formulae, reading of graphs and tables, rules, concepts and generalisation (Kalejaiye, 1982; Bolaji,1984; Jahun,1988; Abakpa, 1993; and Bolaji,1994).

Some studies (Adetula, 1989; Odili, 1990) showed that students are bolder to answer problems requiring recall of knowledge than the other abilities. The result of their studies consistently indicated that the students could recognise shapes, terms, formulae and generalisations necessary for the solution of a given problem but could not apply their knowledge to solve the related problems.

Jahun (1988) and Abakpa (1993) in separate studies found that students obtained higher scores in knowledge than in other learning outcome areas such as comprehension, application, and so on. Their studies also showed that students responded favourably to questions testing their knowledge.

The studies reviewed show that most students do not go beyond basic knowledge of mathematics. There is therefore an appeal from mathematics educator (Ale, 1989) that teachers should teach the students to see the usefulness of mathematics. This implies that the teaching of mathematics should be application oriented and not as an abstract subject. Class lessons should focus on many examples on application of learnt materials, rules concepts and generalisation. Thus if students are taught to apply learnt knowledge to other parts of mathematics, performance in mathematics achievement test will be improved. This is why it is necessary to ascertain the students' computation in knowledge in this present study.

2.4.2 Skills

Many educators consider the development of process skills in children to be the major objective of education (Gagne, 1979, Okey, 1972). Several educators have provided explanation for this belief. Gagne (1979) contends that the science process skills represent common elements in the scientific endeavour as well as carrying the promise of broader transferability across many subject areas.

Okey (1972) states that a major goal of education should be to teach students how to acquire and process information. He states further that "process skills that go beyond the acquisition of facts are of value because they approximate how students will use or operate on knowledge in out of school situation".

One of the basic mathematical skills is computation. According to Suydam et al (1980), computational skills is one of the main primary goals of school mathematics. Computation is the ability of the student to manipulate confidently and flexibly numbers with the basic operations: Addition, subtraction, multiplication and division.

According to (Lassa, 1978), computation is one of the lowest level in Bloom's taxonomy of educational objectives, yet teachers' instruction, testing and grading tend to emphasise so much on it. Studies conducted on basic skills in mathematics found that most students attempted computational problems more than other types of problems.

The result of NAEP (1978) indicates that most students (the 13-year olds which is the equivalent of Nigerian Junior Secondary School) could perform simple computation involving additions, subtractions and multiplication. However, the report showed that the students encountered greater difficulties in coping with whole number division and manipulation of fractions and decimals. This implied that students could do computations involving whole number additions, multiplication and subtractions but weak in other aspects of computations.

Analysing the students' performance on computational skills, Adetula (1989) found that the results obtained supported that of NAEP. Computations of perimeters, areas of simple geometrical shapes were performed easily by students. Calculations of long distance, according to Carpenter et al (1975) was done poorly and needed to be improved upon.

Suydam et al (1980) suggested that teaching should be made meaningful to learners in order to develop computational skills. Drills and practices are considered as important tools in mastery of computation. However, drills should not be over used, rather it should be systematic, distributive and interesting, and varied from topic to topic. But with the modern technologies, there should be shift from manipulative skills to concepts, relationships, structure and problem solving.

2.4.3 Problem Solving

Krulik and Rudmick (1980) and Bolaji (1984) defined problem solving skills as " means by which an individual uses previously acquired knowledge, skills and understanding to satisfy the demands of an unfamiliar situations". Bolaji (1994) described problem solving as a complex process of solving a problem. From the definitions of problem solving skill above, it implies problem-solving skill involves the application of pre-requisite knowledge to solve unknown problems.

According to Aina, (1986) problem solving skills were considered to be the highest level of learning that should be encouraged by teachers and parents. Nigeria as a developing nation requires a lot of problem solvers that will liberate her socially, politically, scientifically and technologically. Thus Aina (1986) suggest that to be a self-reliant nation, Nigeria needs to develop great thinkers who will enhance her scientific development.

Problem solving is the most fundamental mathematical skills of all and also relates very much to "real life" application of mathematics, learning solving problems mainly comes from the experience of solving problems. By seeking more everyday examples of mathematics and using them in problem solving situations, curriculum designers can encourage and guide students to use these solution skills as a regular practice (Bolaji, 1984).

The secondary school students' performance in problem solving skills in achievement tests has not been encouraging. NAEP's (1978) report shows that students favourably attempted one-step problems but encountered difficulties in multi-step problems. The studies conducted by Aina (1986) supports the results of NAEP. That is, the students were poor in problem solving. The result shows that performance in problem-solving skills was the worst of the skills analysed. Adetula (1988) in a similar study of Junior Secondary three students in Kano State, Odili (1990) in Rivers State and Abakpa (1993) in Kaduna State all found that the students were weak in problem solving.

Recent research studies (Adetula, 1990; Bolaji, 1994) indicates that one area of problem solving that has immensely contributed to students deficit in mathematics is the translation of word problems into mathematical sentence, and that the key words of the problem may affect students' performance. The implication of this for teaching is that teachers should expose the students to the semantic structure of certain key words with variety of examples.

In order to achieve the objective of teaching and developing problems-solving skills, certain qualities should be encouraged. Notably among these according to Adetula (1988) were the spirit of perseverance, desirability, interest and ability. Moreover the students must learn to solve problems using a variety of skills and processes. He further contended that problem solving prepares the students for future challenges and so they (students) should be "guided and encouraged to construct their own knowledge".

Asubel (1963) found that only few students can carry out problem solving successfully and so it is pointless teaching every student in the class. That is only those who are mathematically talented should be taught problem solving in view of its difficult. On the other hand, Polya (1962) suggested that problem solving should be taught to every child like any other skill with the aid of adequate practice.

2.5 Current studies on junior secondary school mathematics curriculum.

There are four main content areas of the Junior Secondary School mathematics curriculum (NRC, 1979). These include number and numeration, algebraic processes, geometry and mensuration and everyday statistics. Here the performance of students in each curriculum content area is reviewed.

2.5.1 Number/Numeration

The topics on number and numeration in the Junior Secondary School mathematics Curriculum (NRE, 1979), include manipulation of number systems, fractions and decimals factorization, proportion and approximation using the basic mathematics operations. According to Carpenter et al (1975) NAEP result shows that the 13-year olds are less deficient in whole number concepts. The result further shows that the performance of 13-year olds was deficient in simple word problems relating to number concepts.

Studies by Adetula (1989) and Odili (1990) support the NAEP result. Adetula (1989) found that 76% of the students performed well in the whole number computation whereas only 43% of them could do exercises involving fractions such as decimals, percentages and ratio. This deficit, according to Carpenter (1975) may be as a result of the current "mathematics curriculum in the upper elementary grades which does not provide enough background for work on percentages". It may also mean that the students were ill equipped to do percentage problems. Thus, the teaching and learning of fractions need to be improved.

2.5.2 Geometry/Mensuration

Geometry and Mensuration deals with basic properties and simple mensuration on 2-dimensional and 3-dimensional shapes, geometrical skills include measurement of distances, perimeter plans shapes, areas, volumes, drawing and measuring of angles and elementary trigonometrical ratios.

Research study conducted by Adetula (1989) states that "students performed better in basic geometric concepts" (points, line, plane, parallel lines) than in either knowledge of relationships among geometrical shapes (46%). Similarly Odili (1990) found that only 6% of the students were able to pass in geometrical exercise. According to earlier, studies conducted by Lassa (1986) who in his study with the then ten Northern States of Nigeria found that geometry was the least understood among the four content areas of the mathematics curriculum. According to him many of the teachers had deficit knowledge of geometry. Thus, teachers should be properly prepared for in this areas. It is also suggested that physical models and other teaching aids should be made and used, while students should be given enough exercises for practice.

2.5.3 Algebraic Process

In algebraic process, result of mathematics test shows that students could do one-step problems. Carpenter (1975) reports that the 13 year olds (85%) could do one-step algebraic tasks. In that study only 20% of the students could translate algebraic problems into mathematical sentences.

On the other hand, Adetula (1989) in a study shows that the students' performance on algebraic symbolic manipulation was fair (52%), similarly, Odili (1990) reports that 43.8% of the students passed the algebraic mathematics achievement tests based on the Junior Secondary School mathematics curriculum.

2.5.4 Everyday Statistics

For the junior secondary school mathematics curriculum, everyday statistics starts with data collection techniques and graphs of frequency tables, measures of central tendency, elementary ideas of probability, mean, median, mode and range.

According to Carpenter et al (1975), everyday arithmetic involves the mathematics commonly used by people. It is thus called the consumer mathematics. From the NAEP's (1975) report, it was found that over 75% of the students could work problems on arithmetic, averages but found it difficult to compute weighted means and median of data. Similarly, the report showed that students did not do well in percentage on word problems. The result of this study also shows that skills of reading tables and graphs were favourably attempted. However, the students found it more difficult to interpret graphs.

Adetula (1989) found that majority of the students (58%) could read graphs but less than 50% of them could not condense numerical information into a more manageable or meaningful terms by setting simple tables, charts and graphs. Odili (1990) found that only 11.3% of the students passed everyday statistics.

The studies reviewed so far indicated that students' performance in everyday statistics is deficient as many of them failed in mathematics achievement tests. This implies that attention should be given to this areas so that students can improve their scores in mathematics in future. This is why these deserve more researches.

2.5 Teacher factor in mathematics achievement

Teacher education programme is of great concern to curriculum planner in view of the roles teachers play in the implementation of any curriculum. Grifts and

Howson (1974) state that: "the potential of an educational system is directly related to the ability of its teachers. No matter how distinguished the members of a curriculum team are, how carefully structured media have been exploited, the success or failure of any innovation, ultimately hinges on the perceptiveness and flexibility of the classroom teacher". (Akale, 1987).

