COMPUTER AIDED LEARNING
(A CASE STUDY OF MATHEMATICS)

BY

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DEDICATION.

This work is dedicated to the past, present and future generations of mankind.

DECLARATION.

I Musa Bawa, hereby declare that the whole of the work submitted to the Post Graduate

School, Federal University of Technology, Minna, is the result of my research work except

where references are made to published literature and this has been duly acknowledged.

This material has never been presented elsewhere for the award of any certificate.

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MUSA BAWA.

APPROVAL PAGE.

This project has been read and approved as meeting the requirements of the department of

mathematics and computer science, Federal University of Technology (FUT), Minna.

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ACKNOWLEDGEMENT

ABSTRACT.

As a result of the findings of this project there is need to computerise the teaching and learning of mathematics in our schools for the attainment of greater benefit, and efficiency.

Since it will be extremely difficult to conduct a thorough investigation that will embrace the whole country, the study is confined to a manageable size by restricting itself to Minna and Bosso Local Government Areas of Niger State where relevant data could be easily secured; this is for a thorough meaningful study. However, the findings of this study are applicable to other secondary schools outside this area.

Relevant literatures that are either directly or indirectly related to the study were reviewed. The method of data collection was through questionnaires, interviews and observation. The administration of the questionnaire was done by visiting the respondents in their various places. About 7 days were given to the respondents for their respective responses. Interviews and observation were used to clarify things further for better understanding.

The finding of this research revealed that the dominant method of teaching mathematics in these secondary schools is the lecture method. However, as a result of major lapses, an alternative strategy to replace the existing system has been designed in the form of CAL.

Finally, conclusion and recommendations were drawn as a result of the statistical outcome of the analysis.

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CHAPTER ONE.

1.0 **INTRODUCTION:**

1.1 **BACKGROUND OF THE STUDY.**

Man's earliest contact with mathematics was through counting, then came the naming of numbers. Much later, the idea of reckoning and computing developed. At a much later age, p roofs of theorems and logic came in. This was how mathematics came into existence.

When one speaks of mathematics at its most primitive level, one signifies the existence of atleast sim ple rules about calculation and measurement.

The term computer is literally used to identify any device that calculates. Initially the computer was designed as a tool to manipulate numbers and solve arithmetic problems; this can be understood from the fact that early designers were mathematicians, scientists and engineers. The harper Collins dictionary of computer terms by Ian R. Sinclair defines computer as "a device that will manipulate data."

It therefore suffices to say that computer science and mathematics are like twin brothers or sisters particularly when one reckons the fact that some major events, discoveries and inventions that paved way to success in the development of a modern day ultra fast computer required an intensive analysis of computational mathematics and major contributions were made by the mathematicians like John Vincent Attanasofe,

a mathematics professor of Iowa state college who was the first man to design and developed the first electronic computer

There are many approaches to the teaching and learning of mathematics. In volume II of

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mathematical discovery on understanding, learning, and teaching problem solving by George Polya, (1965) three principles of learning were identified as active learning, best motivation and consecutive phases.

The principle of active learning directs that learning should be active, and not merely passive or receptive. As the saying goes;" the best way to learn anything is to discover it by yourself."

The first principle said learning should be active, however learner will not act if he has no motive to act. Therefore, the principle of best motivation induce the learner to act by some stimulus, by the hope of some reward.

Under the consecutive phases, three phases of exploration, formalisation, and assimilation is distinguished.

A first exploratory phase is closer to action and perception and moves on a more intuitive, more heuristic level.

A second formalizing phase ascends to a more conceptual level, introducing terminology, definitions, proofs.

The phase of assimilation paves the way to applications on one hand, and to higher generalisations on the other. The material learned is mentally digested, absorbed into the system of knowledge, into the whole mental out look of the learner.

Today, computers are active in almost all the spheres of human life and are doing their jobs efficiently. The greatest use in educational sector is in CAL which is an acronym for computer Aided learning.

Computer Aided learning (CAL) is the use of the computer as a learning resource to assist learners in the totality of their tasks. CAL is the general term used to describe virtually any

developing both students' and teachers' interest.

The result of this study will enable the students to learn at their own pace and at their convinient time. The computer is able to endure what might frustrate the most patient of all humans.

The state of mathematics in our secondary schools today is alarming disheartening, people have lamented about this time and again. The end product of this research will make learning of the subject easier by exposing teachers to the

modern scientific method of teaching the subject CAL.

1.4 **THE SCOPE AND LIMITATIONS OF THE STUDY.**

This work is solely focused on how computer can be used in the teaching and learning of mathematics in the secondary schools. However, it is an extremely difficult task to conduct a thorough investigation that would embrace the whole aspects of mathematics. Hence, this research has its investigation confined to a manageable size by restricting itself to the secondary school mathematics syllabus and taking as it study area Minna and Bosso Local Government Areas.

The choice of these local government areas was as a result of the fact that there was a long time persistent high failure rate in mathematics examinations at the senior school certificate examination (SSCE) in Niger State and the two local Government area in particular. The high failure rate is of great concern to the nation because the situation is adversely affecting her in achieving her objectives towards science and technology.

Therefore, in my position as an insider narrowed down my research to Minna and Bosso local Government Areas from which the result of the work can be used in other secondary schools

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both within and outside the state

For thorough meaningful study, the following topics are taken as a case study;

(1) Simple Linear Equation

(2) Mean, Median and mode

(3) Simple Interest

THE LIMITATIONS OF THE STUDY.

The following are limitations encountered during the process of carrying out this study;

(i) Finance

Fund to carry out all activities connected with this study from conceptualization stage to full writing of the programs and debugging was not an easy task. This is because of the expensive nature of things nowadays and undertaking such a capital intensive venture by a poor student of my type makes it all the more difficult.

(ii) **TIME LIMITATION**

The time limitation had advertently affected this research work from head to toe. Infact, to conceptualise and fully develop a working program and research to the system requirement and suitability take time.

I hope that the software package that is produced as a result of this study will be of relevance to others who might want to carry CAL to new frontiers.

1.5 METHODOLOGY.

The data collection techniques which were used for the purpose of this research are:

i). Interview

ii). Observation

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iii). Questionnaire

Interview

This is a question and answer session between two or more people. It could be face to face or even over the telephone.

For this research, two kinds of interviews were administered; the structured and the unstructured interviews the former is an interview scheduled with lead questions that is already prepared questions while the latter is an unscheduled interview in which the questions from the interviewer arise as a result of the circumstance and answer given by the interviewee, the structure of the interview has no permanent pattern but rather situational.

A series of interviews were carried out with the heads of schools, students as well as staff particularly those in the mathematics department. Staff from the Niger State Ministry of Education, the State Secondary School board and the Educational Resource Centre were also interviewed. The interview was aimed at gathering some important facts like problems and failures in the existing system as such both open ended and close ended questions were used.

Coupled with the fact that interview is one of the most satisfactory ways of obtaining information, the choice for this technique was as a result of the researcher's position as an insider and the small number of people or staff involved thus making the interview easier.

OBSERVATION.

Observation is a method of collecting data by taking closer look at the occurrence or phenomena under research. It involves watching an operation for a period to see for oneself exactly what happens for example, observing how the system works.

Observation was adopted in order to authenticate the responses from the respondents

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during the interview. That is, to know whether the interviews held were consistent to the observation. Students exercise books, continuous assessment forms, internal and external examination result and diaries were some of the records considered.

QUESTIONNAIRE.

This is a written or printed set of questions used in gathering information on some subject(s) usually submitted to one or more persons called the respondent(s).

A simple questionnaire was sent to the head of mathematics department of each of the schools requesting for a number of information like the number of mathematics teachers, the number of arms in the school and the number of mathematics periods a class is having per week. In each case, the purpose of the questionnaire was fully explicated and the respondents were allowed to ask questions where they did not understand.

Find attached a copy of the questionnaire.

CHAPTER TWO.

LITERATURE REVIEW

2.0 BRIEF HISTORY OF MINNA AND BOSSO LOCAL GOVERNMENT AREAS

2.1.1 MINNA LOCAL GOVERNMENT.

Minna local Government lies on latitude $09^{\circ} 37^{I}$ N and Longitude $06^{\circ} 33^{I}$, on a geographical base of undifferetiated basement complex rock of mainly queiss and magnatile situated at the base of prominent hills an undulating plain. Between these two hills paida and Minna Gwari hills runs the valley of the suka river which only flow during raining season. The whole of the surrounding of Minna is very rocky.

Presently Minna enjoys a climate typical of the middle belt zone. The rainy season starts around April and last till October, it has a mean annual rainfall of 1334mm (52 inches) with September recording the highest rains of 300mm (11.7inches). The mean monthly temperature is highest in March at 30.50° C (85° F) and lowest in August at 22.3°C (72° F).

It should be noted that Minna local Government is strategically located with relatively easy accessibility from all parts of Niger State and other parts of the country.

