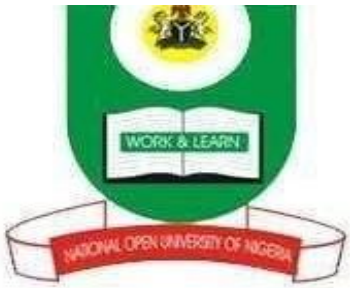


NATIONAL OPEN UNIVERSITY OF NIGERIA

FACULTY OF EDUCATION

COURSE CODE: EDU 258

COURSE TITLE: COMPUTER SCIENCE EDUCATION METHODS

EDU 258
COMPUTER SCIENCE EDUCATION METHODS

COURSE TEAM Dr Olayiwola Usman **(Developer/Writer) - UNN**

COURSE REVIEWER Dr. Josiah Owolabi - NOUN

Date Reviewed: **January, 2020**

COURSE GUIDE

Introduction

Welcome to EDU258 titled Computer Science Education Methods which is a two credit unit course offered in the second year of the undergraduate degree programme in Science Education. There are fifteen Study Units in this course. There are no prerequisites for studying this course. It has been developed with appropriate local examples suitable for the Nigerian audience. This course guide is for distance learners enrolled in the B. Sc Ed Science Education programmes of the National Open University of Nigeria. This guide is one of the several resource tools available to you to help you successfully complete this course and ultimately your programme.

In this guide you will find very useful information about this course; aims, objectives, what the course is about, what course materials you will be using; available services to support your learning; information on assignments and examination. It also offers you guidelines on how to plan you time for study; the amount of time you are likely, to spend on each study unit; your tutor-marked assignments.

I strongly recommend that you go through this course guide before you begin your study of the course. This guide also provides answers to several of your questions. However, do not hesitate to contact your study centre if you have further questions.

I wish you all the best in your learning experience and successful completion of this course.

Course Objectives

a. There are objectives to be achieved in each study unit of the course. You should read them before studying each unit. On completion of this course you will be able to:

    a. List the sequences of early non-mechanical counting aids and articulate the stages of envelopment of electronic numerical machine.

b. List the generations of computers.

c. List various components of computer and their functions and identify different types of software

d. Articulate the uses of computer in teaching and learning processes

e. Identify the three modes of computer lesson presentation

f. Prepare and deliver a computer based instruction

g. Identify problems militating against the global use of computer in the teaching and learning processes with particular attention to Nigerian schools.

Course Summary

Module 1 introduces you to historical development of computer. Module 2 presents computer and computer components. Module 3 deals with computer and instructional processes. Module 4 presents computer based instruction and Module 5 deals with problems militating against the use of computers in the classroom. There are fifteen Study Units in this course. Each study unit consists of one week‘s work and should take you about three hours to complete. It includes specific learning outcomes, guidance for study, reading material, and Self-Assessment Exercises. Together with tutor-marked assignments, these-exercises will assist you in achieving the stated learning objectives of the individual Study Units and of the course.

How to get the most from this Course

In distance learning, you can read and work through the course materials at your pace, and at a time and place that suits you best. Think of it as reading the lecture instead of listening to a lecturer. Just as a lecturer might give you in-class exercise, your Study Units provide exercises for you to do at appropriate times. Each of the Study Units has common features which are designed to aid your learning. The first feature is an introduction to the subject matter of the unit and how a particular unit is a set of learning objectives. These objectives let you know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study.

When you have finished the unit, you should go back and check whether you have achieved the objectives. Self-Assessment Exercises are interspersed throughout each study unit and answers are given at the end of the course. These exercises are designed to help you recall what you have studied and to evaluate your learning by yourself. You should do each Self-Assessment Exercise as you come to it in the study unit. The summary at the end of each unit also helps you to recall all the main topics discussed in the main content of each unit. There are also tutor-marked questions at the end of each unit. Working on these questions will help you to achieve the objectives of the unit and prepare you for the TMA and the final examination.

It should take you at least three hours to complete a study unit, the exercises and assignments. When you have completed the first study unit take note of how long it took you and use this information to draw up a timetable to guide your study for the rest of your course. The wide margins on the left and right side of the pages of yours course book are meant for you to make notes of main ideas or key points at which you can use when revising the course. If you make use of all these features, you will significantly increase your chances of passing the course.

Course Delivery

As an open and distance learner, you learn through several ways. You learn when you interact with the content in your course material in the same way as a student interacts with the teacher in a conventional institution. You also learn when you are guided through the course; however you are not taught the course. Instead, your course material is your teacher, and as such you will not be able to get answers to any questions which may arise from your study of the material. It is for this reason that, in addition to the course material which you have received, the delivery of this course is supported by online facilitation, and counselling support services. Although these services are not compulsory, you are encouraged to take maximum advantage of them.

Online Facilitation

The total number of online facilitation hours for this course is 8 hours. The online facilitation sessions form a part of your learning process as you have an opportunity to receive meet you're your facilitators online and subsequently receive the link to access the lectures to enable you listen to it as many times as you could. Also you may contact your online facilitator by phone or mail.

On your part, you will be expected to prepare ahead of time by studying the relevant in the study unit, write your questions so as to gain maximum benefit from the sessions. Information about the time schedule for facilitation will be sent to your mail.

Counselling

Counselling forms a part of your learning because it is provided to make your learning experience easier. Counselling is available to you at two levels, academic and personal counselling. Student counsellors are available at the study centre to provide guidance for personal issues that may affect your studies. Your study centre staff can assist you with questions on academic matters such as course materials, facilitation, grades and so on. Make sure that you have the phone numbers and email addresses of your study centre and the various individuals.

Assessment

There are three components of assessment for this course: Self-Assessment Exercises and assignments at the end of each study unit; the Tutor-Marked Assignments; and a written examination. In doing these assignments, you are expected to use the information gathered during your study of the course. Below are detailed explanations on how to do each assignment.

Self-Assessment Exercises (SAEs)

There are Self-Assessment Exercises spread out through your course material. You should attempt each exercise immediately after reading the section that precedes it. Possible answers to the exercises are provided at the end of the course book, however, you should check the answers only after you must have attempted the exercises. The exercises are for you to evaluate your learning; they are not to be submitted. There are also questions spread through each study unit. You are required to attempt these questions after you have read a study unit. Again, the questions are to help you assess your knowledge of the contents of the unit. You are not required to submit the answers for SAEs.

Tutor-Marked Assignments (TMAs)

There are three Tutor-Marked Assessments for this course. The assessments are

designed to cover all areas treated in the course. You will be given the periods you are expected to attempt each of the assessments during the semester. The assessments are available online. You are required to attempt all the three assessments. Each assignment carries 10% and together will count for 30% of your total score for the course. The assessments are done and marked online.

Final Examination and Grading

The final examination for EDU258 will be of two hours duration, and will carry 70% of the total course grade. The examination will consist of questions which reflect the kinds of Self-Assessment Exercises and questions in the TMAs which you have previously encountered. All areas of the course will be assessed. You should use the time between finishing the last unit and taking the examination to revise the entire course. You will find it useful to review your answers to Self-Assessment Exercises and TMAs before the examination. For you to be eligible to sit for the final examinations, you must have registered to sit for the examination. The deadline for examination registration will be available online. Failure to register for the examination (even if you sit for the examination) means that you will not have a score for the course.

Course Marking Scheme

The following table lays out the marks that constitute the total course score.

Assessment	Marks
3 TMAs	Each marked out of 10% totaling 30%
Final examination	70% of overall course score

Conclusion

In conclusion, all the features of this course guide have been designed to facilitate your learning in order that you achieve the aims and objectives of the course. They include the aims and objectives, course summary, course overview, Self-Assessment Exercises and study questions. You should ensure that you make maximum use of them in your study to achieve maximum results.

Summary

EDU258 titled Computer Science Education Methods provides you a basic knowledge on the use of computer for instruction upon which you develop skills in the use of computer in the classroom. It is aimed at equipping you with skills necessary for computer usage in the modern classroom. Upon completing the course you should be able to articulate the historical development of computer, identify various components of computer, select necessary software for classroom instruction, prepare and deliver a computer based instruction and articulate problems militating against the use of computers in the classroom. I wish you success in the course and hope that you will find it both interesting and useful.

MODULE 1 HISTORICAL DEVELOPMENT OF COMPUTER

Unit 1 Early Aids to Counting and computing
Unit 2 Evolution of Electronic Machine
Unit 3 Computer Generation

UNIT 1 EARLY AIDS TO COUNTING AND COMPUTING

CONTENTS

1.0 Introduction

History serves as the linkage of the present to the past as well as to the future. Therefore, your understanding of historical development of computer will not only be an impetus for you to appreciate efforts made to arrive at where computer technology is today but also sensitize you to also make your own contribution to its future uses and how to improve computer technology as a whole for the betterment of humanity. An historical approach will help you to understand that the invention of computer was as a result of human problems related to mathematics and the beginning of mathematics is counting. Various aids were used for counting at one time or the other; starting with fingers, pebbles, and ABACUS. This unit will take you through the stages of early aids to counting; starting with early non-mechanical counting aids, followed by early mechanical counting and computation devices and finally the evolution of information processing aids.

2.0 LEARNING OUTCOMES

By the time you complete this unit, you should be able to

i. List the sequences of early non-mechanical counting aids.

ii. Identify the first counting device.

iii. Name early inventors of counting and computing devices.