Brophy (1987) on classroom instruction reveals that students' achievement is determined not only by curriculum content and materials but by the amount and quality of instruction that students received from their teachers. It has been found that effective teaching does not only mean that the teacher has good knowledge of the subject but also of his students and pedagogy. According to Brophy (1987) students achieve more in classes where they spend most of their time being taught or supervised by their teachers rather than working on their own or not working at all.

However, according to Obioma (1996) many mathematics teachers are poorly prepared. For the particular case of mathematics, many teacher preparatory programmes the Nigeria Certificate in Education (NCE) and first degree level, do not cater for the content and methods of secondary education to the extend that pre-service mathematics teachers on graduation cannot cope with teaching some aspects of secondary mathematics (Obioma, 1996). He further states that the trend is mostly observed in further mathematics.

Perhaps it should be stressed that mathematics teachers are not originally trained to teach the subjects. For instance, geography, economics, agriculture trained teachers have been drafted to teach mathematics just because they had rudimentary training in mathematics. A reason may well be the paucity of mathematics teachers. But the damages incurred in doing this, far out-weigh the needs the practice is supposed to meet. Besides, it is known that learners brought up under this practice exhibit a high degree of deficiency in the subject, (Obioma, 1996). He suggested that competency-updating programmes should be developed to meet the needs of teachers who are being used to teach mathematics other than areas they originally trained in. This programme should be suitable on a short or long in-services basis.

Teachers' attitudes towards mathematics will equally affect the students' achievement. An unhealthy attitudes developed towards mathematics by students may be a result of teachers' negative attitudes towards the subject. Husen (1967) also asserted this by adding that an interested and enthusiastic teacher would transmit his love and understanding of mathematics to the students.

The teacher variable thus has a lot of positive and negative effects on the students' achievement in mathematics. The implication of this is that mathematics teachers should be trained properly in all component areas of mathematics.

2.7 Sex-difference and mathematics achievement

In Nigeria boys are ascribed certain roles and girls others. Most people look up to maleness as masterful. A boy in any family will be expected to perform better in any involvement with a girl. Girls are looked upon as the weaker sex. Boys and girls are diverse in both biological and cultural terms, therefore one expects a difference in the mathematical tasks.

Some research findings show that the differences, where they exist varies with locality, age of students and from skill to skill. Mulli (1985) indicated that the difference is in favour of girls while Obioma (1980) and Mitchelmore (1973) showed that it is in favour of boys. Other studies (Galadima, 1988; Abakpa, 1993) showed no difference between male and female of the Junior Secondary three in their overall performance in scores at the same level.

Mulli (1975) evaluated sex difference in mathematics achievement among children of ages 9 and 13 years. The result shows that the difference never exceeded six points percent, and that where they existed, it was in favour of female students at times.

The second mathematics assessment of the National Association of Education Progress (NAEP II) provides the most comprehensive look at sex-related differences in learning mathematics on a nation-wide scale (Fennema and Carpenter, 1981). The study concentrated on courses taken as well as achievement in specific content area (such as variables, relations and word problems) and at different degrees of complexity (knowledge, skills, understanding and application exercise. The Junior secondary schools level appears to be crucial one in the development of these sex-related differences.

Mitchelmore (1973) studied the performance of students in modern mathematics and found that sex is a predictor of mathematics achievement. In the study, male students consistently obtained significantly $P < 0.05$ higher scores than their female counterparts, similarly the work of Ohuche and Obioma (1980) on effects of sex and environment on mathematics achievement showed a similar result to that reported by Mitchelmore (1973).

Also the findings of Suydam and Riedesal (1969) when they investigated sex-related difference in mathematics indicated that there was no significant difference between the sexes in arithmetic achievement before seventh grade. Similarly, Suydam and Desert, (1980) stated that boys scored higher in mathematics reasoning and girls were better in the fundamental. These findings indicated that sex difference in mathematics achievement often occur in favour of boys mainly in higher cognitive abilities, though Fennema and Sherman (1981) studies reported that when boys and girls studied the same mathematics course during higher schools, few sex-related difference in achievement were found.

Obioma et al (1980) in another study stated that sex is also a predicting factor in mathematics achievement. He reported that the Junior Secondary Schools female students demonstrate greater deficiency in mathematics achievement test than their male counterparts. On school type, the study showed that co-educational schools performed better than the single sex schools but the single sex female school was the worst in performance.

A comparative performance by gender in the sub-topic of Junior Secondary three algebra was carried out in the then Sokoto State Nigeria by Galadima (1988). His findings based on the population studied indicated that, in the overall performance no significant difference was found. This implies that both boys and girls performed the same in the algebraic content. Similarly, the work of Abakpa (1993) on the performance of Junior Secondary three students in basic mathematical abilities in Kaduna State show a similar result to that reported by Galadima (1988).

This current research is similar to that of Abakpa (1993) especially in the areas of population and the curriculum content under investigation. However, the bases for the study are distinctively different. While Abakpa was concerned with performance of Junior Secondary three students whose sample was too small selected randomly from one educational zone with the instrument of his study being adopted, the present research is to study students' performance in mathematics component of the Junior Secondary School mathematics curriculum. This research also used larger sample selected randomly from the Adamawa state three educational zones and the test instrument used was developed by the researcher. Also Adamawa State falls outside the area covered by Abakpa (1993). His findings will however provide a good base for comparison with the result of this study.

A sizeable amount of literature with sizeable controversy exists concerning gender difference in mathematics. In general, girls have been found to attain higher grades beginning in the primary years, although boys tends to do better on novel tasks

(Kimball, 1989). By high school, difference in performance consistently favour boys (Hedges and Nowell, 1995; Hyde, Fennema and Lamon, 1990). National samples of persons from eight grade to young adulthood demonstrate higher variances in boys than in girls in most cognitive test scores; boys are consistently over-represented in the upper extremes in mathematics (Hedge and Nowell, 1995).

Mills et al (1993), examining sample of academically talented students in grades 2-6, found boys performing higher as early as second grade in applications of pre-algebraic algorithms and task involving mathematical concepts and number relationships but not on a task requiring judgement as the adequacy of information. Stanley (1994) reported similar differences for fifth and sixth graders.

This study among other things intends to evaluate students' performance in mathematics component of the Junior Secondary School mathematics curriculum. It goes further to find out if inadequacy in performance observed are due to gender differences. This will provide a clear picture of the areas of difficulties among students in mathematics and also provide bases on which areas of difficulties could be tackled effectively. Moreover there is the need to study how performance in a subtopic will contribute to performance in the other content areas. For instance, how performance in algebraic processes will contribute to performance in geometry and mensuration or everyday statistics among the junior secondary students. Therefore, the present study would like to ascertain whether there is sex differences in the contents of mathematics in terms of performance in solving mathematics tasks by students at the Junior

Secondary School level.

2.8 Effects of school location on mathematics achievements

Daramola et al (1985) sought to find the influence of both school location and sex differences on the knowledge of basic mathematics possessed by studying form three students in Kwara State schools. The students were chosen from five urban and four non-urban schools. His result indicated that the mean scores on the basic mathematics tests for female and male students were not significantly different.

Separate studies by Kalejaiye (1982) and Adeagbo (1983) on reading performance, Ojo (1986) on achievement in mathematics, Odili (1990) on failure rate in English and mathematics, all showed unequal pattern of performance by rural and urban students with the later group performing better than the former. Adeniyi (1988) also showed that male students attending the urban schools performed significantly better in mathematics test than their female counterparts, and that the male and female students attending the urban schools performed almost equally.

In another study Aina (1986) found that there were significant differences in verbal reasoning and abstract reasoning. It was found that urban female students were better than urban male students and both sexes from the rural schools. Also, the rural boys were shown to be less deficient than the other categories of students in mathematical reasoning.

On the other hand, the result of study conducted by Obioma et al (1980) indicated that students in the State Capitals and urban centres were more deficient in mathematics achievement tests than the students in rural schools. This implies that students from rural schools were more likely to have high achievement in mathematics tests than the urban students. No tangible reason was advanced for this development.

The findings of the above studies have shown that the issue of particular school location being an advantage or disadvantage in mathematics achievement is still inconclusive. This area still deserves more attention in research, particularly in Adamawa State because of the consistent low performance in Junior Secondary School Mathematics Curriculum Contents over the years by the Junior Secondary Students.

2.9 Instructional materials factor on mathematics achievement

Mathematics at all levels of education is abstract in nature (Bello, 1992). For instance, at the primary school level, the very first concept that is taught number is abstract. Also at the Junior Secondary School level, abstraction in one form or another is present in almost all the topics covered at this level (Bello, 1992). For instance, proofs in geometry, quadratic equation in algebra, are all abstract concepts. Hence, many mathematics educators have strongly encouraged the use of instructional materials in the teaching and learning of mathematical concepts, especially at these levels.

According to Hadejia (1992), instructional materials help in clarifying facts or concepts in teaching or guiding students in learning theoretical or imaginary concepts.

Apart from making lessons real and practical, instructional materials supply concrete basis for conceptual thinking, stimulation, self-activity and group participation. If used effectively, they arouse interest, fasten creative imagination, increase retentive ability, make the subject matter relevant to life and lessen the burden of teaching.

However, in spite of the crucial role instructional materials play in teaching and learning process, research and experience have shown that most teachers have continued to present some mathematics concepts in abstract form without the use of any instructional materials.

Recent study (Agwagah, 1996) revealed that teachers perceived some secondary school mathematics concepts as those for which instructional materials for teaching them cannot be improvised. Hence the concepts can only be taught in abstract form. The topics are: simplification of algebraic expression, linear equation in one and two variables, prime numbers, factors and multiples, standard form, base conversion, linear inequalities, in one and two variables, non-rational numbers, indices and quadratic equations, geometric proofs, standard deviation, arithmetic and geometric progression and quartile and interquartile ranges. The result of this study agrees with some of the findings of Agwagah (1996) which showed that the topics: simple algebraic processes, factors and multiples, prime number and indices were among primary school mathematics which teachers perceived as not amenable to instructional materials.