According to the 1991 census figure announced by the national populations commission, the population of the Local Government was 157,159 in 1991. Many ethni groups exist, the Gwari were the original settlers and probably the most numerous. The Hausa came in from around 1905 at the coming of the rail ways to Minna and their population is infact as much as the

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Gwari's today. Other ethnic groups include the Nupes, Yorubas and Ibos. The rest which constitute a minor grouping are fulani, Kamukus, Kambaries and Igbiras.

Both Islam and Christianity are alien to the ordinary Gwari man. Before the introduction of these religions into Minna, the Gwari's traditional religion which is the daity worshipped called SHEKWU (GOD), through deified unique natural objects such as rocks which were closely associated with their ancestors. Besides, they had gods of different times and purposes which were symbolised with objects that have now turned to be master of Art. The main fettish honoured was KARMA and the officiant was called JIBADA. To the other inhabitants who are not indigeneous to Minna like Hausas, Nupes, Yorubas and Igbos had both Islam and Christianity as their major religions.

There are eleven political demacations within the local Government. These are; Minna central, Minna South, Limawa 'A', Limawa B, Makera, Nassarawa A, Nassarawa B, Nassarawa C, Tudun Wada North, Tudun Wada South and Sabon Gari. The following are the Secondary School in the Local Government.

1   Day Secondary School Minna

2   Government Secondary School Minna

3   Ahmadu Bahago Secondary School Minna

4   Zarumai Model School Minna

5   Women Teacher's College Minna.

6   Girls' Day Secondary School (OAP) Minna

7   Day Secondary Tunga Minna

8   Niger State for the Handicap Minna

9.   Government Vocational Training College Minna

10.   Women Day College Minna.

11.   Al-Amin International School, Minna

12.   Horizon Secondary School Minna.

13.   Decs New College, Minna

BOSSO LOCAL GOVERNMENT

The Bosso Local Government Area of Niger State was carved out of the former

Chanchaga Local Government on Friday 27th September, 1991 by the former Head of State and

Commander in-chief of the Armed forces, federal republic of Nigerria, General Ibrahim Badamasi

Babangida.

Maikunkele, which is the Headquarters of Bosso Local Government Area has about 1.5

Kilometres to the North-west of Minna international Airport and about 12km drive from the

centre of Minna metropolis along Zungeru road, with 338.4 hectares of land.

The local Government has a population of 92,263 using the 1991 population census

figures, while it is positioned on longitude 06° 28^I and latitude 09° 41^{I}N of the equator and is

located at the Eastern quarter of the West-East axis.

The Local Government Area has the land mass which completely enveloped Minna Local

Government Area (Minna Metropolis) and bounded to the North and North-East by Shiroro

Local Government, to the South by Gbako Local Government, to the South-East by Paikoro

Local Government, this then makes it nearly equal distance from the extreme corner of the state

and it takes a relatively short-time to travel round the Local Government Area because of the

good accessible linking it to the state capital, Minna.

The climate of the Area is typical of the tropical regions of the World. The major winds directions is normally along South-west and North-East Axis. The rainy season lasts between 190 - 200days (6-7 months) while about 1,350mm (54 inches) is the mean annual rainfall with September recording the highest rains of 300 mm (11.7 inches). Mean monthly temperature in March at 35°C (88°F) and lowest in August at 25°C (75°F).

The pre-dominant tribes inhabiting Bosso Local Government Area are the Gwaris and Fulanis. However, other tribes such as Nupe, Hausa, Pangu, Kadara, Koro, Ibbos and Yorubas are available. Major occupation of the people within the Area is farming, fishing and rearing of animals.

There are about 448 village/Hamlets within the local Government Area and comprises of two Districts: Bosso and Maikunkele. Five administrative village Areas, Bosso, Maikunkele, Shako, Beji and Maikunkele Gabas. Ten wards; Bosso central I, Bosso centralII, Beji, Chanchaga, Garatu, Kampala, Kodo, Maikunkele, Maitumbi and Shatta.

The Local Government has a total of 45 primary schools and the following secondary schools:

1   Maryam Babangida Girls Science College, Minna

2   College of Arts and Islamic Legal Studies, Minna

3.   Day Secondary School Bosso

4.   Government Technical College Minna

5.   Hill-Top Model School Minna

6.   Day Secondary School Maitumbi

7.   Junior Secondary School Chanchaga

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8.   Junior Secondary School Beji

9.   Day Secondary School Maikunkele

10.   Army Day Secondary School Minna

11.   Police Secondary School Minna

12.   Federal Government College Minna

13.   Mawo Comprehensive School Minna

2.1   BRIEF HISTORY OF MATHEMATICS IN MINNA AND BOSSO LOCAL GOVERNMENT SECONDARY SCHOOLS.

The teaching of mathematics started in Nigeria as far back as the colonial era. Though, what was taught then was a branch of mathematics called Arithmetic which did not go beyond ordinary computation using the four rules of addition, subtraction, multiplication and division.

The teaching of the subject in Niger State can be traced back to 1905 (History of education in Nigeria A. Babs Fafunwa 1982) when church missionary society (CMS) opened a school in Bida. At that time subjects taught were scripture, geography, singing, reading, writing and Arithmetic which is a branch of mathematics.

The history of mathematics in Minna and Bosso Local Government Secondary Schools can be dated back to Jan 5 1977 when Fatima Secondary School now Government Secondary School Minna was established. It was the first secondary school to teach mathematics up to ordinary level in the two Local Government. There after, the teaching of the subject spread along with the establishment of the secondary schools in these areas.

Early secondary schools in Minna local government include: Community secondary school

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now science secondary school Kagara, Verhoven technical college now Government technical college Minna, and Women teachers' college Minna. In Bosso Local Government Area, early secondary schools include: Saint Malachy teachers college now Bosso secondary school, Ahmadiyyah secondary school now College of Arts and Islamic Legal Studies Minna, and Government Girls secondary school Minna now Maryam Babagida Girls' science college Minna.

At the secondary level, Arithmetic, Algebra, Geometry, Trigonometry and statistics. In addition, mathematics is one of the core subject in both the Junior and senior secondary school curricular.

2.3   THE TRADITIONAL METHOD OF TEACHING MATHEMATICS

It is important to note that despite the different methods and techniques of teaching mathematics and the great diversity, there is no one of them that can be regarded as the best for EVERY maths teaching situation. The success in the use of any method depends to some extent on an intelligent analysis of the educational purpose, the students in the class, and the curriculum content of the moment or the type of subject matter being taught. However, the aim of any method is to present the material of a lesson in a meaningful way. It must also seek to stimulate interest.

This section attempts to discuss some of the traditional maths teaching methods. Usually these methods are use in such notation and combination as will be necessitated by existing needs. The methods are: the discovery method, lecture method, discussion method, group method, individual method and the textbook method, project method . Others include the question answer method home work method, project method and field strips.

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2.3.1 THE DISCOVERY METHOD

The method by which the student is encouraged to use his initiative to explore things is known as discovery method. In this case, children can be helped to think how to work out problems for themselves. The discovering is done by the students, the teacher only guides. Also, they need not to be told mathematical formulae to be used without knowing where they come from and questions are often answered with questions or suggested strategies rather than with direct answers.

The discovery method is one of the methods that is used extensively in good teaching of mathematics and sometimes known as the problem-solving method or the inductive method. It provides student with a chance to learn from their successes and failures. Moreover, it leads to real understanding because it allows the students to become really involved in their learning.

This method is applicable to most of the maths topics that are taught to secondary school students. Though, it is time consuming, it makes learning more effective because pupils are actively involved in the learning situation. With this method, the class proceeds from known to the unknown, particular to the general, concrete to the abstract.

The method as a technique of teaching is rather demanding on the teacher in terms of planning, organisation and execution. It requires well selected quantity of materials. Although, it is difficult, it is practicable.

2.3.2 THE GROUP METHOD.

This is the method by which the entire classs is re- arranged in two, three, four or more groups depending on the size of the class and the nature of the work to be done: Have one or two dependable members of the class leading each group. A specific work is given to each group

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and the teacher goes round from group to group to correct children's mistakes and discuss the difficulties they may be having.

The basis for this method is that pupils will be in a freer atmosphere, they are likely to learn more effectively through the help of their mates than when the teacher does all the teaching by himself or herself. One other advantage comes through ability grouping. In this situation, slow learner get encouragement from satisfactory performances and the fast ones go att their own rate. In a topic like quadratic expressions and equations for instance, the less able group may be working on factorisation of quadratic expression able group on solutions of quadratic equations, more able group on stary problems involving solutions of quadratic equations.

The group method, however, has some disadvantages, for example some of the pupils may not have the opportunity of learning directly from the teacher or may even learn wrong approaches from their peers.

2.3.3 THE INDIVIDUAL METHOD.

This is a method in which children are dealt with individually. It is a breakdown of the group method, instead of students working in groups of two or more, each child works on his own through a set of activities.

This individualized instruction is sometimes called the dalton method of teaching. It can be used to advantage in a class in which students have differences in background, general learning ability, irregularity in attendance and differences in speed. The method in the teaching of maths is usually enriched with materials.