3.0 MAIN CONTENTS

3.1 Early Non-mechanical Counting Aids

Throughout history, man experienced an ever-increasing need for numerical calculations and has continued to seek ways to meet this need with a minimum of mental and manual efforts. The early man, like his predecessors, was blessed with fingers and toes

as an inherent means of counting. For instance, look at your hands; have you ever used your fingers to help you count? Perhaps you used them to help you to add two numbers. When you did this, you were using your fingers as a counting device. It was a very simple device which helped you to carry out simple additions. However, there were limitations on how far one could go with these facilities. As time progressed, these limitations were overcome by the discovery that pebbles, grains of corn, and other small objects could be used for counting. Again, look at your fingers . How many have you? You have ten if you include your thumbs. Because you have ten fingers, they are not very good for counting when the numbers are larger than 10. Because of this, primitive man started to use pebbles and related materials, instead of fingers, to help him to count. Suppose he wanted to count the number of animals he owned, He built a pile of stones with one stone for every animal. After he had finished building the pile he would then look at it and see how many stones there were in it. This was not easy if all the stones were in a single pile. So he put them into smaller piles of the same size. What size did he choose for each of these smaller piles? He decided that the size of each pile should be ten. He picked this number because he had ten fingers.

Suppose that after counting his animals the primitive man had three piles of ten stones and one smaller pile of four. After looking at the piles he said, –I have three tens and one four. He called the number thirty-four. Even quite small numbers like 34 used a lot of stones. Using stones is no good for large numbers. The next step was to use a different stone to mean ten animals. Perhaps our primitive man used black stones to count up to 10. He used white stones to count the number of tens. The number 34 only needed 7 stones, 3 white and 4 black. This method was also used to count larger numbers. Red stones could be used for hundreds. Then the number 154 used only ten stones. The piles of stones looked like this: ***1 red stone, 5 white stones and 4 black stones.*** This simple way of counting was difficulty to use because stones were very awkward.

Finger Counting

Man has always been challenged by Mathematics and the need to solve mathematical

problems. To most people, however, the job of solving a problem is both boring and time-consuming. For this reason, attempts have been made from the very beginning to make calculating less tedious and much faster.

Until the nineteenth century, most business calculations were performed mentally. To reduce this problem, Roman schools taught finger counting and actually devised various methods of doing such advanced operations as multiplication and division of fingers.

The roman student was only required to learn the multiplication table up to 5x5. To figure out the product of any numbers between 5 and 10, he used his fingers. Suppose, for example, he wished to multiply 7x9. To find the product, he would raise two fingers on one hand to represent the numbers over 5 (that is 7 – 5) plus four fingers on the other hand (9 – 5). He obtained the product as follows:

i. Add the number of fingers raised, 2 + 4 = 6 (the value of ten‘s position)

ii. Multiply the number of fingers not raised in each hand.

iii. 3 x 1 =3 (the value of the unit‘s position) Therefore,

7 x 9 = 63

The Abacus

The next idea was to use coloured beads threaded on a string. At first the beads were made of stone. The beads were threaded on lines of wire frame. The beads on the first line counted the units. The beads on the second wire counted the tens. The bead on the third wire counted the hundreds and so on. By moving the beads back and forth along wires, numbers could be added and subtracted. This device was called an ***ABACUS***. ***The Abacus is a Wooden frame with strings on which colourful beads are strung.*** However, the problem of how to handle pebbles conveniently had earlier been solved in the Tigres-Euphrates Valley about five thousand years ago by designing a clay board with grooves into which the pebbles could be placed. This device enabled the grooves to be moved from one side of the

instrument to the other to facilitate counting. This technique, which was the forerunner of the ABACUS, came to be adopted and modified by the Chinese and Japanese. The ABACUS in its present form is believed to have originated in China about 2600 B. C. The Japanese had a similar device called the soroban. The ABACUS probably did not reach Europe prior to the beginning of the Christian era because the abax (as it was called by the Romans) was first described by Greek authors about A. D. 300, and was of exactly the same design as the Chinese and Japanese devices.

The ABACUS comprises several rows of beads which slides on sticks or wires mounted in a rectangular frame. The frame of the ABACUS is divided by a cross member so that each row of beads has a sector with one bead (two on some ABACUSES), and another sector with four or five beads. Although simple in appearance, the ABACUS is an amazingly versatile and efficient computing device and is still widely used in certain parts of the world.

SELF ASSESSMENT EXERCISE 1

1. What is the first device built for counting?
2. Can you explain the steps used in multiplying two numbers that are between 5 and 10 using fingers?

3.1 Early Mechanical Counting Aids and Computing Device

Napier Bones

ABACUS can be said to be the first device for counting and computation. However, emergence of more sophisticated problems gave way to other computation devices. For example, In 1617 John Napier, a Scot, developed logarithms, a tabular system of numbers by which arithmetic operations are simplified. With tables of logarithms; multiplication and division are more easily performed as addition and subtraction, respectively. This development stimulated the invention of many devices that used addition of logarithms in place of

multiplication. Notable among these was an instrument invented by Napier himself in 1617 and came to be known as –Napier's bones. The device was a mechanical arrangements of strips of bone on which numbers were printed. When brought into combination, the strips were capable of performing direct multiplication. However, just over three hundred years ago, the first machines for helping with calculations were invented. These machines were mechanical. They had parts which moved. The person who was using the machine provided the power that caused the movement. Calculating machines like these were used in the 1970s but became out of date with the invention of electronic calculators.

Pascaline

A Frenchman called Blaise Pascal was the first person to achieve success in the development of a digital counter. In 1642, at 19, he invented a device to assist in adding long columns of figures in his father's tax office in France. Pascal's gear-driven machine, named ***PASCALINE***, the size of a shoe box, comprised a row of wheels with teeth numbered from 0 to 9. The first wheel denoted units, the second, tens; etc. When the first wheel was turned five spaces, 5 showed in a window at the top of the machine. If the wheel was turned two more spaces the result was 7. The addition of another seven caused the indicator to proceed through 0 to 4. In this instance, a lever on the units dial must have moved the tens dial one-tenth of a revolution so that the machine had –carried one,‖ indicating a total of 14. This was a simple device, more like a mileage gauge or a revolution counter than a modern computer, but it contained three principles that were used in later inventions: (i) carry over should be automatic (ii) subtraction could be accomplished by turning dials in reverse (iii) multiplication could be performed by repeated addition. *The period of Pascal invention can be described as the transition between mechanical computation aids and calculating machine.*

The Stepped Reckoner

In 1671, the German Philosopher and Mathematician, Gottfried Leibniz, conceived a calculating machine, called ***The Stepped reckoner,*** which utilized the principle of multiplication by repeated

addition. The most important component of his instrument, completed in 1674, was the Stepped Reckoner where, a cylindrical drum with nine teeth of increasing length along its surface. On rotating the drum, a gear sliding on an axis parallel to that of the drum engaged some of the teeth, thus being rotated on equal number of steps. This feature of the Leibniz machine is still present in some of today's calculators. The next century was marked by a futile search for a satisfactory machine.

SELF ASSESSMENT EXERCISES 2

1. What is the name of the first device used for counting?
2. What did John Napier develop in 1617?

a. Information Processing Devices

The machines mentioned so far are only calculators. They are used to add, subtract, multiply and divide two or more numbers. However, In the nineteenth century there was a new idea. This idea was to give a machine some information, which was then used by it. We say that the machine is ***processing*** the information, which it has been given; hence, it was called ***Information Processing Device.***

Jacquard Loom:

Invented by Joseph Jacquard and demonstrated in 1801, the Jacquard Loom is an attachment for powered fabric looms. It used a chain of punch cards to instruct the loom on how to make intricate textiles. For example, a loom could have hundreds of cards with holes in them that correspond to hooks that can be raised or lowered to make textile brocade.

The Jacquard Loom is important to the history of computers because it is the first machine to use interchangeable punch cards to instruct a machine to perform automated tasks. Having a machine that could perform various tasks is similar to today's computer programs that can be programmed to perform different tasks. The Jacquard Loom was also an inspiration to Charles Babbage planning to use perforated cards in his analytical engine. Herman Hollerith also used the idea of punch cards to

not only store information but used to input information into a computing device and is what help create the company IBM. Today's textile looms no longer use punch cards. Instead, they can use a digital scanner to create a pixelated digital version of any image. This digital version is used to create instructions for the loom to make a textile version of the scan.

The Engines

Charles Babbage (1791-1871), computer pioneer, designed two classes of engine, Difference Engines, and Analytical Engines. Difference engines are so called because of the mathematical principle on which they are based, namely, the method of finite differences. The beauty of the method is that it uses only arithmetical addition and removes the need for multiplication and division which are more difficult to implement mechanically.

Difference engines are strictly calculators. They crunch numbers the only way they know how - by repeated addition according to the method of finite differences. They cannot be used for general arithmetical calculation. The Analytical Engine is much more than a calculator and marks the progression from the mechanized arithmetic of calculation to fully-fledged general-purpose computation. There were at least three designs at different stages of the evolution of his ideas. So it is strictly correct to refer to the Analytical Engines in the plural.