On the issue of teachers ratings and curriculum provisions, Agwagah (1996) revealed that in the junior secondary school mathematics curricular, suggestions on instructional materials are provided for most topics which teachers also perceived as amenable to instructional materials. However, there are some topics mean, median, mode, range, square root and squares, trigonometric ratios, locus, frequency polygon and histogram and gradient which teachers perceived as amenable to instructional materials but for which the curricular did not provide material. It is not known, in any case, whether lack of suggested materials for these topics is a result of difficulty in the development of materials for such topics.

The implication of this is that curriculum planners should make more efforts in identifying and suggesting instructional materials and activities for use of teachers in the teaching of Junior Secondary School mathematics. Authors can also be of help in this regard.

2.10 Review of previous study on the junior secondary school mathematics curriculum.

Another study that made use of the Junior Secondary School Mathematics Curriculum was one carried out by Jahun 1985. The study was to standardised test items for use in Kano state for the purpose of implementing continuous assessment programme recommended by new education policy. The items were drawn from the algebraic section of the Junior Secondary School Mathematics Curriculum form three and was administered in Kano state.

The study showed a poor performance by students on the items and this made the standardisation of the test difficulty. The primary concerned which this brings to mind is the cause of this poor performance. Among other questions that need to be answered first is whether students have a good background knowledge of the JSSMC in order to perform well.

2.11 Summary

The literature reviewed is quite a useful guide for this study. Few clear patterns emerged from it. This might be due to variability in criteria, investigation techniques and grade levels. However, many studies reviewed indicated that the students' level of acquisition of mathematical abilities are rather low.

A number of research studies showed that the differences in deficiency of performing mathematics tasks by the Junior Secondary mathematics learners are due to physiological and environmental factors, while some believed that the occasioned differences observed between the two sexes are due to teaching and training expectations, traditions, motivation and socio-cultural factors. Also, the review indicated that sex-differences in mathematics achievement test are not significantly different before adolescence. Some of the previous studies showed that students from urban schools have superior scores to those of students from rural schools in mathematics.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

In this chapter a detailed description of the procedure of investigation is presented. Attempts are made to describe the selection of the sample for the study. The procedure adopted for the selection of the sample size is given in details. Detailed explanation on how each instrument was developed are presented. The administration of the research instrument and statistical technique to be used are discussed.

3.2 Design

This study used casual-comporative or Ex-post facto design. (Nworgu, 1991; Gay, 1992), pointed out that, the casual comparative or ex-post facto research, is that research in which the researcher attempts to determined the cost or reason, for existing differences in the behaviour or status or groups of individuals. In other words it is observed that groups are differnt on some variables and the researcher attempts to identified the major factor that lead to these differences. Such research is referred to as casual comparative or ex-post facto (latin- "after the fact") since both effect and the alleged caused have occured are studied by the researcher in retrospect. Hence the researcher finds this design relevant to the present study.

3.3 Population

The population of this study is made up of the Junior Secondary three students in Adamawa State. There are six (6) educational zones in Adamawa State, namely; Yola, Song, Gombi, Numan, Ganye and Mubi. Data from the State Ministry of Education Office, Yola reveals that there are 179 Secondary Schools in the State. Out of which 176 are owned by the State government. Two Federal Government Colleges and one private secondary school.

Therefore this research is meant for all the 62,000 Junior Secondary Schools students in the 179 Adamawa State owned secondary schools. However, only a sample of 360 students from 24 secondary schools were randomly selected using Krejcie and Morgan (1970) table for determining sample size. A summary of the distribution of schools among the zones in Adamawa State are provided in Table 3.1:

Table 3.1: DISTRIBUTION OF SCHOOLS AMONG EDUCATIONAL ZONES IN ADAMAWA STATE.

ZONES	MIXED	MALE	FEMALE	TOTAL
YOLA	32	1	3	36
NUMAN	28	0	0	28
GANYE	30	0	1	31
SONG	30	0	0	30
MUBI	28	0	0	28
GOMBI	25	0	1	26
TOTAL	173	1	5	179

SOURCE: Ministry of Education, Yola, 1997.

The total population of the students for this study is 62,000 from the 179 schools (Ministry of Education, Yola, 1997).

3.4 The sample

The subjects of this study are the Junior Secondary three students from the six education zones mentioned above. It should be noted that the purpose of sampling is to achieve a fair representation of all the characteristics of the parameters of the population. The characteristics of the population include, among others, sex, (mixed, boys and girls) institutions, urban, rural setting. In order to ensure that each of the characteristics mentioned above is a fair representation, a random sampling technique was employed.

Three zones were randomly sampled from the six zones. When random sampling is employed, the purpose is that every subject in the parent population has equal opportunity of being selected or rejected. That is to obtain an unbiased sample for this study. The three zones therefore formed the strata for sampling and have 90 secondary schools (Ministry of Education, Yola).

Distribution of Schools within the three zones according to school location and sex are provided on Table 3.2.

TABLE 3.2: DISTRIBUTION OF SCHOOLS AMONG THE THREE EDUCATIONAL ZONES.

Zones/Location/ sex	URBAN			RURAL			TOTAL
	Mixed	Male	Female	Mixed	Male	Female	
YOLA	17	1	3	15	0	0	36
GOMBI	14	0	0	12	0	0	26
MUBI	14	0	1	13	0	0	28
TOTAL	45	1	4	40	0	0	90

Source: Ministry of Education, Yola, 1997.

The institutions were randomly selected from the three education zones in the State, who were state government owned, mixed Junior Secondary III students and were operating both Junior Secondary and Senior Secondary School under the same roof. That is in the same premises. It has been found that 25 out of the 90 secondary schools in these zones satisfy these conditions.

This research therefore, in order to have a fair representativeness of the sample has adopted the use of Krejcie and Morgan (1970) Table. Therefore, this study has considered 360 mixed students of Junior Secondary Schools from the selected 24 Junior Secondary Schools. See Table 3:3. In each school the students in one randomly selected stream of junior secondary three were tested.

A summary of distribution of the schools that were sampled is provided on Table 3.3 below:

TABLE 3.3: DISTRIBUTION ON SAMPLED SCHOOLS AMONG EDUCATIONAL ZONES.

ZONES	TOTAL No. of Students	No.of qualified Sch.	Percentage of Total	Sample size
YoLA	36	12	40	11
GOMBI	26	6	28.9	6
MUBI	28	7	31.1	7
TOTAL	90	25	100	24

Source: Ministry of Education, Yola, 1997.

3.5 Instrumentation

This study involved the development and construction of test instruments by the researcher after some thorough analysis of the content and objectives of the Junior Secondary three mathematics curriculum. An investigation from the post primary schools management board, Yola, revealed that all the Junior Secondary Schools are using the same mathematics curriculum and textbooks in the state. Hence, the test items were developed from the textbooks written for the new curriculum under study and which all the Junior Secondary Schools in Adamawa State are using. That is the New General mathematics for West Africa by Channon, Smith, Head, Kalejaiye and Macrae (1982).

Ebel (1979) recommends that a good test sets explicit specifications that indicate:

1. forms of test items to be used;

2. number of items of each form;

3. kinds of task the items will represent;

4. Number of task of each kind;

5. Areas of content to be sampled;

6. number of items in each area;

7. level and distribution of item difficulty.

When this plan is outlined the test constructor then prepares as part of the test specifications, a two-way grid, sometimes called a test blueprint. In this kind of chart the researcher relates the content topics with the objectives already set in the curriculum. The researcher indicates the number of questions in each topic and skill in the blue print, taking into consideration all the steps recommended by Ebel above. After this the researcher begins to write the items as in the words of Hill (1972) that; the paper setter should make a blue print a table of specifications before he begins to write questions. The design of a table of specification of the test item by content areas are provided in Table 3.4.

TABLE 3.4: A TABLE OF SPECIFICATION OF THE TEST ITEMS BY CONTENT AREAS.

Content	N/N	G/M	AP	ES	Total
No.of Objectives	20	20	10	10	60

The unequal distribution of questions over the curriculum content areas is due to differences in time allocated in the syllabus.

Table 3.5 below also shows the distribution of the questions according to the students' abilities.

TABLE 3..5: ITEM DISTRIBUTIONS ACCORDING TO ABILITIES/CONTENT AREAS.

Basic mathematical ability.

CURRICULUM COMPONENTS	KNOWLEDGE	SKILS	PROBLEM SOLVING
Number/Numeration	6	6	8
Alg. Processes	2	4	4
Geometry / Mensuration	5	7	8
Everyday Statistics	2	2	5

3.5.2 Validation of the Test Instruments.

The attainment test items were given to four mathematics educators to validate, and to recommend deletions, modifications and additions as to the way the instruments were to be improved.

Criterion-related validity was also used in validating the attainment test. A standardised mathematics achievement test set by Adamawa State Ministry of Education for Junior School Certificate Examination (JSCE) 1996, was administered in two randomly selected Junior Secondary Schools. The examination paper consists of questions, parallel to the test items developed by the researcher.

In each school one arm randomly selected participated in the test. After four days the attainment test was administered to the same students. The result was a double measure of each student. Pearson's Product Moment Correlation was used to calculate the correlation coefficient, which was found to be 0.61. This was to ensure that both content and face validity were properly taken care of. The criteria of validation were based on course objectives, content coverage, scope and standard of the test. The comments, suggestions and corrections by the mathematics educators who validated the attainment test were fully integrated in the final draft of the test instruments, see Appendix A.

3.5.3 Establishing the Reliability Coefficient of the Test.

A pilot testing was done to ascertain the reliability of the attainment test. One arm of each four randomly selected Junior Secondary three students in Mubi Local Government Area of Adamawa State were used. The researcher administered the test instruments to 180 Junior Secondary Schools students in these schools in randomly selected classes. The reliability was calculated using Pearson's Product Moment Correlation co-efficient between odd and even scores (split half).

It was discovered that the test have coefficient of reliability of 0.81. This was found to be good enough for operational purposes and so the tests were judged reliable for the purpose of this study.