In the use of this method, there is friendly relation between the teacher and the children. However, it is more demanding in terms of materials, supervision and time, more than any other

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method, it is time consuming.

2.3.4 THE LECTURE METHOD.

The lecture method is sometimes known as the telling method". In low (1965) defined the lecture method as "a verbal presentation of subject matter content, formally organized and supported by other learning media, extending over a protracted period of time".

This method is one of the teaching methods that has been criticised widely as an inappropriate learning activity particularly in the teaching of mathematics in the Secondary Schools. Though, it affords opportunities for obtaining useful and essential facts at a minimum expense of time, students consider lecturing as a passive listening activity while the teacher is the active person in this teaching- learning exercise.

The lecture, therefore, reverses concept of education which maintains that the best learning is that which results from purposeful activity. Further more, anything, which puts the students in a passive situation and stresses activity for the teacher is bound to benefit the teacher more than the student.

Under the setting of the lecture method, it is the teacher who learns to use reference sources, to outline, to organize ideas, to formulate conclusions, and to speak. The student who ought to be practising these things, is a listener and taker of notes.

2.2.5 THE PROJECT METHOD.

This is a natural life-like learning activity involving the investigation and solving of problems by an individual or group, it involves an idea or plan to be carried out. The aim is to produce some special thing or to carry out some special undertakings. In this, students are directly inviolved in creative thinking and practical application of mathematical principles already

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learned.

However, many mathematics teachers may consider this method rather expensive in terms of money, time and energy, but it is one of the best ways of practicalising what has been taught theoritically in the classroom. If carried out sensibly under a good teacher, it enables students to tackle spontaneously topics in which they have, in the normal way, little interest.

2.3.6 THE DISCUSSION METHOD.

This is important as a learning method because it is a way of considering various faces of a problem. Essentially, it is based upon extensive contributions of ideas and expressions from the members of the group participating.

This method implies the participation of pupils in the process of learning by evaluating points of view, raising issues of their own, and seeking solutions based upon study, examination, and group analysis under the teacher's guidance.

Any class discussion must be purposeful in order to keep it from degenerating to the level of idle talk or conversation. The discussion must be focused on a problem or issue that is common to all potential participants. In other words, the topic must be one which has meaning, interest, and appeal to students.

Generally, the discussion of any class must be about something pertinent to the work of the course. Discussions may be centred on an assignment, a mathematical film the class has seen, or a controversial issue of common interest. All these tend to give the discussion a purpose which differentiates it from idle talk or conversation.

In a genuine discussion, the pattern of participation should be circular in nature by involving the teacher as well as a chain of student's reactions. Ideally, a worthy discussion topic should

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stimulate an entire class into verbal activity. Infact, all students should be active during a good discussion period provided the leader sees to it that no small group is allowed to monopolize the discussion.

2.3.7 THE TEXTBOOK METHOD.

Mathematics teachers have for a very long time depended on the textbook as the primary means of acquiring information. However, in most recent times, the use of textbooks alone in teaching is being seriously questioned.

The textbook furnish definite basic information regarding the subject being covered in calss. Usually, the recommended textbooks have in themdetailed explanations covering the fundamental operations as well as other relevant information that has bearing on the subject under discussion. They have also been found to be very useful by beginning teachers because textbooks are of great help in their planning for courses and lessons. Some textbooks have sections for activities and suggestions for teaching which are of invaluable help to the beginning teacher. Through the use of the textbooks further activities such as discussions and research can evolve. Essentially, textbooks help a teacher to provide an organisation or structure for his course.

As a matter of fact, textbooks should contribute to, without being the exclusive means of, learning. Teacher- initiative and creativity can be stifled as aresult of twoo much adherence to a single textbook.

2.3.8 THE QUESTION - ANSWER METHOD.

It has been observed that since the time of socrates the questioning technique has been recognised as a common and necessary way of learning. Socrate was a very wise ancient greek

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who used to lead his listeners to right thinking by asking them a series of carefully thought out questions. This method is also known as socratic method

A teacher's success in the use of questions is indicated as much by the kinds of questions asked by the student as the questions the teacher himself asks.

It is evident that good questions which will accomplish teacher's purpose are not always easy to frame. In framing the questions, there are certain prescribed rules and language to adopt. The teacher should try to use such words as "what", "why", and "how". His questions should call upon the students to explain, illustrate, justify, trace, discuss, compare, contrast, agree or disagree, interpret, evaluate, and summarize.

The art of questioning will be most effective when questions are planned in a logical and sequential manner, when they are addressed to the entire class or posed so that students will have time to think, when asked in a conversational tone, or designed to elicit sustained responses.

2.3.9 HOMEWORK.

Homework involves the participation of students in learning activities outside the classroom and away from the teacher's immediate supervision. It is important to note that this type of learning activity can be frustrating to the students if it is done too much.

Evidence has shown that even some parents sometimes frown at homework when it demands too much of their children's time or when the assignment is not well stated for their children. Likewise, most educators see little value in the routine homework assignment given in terms of so many exercises to be completed, or so many questions to be answered.

A teacher using homework as a teaching method should be able to recognize that student need time for social activity and for taking part in organized groups outside the school. Infact, some pupils need time to apply what they have learned in school to their problems outside school. Any type of homework given to the students should be made functional and socially useful.

In preparing homework for the students, there are certain guide lines which the teacher should follow. For example, he should avoid giving excessive homework assignments or any thing which will have a negative effect on the motivational pattern which he is striving to develop.

Some of these guidelines stems from the revelation of Joh U. Okorie (1986) when he stated that the teacher should not give homework on a problem not yet covered in the class. The emphasis on homework should be directed to assignments which allow the students to practise what has been learned, to analyse, compare, classify or illustrate. It is not proper for pupils to struggle with new problems without the guidance and help of their teacher.

According to him, it is important to assign homework to individual students which will meet their needs, interests and capabilities. They should be provided with an opportunity to ask questions both before and after the assignment so that they can understand fully what they have done.

2.3.10 FIELD TRIPS.

Quite often it has been stated that there is no better way to discover knowledge in a real-life situation than to actually be there "on the scene". Field trips have been found valuable as they provide students with direct first-hand experiences. In other words, a field trips allows pupils to

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see and observe processes in natural life settings. The field trip takes the school to the community.

The interest in the trip is usually automatic when the students consider the idea of going somewhere and for a definite purpose. The educational value of a field-trip is the opportunity to discover and explore new information as well as to apply and organise previous knowledge by concrete examples.

Field trips quite frequently afford the students the opportunity to explore accomplishments of the community as well as other vocational situations. Good public relations can also be developed through field trips. Such trips serve to develop the interest of the pupils in learning as well they can gather first-hand information regarding the topic being discussed in the class.

2.4 WHAT IS A COMPUTER.

The Webster's New World Dictionary of the American language in its second college edition (1976) implies that a computer is "a device used in computing; specifically, an electronic machine which, by means of stored instructions and information, performs rapid, often complex calculations or compiles, and selects data." However, the concise Oxford Dictionary defines computer as "electronic Calculating devices" one may be forgiven if this is the image he holds, especially when we recall that the binary number system is used to represent information held in store, that its main operations consist of Arithmetic operations and comparing numbers, and that the early computers were designed specifically as calculating devices.

"A computer is admirably suited to handle any information and first and foremost it is an information processor. That it can receive information, perform some basic operations on that information and produce results according to a pre-determined program" shelley (1984). As it

becomes increasing difficult for human minds to cope and sort through information, the more necessary it becomes to rely upon the computer.

Every computer system contains a unit whose primary aim is to process data. This unit is the control centre of the entire computer system that accepts data from the various input devices, process these data according to the programmer's instructions, and sends the results to the printer or other output devices for recording . This unit can in millionths of a second, add, subtracts, multiply, divide, move items of data from one place in its storage area to another, or compare two quantities, to mention but a few of its capabilies. The name of this unit is called the central processing unit (CPU).

From the foregoing, computer can rightly be defined as an electronic device that is capable of accepting data (input), processing the data, and producing information (output) rapidly, accurately, and thus more efficiently than human efforts.

2.5 THE ADVANTAGES OF USING A COMPUTER.

This section is intended to examine the advantages of using a computer. These are discussed in the following headings.

Speed:

The computer can perform many thousands (even millions in the larger machines) of calculations per second. For example, a super computer is capable of performing at least ten million arithmetic operations per second.

STORAGE AND RETRIEVAL OF INFORMATION

Computers can store vast amounts of information on magnetic media such as magnetic tape and magnetic disk. Equally important is that information held on such media can be sifted

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through and accessed, within a few milli-seconds more and more
details are being amassed and not just by administrative
departments. Science alone is reputed to generate six milion
new facts each year. It now becoming more expensive to house
the information than the people who generate it. The important
fact of computers thus, is that they are not only store
information in a very compact form but they can also retrieve
any item within seconds.