Binary, Decimal and Error Detection

Babbage's calculating engines are decimal digital machines. They are decimal in that they use the familiar ten numbers '0' to '9' and they are digital in the sense that only whole numbers are recognized as valid. Number values are represented by gear wheels and each digit of a number has its own wheel. If a wheel comes to rest in a position intermediate between whole number values, the value is regarded as indeterminate and the engine is designed to jam to indicate that the integrity of the calculation has been compromised. Jamming is a form of error-detection.

Babbage considered using number systems other than decimal including binary as well as number bases 3, 4, 5, 12, 16 and 100. He settled for decimal out of engineering efficiency - to reduce the number of moving parts - as well as for their everyday familiarity.

Difference Engine No. 1

Babbage began in 1821 with Difference Engine No. 1, designed to calculate and tabulate polynomial functions. The design describes a machine to calculate a series of values and print results automatically in a table. Integral to the concept of the design is a printing apparatus mechanically coupled to the calculating section and integral to it. Difference Engine No. 1 is the first complete design for an automatic calculating engine.

From time to time Babbage changed the capacity of the Engine. The 1830 design shows a machine calculating with sixteen digits and six orders of difference. The Engine called for some 25,000 parts shared equally between the calculating section and the printer. Had it been built it would have weighed an estimated four tons and stood about eight feet high. Work was halted on the construction of the Engine in 1832 following a dispute with the engineer, Joseph Clement. Government funding was finally axed in 1842.

The Analytical Engine

With the construction project stalled, and freed from the nuts and bolts of detailed construction, Babbage conceived, in 1834, a more ambitious machine, later called Analytical Engine, a general-purpose programmable computing engine.

The Analytical Engine has many essential features found in the modern digital computer. It was programmable using punched cards, an idea borrowed from the Jacquard loom used for weaving complex patterns in textiles. The Engine had a 'Store' where numbers and intermediate results could be held, and a separate 'Mill' where the arithmetic processing was performed. It had an internal repertoire of the four arithmetical functions and could perform direct multiplication and division. It was also capable of functions for which we have modern names: conditional branching, looping (iteration), microprogramming, parallel processing, iteration, latching, polling, and pulse-shaping, amongst others, though Babbage nowhere used these terms. It had a variety of outputs including hardcopy printout, punched cards, graph plotting and the automatic production of stereotypes - trays of soft material into which results were impressed that could be used as molds for making printing

plates.

The logical structure of the Analytical Engine was essentially the same as that which has dominated computer design in the electronic era - the separation of the memory (the 'Store') from the central processor (the 'Mill'), serial operation using a 'fetch-execute cycle', and facilities for inputting and outputting data and instructions. Calling Babbage 'the first computer pioneer' is not a casual tribute.

A New Difference Engine

With the groundbreaking work on the Analytical Engine largely complete by 1840, Babbage began to consider a new difference engine. Between 1847 and 1849 he completed the design of Difference Engine No. 2, an improved version of the original. This Engine calculates with numbers thirty-one digits long and can tabulate any polynomial up to the seventh order. The design was elegantly simple and required only approximately a third of the parts called for in Difference Engine No. 1, while providing similar computing power.

Difference Engine No. 2 and the Analytical Engine share the same design for the printer - an output device with remarkable features. It not only produces hardcopy inked printout on paper as a checking copy, but also automatically stereotypes results, that is, impresses the results on soft material, Plaster of Paris for example, which could be used as a mold from which a printing plate could be made. The apparatus typesets results automatically and allows programmable formatting i.e. allows the operator to preset the layout of results on the page. User-alterable features include variable line height, variable numbers of columns, variable column margins, automatic line wrapping or column wrapping, and leaving blank lines every several lines for ease of reading.

Herman Hollerith

The year 1880 marked the beginning of the modern punched-card era. During this year, Dr. Herman Hollerith, a statistician, was engaged by the United States of America Census Bureau as a special agent to speed up processing of census data. The 1880 census took seven and a half years to complete. Manual tabulating methods were used in the survey of a population of 50 million people and proved hopelessly inadequate. It was obvious that the next census in 1890 could not be

processed by the same means if the information was to have any real value.

Furthermore, many facts of interest could not be complied to at all, or could not be handled in a manner which satisfied the Census Bureau's objectives. Despite an increase in the population of America to 63 million, the 1890 census was tabulated in two and a half years, a job which would have taken several more years to do manually. In 1911, Hollerith's company merged with a competitor to found the corporation which in 1924 became International Business Machines (IBM).

Computing Devices

The Mark 1 Computer

There was no major advance in automatic computation until 1937. Professor Howard Aiken of Harvard University became interested in combining some established principles with the punched card pioneered by Hollerith and others to build an automatic calculating device. In May 1944, with the cooperation of IBM, an automatic sequence controlled calculator named the Harvard Mark 1 was built and formally presented to Harvard University. After Mark 1, Professor Aiken also constructed three more models, the Mark II, Mark III and Mark IV. The Mark I computer is considered to be the first successful general purpose digital computer.

SELF ASSESSMENT EXERCISES 3

1. Who is the father of computer?

2. What did Hermann Hollerrith use his machine to process?

4.0 CONCLUSION

The Early man is believed to have started the counting with his fingers and due to the limitation of this counting aid, he used pebbles, grains of corn, and other small objects to assist him in the process of counting. The problem of how to handle pebbles conveniently motivated Tigres-Euphrates Valley about five thousand years ago to design a clay board with grooves into which the pebbles could be placed. This device enabled the grooves to be moved from one side of the instrument to the other to facilitate counting. The first computation device is ABACUS and it took a period of four thousand years after the invention of ABACUS before the invention of Roman and Arabic numerals. The invention of numerals paves way for invention of various

computational and information processing devices, including punched card machines.

5.0 SUMMARY

In this Unit, you have been exposed to various developmental stages of counting, computing, and information processing devices. The limitations of one counting device pave way for another counting device, until the arrival of counting, computation and information processing devices. The invention of counting, computation and information processing devices lead to the evolution of electronic machines. Therefore, the next units will expose you to evolution of electronic machines.

6.0 TUTOR MARKED ASSIGNMENT

i. List the sequences of early non-mechanical counting aids.

ii. List the limitations of each of the non-mechanical counting aids

iii. List the advantages of mechanical computation and information processing aids over mechanical computation aids and non-mechanical counting aids.

iv. Explain the Mark I computer.

7.0 REFERENCES/FURTHER READINGS

Eke, A. (2006). *Welcome to Computer Science*. Los Angeles: Acena Publishers

Eyitayo, A. O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studies for Beginners 1*, Ibadan: Bounty Press Limited

Olayanju T.A (2008). Introduction to Information Technology and Computer Applications. Printed by DABAN Printers. ISBN:978-8047-62-0

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Usman, K. O. (2002). *Computer Competencies Required of Mathematics Teachers for the use of Computers in Instructions.* Unpublished thesis of University of Nigeria, Nsukka.

Talabi A.A (2011). Basic computer Studies: A Beginner's Text (3rd Edition). Published by Data Link

Associates Limited. ISBN: 978-057-487-5

Turner, S., & Land, M. (2007). *Tools for Schools: Applications software for classroom*, Belmont, CA: Wadsworth

UNIT 2 EVOLUTION OF ELECTRONIC MACHINE CONTENTS

1.0 INTRODUCTION

The need to understand the stages of development that led to the emergent of computer necessitate the study of evolution of electronic machine. Hence, the evolution of electronic machine will expose you to efforts made to arrive at present day computer. The evolution of electronic numerical machine started with musical box. The music box builder deals with only two options when it comes to placing pins on the drum: put a pin in or don't put a pin in. This is the principle based on the binary system. During the seventeenth, eighteenth, and nineteenth centuries, several scientists including John Napier, ***Blaise Pascal,*** Gottfried Leibnitz, and Charles Babbage, invented mechanical aids for solving simple mathematical problems. The devices of Pascal, Leibnitz, and Babbage all used intermeshed gears to represent the basic mathematical operations of adding and subtracting. The most ambitious of these devices, the ***difference engine*** of Charles Babbage, was so complex that it required gears more precise than could be produced in the nineteenth century. As the nineteenth century ended, the precision required to produce reliable mechanical calculators became available. ENIAC was the beginning of the age of computers. The first of these developments was the transistor, which was developed in 1947. The mid 50s marked a period of transition in the history of computers. Many of the computers developed were built specially for business use. It made modern computers practical because of its dependability, small size and low power requirements. Another computer revolution occurred in 1971 when Intel Corporation produced the **microprocessor** IC. The details of these stages of the development are fully discussed under this unit.