2.5.4 Instrument

The test papers covered the four basic areas of the Junior Secondary School mathematics Curriculum, namely: number and numeration, algebraic processes, geometry and mensuration and everyday statistics. Besides the content dimension the students' abilities were measured around knowledge, skills and problem solving. These abilities were distributed over the mathematics content areas, Federal Ministry of Education (1981).

The test contained 60 questions (multiple choice objectives test items) and the items include both word and non-word problems. In each of the four content areas items were picked in developing these test instruments. The reason for picking unequal number of test items from each curriculum content areas is because of the different times allocated to the curriculum content areas in the syllabus of the Junior Secondary School Mathematics Curriculum.

3.6 Pilot study

A pilot study using Junior Secondary three students from four randomly selected secondary schools were carried out in Mubi Local Government Area of Adamawa State in June, 1997.

Of the 180 test instruments administered, all were fully completed and collected back by the researcher, giving a return rate of 100%. It took one day of visit to administer the test questions.

Perhaps, an area where the pilot study has been most useful to the researcher is in identifying administrative problems that could arise during the main study. For two days, a letter permitting the pilot testing could not be got from the zonal headquarters of the Adamawa State Ministry of Education in Mubi Local Government Area, what the researcher had at first thought was not necessary, that is the pilot study. The pilot study has also helped in straightening out matters related to the design of the test items by redirecting the researcher to review some of the test items, the appropriate time required for the students to complete the test and their co-operation.

3.7 Administration of test instruments

The test instrument was administered to all the sampled schools in the same day in the third term, a week to their final Junior Secondary School Certificate Examination. That means they have finished the syllabus. The administration of the test was carried out with the help of some mathematics teachers from the various schools. The teachers of the schools were used so that the students do not get frightened at the sight of a stranger. However, the teachers were instructed to keep the students under strict normal examination condition. There was no prior notice so that students will not have any fear of examination fever, though, the instruction on the question papers encouraged the students to do their best.

Permission was obtained from the State Ministry of Education, Curriculum Division, Yola, Adamawa State to carry out the research. A letter was then given to the researcher by the Ministry of Education instructing all principals from the sampled schools to give assistance to the researcher. With this, arrangement was made with both the principals and the mathematics teachers in the sampled schools. The test items were deposited with the principals through the zonal inspectors of education in each zone a week before the time of the test in those schools that are far away and a day or two before the time of the test in those schools that are nearby. On the day of the test, the researcher went round some of the schools to see how the administration of the test was going on. After the test the researcher went round the educational zones and collect the answer scripts since immediately after the test all the principals of the sampled schools will delegate a mathematics teacher to carry the scripts to the zonal offices for collection by the researcher.

Five researcher assistants were employed to help in the scoring of the answer scripts. They were given a scoring scheme prepared by the research. Discussions were often held with them whenever they have a problem in the scoring of the answer scripts. Marks were given strictly as it is indicated on the marking scheme.

Final moderation of the scored scripts were carried out by the researcher to make sure that the marking strictly adhered to the marking scheme and that marks were allocated accordingly.

3.8 Statistical techniques

After the scripts have been marked based on ability and content areas of the mathematics curriculum, the performance scores of all the students in each ability and content areas were obtained as well as obtained the followings: the performance scores of all male students, the performance scores of all female students, the performance scores of urban and rural students, the performance scores of male and female in urban and rural settings.

The test of hypotheses in this study involved a lot of pair of variables to be considered. Thus, t-test for independent sample was used to test HO3, while one way analysis of variance was used to test HO1, HO2 and HO4.The level of significance was put at 5% for all the tests.

Performance of the students were identified from both answers scored and the obtained raw scores in each ability and content areas of the mathematics curriculum contents.

3.9 Summary

This chapter has attempted to describe the detailed methodology that were used in this study, and has explained the procedures for the study. The chapter discussed the research design and procedures in detail for this study, population, instrumentation, administration of the test instruments and finally the statistical techniques that were employed for the analysis in this study.

CHAPTER FOUR

4.0 ANALYSIS OF DATA AND INTERPRETATION OF RESULTS

4.1 Introduction

This chapter presents analysis of data obtained from this study. The presentation include both results from hypothesis testing and discussions of specific content areas of difficulties among the students. The areas of difficulties were identified from the students' marked scripts as well as the mean performance socres obtained from the test. Statistical techniques such as mean scores, standard deviation, t-test and analysis of variance were presented.

4.2 Results

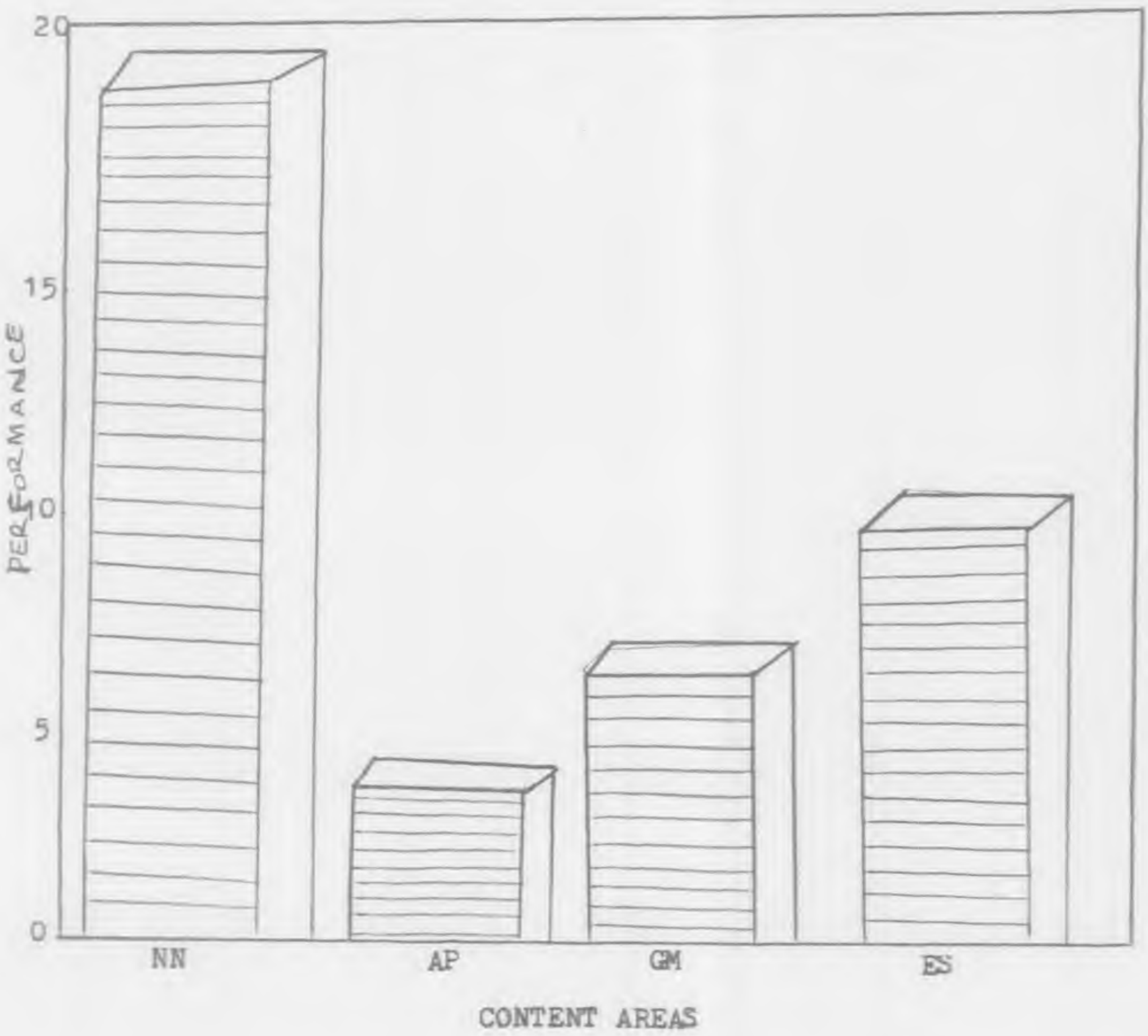
The students' mean scores and standard deviation on each of the four content areas is presented. The peformance of students in the content areas have indicated that horizontal discrepancies in socres of students varied very high with high standard deviation across the various components of school mathematics curriculum content at JSS III level. These could be a result of the high variability in the raw scores obtained by students in the attainment test. Besides, the general performance of students were found to be very low as only 41 (11.4% of the sample) students scored the minimum 40% passed mark and above in the overall performance. The Pass mark was determined through constructing 95% confidence interval for the mean difference between Random Effects Model and Estimate between Component Variance which was found to be 39.88% (approximately 40%). Out of these 22 (53.7% of the passes) were boys while 19 (46.3% of passes) were girls. The student's mean performance and standard deviation were distributed according to the four basic content areas of the JSSMC. Table 4.1 summarised the computation below:

TABLE 4.1: MEANS, STANDARD DEVIATIONS AND PERCENTAGES OF STUDENTS WHO PASSED IN EACH CON ENT AREA

CONTENT	MEAN	SD	PEERCENTAGE	NO. OF PASSES
NN	17.64	10.33	41.3	149
AP	4.26	5.44	2.8	10
G/M	5.82	5.65	3.5	12
ES	9.49	6.45	8.1	29

Table 4.1 shows that the mean scores in each content area varies widely from each other. The highest standard deviation was recorded in Number and numeration which indicated that students' scores were highly varied from each .see Figure 4.1 for the bar chart of students' mean performance in each four content areas.

Fig. 4.1: PERFORMANCE OF STUDENTS IN THE CONTENT AREAS



4.3 The hypotheses testing

In chapter one, a number of hypothesis were formulated with the view of answering the questions raised. In this section attempts were made to test the hypotheses at 0.05 level of significance.

HO1:

There are no significance difference in mean performance among the JSS III students in mathematics in the various content areas, namely; number and numeration, algebraic process, geometry and mensuration and every day statistics.