CONSISTENCY

Computers unlike frail human being do not become bored, tired
or lose concentration when performing highly repetitive work,
If a computer has to compute a million numbers, it will compute
each one with equal dilligence. This is something which we cannot
attribute to human beings becouse if any human being has to add
up 100 numbers and did so three times, there are chances that
3 different answers may be obtained. But a computer will get the
answer correct first time and the same answer all the times.
This means that we can frequently give a credence to the output
produced by computers which we would not and could not give to
human beings.

ACCURACY

If the program and the data are correct, there is no reason
for a computer to produce erroneous results. It can only do so
when the human element involved makes a mistake. The language
is "Garbage in Garbage out(GIGO)".

2.6 THE ADVANTAGES OF CAL

Unlike all the other learning aids experienced, computers
as a learning aid is versatile. It may be used to teach/learn
facts, concepts, skills, discovery and learning as well as
practice of routines. Although the computer potential in schools
has not yet been fully explored, its importance in society and
industry will ensure it a place in schools. The following are
advantages of CAL.

(1)   INFINITE PATIENCE:-

The computer is able to endure what might fusrate the most
patient of all humans. The computer would merely remain in a
position until the user does the appropriate thing to preceed.

(ii)   INSTANT FEEDBACK:-

The speed of the micro-computer which is quite remarkable to the human enables the learner to get undelayed information from the computer and probably the procedure for obtaining such information.

(iii)   INTERACTIVE:-

Suprisingly, the computer is able to a large extent converse with the leaner through the Visual Display Unit (V.D.U), the ability of the computer to display texts of instruction makes learning more interesting.

(iv) Alternative resource as an aid to understanding.

(v)   Alternative teaching strategy.

CHAPTER THREE

3.0 SYSTEM ANALYSIS AND DESIGN

3.1 PREAMBLE

System analysis is a logical process of determing how best to use resources to perform task which will meet the information requirement of an organization and developing detailed procedure for collection, manipulation and evaluation of all the necessary data involved. The aim of this analysis is for better understanding of the present method of data processing in the organization and giving best alternative method.

The design stage of the project was focused on the description of the new system. Here discussion was based on system requirement and system specification. Hence, it is carried out in various stages such as the following:

1 Problem definition and identification

2 Identification of the existing manual system

3 Feasibility studies

4 Requirement specification for the proposed new system

5 Cost and benefit analysis of the new system.

6 Output/input specification

3.2 PROBLEM DEFINITION AND IDENTIFICATION.

The problems of teaching and learning of mathematics in Minna and Bosso Local Government Secondary School has grown astronomically over the years. Consequently, students'

academic achievements in mathematics had degenerated (and is still falling) at an alarming geometrical rate. Parents, students, mathematics educators and researchers have expressed serious concern about the awful, sordid and shoddy states of poor academic performances of students in mathematics.

The existing system entails a lot of effort from the part of the teacher. There are so many students to few teachers making the work difficult and resulting into other problems like students missing some lessons through the absence of teachers and also delay in students' result. More often than not, the syllabus is not covered at the end of the academic Year.

This awful situation in the secondary schools is largely blamed in the fall in standard on the quality and quantity of mathematics teachers. Mathematics teachers are the implementers of the mathematics curriculum for schools, they are indispensable in the execution of the intended mathematics learning outcomes. This means that teachers could constituted a contextual constraint or resource for the effective teaching of mathematics. The mathematics teachers comprehensive view of mathematic and the subject matter of mathematics may affect the teachers pedagogical effectiveness.

However, other variables ranging from the learners themselves, textbooks, to the school environment have also been identified as contributing to poor students achievement, one of the students expressed his lack of enthusiasm in the following jargon:

> "The ideology of mathematics has come to light and I should like to go no further and it is logical and rigid while its body contained a logic disease mixed with tetraoxocabonet III acid and it cannot be cured by its statistical tables and formulae"

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The impediment encompasses lack of enough facilities, low morale of teachers method, poor teaching/learning environment and teachers method of presenting the problem solving process. The lecture method which is commonly used in the secondary schools have been widely criticized because little opportunity was given to students' resourcefulness, creativity, initiative, self expression and reflexive thinking. Other subsidiary methods used require competent and experience teachers unlike the existing system that incorporates other science teachers who have no sound mathematical base to help in the teaching of mathematics due to lack of enough qualified mathematics teachers. The situation is infact pathetic.

It is therefore, worthwhile to carry out a study in the area of mathematics instruction to find alternative method to be used in the learning of mathematics.

3.3   IDENTIFICATION OF THE EXISTING MANUAL SYSTEM

Basically, the lecture method is curiously embraced in the mathematics classroom. However, discussion method and the textbook method are used as subsidiary methods

There was an average of 75 students per class and 5 mathematic periods per week per class. The average workload for each mathematics teachers is 30 period per week quite more than the range of 15 to 25 - 40 minutes periods a week prescribed by the Nigeria Union of teachers for the secondary school teachers. The duration of each period is 40 minutes with the exception of Fridays which is 30 minutes.

3.4   FEASIBILITY STUDY

The purpose of the feasibility study is to examine why computer system should be introduced in the teaching of mathematics in our secondary school. To determine what the scope of the system should be and specify the requirements in data. Finally, to define and quantify the benefits which are likely to accrue from the use of such a system.

In carrying out the feasibility studies, the principles of procedures will be used to determine the strength and weaknesses of the Existing system. These principles are:-

(i)   Purpose:-The purpose behind the present system was to raise the standard of mathematics making it more meaningful and functional and to improve the state of technological growth but with the present situation where classes were over populated, many mathematics teachers were under staffed. The present manual system is not meeting the system demand.

(ii)   Economical:- The system is not economical because of the huge fund needed to recruit, deplore and retain qualified mathematics teachers. Their monthly salaries and fridge benefits as well as other teaching materials needed will sum up to millions of naira.

(iii)   Workflow:- The present system does not allow satisfactory workflow. This is manifested in the fact that the syllabus is hardly covered at the end of the academic year. In addition, students' results, including results for the promotion examinations are delayed for months without students knowing their faith. The system does not make the work easy at all.

(iv)   Specialization and standardization:- It allows unqualified teachers to participate in the teacher process. Infact, in some schools, some teachers were forced to abandon their main subject and help in the teaching of mathematics in lower classes.

(v)   Flexibility:- The present system is not flexible, with increase in the number of students the

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system is not meeting its target i.e it does not accept large volume of work.

(vi)   Reliability:- the system is reliable if sufficient and competent mathematics teachers were involved. Despite the fact that unqualified teachers partake in the teaching process, mathematics teachers were not sufficient.

(vii)   Time:- It is too demanding in terms of time and the syllabus is hardly covered at the end of the academic year.

3.5 TESTING PROJECT FEASIBILITY

For testing project feasibility, the following were undertaken

a.   Operational feasibility

This is concerned with the work ability of the proposed computerized system of teaching mathematics. From the feasibility study, through the questionnaire, interview, observation and record searching. It can be found out that this receives the support of the educational administrators, teachers and students. This proposed system will also enhance efficiency and effectiveness instead of error which will affect performance.

b.   Technical feasibility

This is concerned with clarifying whether the computerized system can be done with the available personnel. This is possible bearing in mind that the few available personnel are mathematics who only need to undergo short time training and more so, some of them are already holders of post graduate Diploma in computer science from the Federal University of Technology Minna.

c.   Financial Feasibility

From the cost-benefit analysis done in the sub-sequent pages, it can be seen that there are

benefits derived from implementing this project.

Judging from the above analysis of the three tests, there is sufficient reasons to conclude that the project is feasible.

3.6 REQUIREMENT SPECIFICATION FOR THE PROPOSED NEW SYSTEM

The importance of this analysis is to produce a requirement specification. The requirements will be divided into two, these are:

1. **HARDWARE**

a. P.C IBM Compatible

b. Memory 1.44 MB

c. Disk drive: 120MB one floppy disk drive 3 1/2 inches

d. Display: Monochrome/color

e. Hard disk: 120 MB

f. Stabilizer/UPS

g. Stabilizers: 250 V

 UPS: 500 V

2. **SOFTWARE**

a. Disk Operating System (DOS)

 MS-DOS 6.0

b. DBMS Package: DBASE III Plus

c.   Word processing: Word perfect 5.0

3.7 COST AND BENEFIT ANALYSIS OF THE NEW SYSTEM:

The cost can be broken down into two major areas, these are:

i.   The cost of equipments

ii.   The running cost or operating cost.

THE COST OF EQUIPMENTS

These include the cost of purchasing a work station and terminals including all necessary hardware like printers, cables, UPS/Stabilizers, and file servers Others include software like the operating system, word perfect, BASICA, DBASE IV and the cost of installation of the system.

THE RUNNING COST.

The running cost is on the purchase of back up copies, like diskettes, stationaries, ribbon for printer which are necessary for efficient performance. It also includes the cost of training personnel to handle the computers and their monthly remuneration or salaries. The maintenance cost will mostly be on repair and servicing of the system.

3.7.1 COST

The new system will be on local net-work. The following is a cheklist of cost headings.