2.0 LEARNING OUTCOMES

At end of this unit, you will be able to:

1. Articulate the stages of development of electronic numerical machine.
2. List the processes that lead to the invention of modern computer.
3. Identify examples of first generation computers

3.0 MAIN CONTENTS

3.1 Electronic Numerical Machine

One of the earliest ancestors of electronic computers is the music box. The sound from a music box is created by a slowly rotating drum with small metal pins protruding from it. As the drum revolves, the pins catch music boxes that play very complex, very beautiful compositions. The important point you have to remember is that the music box builder deals with only two options when it comes to placing pins on the drum: put a pin in or don‘t put a pin in. When you have only two choices you have a ***Binary system.*** The binary number system has only two digits, 1 and 0, and it uses these two digits to build larger numbers. The music box builder converts binary 1‘s and 0‘s into pins on a drum (that is, 1 = pin, 0 = no pin). Today, computer designers convert binary numbers into electrical signals (1=on, 0 = off). The basic principle is the same. The music box builder and the modern computer designer both build complicated patterns from simple ones. Inside the computers you will use in your classroom everything is expressed in patterns of 1‘s and 0‘s. While the music box is one ancestor of the computer, it is not the only one. During the seventeenth, eighteenth, and nineteenth centuries, several scientists including John Napier, ***Blaise Pascal,*** Gottfried Leibnitz, and Charles Babbage, invented mechanical aids for solving simple mathematical problems. The devices of Pascal, Leibnitz, and Babbage all used intermeshed

gears to represent the basic mathematical operations of adding and subtracting. On these machines, adding numbers involved turning gears that in turn caused other gears to rotate. The answer to the problem was then read from indicators attached to the gears. The most ambitious of these devices, the ***difference engine*** of Charles Babbage, was so complex that it required gears more precise than could be produced in the nineteenth century.

In spite of his difficulties in actually building the difference engine, the English mathematician

Charles Babbage is generally considered the father of computing (Evans, 1981), because he also designed the ***analytical engine,*** a device that could be programmed or instructed to perform a variety of computational tasks. Babbage was assisted by ***Ada Lovelace***, the daughter of the poet Lord Byron and a theoretical mathematician in her own right. Her contribution to the development of computing was acknowledged in the 1970s when a new computer language, Ada, was named after her.

The reason that computers are relatively young, therefore, is not the complexity of the concepts used to create them. It was the problem of manufacturing them that held back earlier efforts. Babbage's analytical engine was to be a huge assemblage of metal rods, wheels, and gears run by a steam engine. The precision possible at that time was simply not good enough to allow the design to work properly. Charles Babbage died in 1871 and in 1876 and American engineer named George Grant demonstrated a difference engine that worked. Grant, in fact, actually sold a number of machines, which he called rack and pinion calculators.

As the nineteenth century ended, the precision required to produce reliable mechanical calculators became available. It was also at this time that American technology began to equal and even exceed European technology. In the first half of the twentieth century, researchers continued to work on mechanical computers in the tradition of Babbage. For example, Vannevar Bush, a professor at MIT, built and demonstrated a differential analyzer in 1930. Bush's machine was the first to use

electricity not only to turn the gears, but also to store data. His machine could store numbers or quantities as electricity in one part of the system. Because memory, the ability to store data the computer will use later, is an important aspect of any electronic computer.

Konrad Zuse, a German engineer, and Howard Aiken, a Harvard math professor, both built hybrid, part mechanical and part electronic machines in the period between 1930 and 1945. These hybrid computers were never widely used in Germany or the United States. The future belonged to fully electronic computers. Although there is some controversy over the title, many consider the still secret British computer called Colossus the first special-purpose, electronic digital computer. Digital computers are on/off devices. In computers On and Off are generally referred to as 1 and 0, and all data inside digital computer consist of patterns of 1‘s and 0‘s. Colossus was developed by a secret team of scientists that included ***Alan Turing***, a mathematician who made several contributions to the theoretical concepts of computing.

Another major contributor to the intellectual and conceptual stew that led to the development of modern computers was John von Neumann (goldstone, 1972). Born in Budapest and educated at several major European universities, he published a scholarly treatise at age 18. Both Von Neumann and Turing believed that binary numbers should be the basis of computers. At first glance it is difficult to see how a machine that can deal with only two states, on and off (or 1 and 0), could accomplish anything important. Fortunately, more than 100 years earlier another British mathematician, ***George Boole,*** had developed a complete algebraic system of logic that used only two digits, 1 and 0. Early computer theorists, who needed a system of logic for a machine that could deal with two states, ***on and off,*** found Boole‘s logic essential to their work. The leap from obtuse theory to electric circuits was by George Shannon. He used the **yes - no, true – false** of Boolean logic to wire electrical switching circuits. Shannon expressed Boolean logic with electrically operated mechanical relay. Less than a decade later others created a computer by expressing Boolean logic with vacuum tubes.

The general-purpose electronic digital computer which is said to have had its beginning with Electronic Numerical Integrator and Calculator (ENIAC) was developed between 1942 and 1946 at the University of Pennsylvania by Dr. John Mauchly and J. Presper Eckert. The

ENIAC occupied the entire basement of the University's School of Electrical Engineering, weighed almost 30 tons, had more than 18,000 vacuum tubes, and needed more than 1,500 square feet of floor space. History shows that many early creative minds made their mark on the development of today's electrical computer. In 1948, there was invention of transistor to replace vacuum tubes by a single small device.

During the early days of computers, machine instructions were programmed on interchangeable control panels, cards or paper tapes. As work progressed, detailed instructions were wired or read into the machine. As the computer processed data according to predetermined instructions, the operations of the ENIAC were very inflexible. In order to increase the computer's ability to process data without the assistance of an operator, it was important to have its program (i.e. instructions) stored in a high-speed internal storage unit. This was such an internal storage system the computer would be able to process a program in the same way that it processed data and would also be able to modify its own instructions as necessary during processing.

3.2 Electronic Computers

ENIAC was the beginning of the age of computers. Over the next two decades, a number of developments ensued. The first of these developments was the transistor, which was developed in 1947. It made modern computers practical because of its dependability, small size and low power requirements. Transistors replaced vacuum tubes as the building blocks of computers, and the computer age was underway. Since 1947, several major advances in semiconductor technology have produced smaller and smaller components that do more and more. The most important of these advances is the development of the ***integrated circuit*** or IC. By 1958, transistors had revolutionized the electronics industry. However, during manufacture each component in a transistorized electronic circuit had to be connected to other components. In large computer, this meant millions of connections.

Large scale integrated (LSI) circuits followed soon after ICs with hundreds and then thousands of components packed into a single ***chip.*** Chip contains many transistors, resistor, and

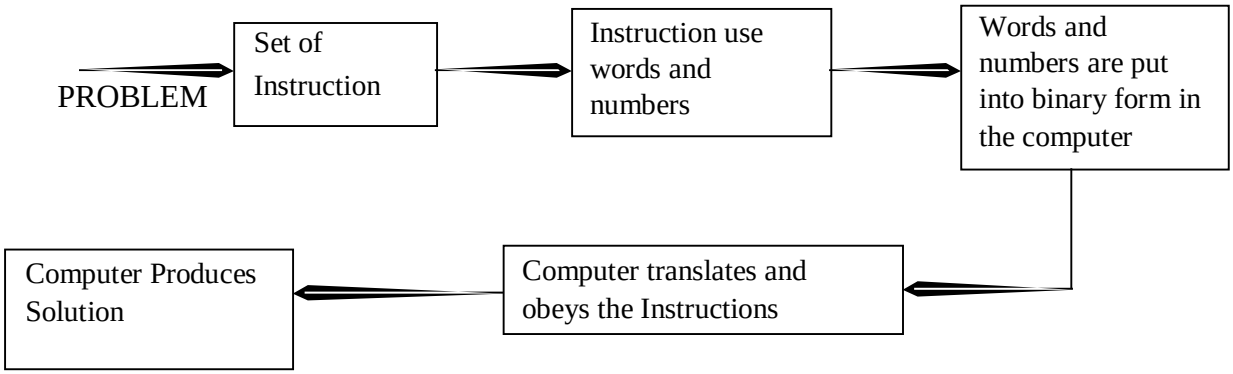
capacitors in a circuit enclosed in a single small case. The large scale integrated, followed by very large scale integrated (VLSI) and ultra large scale integration, enabled designers to put the equivalent of large room and then buildings full of 1950s-era vacuum tube circuits on a tiny sliver of silicon smaller than the smallest coin.

Another computer revolution occurred in 1971 when Intel Corporation produced the **microprocessor** IC. These computers on a chip are what made personal computers possible. In 1974, the first microcomputer kit was advertised. In 1977 and 1978, several companies, including Tandy/Radio Shack and Apple Computer Company, began selling assembled computers. These personal computers (PC) were designed so that the buyer could unpack the system, plug it in, and begin using it. Tandy/Radio Shack and Apple Computer still manufacture popular computers that are widely used in business and education.

Electronic computers are possible because of these two important points:

i. Information such as words and numbers can be put in a binary form. Each number and letter is represented by a series of Is and Os.

ii. Electronic devices have been invented to enable words and numbers to be represented in binary form. Each number and letter is represented by series of ONs and OFFs of a current. Computers are used to solve problems. Problems are solved by giving the computer a set of simple instructions. Here is a picture of what happens.



The VALVE provides a method of switching a current on and off. A set of ONs and OFFs can be used to represent the binary form of a number. The invention of value allowed the first electronic computers to be built. However values are quite large. Because these early computers had many values, they were very large. Values were also unreliable and so they had to be replaced very often.

These features were built into the stored program digital computers that marked the next great milestone in the evolution of electronic computers. The first to be completed was the EDSAC, Electronic Delayed Storage Automatic Computer, built by Cambridge University in England and came into operation in 1949. The EDSAC employed mercury acoustic delay lines for storage. These devices comprise thin tubes of mercury with crystals at both ends. An electrical impulse entered on the input crystal, causes the crystal to vibrate mechanically, thereby sending as acoustic signal through the fluid to the output crystal. When this sound wave hits, it produces a mechanical vibration in the second crystal. This vibration becomes an electrical signal (the image of the one originally transmitted). The reformed and amplified

electrical impulse is fed back to the input crystal with the process repeated. By the process of this loop, data represented by a set of impulses may be kept circulating through the mercury until it is needed.