To test this hypothesis the F-statistics (one way analysis of variance) was used. The result is shown on Table 4.2.

TABLE 4.2: SUMMARY OF ONE WAY ANOVA ON THE FOUR CONTENT AREAS.

SOURCE OF VARIATION	DF	SUM OF SQUARE	MEAN SQUARES	Fratio	FC
Between	5	68493.33	13698.67	*234.87	2.31
Within	2154	125630.00	58.32		
TOTAL	2159	1194123.33			

* Significant, $P<0.05$, Fc = critical value of F.

The result has shown that there exists significant difference in mean performance among JSS III in the various components of mathematics curriculum contents. Thus the null hypothesis was rejected. The Scheffe's Test results Table 4.3 below displayed the result for the pair wise significant differences in the content areas.

TABLE 4.3: DIFFERENCES IN MEAN PERFORMANCE AMONG THE JSS III STUDENTS IN MATHEMATICS IN THE VARIOUS CONTENT AREAS.

MEAN	GROUP	AP	G/M	ES	NN
4.26	AP				
5.82	G/M	*			
9.48	ES	*	*		
17.64	NN	*	*	*	

*Denotes pairs of groups significantly different at the 0.05 level. It is clear from the table that geometry and mensuration (mean = 5.82) is significantly different from algebraic process (mean = 4.26). Every day statistics (mean = 9.48) is significantly different from algebraic process (mean = 4.26), geometry and mensuration (mean = 5.82).

Similarly number and numeration (mean = 17.64) is significantly different from algebraic process, geometry and mensuration and Every day statistics.

Comparing the critical value for the scheffes' test with the pairwise comparisons on Table 4.3, it is seen that all the entries are significant except for algebraic process and number and numeration. Thus, there is enough evidence to suggest that students' performance on any one of the content areas differ significantly from the others.

HO2:

There is no significant interaction effect between performance and gender in JSS III students and their mathematical performance in the various mathematics content areas.

The mean scores of students were obtained according to sex in the various mathematics curriculum content areas. The mean scores for males were: number and numeration 18.39, algebraic process 4.17, geometry and mensuration 6.13 and every day statistics 9.93 respectively. Similarly, the mean scores for females were: number and numeration 16.51, algebraic process 4.41, geometry and mensuration 5.36 and every day statistics 8.82 respectively.

To test the hypothesis the F-statistics (two-way analysis of variance) was used. The result is provided on Table 4.4 :

Table 4.4: THE SUMMARY OF 2 - WAY ANOVA BY SEX AND CONTENT AREAS.

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIC	FC
Mean effect	69037.24	6	11506.21	*198.2	
Sex	543.91	1	543.91	*9.37	
Content	68493.33	5	13698.67	*235.97	
2-Way Interaction	386.96	5	77.39	*1.33	
Sex content	386.96	5	77.39	*1.33	1.00
Explained	69424.20	11	6311.29	*108.72	
Residual	124699.13	2148	58.05		
TOTAL	1941123.33	2159	89.91		

* Significant, Fc = Critical Value of F.

The result on Table 4.4 above has indicated there exist significant interaction effect between performance and gender in the JSS III students and their mathematical performance in mathematics curriculum content areas. Hence, the null hypothesis was rejected at 0.05 level of significance.

HO3:

There is no significant difference in mathematical mean performance between the urban and rural JSS III students.

To test this hypothesis T-test statistics was used. The scores of students were sorted according to their location (Urban and Rural). The data is displayed on Table 4.5.

TABLE 4.5: MEANS AND STANDARD DEVIATIONS OF JSS III STUDENTS' ERFORMANCE IN EACH AREA OF MATHEMATICS CURRICULUM CONTENT BY SCHOOL LOCATIONS.

Content	N	Mean	SD	N	Mean	SD	T-critical	T-value
NN	196	18.95	10.69	164	16.09	9.96	1.96	2.64*
AP	196	3.90	5.40	164	4.70	5.47	1.96	-1.38
G/M	196	5.54	5.74	164	6.16	5.55	1.96	-1.52
ES	196	9.97	7.04	164	8.90	5.72	1.96	1.52

df = 358, á = 0.05 * Significant.

The result from Table 4.5 indicated that students' performance by school location in algebraic process, geometry and mensuration and every day statistic are not significant. Thus the hypothesis (HO3) cannot be fully rejected, since students' performance in numbers and numerations are statistically different in favour of urban JSS III students.

4.4 Test of hypotheses on mathematical abilities

HO4:

There are no significant differences in mean performance in each of the three basic mathematical abilities, knowledge, skills and problem solving among the Junior Secondary three mathematics learners.

One way Analysis of variance technique was employed to test this hypothesis. Table 4.6 summarised the computation below.

Table 4.6:Summary of one way ANOVA for the basic mathematical abilities.

Source of variation	DF	Sum of Squares	Mean squares	F-ratio	FC
Between	2	2490.92	1245.46	*215.00	2.31
Within	1041	6030.28	5.79		
Total	1043	8521.20			

* Significant, Fc = critical value of F.

Table 4.6 shows that the F calculated (F=215.00) is greater than the F critical F=2.31). Hence the null hypothesis (HO4) was rejected at the 0.05 level of significance since significant differences in performance existed between the three basic mathematical abilities (knowledge, skills and problem solving) among the JSS III mathematics learners. Table 4.7 below provide the Scheffes' Test of pairwise significant differences among the basic mathematical ability.

TABLE 4.7: DIFFERENCES IN MEAN PERFORMANCE AMONG STUDENTS IN THE THREE BASIC MATHEMATICAL ABILITIES.

		P-S	S	K
MEAN	GROUP			
11.26	P-S			
13.25	S	*		
15.04	K	*	*	

* Denote pair of groups significantly different at the 0.05 level.

The table shows that skill (mean = 13.26) is significantly different from problem solving (mean = 11.26), similarly knowledge (mean = 15.04) is significantly different from problem solving (mean = 11.26) and skill (mean = 13.25). Hence (*) indicated on the table shows that there is significant differences between pairs of groups.

4.5 Discussion

The major objective of this study was to investigate areas of difficulties in the various content areas as well as the basic mathematical abilities in Junior Secondary School Mathematics Curriculum (JSSMC). The aim was to establish which areas of the mathematics Curriculum content and ability students were weak which had contributed to their consistent low performance in secondary school mathematics achievement over the years.

The mathematical performance of students were found to be very low. These varied widely across the various components of the school mathematics curriculum content and the complex level of performance, according to sex and school locations.

Areas of difficulties among the Junior Secondary III students in Junior Secondary School Mathematics Curriculum under numbers and numeration's include multiplication and additions involving decimal fractions with negative powers and change of bases. The distinction between decimal point and significant figures were of great difficulty. However, numbers and numeration are found to be the areas where students were less deficient compared with other content areas. the result is consistent with carpenter et al (1975) NAEP report, Adetula (1989), and Odili (1990) who reported in their findings that the JSS students were less deficient in whole number concepts whereas they were deficient in exercises involving fractions such as decimal, percentages and ratios.

The students appeared to had low performance in algebraic processes, geometry and mensuration, as could be seen on Table 4.1. This would mean that Junior Secondary III Students experienced greater difficulties in understanding algebraic processes, geometry and mensuration concepts of skills and problem solving. The finding of this study support earlier studies conducted by Lassa (1986), who found that geometry was the least understood by students and Odili (1990) who found that only 6% of the students passed in geometric exercises. The main areas of difficulties encountered by students in algebraic processes were; factorizations, inverse variations, graphical solutions of simultaneous linear equations, linear inequalities simplification of algebraic expression and worst of all the word problems. These findings support Galadima (1988), Abakpa (1993) who reported that students' low performance were poor in these topic areas. This is also consistent with Adetula (1990) and Bolaji (1994), who found that one area of problem solving that immensely contributed to students' deficiency in mathematics is the translation of word problems into mathematical sentences.

The areas of difficulties encountered by students in geometry and mensuration include identification of shapes, measuring of angles and elementary trigonometrical ratios, while in everyday statistics students experienced greater difficulties in problems involving probability, reading graphs and recall of basic definitions of statistical terms. The findings of this study support that of Odili (1990) who found that only 11.3% of the students passed everyday statistics.

The result of analysis associated with the first null hypothesis (HO1) indicated that there were significant differences in mean performance among the JSS III students in various content areas of the Junior Secondary School mathematics Curriculum.

The result of the analysis for testing the second hypothesis (HO2) indicated that there were no significant differences in mathematical performance between boys and girls in JSS III students. This result is consistent with Galadima (1998) and Abakpa (1993) who in their studies of performance of JSS III students found that in the overall performance no significant differences were observed. Similarly, Suydam and Riedesal (1969) when they investigated sex related differences in mathematics indicated that there was no significant differences between the sexes in arithmetic achievement before seventh grade.

The third hypothesis (HO3) was formulated which states that there is no significant difference in mathematical mean performance between the urban and rural JSS students. This hypothesis was partially rejected because in numbers and numerations there were significant differences in mathematical performance between the urban and rural JSS III students Table 4.5. But in algebraic processes, geometry and mensuration and everyday statistics there were no significant differences. The result of no significant differences in this finding is consistent with Daramola et al (1985) who indicated that the mean scores for male and female students were not significantly different.

The findings of this study however, differs from earlier treatment on the subject by Adeagbo (1983), Adeniyi (1988), Kelejaiye (1982), and Odili (1990) all showed unequal patterns of performance by rural and urban students with the later groups performing better than the former.

The analysis for testing the fourth hypothesis (HO4) indicated that there were significant differences in performance in each of the mathematical abilities among the JSS III students.

4.6 Summary

The four major hypotheses in this study were tested using various statistical techniques such as means, standard deviations, t-test and analysis of variances. The result of the hypothesis testing indicated there were significant differences in mean performance in the various content areas and the basic mathematical abilities among the JSS III students.