COST OF EQUIPMENTS

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The cost of equipments can be divided into two

a.   Hard ware

b.   Software

Hardware requirements	N	k
1. The work station	250000.00	
2. Ten terminals at 30000.00 each	300,000.00	
3. Three concentrators at 5000.00 each	15 000.00	
4. Two file servers at 120 000.00 each	240 000.00	
5. Cables	15 000.00	
6. Two printers	100,000.00	
7. Three Ups/stabiliser at N5000.00 each	15000.00	
Software requirements		
1. The Operating system		
2. Word perfect	10,000.00	
3. BASICA	10,000.00	
4. DBASE IV	10,000.00	
5. Installation cost	12,000.00	

OPERATING COST

1.   One programmer per school at N5000.00 per month   5,000.00

2.   Two operators or data entering clerks at N3000.00 each   6000.00

3.   Cost of stationaries (Diskettes, printing papers, printing ribbon).

15,000.00

4. Four weeks cost of central training for mathematics teachers, principals, vice principals, examination masters on how to use the computer at N3000.00 per week for the training staff.
12,000.00

5. Maintenance cost.   30,000.00

TOTAL COST   1045,000.00

3.7.2 BENEFITS

Initially, the proposed system might look costly because of the need to purchase the computer system and install them, but however the long time benefits is more.

After the first year, the cost will reduce drastically because only the running cost will be incurred, as such, the system will be able to pay back the initial investment in the next four or five years [1]f the benefits derived from the new system is considered. The following are benefits deliverable from the new system.

1. Reduction in the number of the mathematics teachers.

        This means drastic reduction in the number of mathematics teachers to be employed and consequently there will be reduction in the fund that will go for the staff salaries and fringe benefits.

2. Reduction in the purchase of teaching materials.

        There will be reduction in the purchase of teaching materials like textbooks, chalk, black board ruler, protractor and other stationaries if the new system is in operation.

3. Time

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The speed of the computer which is quite remarkable to the human enables the learner to get undelayed information from the computer. The learners can approach the computers at their free or leisure time and call on the program. In this case, the syllabus can be covered in good time and students examination results can be obtained likewise.

4.   Effective scholarship

In addition to students greater enthusiasm, they will gain more in their learning because computer as a learning aid is versatile and can be used to teach/learn facts, concepts, skills, discovery and learning as well as practice of routines. This will help ensure better understanding and qualitative education.

5.   Better management information

3.8   OUTPUT/INPUT SPECIFICATION

OUTPUT SPECIFICATION

It is necessary to consider what is required from the system before deciding how to set about producing it. For the purpose of determining the output requirements, consideration will need to be made on the form, types, volumes and frequency of reports and documents.

Since the main concern of this work is on computer Aided learning a case study of mathematics teaching, emphasis will be on entering the lecture notes, viewing of the documents, and updating of the hard copies as such our input will serve as our output files.

INPUT SPECIFICATION

Consideration of input will be influenced greatly by the needs of output. In determining the

input the following will be noted.

a. Data collection methods and validation

b. Types of input media available

c. Volumes of input documents

d. Design of input layouts

CHAPTER FOUR

4.0 PROGRAMME IMPLEMENTATION AND DEVELOPMENT

4.1 PREAMBLE

For the purpose of computerising the teaching of mathematics in our secondary schools for which the project is being undertaken. The process of programme implementation and development will be discussed in the following sub-headings:

1. The choice of software packages and programming language

2. Software requirement and its features

3. Software development and testing

4. Inplementation

5. Change-over procedure

4.2 THE CHOICE OF SOFTWARE PACKAGES AND PROGRAMMING LANGUAGE

In making choice of software packages and programming language, the following criteria should be considered.

i. The effectiveness and the efficiency of the package with regard to the function of the program.

ii. The facilities for different types of file processing

iii. Security of the records in the file

iv. The facilities for maintaining of the record

v. The flexibility of the packages

vi.   User's friendliness quality of the package.

Based on the above outlined criteria and the types of files that will be required for processing, two applications software packages will be adopted for this project. These are Basic and word perfect 6.0.

Basic is the acronym for beginners All-purpose symbolic instruction code. It was developed at Dartmouth College in 1963. It is an easily learned and easily used computer language and widely used in programming scientific, mathematical and many business problems.

One good thing about basic is that it encourages running the computer in an interactive mode. As soon as the user submits a program and some data to the computer, the computer executes the program, produces the result back to the user immediately. In this way, it is easy for the user to find out whether the program is working properly or there is a bug.

4.3   SOFTWARE REQUIREMENT AND ITS FEATURES.

There are other categories of softwares that are required for this project: these are:

i.   Generalised application packages

ii.   User application programs

Application packages: are suits of program with associated documentation used for particular type of problem or variety of similar problems.

A generalised applications packages, is one which provides a completely general set of facilities which are use in dealing with similar types of task which arise a wide variety of different applications problems.

The generalised application packages required for this project work are:

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i.   Basic programming packages - BASIC

ii.   Word processing package - Word Perfect WP 6.0

The user application programs are applications specifically written by the user and are aimed at providing all the facilities required for a particular class of application problem.

The user application programs are the main task of this project.

4.4 SOFTWARE DEVELOPMENT AND TESTING

When a new computer system is to be developed, it becomes necessary to express the requirements. The requirements must initially be expressed in terms that the user can understand and agree to. Ultimately these requirements will be presented to the computer in the form of a set of instructions which the computer obeys that is program. Any associated manual procedure must also be specified.

In this sub-heading therefore, effort will be made to discuss the algorithms, flow chart, lecture notes, programming and program

4.5 CHANGE-OVER PROCEDURE.

Change-over is the process of changing from the old system to the new one. Under this heading/would like to briefly discuss the methods of p erforming systems change- over and recommend an appropriate approaches for this research work.

There are three methods of changing over to a new system. Each method should be considered in light of the opportunities that it offers and problems that it may cause. However, some situations dictate the use of one method over other, even though other methods may be more beneficial. The three methods are discussed below:

1. PARALLEL CHANGE-OVER.

This is the method by which the old and new system are run concurrently, users continue to operate the old system in the accustomed manner but they also begin using the new system. If the new system has proved satisfactory, the old system is discontinued and the new one takes over fully.

2. DIRECT CHANGE OVER.

The direct method converts from the old to the new system abruptly, sometimes over a weekend or even overnight. The old system is used until a planned conversion day, when it is replaced by the new system. There are no parallel activities. If the analyst must make the change and wants to ensure that the new system fully replaces the old so that users do not rely on the previous methods, direct approach will accomplish this goal. This forces all users to make the new system, work; they do not have any other method to fall back on.

The advantage of not having a fall back system can turn into a disadvantage if serious problems arise with the new system. In some instances, organisations even stop operations when problems arise so that difficulties can be corrected.

3. PILOT CHANGE-OVER.

A variation of either of the two basic methods above is called pilot change-over. In this approach, a working version of the system is implemented in one part of the organisation, such as a single work area or department. The users in this area typically know that they are piloting a new system and that changes can be made to improve the system.

However, if the implementation is not properly handled, users may develop the impression that the system continues to have problems and that it cannot be relied on.

From the foregoing, it is suggested that the conversion to the proposed system (CAL) be made side by side with its existing manual system. The advantage of this parallel system of conversion is that, should the new system fail, no data or information will be lost. Secondly, outputs from both the old and new system can easily be compared by the user.

ALGORITHM PROJECT

DECLARE:

Name, Topic, Number, N

EXECUTE:

Output: "Computer Aided learning".

Output: "Case study of mathematics teacging in the"

Output: "Secondary Schools"

Output: "Supervised"

Output: "By mat Audu Isah"

Output: "Welcome to this tutorial"

Output: "Lecture on some selected topics in mathematics"

Output: "Supply your name": more

Input: Name

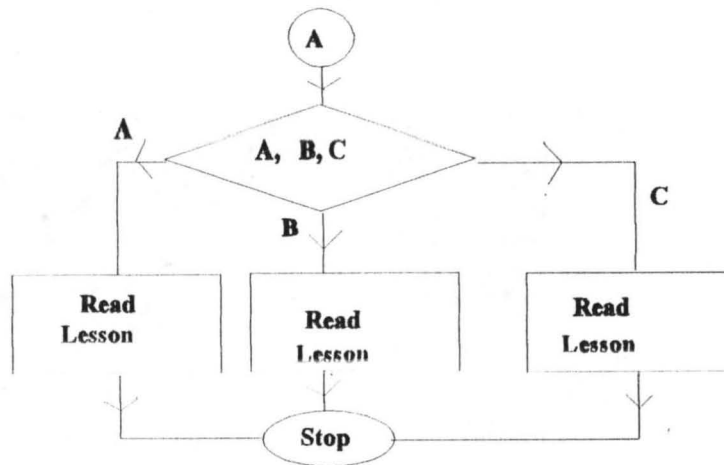Output: "Supply your number": more

Input: Number

While choice <> "N"

Output: "Choose topic": more

Inputs: "Topic

Read topic and Assignment

END PROJECT

FLOW CHART FOR CAL PROGRAMS

Start

Display Title
and welcome

Input your
Name

Input your
number

Choose Topic

A

A

A, B, C

A

B

C

Read
Lesson

Read
Lesson

Read
Lesson

Stop
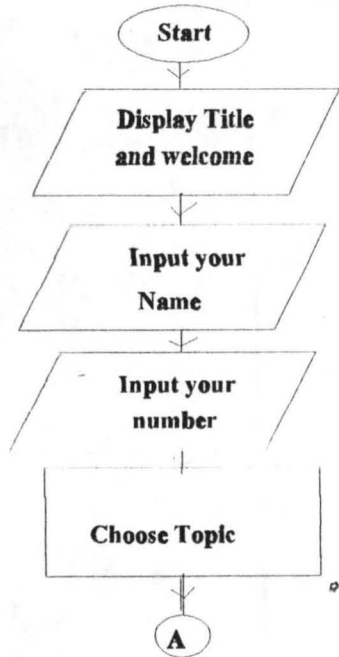
PROGRAMMING AND PROGRAM

For a computer to be controlled, it requires writing a program and this process is referred to as programming. Therefore, a program can then be defined as a set or sequence of instructions which informs a computer of the steps required for achieving a defined task.