The EDVAC, Electronic Discrete Variable Automatic Computer, designed for the US army by the University of Pennsylvania, was completed in the early 50s and was comparable to the EDSAC since it also utilized the sonic delay properties of mercury for storage. Another well-designed machine was the ACE (Automatic Calculating Engine) completed at the National Physical Laboratory, London in 1950. Compact and reliable in operation, the ACE used standard punched card equipment for input and output. Unlike the EDVAC and EDSAC which operated in such a way that instructions are placed in consecutive positions in storage, the ACE adopted the two- address system in which each instruction contains not only the location of the number to be operated upon (operand) but also the location of the next instruction. This procedure minimized the waiting time inherent in delay line storage device by allowing the use of better programming techniques. Among other machines developed on the principle of acoustic delay line storage was the UNIVAC (Universal Automatic Computer), designed by Eckert and Mauchly, builders of the ENIAC. The first UNIVAC computer was delivered to the census Bureau in 1951, and was used almost continuously 24 hours a day, 7 days a week for over 12 years.

UNIVAC was among the first computers to use magnetic tape as an input-output medium. It was well-known for its speed, reliability, memory capacity, and the ability to handle numeric and descriptive information equally well. Since these features make computers economically attractive, the first UNIVAC was delivered to a business enterprise in 1954.

The mid 50s marked a period of transition in the history of computers. Many of the computers developed were built specially for business use. Although they processed data in much the same way as previous computers, the new business systems

were designed to handle the vast quantities of data typical of business operations. Instead of the punched cards or punched tape used for input of data in earlier computers, magnetic tape was used for external data storage. The new method increased input speed from 50 to 75 times that of punched cards and also improved output and storage. For internal storage, magnetic cores came to be used and were destined to become the predominant form of internal storage. Magnetic cores are small rings of ferromagnetic material, which when strung on a complex of wires constitute a high-speed internal storage system in which items of information can be located and made available for processing few millionths of a second.

SELF ASSESSMENT EXERCISES 1

1. What is ENIAC?
2. What factors made electronic computer possible?

4.0 CONCLUSION

The evolution of electronic machine, started as one of the earliest ancestors of electronic computers. The music box which forms the basis for the development of modern computers is created by slowly rotating drum with small metal pins protruding from it. The Binary System are also used to build larger numbers from the two digits of 1 and 0. There are other devices apart from the earliest ancestors computers (music box) developed in the seventeenth, eighteenth and nineteenth centuries. ENIAC was the beginning of the age of computers. Over the next two decades, a number of developments helped bring us from boxcar-sized computers like ENIAC to computers the size of a book. The first of these developments was the transistor, which was developed in 1947. Large scale integrated (LSI) circuits followed soon after ICs with hundreds and then thousands of components packed into a single ***chip.*** The EDVAC, Electronic Discrete Variable Automatic Computer, designed for the US army by the University of Pennsylvania, was completed in the early 50s and was comparable to the EDSAC since it also utilized the sonic delay properties of mercury for storage. The mid 50s marked a period of transition in the history of computers. For internal storage, magnetic cores came to be used and were destined to become the predominant form of internal storage.

5.0 SUMMARY

This unit has revealed the evolution of electronic machine called the music box. This machine has led to the development of modern computers over the years. The Binary System are also used to build larger numbers from the two digits of 1 and 0. The first of these developments was the transistor, which was developed in 1947. A number of developments helped bring us from boxcar-sized computers like ENIAC to computers the size of a book. The EDVAC, Electronic Discrete Variable Automatic Computer, designed for the US army by the University of Pennsylvania, was completed in the early 50s and was comparable to the EDSAC since it also utilized the sonic delay properties of mercury for storage. However, the computers are classified according to either time of invention or size of memory, the detail of these classifications will be discussed in the next Unit.

6.0 TUTOR-MARKED ASSIGNMENT

(1) Explain the operation of the music box?

(2) Mention and explain the trends that led to the evolution of modern computers?

7.0 REFERENCES/FURTHER READINGS

Eke, A. (2006). *Welcome to Computer Science*. Los Angeles: Acena Publishers

Eyitayo, A. O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studies for Beginners 1*, Ibadan: Bounty Press Limited

Olayanju T.A (2008). Introduction to Information Technology and Computer Applications. Printed by DABAN Printers. ISBN:978-8047-62-0

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Usman, K. O. (2002). *Computer Competencies Required of Mathematics Teachers for the use of Computers in Instructions.* Unpublished thesis of University of Nigeria, Nsukka.

Talabi A.A (2011). Basic computer Studies: A Beginner's Text (3rd Edition). Published by Data Link Associates Limited. ISBN: 978-057-487-5

Turner, S., & Land, M. (2007). *Tools for Schools: Applications software for classroom,* Belmont, CA: Wadsworth

UNIT 3 COMPUTER GENERATIONS

CONTENTS

1.0 INTRODUCTION

From the previous units, the developmental stages of computers were discussed. During the discussion, it was discovered that the invention of computers spanned across a long period of time. Besides, the earlier computers were so big and latest are of reasonable sizes. The history of the computer goes back several decades however and there are five definable generations of computers. Each generation is defined by a significant technological development that changes fundamentally how computers operate – leading to more compact, less expensive, but more powerful, efficient and robust machines.

2.0 LEARNING OUTCOMES

At the end of this unit, you will be able to

1. List the generation of computers
2. Identify the peculiarity of each generation of computers

3.0 MAIN CONTENT

Generation in computer terminology is a change in technology a computer is/was using. Initially,

the generation term was used to distinguish between varying hardware technologies. But nowadays, generation includes both hardware and software, which together make up an entire computer system.There are totally five computer generations known till date. Each generation has been discussed in detail along with their time period, characteristics.

3.1 First Generation of Computer (1942-1954)

The first generation computer systems used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. These computers were very expensive to operate and in addition to using a great deal of electricity, the first generation computers generated a lot of heat, which was often the cause of malfunctions.

First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time. It would take operators days or even weeks to set-up a new problem. Input was based on punched cards and paper tape, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

The main features of First Generation are:

- Vacuum tube technology
- Unreliable
- Supported Machine language only
- Very costly
- Generate lot of heat
- Slow Input/Output device
- Huge size
- Need of A.C.
- Non portable
- Consumed lot of electricity

Some computers of this generation were:

- ENIAC
- EDVAC
- UNIVAC
- IBM-701
- IBM-650

Advantages:

1. It made use of vacuum tubes, which are the only electronic component available during those days.
2. These computers could calculate in milliseconds.

Disadvantages:

1. These were very big in size, weight was about 30 tones.
2. These computers were based on vacuum tubes.
3. These computers were very costly.
4. It could store only a small amount of information due to the presence of magnetic drums.
5. As the invention of first generation computers involves vacuum tubes, so another disadvantage of these computers was, vacuum tubes require a large cooling system.
6. Very less work efficiency.
7. Limited programming capabilities and punch cards were used to take inputs.
8. Large amount of energy consumption.
9. Not reliable and constant maintenance is required.

SELF ASSESSMENT EXERCISES 1

(1) What are the features of the first generation?

3.2 Second Generation of Computers (1952-1964)

In the second generation of computers. The transistor was invented at Bell Labs in 1947 but did not see widespread use in computers until the late 1950s. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The first computers of this generation were developed for the atomic energy industry.

The main features of Second Generation are:

- Use of transistors
- Reliable as compared to First generation computers
- Smaller size as compared to First generation computers
- Generate less heat as compared to First generation computers
- Consumed less electricity as compared to First generation computers
- Faster than first generation computers
- Still very costly
- A.C. needed
- Support machine and assembly languages.

Some computers of this generation were:

- IBM 1620
- IBM 7094
- CDC 1604
- CDC 3600
- UNIVAC 1108

Advantages:

1. Due to the presence of transistors instead of vacuum tubes, the size of electron component decreased. This resulted in reducing the size of a computer as compared to first generation computers.
2. Less energy and not produce as much heat as the first generation.

3. Assembly language and punch cards were used for input.
4. Low cost than first generation computers.
5. Better speed, calculate data in microseconds.
6. Better portability as compared to first generation

Disadvantages:

1. A cooling system was required.
2. Constant maintenance was required.
3. Only used for specific purposes

SELF ASSESSMENT EXERCISES 2

1. State the features of the second generation of computers
2. What are the advantages of the second generation of computers

3.3 Third Generation of Computer

The development of the integrated circuit was the hallmark of the third generation computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory.

Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors were.

The main features of Third Generation are:

- IC used
- More reliable
- Smaller size
- Generate less heat
- Faster
- Lesser maintenance
- Still costly
- A.C needed
- Consumed lesser electricity
- Support high level language

Some computers of this generation were:

- IBM-360 series
- Honeywell-6000 series
- PDP(Personal Data Processor)
- IBM-370/168
- TDC-316

Advantages

a. These computers were cheaper as compared to second-generation computers.

b. They were fast and reliable.

c. Use of IC in the computer provides the small size of the computer.

d. IC not only reduce the size of the computer but it also improves the performance of the computer as compared to previous computers.

e. This generation of computers has big storage capacity.

f. Instead of punch cards, mouse and keyboard are used for input.

g. They used an operating system for better resource management and used the concept of time-sharing and multiple programming.

h. These computers reduce the computational time from microseconds to nanoseconds.