It was discovered that the JSS III students have low level of mathematics performance across the various components of school mathematics curriculum content.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the results of the findings in this study. Suggestions are offered for the improvement of the students' low mathematical performance at the Junior Secondary School Level.

5.2 Summary of findings

This study investigated the mathematical performance of the JSS III Students in the various Components of Junior Secondary School Mathematics Curriculum contents. The study tried to establish whether gender and school locations are associated with the Students' mathematical performance.

Four major hypotheses were formulated and tested at 0.05 level of significance. The investigation made use of a sample of 360 students randomly drawn from 24 JSS in Adamawa State. Various statistical techniques such as means, standard deviations, t-test and one way analysis of variance were used.

The findings of this study are summarised as follows :- with regard to the **HO1**:, the data suggest that there were significant differences in mean performance among the Junior Secondary three Students in mathematics in the various curriculum content areas.

HO2:

There were significant interaction effect between performance and gender in the junior secondary three Students, and their mathematical performance in mathematics curriculum content areas.

HO3:

There were no significant differences in mathematical performance between the urban and rural junior secondary students, except in Number and Numeration.

HO4:

There were significant differences on performance in each of the three basic mathematical abilities; knowledge, skills and problems solving among the junior secondary three mathematics learners.

5.3 Conclusions

Based on the results of this investigation it is appropriate to conclude that the students' performance in mathematics in the various curriculum content areas of the JSSMC were low. The result showed that only 41 (11.4% of the sample) students scored the 40% minimum pass mark, which was determined by constructing 95% confidence interval for the mean difference between random effects model and estimate between component variance. The students were less deficient in number and numeration 149 (41.3% passed) while the students were weak in geometry and mensuration 12 (3.5% passed) and Algebraic processes 10 (2.8% passed), and Everyday statistics 29 (8.1% passed).

The students major areas of difficulties in Algebraic processes include :- factorization, inverse variations, simultaneously linear equations graphically, simplification of algebraic expression. In Number and Numeration include number bases (base conversion) standard form, prime numbers while in Geometry and Mensuration the areas of difficulties encountered by the students include: measurement of angles, trigonometry ratios, identification of line of symmetry in geometrical shapes and calculations of volumes particularly involving Pi (π = 3.142 or 22/7) and in Everyday statistics, probability were the main areas of difficulties encountered by the students.

These imply that planning of intervention programmes to arrest low mathematical performance in the JSS should be directed to specific content areas and the basic mathematical abilities.

Considering the level of performance of both male and female students in the JSS, sex differences did exist in each of the various content areas of the JSSMC. However, this may not probably be the case in SSSMC.

Performance in mathematics associated with school location (urban and rural) were also investigated. The result of this study showed that students from both urban and rural JSS 111 had similar mathematics performance in the various content areas, except in number and numerations.

These finding have implications for remedying low mathematics achievement among the JSS mathematics learners. Remediation should not only be directed to content areas of mathematics but also to the basic mathematical abilities.

5.4 Limitations

The limitations of this study were the intervening variables. Intervening variables are those characteristics that cannot be control or measured directly though they have an important effect upon the outcome of this research understudy. These include, home environment, location of schools (urban/rural), socio-economic background. The findings of these study therefore holds only to the extent that there were no serious violation of these conditions.

5.5 Recommendations

1. To reduce the low mathematics performance and their levels are for the teachers to present mathematics tasks with materials familiar with the learners drawn from their

environment and also relevant to Science and Technology. mathematics teachers have to explore the construction of activities which will engender and sustain learners level of participation in mathematics classroom.

2. Teachers should pay greater attention to the topics which were identified in (5.3) as causing difficulties to most of the students. They should try to see that difficult concepts and symbols were properly understood by the students in the process of teaching and learning.

3. Many of the schools visited by the researcher during this investigation showed that there were lack of relevant and suitable teaching aid designed to support the learning of mathematics at this level. Based on these, the researcher recommend an urgent need to the curricalists to develop relevant teaching aid to support the study of mathematics. Mathematics authors are challenged by the state of arts in the JSSMC and school technology. The urgency to prepare teaching aid in mathematics need not be over-emphasised.

4. Curriculum planners should exert more effort in identifying and suggesting instructional materials and activities for the use of teachers in the teaching of JSSMC. Authors of mathematics textbooks can also be of help in this regard. The importance of practice by the students in learning a subject like mathematics cannot be over emphasised. Practices does provide for refinement of techniques and

fixation of concepts and procedures in the students for retention, building accuracy, improving efficiency and establish confidence, because success in computing correctly and efficiently improves the students motivation, participation and positive altitude towards mathematics there by improving the students mathematics performance.

6. Research of this kind should be extended to senior secondary school mathematics curriculum to find out those areas majority of students have greater difficulties in the subject. This will provide a clear picture of the areas of difficulties that need a special attention by both teachers and students, also provide bases on how those areas could be tackled effectively.

7. The researcher recommends that a similar research should be conducted in another environment to compare with the present study in question.

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APPENDIX A

JUNIOR SECONDARY THREE DIAGNOSTIC MATHEMATICS ACHIEVEMENT TEST.

CANDIDATE NAME :_____________ SEX(MALE/FEMALE:_____

SCHOOL :_________________________ AGE: __________

CLASS : ____

INSTRUCTIONS : TIME ALLOWED 1½ HOURS

This test is aimed at assessing your total achievement in mathematics course of your mathematics curriculum. In this test each item is designed to test an important idea from your mathematics contents. Do your best to answer each question correctly.

For each problem, there are five options i.e. alternative answers. Only one of these is the correct answer. In your question paper, for each problem circle the letter corresponding to the correct answer.

You are allowed to use logarithms, sine, cosine and tangent tables. Do not spend too much time on a question. If you find a question difficult, leave it and try it again later.

ATTEMPT ALL QUESTIONS

TRY THIS EXAMPLE

EXAMPLE: Given that 3y-2 = 10, Find the value of y.

A. 2 B. 3 (C). 4 D. 10 E. 12

The value of y is 3y = 12 => y = 4 and so C is circled

NUMBER AND NUMER0ATION

1. Base 2 normally referred to as:(k)

A. Binary B. Octal C. Tentagon D. Denary E. Decagon

2. Write three hundred and twenty four thousand in figures.(k)

A. 3002400 B. 324000 C. 32400 D. 3240 E. 324

3. Change 0.000219 into standard form.(s)

A. 219×10^{6} B. 2.19×10^{4} C. 21.9×10^{-5} D. 2.19×10^{-4} E. 219×10^{-6}.

4. What is 0.003867 to 3 significant figures? (s)

A. 0.004 B. 0.00386 C. 0.00387 D. 386 E. 387

5. The set of numbers which cannot be expressed in the form of a/b where a and b are integers and $b \neq 0$ are called: (k)

A. real numbers B. rational numbers C. integers D. non-rational

E. positive numbers

6. Calculate 0.0535 x 0.00182 and give your answer to 3 significant figures. (p-s)

A. 0.0000974 B. 0.000973 C. 0.000974 D. 0.00974 E. 0.974

7. Simplify $3.365 \times 10^{3} + 1.12 \times 10^{-4}$ and write your answer to one decimal place. (p-s)

A. 3365.0 B. 336.500 C. 336.5 D. 33.650 E. 33.65

8. Find the square root of 0.74 to 2 decimal places. (p –s)

A. 0.82 B. 0.86 C. 0.862 D. 0.87 E. .875

9. The reciprocal of 5/12 is : (p-s)

A. 416 B. 60 C. 12 D. 5 E. 2.4

10. Subtract 101_2 from 1010_2.(s)

A. 11001_2 B. 1010_2 C. 1001_2 D. 101_2 E. 10_2.

11. What is the smallest fraction among the following 3/4, 2/3, 5/6, 1/2, 7/12.(s)

A. 3/4 B. 2/3 C. 5/6 D. 1/2 E. 7/12

12. In a school, a child is asked to repeat the class if his total marks in the

examination is less than 240. Musa found out that he scored 45% in English, 35% in mathematics, 50% in Social studies, 38% in Physics and 22% in Chemistry. What must be the least score in Religious Studies if Musa not repeat? (p-s)

A. 50%   . 49%   C. 45%   D. 40%   E. 24%

13. Find the simple interest on N 550 for 6 years at   7% (p-s)

A. N231.00   B. N77.00   C. N33.00   D. N21.00   E. N16.70

14. By writing each number to 1 significant figures give an approximate answer

$\frac{9482 \times 3741}{27 \times 7949}$ (p-s)

A. 150   B. 250   C. 4000   D. 8000   E. 300

15. A man borrows for N350.50 for 3 years at a rate of 15% per annum. How much Interest will he have to pay?(p –s)

A. N175.50   B. N157.50   C. N155.70   D. N57.50   E. N15.75

16. 150 Armies can be fed on some quantity of food for 30 days. How many armies can the food feed for 45 days?(p-s)

A. 110 Armies   B. 100 Armies   C. 120 Armies   D. 150 Armies   E. 160 Armies

17. Find the value of $(101_{two})^2$ in base two (s)

A. 1010   B. 1111   C. 10100   D. 10101   E. 11001

18. Simplify: (4.87 - 3.22)/1.5 (s)

A. 11   B. 2.475   C. 1.2   D. 1.1   E. 0.97

19. A dealer gained N 400.00 on a sale which was equivalent to 8% profit. What was the cost price? (p-s)

A. N5400   B. N5000   C. N3200   D. N50   E. N32

20. What is the value of 8 in 18214? (k)

A. 8 units B. 8 hundreds C. 8 ten thousand D. 8 tens E. 8 thousands

ALGEBRAIC PROCESSES

21. The connection between x and y in the table below is an instance of : (k)

y	24	12	6	3	3.
x	12	6	3	1.5	0.