4.6   IMPLEMENTATION

After the physical system has been designed as contained in the previous chapters. The next stage is to described how the system works. This is very important because it is the area that user need to understand so as to allow proper interaction with the system. Therefore, system implementation is that stage in system development where the process and procedures of working system are started.

This newly developed software is developed to be user's interactive and friendly. Once the program is activated, the title of the project is displayed on the screen. Before the topics, the user is expected to enter his/her name and registration number for record purpose. After this, a menu showing the topics treated will be shown in which the user is expected to select an option. Specifically, the option to be displayed are: simple linear equations, simple interest and set theory.

Once this is done, it is followed by the display of the operational instructions associated with the step by step working of the system.

CHAPTER FIVE

5.1 CONCLUSION AND RECOMMENDATIONS.

5.1 CONCLUSION:

From the findings of this research it is apparent that there is the need to computerise the teaching of mathematics in our secondary schools.

The present situation where mathematics teachers both qualify and unqualify are over loaded with an average of 30 periods per week instead of the specify range of 15 to 25 - 40 minutes periods per week is very unhealthy and causing fall in standard and delay in results. The students are persistently failing and are beginning to develop mathematics phobia.

The fact finding techniques that are used which include questionaires, interveiw and observation exposed the traditional methods use in these secondary schools as the lecture, discussion and the textbook methods. The lecture method which is dominantly used is not the best method of teaching mathematics in the secondary schools because it puts the students in a passive situation and stresses activity for the teacher.

The significance of this research is to help reduce or even eliminate the poor performance of students in mathematics. The students will develop greater enthusiasm and gain more in their leaning. It will further ease and hasten the work of mathematics teachers so that the syllabus can be covered in good time since students can now study at their convenient time using the system.

Three topics were selected at random from the secondary school syllabus and used as a case study. The research is a complete and efficient system in itself and therefore open for use by both the government and private secondary schools. The system is further designed and tested on a PC

as well as IBM compactible brand of computer

The software has therefore been made user friendly since the programs are structured in such a way that changes can easily be effected.

5.2 **RECOMMENDATIONS:**

As a result of the findings of this research, the researcher felt the following recommendations are worthwhile if all things are to be put right to enhance effective computerisation in the area of study.

As a result of lack of enough computer literates in the state, it is recommended that users should be trained properly for the job so as to ensure success and continuety of the proposed new system. Mathematics teachers are potential candidates who need to undergo only little training, some are already holders of PGD in computer science of the F.U.T Minna.

Precautionary measures should be taken to guide against fraud, sudden breakdown of machine, fluctuation in the flow of electricity current, fire out break and theft

There could be those who want to carry CAL to new frontiers, any other researcher that wishes to carry our a similar study should know that there is room for improvement, people can write additional programs that will include Questions and Answers.

Since the intersection of mathematics and computer science is far from an empty set, I suggest to the federal and state Government to provide computers and funds for installation of computer in the teaching of mathematics in atleast some of our secondary schools, if not all.

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```
10 REM Program display the Title and welcome address
20 COLOR 7,4
30 PRINT TAB(28) "Computer Aided Learning"
40 PRINT TAB(22) "A Case Study of Mathematics Teaching"
50 PRINT TAB(30) "In Secondary Schools"
60 PRINT
70 PRINT
80 PRINT TAB(39) "BY
90 PRINT
100 PRINT TAB(33) "Mal. Musa Bawa"
110 PRINT
120 PRINT TAB(35) "SUPERVISED"
130 PRINT
140 PRINT TAB(39) "BY"
150 PRINT
160 PRINT TAB(34) "Mal. Audu Isah"
170 LOCATE 23,10: PRINT "PRESS D TO PGDOWN"
180 LOCATE 23,45: INPUT U$
185 IF U$ = "D" THEN 186
186 CLS
190 COLOR 7,0
200 PRINT TAB(20) "Welcome to this tutorial lecture on selected"
210 PRINT TAB(36) "in Mathematics"
215 LOCATE 23,10: PRINT "PRESS D TO PGDOWN & U TO PGUP"
216 LOCATE 23,50: INPUT U$
217 IF U$ = "D" THEN  220
218 IF U$ = "U" THEN 20
220 CHAIN "TOPIC"
230 END
```

```
10 REM Program to display the topics
15 CLS
20 COLOR 7,0
30 LOCATE 2,10: COLOR 7: INPUT "ENTER YOUR NAME:"; M$
40 LOCATE 4,10: COLOR 7: INPUT "ENTER YOUR REG. NO.:"; N
45 LOCATE 9,23: COLOR 7: PRINT "TOPICS MENU"
50 LOCATE 11,18: COLOR 12: PRINT "E -----SIMPLE LINEAR EQUATION"
60 LOCATE 13,18: COLOR 12: PRINT "I------SIMPLE INTEREST"
70 LOCATE 15,18: COLOR 12: PRINT "S     MEAN, MEDIAN MODE"
80 LOCATE 17,18: COLOR 12: PRINT "Q------Exit"
90 LOCATE 19,18: COLOR 12: PRINT "SELECT AN OPTION"
100 LOCATE 19,37: INPUT C$
110 IF C$ = "E" THEN CHAIN "Mat1"
120 IF C$ = "I" THEN CHAIN "Mat2"
130 IF C$ = "S" THEN CHAIN "Mat3"
140 IF C$ = "Q" THEN SYSTEM
150 END
```

```
10 REM PROGRAM TO TEACH SIMPLE LINEAR EQUATION
20 CLS
30 LOCATE 2,19: PRINT "SIMPLE LINEAR EQUATION"
40 LOCATE 3,19: PRINT "==================           "
50 LOCATE 5,5: PRINT "OBJECTIVE:-"
60 LOCATE 5,18: PRINT "At the end of the lessom the students"
70 LOCATE 6,18: PRINT "should be able to"
80 LOCATE 7,18: PRINT "define linear equation"
90 LOCATE 8,18: PRINT "solve simple problems on linear equation"
100 LOCATE 10,10: PRINT "Linear equation is an equation in which"
110 LOCATE 11,10: PRINT "the highest power of the unknown is one."
120 LOCATE 13,10: PRINT "Example"
130 LOCATE 13,18: PRINT "3x = 18"
140 LOCATE 14,18: PRINT "x + 5 = 10"
150 LOCATE 15,18: PRINT "x - 10 = 5"

160 LOCATE 16,18: PRINT "(x + 5) + (x - 3) = 10"
170 LOCATE 17,10: PRINT "All these are examples of linear equations"
180 LOCATE 23,10: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
190 IF U$ = "D" THEN 210
200 IF U$ = "U" THEN 30
210 CLS
220 LOCATE 4,10: PRINT "Example 1"
230 LOCATE 5,18: PRINT "Solve the eqution 18 - x = 7

240 LOCATE 7,18: PRINT "The problem is to find number which"
250 LOCATE 8,18: PRINT "when taken from 18 gives 7"
260 LOCATE 9,18: PRINT "The number is 11"
270 LOCATE 10,18: PRINT "x = 11 the solution"
280 LOCATE 20,10: INPUT " PRESS D TO PGDOWN & U TO PGUP", U$
290 IF U$ = "D" THEN 310
300 IF U$ = "U" THEN 30
310 CLS
320 LOCATE 4,10: PRINT "Example 2"
330 LOCATE 5,18: PRINT "Solve the equ. x + 11 = 18
340 LOCATE 7,10: PRINT "Solution:-"
350 LOCATE 8,18: PRINT " x + 11 = 18"
360 LOCATE 9,18: PRINT "Subtract 11 from both sides"
370 LOCATE 10,18: PRINT "x + 11 - 11 = 18 - 11"
380 LOCATE 11,18: PRINT "x = 7"
390 LOCATE 13,10: PRINT "Check: LHS = x + 11 = 7 + 11 = 18 = RHS"
400 LOCATE 23,10: INPUT "PRESS D TO PGDOWN & U TO PGUUP". U$
410 IF U$ = "D" THEN 430
```