Disadvantages:

i. IC chips are difficult to maintain.

ii. The highly sophisticated technology required for the manufacturing of IC chips.

iii. Air conditioning is required.

SELF ASSESSMENT EXERCISES 3

1. List examples of third generation of computers.
2. List Five advantages of third generation of computers

3.4 Fourth Generation

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What was very big in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the central processing unit and memory to input/output controls—on a single chip. In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.

As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

The main features of Fourth Generation are:

- VLSI technology used
- Very cheap
- Portable and reliable
- Use of PC's
- Very small size
- Pipeline processing
- No A.C. needed
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available Some computers of this generation were:

- DEC 10
- STAR 1000
- PDP 11
- CRAY-1(Super Computer)
- CRAY-X-MP(Super Computer)

Advantages:

1. Fastest in computation and size get reduced as compared to the previous generation of computer.
2. Heat generated is negligible.
3. Small in size as compared to previous generation computers.
4. Less maintenance is required.
5. All types of high-level language can be used in this type of computers.

- ***Disadvantages:***

1. The Microprocessor design and fabrication are very complex.
2. Air conditioning is required in many cases due to the presence of ICs.
3. Advance technology is required to make the ICs.

SELF ASSESSMENT EXAMINATIONS 4

1. What are the features of fourth generation computers?

3.5 Fifth Generation of Computer (1990-onwards)

The period of Fifth Generation is 1990-till date. Fifth generation computing devices are based on artificial intelligence and still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization. All the Higher level languages like C and C++, Java, .Net etc. are

used in this generation. AI includes:

- Robotics
- Neural networks
- Game Playing
- Development of expert systems to make decisions in real life situations. Natural language understanding and generation.

The main features of Fifth Generation are:

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing
- Advancement in Superconductor technology
- More user friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates.

Some computer types of this generation are:

- Desktop
- Laptop
- NoteBook
- UltraBook

Advantages:

1. It is more reliable and works faster.
2. It is available in different sizes and unique features.
3. It provides computers with more user-friendly interfaces with multimedia features.

Disadvantages:

1. *They need very low-level languages.*
2. They may make the human brains dull and doomed.

SELF-ASSESSMENT EXAMINATION 5

1. What are the features of the fifth generation of computers
2. List examples of computers in this generation

4.0 CONCLUSION

The history of computing generally deals with the generations of computers. Therefore, this unit exposed you to the fact that the generation of computers started after the Second World War from 1939 to 1945 where some of the first electronic computers were built. You have also learnt that an integrated circuit (IC) is a small electronic device made out of a semiconductor material. The first integrated circuit was developed in the 1950s by Jack Kilby of Texas Instruments and Robert Noyce of Fairchild Semiconductor. The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. They were very expensive to operate in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions. Transistors replaced vacuum tubes and ushered in the second generation of computers. Second- generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN.

The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the central processing unit and memory to input/output controls— on a single chip. Fifth generation computing devices, based on artificial intelligence, are still in development, though there are

some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is also helping to make artificial intelligence a reality.

5.0 SUMMARY

The generations of computers are divided into first and second, third and fourth, fifth and future computers generations. First generation computers were the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology. The first computers of this generation were developed for the atomic energy industry. However, second generation computers were not just more than the earlier computers, they could also carry more difficult calculations. The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. More so, the microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization. Besides, the use of parallel processing and superconductors is helping to make artificial intelligence a reality.

6.0 TUTOR-MARKED ASSIGNMENT

1. What are the features of first, second, third, fourth and fifth generation computers?
2. Name one item used in the building of each generation of computers which distinguishes the computer of one generation from the other.

7.0 REFERENCE/FURTHER READINGS

Ajayi, I.A.,and Ekundayo I. O., & Haastrup, T. (2009). The application of information and communication technology in Nigerian secondary schools Retrieved 25th September 2010 from http://www.academicjournals.org/INGOJ ISSN 1993–8225

Maduakolam, I., & Bell, E. (2003). A product-based faculty professional development model for infusing technology into teacher education. *Contemporary Issues in Technology and Teacher Education*, *3*(3), 340-352

Olayanju T.A (2008). Introduction to Information Technology and Computer Applications. Printed by DABAN Printers. ISBN:978-8047-62-0

Owolabi, K. & Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Talabi A.A (2011). Basic computer Studies: A Beginner's Text (3rd Edition). Published by Data Link Associates Limited. ISBN: 978-057-487-5

MODULE 2 COMPUTER AND COMPUTER SYSTEM

UNIT 1 COMPUTER COMPONENTS

1.0 INTRODUCTION

In this Unit, you will be exposed to the components of computers and how they function. A computer is any machine or device which, under the control of a stored program, can accept data in a prescribed form, process the data, and supply the results as information in a specified form. The components include- Input, Central Processing Unit (CPU) and Output. Input devices transmit information to the CPU and Output devices display information that has been held or generated within a computer. Similarly, computers are classified into digital,

analogue and hybrid computers. Digital computers operate by being given a series of steps of instructions. The analogue computers operate by accepting data as a quantity varying over a length of time. However, hybrid computers combine some of the properties of both digital and analogue; they operate in a programmed form and combine the properties of analogue and digital. Therefore, this Unit presents you with details and examples of each of the components and devices.

2.0 LEARNING OUTCOMES

At the end of this Unit, you should be able to:

1. List various components of computer and their functions
2. Identify types of computers and their futures.

3.0 MAIN CONTENTS

3.1 Features and Functions of Computer

Computer: Definition

A computer is a machine that can be programmed to manipulate symbols. Its principal characteristics are:

- It responds to a specific set of instructions in a well-defined manner.
- It can execute a prerecorded list of instructions (a program).
- It can quickly store and retrieve large amounts of data.

Therefore computers can perform complex and repetitive procedures quickly, precisely and reliably. Modern computers are electronic and digital. The actual machinery (wires, transistors, and circuits) is called hardware; the instructions and data are called software. All general-purpose computers require the following hardware components:

- Central processing unit (CPU): The heart of the computer, this is the component that actually executes instructions organized in programs ("software") which tell the

computer what to do.

- Memory (fast, expensive, short-term memory): Enables a computer to store, at least temporarily, data, programs, and intermediate results.
- Mass storage device (slower, cheaper, long-term memory): Allows a computer to permanently retain large amounts of data and programs between jobs. Common mass storage devices include disk drives and tape drives.
- Input device: Usually a keyboard and mouse, the input device is the conduit through which data and instructions enter a computer.
- Output device: A display screen, printer, or other device that lets you see what the computer has accomplished.

In addition to these components, many others make it possible for the basic components to work together efficiently. For example, every computer requires a bus that transmits data from one part of the computer to another.

II Computer Sizes and Power

Computers can be generally classified by size and power as follows, though there is considerable overlap:

- Personal computer: A small, single-user computer based on a microprocessor.
- Workstation: A powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and, in general, a higher-quality monitor.
- Minicomputer: A multi-user computer capable of supporting up to hundreds of users simultaneously.
- Mainframe: A powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously.
- Supercomputer: An extremely fast computer that can perform hundreds of millions of instructions per second.

Supercomputer and Mainframe

Supercomputer is a broad term for one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations (number crunching). For example, weather forecasting requires a supercomputer. Other uses of supercomputers scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting). Perhaps the best-known supercomputer manufacturer is Cray Research.

Mainframe was a term originally referring to the cabinet containing the central processor unit or "main frame" of a room-filling Stone Age batch machine. After the emergence of smaller "minicomputer" designs in the early 1970s, the traditional big iron machines were described as "mainframe computers" and eventually just as mainframes. Nowadays a Mainframe is a very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously. The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently. In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe. The distinction between small mainframes and minicomputers is vague, depending really on how the manufacturer wants to market its machines.

Minicomputer

It is a midsize computer. In the past decade, the distinction between large minicomputers and small mainframes has blurred, however, as has the distinction between small minicomputers and workstations. But in general, a minicomputer is a multiprocessing system capable of supporting from up to 200 users simultaneously.

Workstation

It is a type of computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other types of applications that require a moderate amount of computing

power and relatively high quality graphics capabilities. Workstations generally come with a large, high-resolution graphics screen, at large amount of RAM, built-in network support, and a graphical user interface. Most workstations also have a mass storage device such as a disk drive, but a special type of workstation, called a diskless workstation, comes without a disk drive. The most common operating systems for workstations are UNIX and Windows NT. Like personal computers, most workstations are single-user computers. However, workstations are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

> N.B.: In networking, workstation refers to any computer connected to a local-area network. It could be a workstation or a personal computer.

Personal computer:

It can be defined as a small, relatively inexpensive computer, designed for an individual user. In price, personal computers range anywhere from a few hundred pounds to over five thousand pounds. All are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is for playing games and recently for surfing the Internet.