A. partial variation B. Direct variation C. Both A and B D. joint variation

E. None of the above.

22. The range of values of a for which $11 - 2a \geq 1$ is (s)

A. $a \geq 5$ B. $a \leq 5$ C. $a = 5$ D. $a \leq 5$ E. $a \geq 5$

23. Factorize, $x^2 + x - 6$ (s)

A. $(x - 2)(x - 3)$ B. $(x + 2)(x - 3)$ C. $(x + 3)(x - 2)$ D. $(x + 2)(x - 3)$

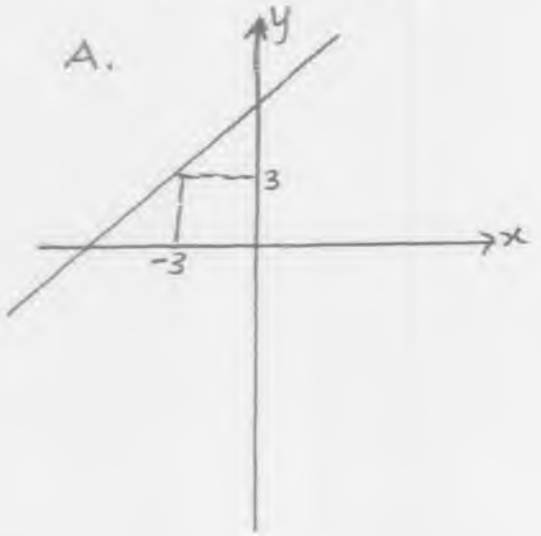
E. $(x - 6)(x + 3)$.

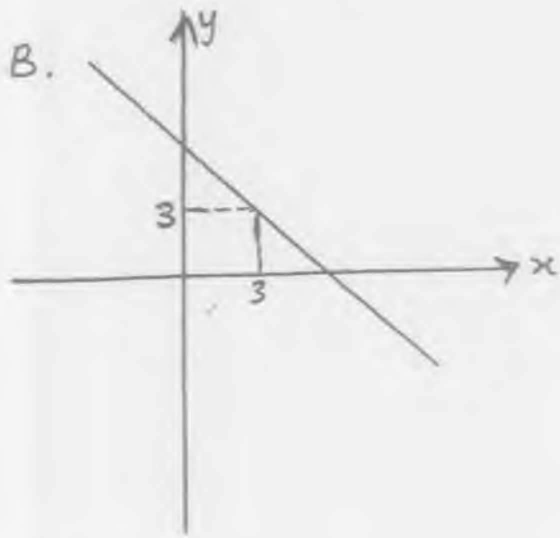
24. The value of x in the equation $(x + 55)/3 = 4x$ is (p-s)

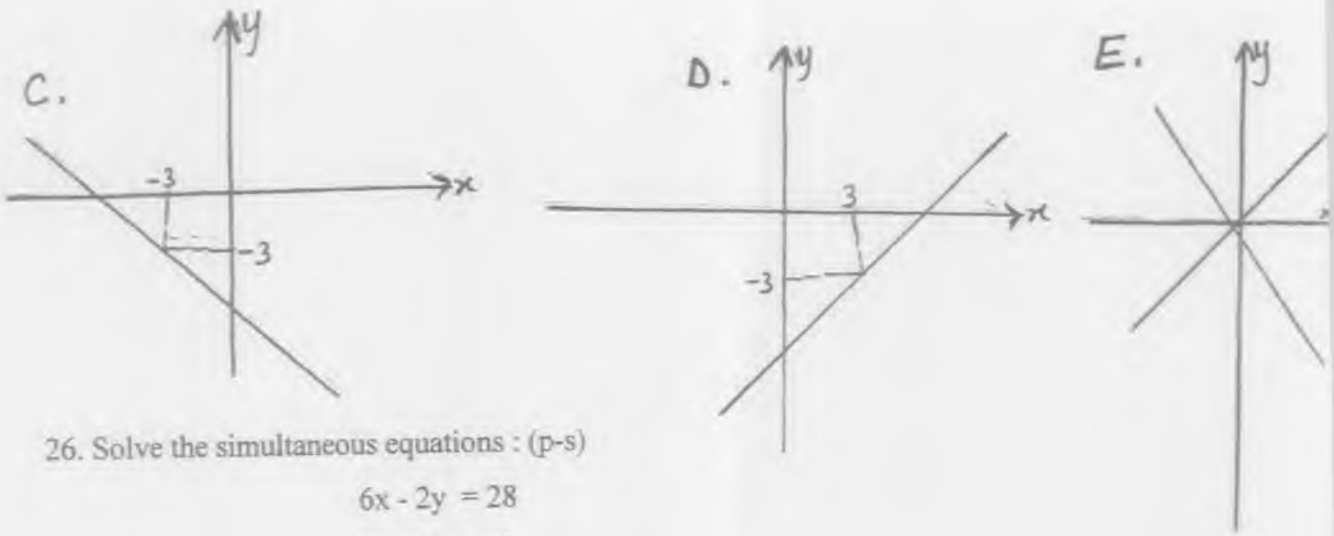
A. 0 B. 4 C. 5 D. 44 E. 66

25. Which of the following represents the graph of the simultaneous equations:

$x + y = 3$, $x - y = 7$ (p-s)







26. Solve the simultaneous equations : (p-s)

$$6x - 2y = 28$$
$$4x + 2y = 2$$

A. (3,5) B. (-3,5) C. (-3,-5) D. (3,-5) E. (-2, 5)

27. x varies jointly with y and z. When y = 2 and Z = 3, x = 300. Find x when y = 4 and z = 6. (p-s)

A. x = 5 B. x = 6 C. x = 20 D. x = 30 E. x = 1200

28. Factorize the expression 6q -rs-6s+qr. (s)

A. (3+r)(2q+r) B. (3-r)(2q+s) C. (3-r)(2q-s) D. (6+r)(q-s) E. (2+r)(q-s)

29. Two divided by Binta's age plus three is equal to one divided by her age five years ago. What is her present age ?. (p-s)

A. 15 B. 14 C. 13 D. 12 E. 11

30. Which of the following best describes inverse proportion? (k)

A. One variable increases and the other decreases at the same rate.

B. One variable decreases and the other increases at the same rate.

C. One variable decreases as the other decreases at the same rate.

D. All of the above E. None of the above

GEOMETRY AND MENSURATION

31. The area of trapezium is measured by the product of measures of half the sum of the...........sides and the perpendicular distance between them. (k)

A. Congruent B. Similar C. Volume D. Adjacent E. Parallel

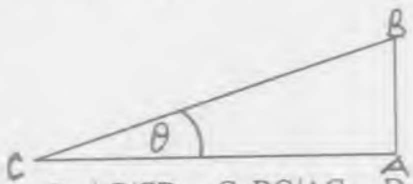
32. The distance around any polygon is called: (k)

A. Distance B. Perimeter C. Circumference D. Contour E. Latitude

33. A plane figure which has all its four sides equal and its angles right angles is called a: (k)

A. Rhombus B. Square C. Pentagon D. Parallelogram E. Trapezium

34. Which of the following alternatives best expresses the cosine of the acute angle marked below: (s)



A. BC/BA B. AC/CB C. BC/AC D. AC/AB E. None of the above

35. Which of the following has two (and only two) lines of symmetry (k)

A. Square B. Isosceles triangle C. Equilateral triangle D. Rectangle

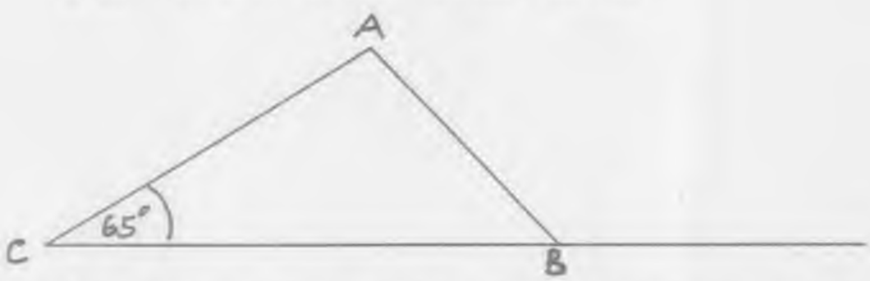
E. Rectangular pentagon

36 If 1cm on a map represents 500km. What is the actual distance of town B from A which is 5cm long on the map? (p-s)

A. 2,500km B. 1,000km C. 1,500m D. 7,500cm E. 2,700cm

37. In the diagram below AC=AB and angle C = 65°, find angle ABD. (p-s)

A. 65° B. 133° C. 115° D. 125° E. 180°



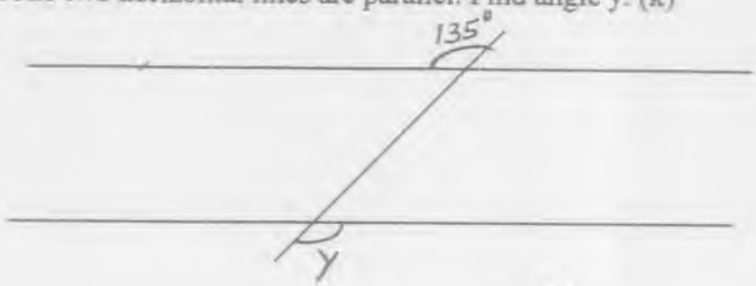
38. A ladder leans against wall 5.37m high. Find the length of the ladder, if it is 7.13m away from the wall. Take your answer to 3 significant figures. (p-s)

A. 8.93 B. 8.96 C. 8.98 D. 9.83 E. 9.93

39. If the two similar squares have corresponding sides in the ratio 3:7, find the area of the smaller square if the area of the large square is $539cm^2$. (p-s)

A. $530cm^2$ B. $470cm^2$ C. $339cm^2$ D. $109cm^2$ E. $99cm^2$

40. The two horizontal lines are parallel. Find angle y. (k)



A. 45° B. 90° C. 135° D. 180° E. 360°

41. A cuboid has following dimensions, 2cm by 2cm by 6cm. Find its volume. (s)

A. $4cm^3$ B. $10cm^3$ C. $12cm^3$ D. $24cm^3$ E. $27cm^3$

42. Five Uniform taps can fill a swimming pool in 20 minutes. How many of such taps would be required to fill the pool in 5 minutes? (p-s)