```
420 IF U$ = "U" THEN 210
430 CLS
440 LOCATE 4,10: PRINT "Example 3"
450 LOCATE 5,18: PRINT "Solve 5x - 6 = 29
460 LOCATE 7,10: PRINT "Solution:-"
470 LOCATE 8,20: PRINT " 5x - 6 - 29"
480 LOCATE 9,18: PRINT "Add 6 to both sides"
490 LOCATE 10,18: PRINT "5x - 6 + 6 = 29 + 6"
500 LOCATE 11,18: PRINT "i.e 5x = 35"
510 LOCATE 12,18: PRINT "Divide both sides by 5"
520 LOCATE 13,18: PRINT "i.e x = 7"
530 LOCATE 23,10: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
540 IF U$ = "D" THEN 560
550 IF U$    "U" THEN 310
560 CLS
570 LOCATE 5,10: PRINT "TAKE HOME ASSIGNMENT"
580 LOCATE 7,10: PRINT "Solve the following equations"

590 LOCATE 8,10: PRINT "and check each solution"
600 LOCATE 9,18: PRINT "(1) 5y + 6 = 2"
610 LOCATE 10,18: PRINT "(2) 3x - 4 = 26
620 LOCATE 11,18: PRINT "(3) 8x - 24 = 0
630 LOCATE 12,18: PRINT "(4) 19 = 16y - 21"
640 END
```

```
10 REM program on simple interest lecture
20 CLS
30 LOCATE 2,18: COLOR 12: PRINT "SIMPLE INTEREST"
40 LOCATE 3,18: COLOR 12: PRINT "================="
50 LOCATE 4,5: COLOR 7: PRINT "OBJECTIVE:-"
60 LOCATE 4,19: PRINT "at the end of the lesson student should be able to:"
70 LOCATE 5,19: PRINT "calculate simple ineterest;"
80 LOCATE 6,19: PRINT "make p,r,t subjects of the formular;"
90 LOCATE 7,19: PRINT210 LOCATE 2,5: PRINT "example:- find the simple interest on #500."
100 LOCATE 9,5: PRINT "definition:- simple ineterest is the interest that is cal
culated"
110 LOCATE 10,5: PRINT "on the basic sum of money saved or borrowed within a"
120 LOCATE 11,5: PRINT "given period of time"
130 LOCATE 13,5: PRINT "Principal(p):- is the money invested"
140 LOCATE 15,5: PRINT "Rate(r):- is the percentage return"
150 LOCATE 17,5: PRINT "Time(t):- is the period which the money is borrowed"
160 LOCATE 19,5: PRINT "Amount(a):- is the total of the principal and interest"
170 LOCATE 23,5: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
180 IF U$= "D" THEN GOTO 200
190 IF U$ = "U" THEN GOTO 30
200 CLS
210 LOCATE 2,5: PRINT "example:- find the simple interest on #500."
220 LOCATE 3,5: PRINT "for 4years at 5% per annum"
230 IF Y$="y" THEN GOTO 380
240 IF Y$="n" THEN GOTO 210
250 LOCATE 5,5: PRINT "the interest on #100. for 1year is #5"
260 LOCATE 6,5: PRINT "the interest on #500. for 1year is (500/100)x5= #25"
270 LOCATE 7,5: PRINT "the interest on #500. for 4years is #25x4= #100"
280 LOCATE 8,5: PRINT "The I=PRT/100"
290 LOCATE 9,5: PRINT "this formula can be transpose to give p,"
300 LOCATE 10,5: PRINT "R and T in terms of the other letters"
310 LOCATE 11,5: PRINT "thus,"
320 LOCATE 12,5: PRINT "T=100I/PR"
330 LOCATE 13,5: PRINT "R=100I/PT"
340 LOCATE 14,5: PRINT "P=100I/RT"
350 LOCATE 23,5: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
360 IF U$="D" THEN GOTO 380
370 IF U$="U" THEN GOTO 210
380 CLS
390 LOCATE 2,5: PRINT "Examples"
400 LOCATE 4,5: PRINT "find the simple interest on #800"
 "calculate p,r,t given the necessary conditions."
410 LOCATE 5,5: PRINT "for 4years at 8% per annum"
420 LOCATE 6,5: PRINT "I=PxRxT/100"
430 LOCATE 7,5: PRINT "P=300,R=8, T=4"
440 LOCATE 8,5: PRINT "=(300x8x4)/100"
450 LOCATE 9,5: PRINT "=3x8x4"
460 LOCATE 10,5: PRINT "=#96"
470 END
```

```
10 REM PROGRAM TO TEACH MEAN, MEDIAN AND MO..
20 CLS
30 LOCATE 2,15: PRINT "MEAN, MEDIAN AND MO..
40 LOCATE 3,15: PRINT "===================="
50 LOCATE 5,5: PRINT "OBJECTIVE:-"
60 LOCATE 6,.. PRINT "At the end of the lesson students"
70 LOCATE 6,18: PRINT "should be able to"
80 LOCATE 7,18: PRINT "define Mean, Median and Mode"
90 LOCATE 8,18: PRINT "calculate the Mean, Median ..
100 LOCATE 9,18: PRINT "of ungrouped data"
110 LOCATE 11,5: PRINT "PRESENTATION:-"
120 LOCATE 12,10: PRINT "MEAN:- Is the sum of all the items"
130 LOCATE 13,17: PRINT "divided by the number of the items"
140 LOCATE 14,10: PRINT "Example:- Find the mean of 3,5,7,10 and 15"
150 LOCATE 16,10: PRINT "Mean = Sum of items/number of..
160 LOCATE 18,17: PRINT " = (3 + 5 + 7 + 10 + 15)/5"
170 LOCATE 19,17: PRINT "40/5 = 8"
180 LOCATE 22,10: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
190 IF U$ = "D" THEN 210
200 IF U$ = "U" THEN 30
210 CLS
220 LOCATE 4,5: PRINT "MEDIAN:- Is the middle item when the marks"
230 LOCATE 5,14: PRINT "are arranged in rank order either"
240 LOCATE 6,14: PRINT "ascending or descending"
250 LOCATE 7,14: PRINT "If there is an even number of items"
260 LOCATE 8,14: PRINT "the median is found by taking the mean"
270 LOCATE 9,14: PRINT "of the two middle numbers "
280 LOCATE 11,5: PRINT "Example (1) find the median of"
290 LOCATE 12,17: PRINT "5,2,4,6,3,4,8"
300 LOCATE 13,5: PRINT "Solution"
310 LOCATE 14,13: PRINT "Re-aranging the data"
320 LOCATE 15,13: PRINT "2,3,4,4,5,6,8"
330 LOCATE 16,13: PRINT "Median = middle item"
340 LOCATE 17,13: PRINT "= 4"
350 LOCATE 20,10: INPUT "PRESS D TO PGDONW & U TO PGUP", U$
360 IF U$ = "D" THEN 380
370 LOCATE IF U$ = "U" THEN 30
380 CLS
390 LOCATE 4,18: PRINT "Find the median of 6,7,5,3,10,9"
400 LOCATE 5,18: PRINT "Re-arranging the data 3,5,6,7,9,10."
410 LOCATE 6,18: PRINT "Median = (6+7)/2"
410 LOCATE 6,18: PRINT "Median = (6+7)/2"
420 LOCATE 7,18: PRINT "= 13/2"
430 LOCATE 8,18: PRINT "= 6.5 "
440 LOCATE 12,10: PRINT "MODE:- Is the item which appears most often"
450 LOCATE 13,17: PRINT "that is item with the highest frequency."
460 LOCATE 14,17: PRINT "It is posssible to have 2,3 or more modes"
470 LOCATE 15,17: PRINT "in a set of items, when we have 2 modes"
480 LOCATE 16,17: PRINT "in a given set of items, it is called bimodal"
490 LOCATE 18,10: PRINT "Example:- Find the mode of 3,10,6,7,3,4"
500 LOCATE 19,20: PRINT "the number with the highest frequency = 3"
510 LOCATE 20,20: PRINT "the mode = 3"
520 LOCATE 23,10: INPUT " PRESS D TO PGDOWN & U TO PGUP", U$
530 IF U$ = "D" THEN 550
540 IF U$ = "U" THEN 240
550 CLS
560 LOCATE 4,10: PRINT "Example:- The marks in an examination of 7 students"
570 LOCATE 5,20: PRINT "were 10,60,10,50,50,30,50,10,50,10,50,30,10."
580 LOCATE 6,20: PRINT "Find the modal mark."
590 LOCATE 8,10: PRINT "10 and 50 have the same highest frequency"
600 LOCATE 9,10: PRINT "i.e modal mark = 10 and 50."
```