Personal computers first appeared in the late 1970s. One of the first and most popular personal computers was the Apple II, introduced in 1977 by Apple Computer. During the late 1970s and early 1980s, new models and competing operating systems seemed to appear daily. Then, in 1981, IBM entered the fray with its first personal computer, known as the IBM PC. The IBM PC quickly became the personal computer of choice, and most other personal computer manufacturers fell by the wayside. P.C. is short for personal computer or IBM PC. One of the few companies to survive IBM's onslaught was Apple Computer, which remains a major player in the personal computer marketplace. Other companies adjusted to IBM's dominance by building IBM clones, computers that were internally almost the same as the IBM PC, but that cost less. Because IBM clones used the same microprocessors as IBM PCs, they were capable of running the same software. Over the years, IBM has lost much of its influence in directing the evolution of PCs. Therefore after the release of the first PC by IBM the term PC increasingly came to mean IBM or IBM-compatible personal computers, to the exclusion of other types of personal computers, such as Macintoshes. In recent

years, the term PC has become more and more difficult to pin down. In general, though, it applies to any personal computer based on an Intel microprocessor, or on an Intel-compatible microprocessor. For nearly every other component, including the operating system, there are several options, all of which fall under the rubric of PC

Today, the world of personal computers is basically divided between Apple Macintoshes and PCs. The principal characteristics of personal computers are that they are single-user systems and are based on microprocessors. However, although personal computers are designed as single-user systems, it is common to link them together to form a network. In terms of power, there is great variety. At the high end, the distinction between personal computers and workstations has faded. High-end models of the Macintosh and PC offer the same computing power and graphics capability as low-end workstations by Sun Microsystems, Hewlett-Packard, and DEC.

III Personal Computer Types

Actual personal computers can be generally classified by size and chassis / case. The chassis or case is the metal frame that serves as the structural support for electronic components. Every computer system requires at least one chassis to house the circuit boards and wiring. The chassis also contains slots for expansion boards. If you want to insert more boards than there are slots, you will need an expansion chassis, which provides additional slots. There are two basic flavors of chassis designs–desktop models and tower models–but there are many variations on these two basic types. Then come the portable computers that are computers small enough to carry. Portable computers include notebook and subnotebook computers, hand-held computers, palmtops, and PDAs.

Tower model

The term refers to a computer in which the power supply, motherboard, and mass storage devices are stacked on top of each other in a cabinet. This is in contrast to desktop models, in which these components are housed in a more compact box. The main advantage of tower models is that there are fewer space constraints, which makes installation of additional storage devices easier.

Desktop model

A computer designed to fit comfortably on top of a desk, typically with the monitor sitting on top of

the computer. Desktop model computers are broad and low, whereas tower model computers are narrow and tall. Because of their shape, desktop model computers are generally limited to three internal mass storage devices. Desktop models designed to be very small are sometimes referred to as **slimline models**.

Notebook computer

An extremely lightweight personal computer. Notebook computers typically weigh less than 6 pounds and are small enough to fit easily in a briefcase. Aside from size, the principal difference between a notebook computer and a personal computer is the display screen. Notebook computers use a variety of techniques, known as flat-panel technologies, to produce a lightweight and non-bulky display screen. The quality of notebook display screens varies considerably. In terms of computing power, modern notebook computers are nearly equivalent to personal computers. They have the same CPUs, memory capacity, and disk drives. However, all this power in a small package is expensive. Notebook computers cost about twice as much as equivalent regular-sized computers. Notebook computers come with battery packs that enable you to run them without plugging them in. However, the batteries need to be recharged every few hours.

Laptop computer

A small, portable computer, small enough that it can sit on your lap. Nowadays, laptop computers are more frequently called notebook computers.

Subnotebook computer

A portable computer that is slightly lighter and smaller than a full-sized notebook computer. Typically, subnotebook computers have a smaller keyboard and screen, but are otherwise equivalent to notebook computers.

Hand-held computer

A portable computer that is small enough to be held in one‘s hand. Although extremely convenient to carry, handheld computers have not replaced notebook computers because of their small keyboards and screens. The most popular hand-held computers are those that are specifically designed to provide PIM (personal information manager) functions, such as a calendar and address

book. Some manufacturers are trying to solve the small keyboard problem by replacing the keyboard with an electronic pen. However, these pen-based devices rely on handwriting recognition technologies, which are still in their infancy. Hand-held computers are also called PDAs, palmtops and pocket computers.

Palmtop

A small computer that literally fits in your palm. Compared to full-size computers, palmtops are severely limited, but they are practical for certain functions such as phone books and calendars. Palmtops that use a pen rather than a keyboard for input are often called hand-held computers or PDAs. Because of their small size, most palmtop computers do not include disk drives. However, many contain PCMCIA slots in which you can insert disk drives, modems, memory, and other devices. Palmtops are also called PDAs, hand-held computers and pocket computers.

PDA

Short for personal digital assistant, a handheld device that combines computing, telephone/fax, and networking features. A typical PDA can function as a cellular phone, fax sender, and personal organizer. Unlike portable computers, most PDAs are pen-based, using a stylus rather than a keyboard for input. This means that they also incorporate handwriting recognition features. Some PDAs can also react to voice input by using voice recognition technologies. The field of PDA was pioneered by Apple Computer, which introduced the Newton MessagePad in 1993. Shortly thereafter, several other manufacturers offered similar products. To date, PDAs have had only modest success in the marketplace, due to their high price tags and limited applications. However, many experts believe that PDAs will eventually become common gadgets.

PDAs are also called palmtops, hand-held computers and pocket computers. A computer is divided into three basic units namely:

1. Input Unit
2. Central Processing Unit
3. Output Unit

These units are defined below:

1) Input Unit

As the name suggests, this unit contains devices with the help of which the data is entered into the computer. This unit is a basic requirement for computer system. The input devices are of many types such as keyboard, mouse, joy stick, microphone, camera etc. Input devices give different set of input values converted into a form understandable to the computer.

2) Central Processing Unit (CPU)

Central Processing Unit (CPU) is known as the brain of the computer. It performs all types of data processing operations as required by a programmer. It stores all the data, intermediate results, and instructions as given by the programmer in the form of codes (program). Central Processing unit controls the operation of each part of the computer.

It has following three components:

1. Arithmetic Logic Unit (ALU)
2. Memory Unit
3. Control Unit

3) Output Unit

The devices with the help of which we get the information from the computer are known as the output devices. Output Unit is an interface between the computer and the user. Output devices notify the information displayed into a form, which is understandable, by the computer user.

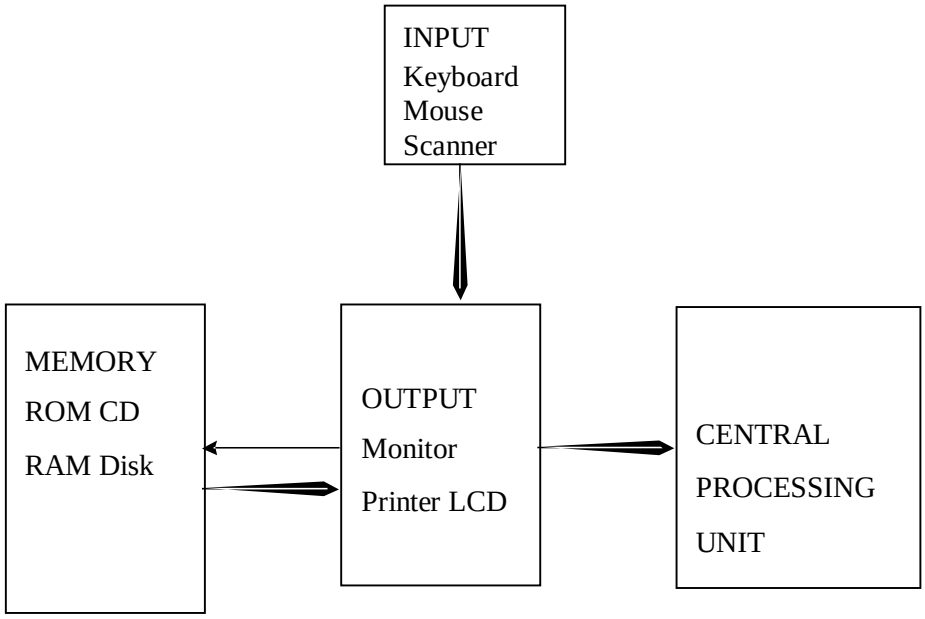


Fig. 2.1.1 Basic Component of Computer

The CPU is the brain of the computer. –It performs the commands you specify, carries out calculations, makes logical decisions, and so forth. The programs that tell the CPU what to do are the software. Read-only memory (ROM) consists of the control instructions that he been –wired permanently into the computer‘s memory (RAM) is the flexible part of the memory. The programs and data being manipulated by the user are temporarily stored in RAM, then erased to make way for the next program or stored on floppy disks, compact disks, or in the computer‘s hard drive for future access.

Input devices transmit information to the CPU. The most common input device is a keyboard. Other input devices include the mouse, joysticks, track balls, scanners, and graphic tablets. Output devices allow the computer to send information to you. Common output devices induce a video monitor, and LCD panel, and a printer.

Computer systems have two main components: hardware and software. The physical parts of the computer, such as the tower, monitor and keyboard, are the hardware. The software consists of the code that controls the hardware and tells it what to do. Computers are general-purpose information machines that can perform a variety of tasks on data. These tasks are all related to the four basic computer operations: input, output, processing and storage.