A. 20 pipes B. 100 pipes C. 125 pipes D. 175 pipes E. 185 pipes.

43. Find the volume of a cylinder whose radius is 3cm and 7cm high. (take ∂ = 22/7). (p-s)

A. $9cm^3$ B. $63cm^3$ C. $198cm^3$ D. $1386cm^3$ E. $2134cm^3$

44. A cylinder is of height 5cm and base radius 2cm. Use the value - = 3.142 to calculate the area of its curved surface to the nearest cm^2. (p-s)

A. $13cm^2$ B. $25cm^2$ C. $31cm^2$ D. $63cm^2$ E. $126cm^2$

45. Two similar drums hold 108 litres and 62.5 litres respectively. If the height of the smaller drum is 80cm,find the height of the bigger drum. (p-s)

A. 96cm B. 94cm C. 86cm D. 36cm E. 25cm

46. Each face of a cuboid is the form of a : (k)

A. triangle B. rectangle C. square D. hexagon E. circle

47. From the top of a small hill 12 metres high a boy throw a stone down the slope. If the stone rolls for 30 metres before it comes to rest on the level ground, find the distance from the bottom of the mountain to the point where the stone stops. (Take your answer to two decimal places). (p-s)

A. 27.50m B. 27.495m C. 27.49m D. 18.9m E. 15.5m.

48. How many 1.25 litres container of oil can be got from a drum containing 9.375 litres? (s)

A. 1.25 B. 7.5 C. 9 D. 9.479 E. 15

474513

49. Two similar tins have heights of 42cm and 30cm. If the smaller tin holds 2.25 litres, find the capacity of the larger tin. (p-s)

A. 6.174 litres B. 4.79 litres C. 3.943 litres. D. 2.934 litres E. 1.934 litres

50. Two rectangular rooms are similar in shape their areas are $6cm^2$ and $1.5cm^2$. If the width of the smaller room is 220cm. Find the width of the larger room. (p-s)

A. 880cm B. 440cm C. 220cm D. 110cm E. 99cm

STATISTICS

51. What do you understand by the mode of a given data? (k)

A. The data number that has the least frequency.

B. The sum of the data number.

C. The difference between the highest and lowest number.

D. The data number that has the highest frequency.

E. The average of the mean.

52. The middle element of a set of number arranged in order of size is called: (k)

A. Mode B. Mean C. Average D. Standard deviation E. Median

53. When tossing an unbiased die, the probability of getting an even number is (s)

A. 5/6 B. 2/3 C. 1/2 D. 1/3 E. 1/6

54. There are 40 pupils in a class of whom 62½% are boys. The teacher writes the name of each pupil on slip of paper. If a slip is drawn at random what is the probability that the name on the slip is a gril? (p-s)

A. 3/8 B. ½ C. 5/8 D. 3/4 E. 7/8

55. In statistics, mean could be referred to as: (k)

A. Half of the total sum of the numbers. B. Average C. Mode D. Range E. Median

56. In a village it is found that the probability of children dying at birth is 3/100. How many children would die in 800 deliveries ? (p-s)

A. 24 B. 36 C. 72 D. 96 E. 108

57. It is known that out of every 1000 new cars, 50 develop a mechanical fault in the first 3 months. What is the probability of buying a car that will develop a mechanical fault within 3 months ?(p-s)

A. 3/20 B. 1/20 C. 1/4 D. 3/4 E. 3/50

58. All the following are methods of presenting data EXCEPT (k)

A. Bar chart B. Frequency table C. Histogram D. Pie chart E. Pie frequency

59. In a plastic cup factory it is found that the probability of a cup being defective is 1/300. How many defective cups would there be in 15,000 cups ? (p-s)

A. 25 B. 50 C. 75 D. 125 E. 300

60.After 5 games a football team's average is 2.8. After one more game the goal average is 3. The number of goals scored in the 6^{the} game was: (p-s)

A. 2 B. 4 C. 5 D. 6 E. 7

SOLUTIONS

1.	A	21.	B	41.	D
2.	B	22.	D	42.	A
3.	B	23.	C	43.	C
4.	C	24.	C	44.	E
5.	B	25.	B	45.	A
6.	A	26.	D	46.	C
7.	A	27.	E	47.	A
8.	B	28.	D	48.	B
9.	E	29.	E	49.	B
10.	D	30.	A	50.	B
11.	D	31.	E	51.	D
12.	A	32.	B	52.	E
13.	A	33.	B	53.	C
14.	A	34.	D	54.	A
15.	B	35.	B	55.	B
16.	B	36.	A	56.	A
17.	E	37.	C	57.	B
18.	D	38.	A	58.	E
19.	E	39.	C	59.	B
20.	E	40.	C	60.	B

APPENDIX B:

Federal Polytechnic Mubi,
P.M.B. 35,
Mubi,
Adamawa State.

21st April, 1997.

The Zonal Chief Superintendent
of Schools,
Post Primary Schools Management Board,
Mubi,
Adamawa State.

Dear Sir,

PERMISSION TO CONDUCT PILOT STUDY FOR A RESEARCH

I am carrying out a study on "A study of students' performance in Mathematics curriculum content of the Junior Secondary School in Adamawa State. The research entails the administration of test items on students as pilot testing of the instrument to be used in the main study.

It has become implicative for me to solicite your support for this study. I would be very glad if you can direct by giving a covering letter that the test items be administered under strict examination condition by mathematics teachers through the directives of the principals in the sampled schools. I deeply appreciate you doing this favour for me.

Please accept my sincere thanks for your cooperation.

Yours faithfully,

(signed)

JACOB TSUWI KADALA
(RESEARCHER)

APPENDIX C:

PPSMB/MBZ/GEN/17/111/153

Post Primary Schools Management Boar
Zonal Office, Mubi.
27th April 1997.

All Principals,
Post Primary Schools,
Mubi Zone.

PERMISSION TO CONDUCT RESEARCH.

You are requested to assist and co-operate with the bearer, Mr. Jacob T. Kadala to carry out the subject mentioned above in your school please.

APPENDIX D:

Federal Polytechnic Mubi,
P.M.B. 35,
Mubi,
Adamawa State.

30th April, 1997.

The Principal,

Dear Sir,

PERMISSION TO CONDUCT PILOT TESTING

I am carrying out a study on an Evaluation of Students' Deficiency in Mathematics component of the Junior Secondary School Mathematics Curriculum.

The pilot testing entails the administration of test items on students.

It has become implicative for me to solicite your support for this study. I would be very glad if you could direct that the test items be administered under strict examination condition by your mathematics teachers. I deeply appreciate you doing this favour for me.

Please accept my sincere thanks for your cooperation.

Yours faithfully,

JACOB T. KADALA,
M.Ed. (Mathematics Educ)
CANDIDATE

APPENDIX E:

Institute of Education
Ahmadu Bello University
Zaria.

26th March, 1997.

The Executive Secretary
Post Primary Schools Management Borad
Yola
Adamawa State.

Dear Sir,

Request for Permission To Conduct Research in Some Selected Secondary Schools.

The bearer Jacob T. Kadala is a Master Student in Faculty of Education. He is working in the area of Mathematics Education with specific reference on A STUDY of students' performance in Mathematics of Junior Secondary School in Adamawa State.

His work involves trying some schools which will identify some deficiencies in the schools Mathematics.

By this letter I am soliciting for your kind permission and moral support to help carry out the research.

Thank you.

Yours Sincerely

Dr. C.A. Bolaji
(Supervisor.)

APPENDIX F:

The Federal Polytechnic Mubi,
Department of Maths and
Computer Science,
P.M.B. 35 Mubi,
Adamawa State.

30th April, 1997.

The Director General,
Ministry of Education,
P.M.B. 2024 Yola,
Adamawa State.

Dear Sir,

COLLECTION OF RESEARCH DATA

My name is Jacob Tsuwi Kadala. I am at an advanced stage of a M.Ed. programme in Mathematics Education at the Ahmadu Bello University, Zaria. My research topic is "A study of students' performance in Mathematics Curriculum contents of the Junior Secondary School in Adamawa State".

The major aim of the study is to investigate whether the performance of the Junior Secondary three students be attributed to poor acquisition level of basic Mathematical knowledge, abilities and problem - solving in number and numeration, algebraic processes, geometry and mensuration and every day statistics. The research will require the administration of test items on students in all the sampled secondary schools in Adamawa State.

It is therefore imperative that I write to seek your permission and support for this study, particularly in communicating with students through their teachers. I would be glad if you could assist me by writing a covering letter to the Principals on the study, and also to allow me use your established communication channel with the secondary schools.

Apart from the direct benefit that the state will derive from the findings of a research of this nature, it could also help teachers in the cause of their everyday teaching of Mathematics curriculum in our schools.

Attached is a copy of the test instruments to be administered on the students.

Thank you for the anticipated cooperation.

Yours faithfully,

JACOB TSUWI KADALA,
(RESEARCHER).

APPENDIX G:

OFFICE OF THE HONOURABLE COMMISSIONER

Ref No. EGS/GG/393/I/330.
Ministry of Education
Curriculum. *Division*
P. M. B. 2024, Yola
Adamawa State, Nigeria.

Telegram:......................................
Telephone: YOLA

25th June, *19* 97.

The Principal,

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Permission To Conduct A Research

The bearer Mr. Jacob Tsuwi Kadala is a student from Ahmadu Bello University, Zaria; Department of Education is conducting a Research on " A study of students' performance in Mathematics curriculum of the Junior Secondary School in Adamawa State". The research require the administration of test items on the students in all the Educational Zones.

I am directed to convey the Ministry of Education Curriculum Division, approval to you for the above mentioned programme.

Give him maximum cooperation.

J.M. Nafarnda
Secretary Exam. Committee
For: HONOURABLE=COMMISSIONER.