```
610 LOCATE 11,10: PRINT "Nine boys take a test. Their marks are"
620 LOCATE 12,10: PRINT "4,8,7,8,4,3,6,4,7."
630 LOCATE 13,10: PRINT "place the marks in rank order"
640 LOCATE 14,10: PRINT "Hence find the mean, median and mode"
650 LOCATE 15,10: PRINT "Re-arranging marks in rank order"
660 LOCATE 16,10: PRINT "3 4 4 4 6 7 7 8 9"
670 LOCATE 17,10: PRINT "(3+4+4+4+6+7+7+8+9)/9"
680 LOCATE 18,10: PRINT "= 52/9"
690 LOCATE 19,10: PRINT "= 5.8"
700 LOCATE 22,10: INPUT "PRESS D TO PGDOWN & U TO PGUP", U$
710 IF U$ = "D" THEN 730
720 IF U$ = "U" THEN 380
730 CLS
740 LOCATE 4,10: PRINT "Median = middle mark = 6"
750 LOCATE 5,10: PRINT "Mode = mark which appears most often = 4"
760 LOCATE 6,10: PRINT "TAKE HOME ASSIGNMENT"
770 LOCATE 8,10: PRINT "A Zoologist caught 10 snakes. their lengths"
780 LOCATE 9,10: PRINT "in cm were as follows."
790 LOCATE 10,10: PRINT "37,39,50,64,81,43,56,43,73,59."
800 LOCATE 11,10: PRINT "Find mean, median and modal length of the snakes."
810 END
```

Computer Aided Learning
A Case Study of Mathematics Teaching
In Scecondary Schools

BY

Mal. Musa Bawa

SUPERVISED

BY

Mal. Audu Isah

PRESS D TO PGDOWN   ?

Welcome to this tutorial lecture on selected
in Mathematics

PRESS D TO PGDOWN & U TO PGUP   ?

ENTER YOUR NAME:? MUSA BAWA

ENTER YOUR REG. NO.:? 057

TOPICS MENU

E -----SIMPLE LINEAR EQUATION

I------SIMPLE INTEREST

S------MEAN, MEDIAN, MODE

Q------Exit

SELECT AN OPTION   ?

SIMPLE LINEAR EQUATION

OBJECTIVE:- At the end of the lessom the students
        should be able to
        define linear equation
        solve simple problems on linear equation

Linear equation is an equation in which
the highest power of the unknown is one.

Example

$$3x = 18$$
$$x + 5 = 10$$
$$x - 10 = 5$$
$$(x + 5) + (x - 3) = 10$$

All these are examples of linear equations

PRESS D TO PGDOWN & U TO PGUP Example 1
    Solve the eqution $18 - x = 7$

The problem is to find number which
when taken from 18 gives 7
The number is 11
$x = 11$ the solution

PRESS D TO PGDOWN & U TO PGUP Example 1
    Solve the eqution $18 - x = 7$

The problem is to find number which
when taken from 18 gives 7
The number is 11
$x = 11$ the solution

Example 2
Solve the equ. $x + 11 = 18$

Solution:-
$x + 11 = 18$
Subtract 11 from both sides
$x + 11 - 11 = 18 - 11$
$x = 7$

Check: LHS $= x + 11 = 7 + 11 = 18 =$ RHS

Example 3
Solve $5x - 6 = 29$
Solve $5x - 6 = 29$

Solution:-
$5x - 6 = 29$
Add 6 to both sides
$5x - 6 + 6 = 29 + 6$
i.e $5x = 35$
Divide both sides by 5
i.e $x = 7$

TAKE HOME ASSIGNMENT

Solve the following equations
and check each solution
(1) $5y + 6 = 2$
(2) $3x - 4 = 26$
(3) $8x - 24 = 0$
(4) $19 = 16y - 21$

SIMPLE INTEREST
================

OBJECTIVE:- at the end of the lesson student should be able to:
        calculate simple incterest;
        make p,r,t subjects of the formular;
        calculate p,r,t given the necessary conditions.

definition:- simple incterest is the interest that is calculated
on the basic sum of money saved or borrowed within a
given period of time

Principal(p):- is the money invested

Rate(r):- is the percentage return

Time(t):- is the period which the money is borrowed

Amount(a):- is the total of the principal and interest

PRESS D TO PGDOWN & U TO PGUP

EXAMPLE :- FIND THE SIMPLE INTEREST OF # 500 FOR 4YAERS AT 5% PER ANNUM

the interest on #100. for 1year is #5
the interest on #500. for 1year is $(500/100) \times 5 = $ #25
the interest on #500. for 4years is #25x4= #100
The I=PRT/100
this formula can be transpose to give p,
R and T in terms of the other letters
thus,
T=100I/PR
R=100I/PT
P=100I/RT

PRESS D TO PGDOWN & U TO PGUP

   Examples
   find the simple interest on #800
   for 4years at 8% per annum
   I=PxRxT/100
   P=300,R=8, T=4
   =(300x8x4)/100
   =3x8x4
   =#96
Ok_

OBJECTIVE:- At the end of the lesson students
    should be able to
    define Mean, Median and Mode
    calculate the Mean, Median and Mode
    of ungrouped data

PRESENTATION:-
    MEAN:- Is the sum of all the items
        divided by the number of the items
    Example:- Find the mean of 3,5,7,10 and 15

    Mean – Sum of items/number of items

        $= (3 + 5 + 7 + 10 + 15)/5$
        $40/5 = 8$

PRESS D TO PGDOWN & U TO PGUP

MEDIAN:- Is the middle item when the marks
    are arranged in rank order either
    ascending or descending
    If there is an even number of items
    the median is found by taking the mean
    of the two middle numbers.

Example (1)
find the median of
        5,2,4,6,3,4,8
Solution
    Re-aranging the data
    2,3,4,4,5,6,8
    Median = middle item
    = 4

PRESS D TO PGDONW & U TO PGUP

        Find the median of 6,7,5,3,10,9
        Re-arranging the data 3,5,6,7,9,10.
        Median = $(6+7)/2$
        = 13/2
        = 6.5

    MODE:- Is the item which appears most often
        that is item with the highest frequency.
        It is posssible to have 2,3 or more modes
        in a set of items. when we have 2 modes
        in a given set of items. it is called bimodal

    Example:- Find the mode of 3,10,6,7,3,4
        the number with the highest frequency = 3
        the mode = 3

PRESS D TO PGDOWN & U TO PGUP

Example:- The marks in an examination of 7 students
were 10,60,10,50,50,30,50,10,50,10,50,30,10.
Find the modal mark.

10 and 50 have the same highest frequency
i.e modal mark = 10 and 50.

Nine boys take a test. Their marks are:
4,8,7,8,4,3,6,4,7.
place the marks in rank order.
Hence find the mean, median and mode
Re-arranging marks in rank order
3,4,4,4,6,7,7,8,9
(3+4+4+4+6+7+7+8+9)/9
= 52/9
= 5.8

PRESS D TO PGDOWN & U TO PGUP

Median = middle mark = 6
Mode = mark which appears most often = 4
TAKE HOME ASSIGNMENT

A Zoologist caught 10 snakes. their lengths
in cm were as follows.
37,39,50,64,81,43,56,43,73,59.
Find mean, median and modal length of the snakes.

QUESTIONNAIRE.

In partial fulfilment for the award of post

graduate in computer science of the Federal University of Technology Minna. I designed

this questionnaire to gather information concerning the use of computer in the teaching and

learning of mathematics in the secondary schools in Minna and Bosso Local Government Areas

of Niger State so that we can find

solution to the various problems we may have. Its success depends greatly on how you

honestly and correctly respond to it.

Could you please supply me with the required information by filling in this questionnaire. Any

information you supply will be treated as confidential and will be restricted to the purpose of

this study.

Attach sheet(s) of paper where the space provided is not enough.

SECTION A.

1. Name of the school:..

2. Year established:..

NCE Degree Masters PhD Others

3. School staff strength

4. Mathematics dept. staff strength   JSSI JSSII JSSIII SSI SSII SSII

5. Student Population

6. Number of class room blocks.

7. Do you have mathematics period laboratory:...

8. What is the number of mathematics periods per class per week?...

44

9. What are the methods use in the teaching of mathematics in your school?.............................

10. Are you satisfy with the activities of your department (mathematics department)?..................

11. Kindly summarise the problems encountered in the department:......................................

....

....

....

SECTION B.

In the following questions kindly tick the appropriate column. (a) Excellent (b) Good (c) Fair (e) poor.

1). How would you rate the morale of your mathematics teachers

2). How would you evaluate the adequate of teaching materials.

3). How would you asses the method of teaching

   mathematics currently in use.

4). How do you evaluate your school library mathematically.

5). How would you rate the government support of your institution.

6). How would you evaluate effective supervision.

7). How would you evaluate students' response to the teaching and learning of mathematics.

8). How would you rate the principal's support of mathematics department.

9). How would you rate the availability of qualified mathematics teachers.

   If the rating in item 1,2,3,7 and 9 above is low fair or poor then answer the following

   questions:

45

i) Are you thinking about an alternative?................   ii)What sort of alternative are you

thinking of?...................................

iii) Do you think computer can solve the problem?...

iv) Have you idea about computer Aided learning?...

v) What do you think computer can do in teaching generally...

....

Please kindly provide any information that you think is necessary and I forget to ask you:

....