Input and Output Functions of a Computer

The input computer function accepts data from input devices and sends it to the computer processor, while the output function communicates the results of processing. A class of hardware devices known as peripherals are used to perform these functions. Common input peripherals include the keyboard, mouse, stylus and touchscreen. Digital cameras, microphones, scanners and joysticks can also be used to input information into a computer. Output peripherals include monitors, speakers and 2D and 3D printers.

Data Processing Computer Function

Data processing is the most basic function of a computer. This function is performed by the central processing unit (CPU), which consists of electronic circuits that can read and execute code

instructions to perform a wide range of tasks, from performing complex mathematical calculations to sorting the entries in a database. The CPU can be seen as the brain of the computer, accepting input data and instructions, executing commands, storing results in memory and sending data to output devices. It controls the sequence of operations and the use of data storage. In addition to the CPU, some of the processing function of a computer may be performed by an arithmetic logic unit (ALU), which performs arithmetic and binary logic operations, or a graphics processing unit (GPU) that's responsible for creating graphical output that displays data in visual form. Gaming computers are heavily dependent on GPUs to generate complex dynamic graphics.

Data Storage Computer Function

One of the most useful functions of a computer is data storage. Besides storing data that has been input through peripherals, computers also need a way to save the results of data processing. All this is accomplished through peripheral storage devices, which may be internal or external. Internal storage includes RAM (random access memory), which is used during processing and temporary in nature. Information stored in RAM memory is not retained if the computer is turned off. Persistent, long-lasting data storage is provided by external devices like CDs, DVDs, hard drives and flash drives.

The computer has some distinguishing characteristics that make it different from the tools mentioned above. Such characteristics include:

- speed
- capacity
- versatility
- programmability

Speed: Ability to process at very fast rate and accurately. The computer is faster than all the machines listed above.

Capacity: Ability to store and process large amounts of data than all the other machines listed above.

Versatility: It can be used for many things. The same computer can be used for all the things the other information processing tools can be used for, such as addition, subtraction, multiplication, division, etc. It can also be used for many other things

they cannot do, such as we have seen earlier in the processing of examination results and the keeping of students records.

Programmability: Ability to be instructed.

SELF ASSESSMENT EXERCISES 1

1. What hardware components is the computer made of?.

3.2 Types and Classification of Computers

There are three main types of computers-they are:

- digital computes
- analogue computers and
- hybrid computers

This classification is based on the way they operate.

Digital Computers: The word, –digital‖, as used here, means whole numbers (discrete); for example the channel selector on the television set is a digital device because it restricts your to a discrete set of channels; you cannot, for example, select channel 3.141. Another example is the digital wristwatch, which shows you the exact time in digits. Digital computers are the most common computers. They operate by being given a series of steps of instructions. Some examples of digital computers are IBM 360/370; PDP 11/34, the various IBM PC compatible and Apple microcomputers often seen in offices and schools.

Analogue Computers: In contrast to digital devices, analogue devices have continuous values.

For example, the volume control on your television set is an analogue device, because it allows you to adjust the volume continuously in one smooth continuous action. Other examples of analogue devices are thermometers, speedometers, and petrol dispensers at the petrol station. You will see that they operate in a very similar way, i.e. in one smooth continuous form. Analogue computers operate by accepting data as a quantity varying over a length of time. They are mostly used in industrial operations.

Hybrid Computers: These combine some of the properties of both digital and analogue. For example, setting (programming) on a modern day television set invokes both digital and

analogue. You first select the channel (digital), you then tune the channel until it receives the station you want clearly (analogue); you then store the station on that channel (digital). This is an example of a hybrid device; it involves different processes that combine both the properties of analogue and digital. Hybrid computers are not too common; they operate in a programmed form and combine the properties of analogue and digital. An example is a robot used in an industrial environment. First, it allows the process to get to a particular temperature (analogue); it then does some other processes, which could be digital and/or analogue.

Similarly there are factors that determine the classification of computers. The following factors are used in classifying computers: size of its internal memory, processing capability, price range and speed of operation. It must however be noted that it is becoming increasingly difficult to distinguish among the classes of computers.

These factors can be used in a general form to classify computers into:

- Supercomputers
- Mainframes
- Minicomputers, and
- Microcomputers

Supercomputers: These are the largest, fastest and most expensive computers. The cost is several millions of dollars, and the speed is between 600 million to 900 million instructions per second (MIPS). Scientists in weather forecasting, oil exploration, etc. use these for complex calculations. Examples of supercomputers are CRAYX-MP which cost about N800, 000, 000.00 million each and CRAY2.

Mainframes: A mainframe computer is a large computer in terms of price, size of internal memory and speed. Mainframe manufacturers tend to make a –family‖ or a range of computers, rather than a single computer-in much the same way as a care

manufacturer produces a range of different cars. A mainframe costs from N300, 000, 000. 00 to several millions of Naira. It also has a variety of peripheral devices such as printers, plotters, terminals, etc more than are found with small computers, and a large amount of external storage. Mainframe computers usually need a specialized environment in which to operate: with dust, temperature and humidity carefully controlled.

The size of the internal memory is usually more than 2.56 megabytes of storage. They are used mostly in large establishments (e.g. universities, banks, commercial houses, etc). They are usually sophisticated and large; thus they call for great detail of support from their manufacturers or representatives.

Examples of mainframes are IBM 360/370 systems, NGR V-8800 system. Figure 3.3 shows a mainframe computer.

Minicomputers: Minicomputers were developed in the 1970s for specialized tasks (i.e. they are special purpose computers). They are smaller and less powerful and less expensive than mainframes. Minis, as they are often called, are easier to install and operate and they require less floor space. Minicomputers do not require specialized environment to operate in, but care must always be taken to ward off dust from the equipment. They cost between N225, 000, 00.000 and N600, 000, 000. 00. Internal storage capacity of a minicomputer is usually between 128 megabytes and 256 megabytes. Examples include PDP 11, VAX 750/6000, NCR 9300, DEC, HEWLETT PACKARD 3000, IBM system 38 and MV400 (Data General).

Microcomputers: A microcomputer is a computer whose central processing unit (CPU) is based on a microprocessor. Miscomputes are at present the most popular of computers. They are complex as minis or mainframes. They are easy to use. They can be linked with mainframes and minis, and their capabilities are gradually approaching those of minicomputers. Most not as

microcomputers today generally have between 16 and 128 megabytes. The price ranges from about 600, 000, 000. 000 to over N750, 000, 000. 00. Examples include IBMPC and its compatible, Apple Macintosh, etc. They are often called PCs.

SELF ASSESSMENT EXERCISES 2

1. Give three examples of analogue devices
2. Give three examples of digital devices

4.0 CONCLUSION

In this Unit you ought to have learnt that a computer is any machine or device which, under the control of a stored program, can accept data in a prescribed form, process the data, and supply the results as information in a specified form. The machine parts are referred to as computer hardware. These parts include input device, CPU and output devices.

Computers are classified into digital, analogue computers, and hybrid computers. Digital computers operate by being given a series of steps of instructions. The analogue computers operate by accepting data as a quantity varying over a length of time. However, hybrid computers combine some of the properties of both digital and analogue; they operate in a programmed form and combine the properties of analogue and digital. Similarly there are factors that determine the classification of computers. The following factors are used in classifying computers: size of its internal memory, processing capability, price range and speed of operation. Some examples of digital computers are IBM 360/370; PDP 11/34, the various IBM PC compatible and Apple microcomputers. Examples of analogue devices are thermometers, speedometers, and petrol dispensers at the petrol station. An example is a robot used in an industrial environment. First, it allows the process to get to a particular temperature (analogue); it then does some other processes,

which could be digital and/or analogue.

5.0 SUMMARY

The computer components which are also referred to as computer hardware is made up of three major parts- input, CPU and output. While the input devices enable the users to send information into computer for processing in the CPU, the output made available the processed information. The computers are classified into three, namely; digital, analogue, and hybrid. Similarly, Computers are rated according to size of its internal memory, processing capability, price range and speed of operation. These factors can be used in a general form to classify computers into- Supercomputers, Mainframes, Minicomputers, and Microcomputers. For better understanding of these parts of computer, their features and functions, the next Unit shed more light on the hardware of the computers.

6.0 TUTOR-MARKED ASSIGNMENT

1. List the three types of computers and explain the differences among them.
2. What are the factors used in the classification of computers?

7.0 REFERENCES/FURTHER READINGS

Ajayi, I. A., and Ekundayo, I. O., and Haastrup, T. (2009). The application of information and communication technology in Nigerian secondary schools Retrieved 25th September 2010 from http:// www.academicjournals.org/INGOJ ISSN 1993–8225 Eke, A. (2006). *Welcome to Computer Science*. Los Angeles: Acena Publishers

Eyitayo, A. O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studies for Beginners 1*, Ibadan: Bounty Press Limited

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Usman, K. O. (2002). *Computer Competencies Required of Mathematics Teachers for the use of Computers in Instructions.* Unpublished thesis of University of Nigeria, Nsukka

Turner, S., & Land, M. (2007) *Tools for Schools: Applications software for classroom,*

Belmont, CA: Wadsworth

UNIT 2 COMPUTER HARDWARE

1.0 INTRODUCTION

Hardware is the word used to describe the electro-mechanical components of a computer system. This is the computer equipment itself. It consists of all the bits and pieces of the computer. In this Unit, we will look at various parts and devices that comprise the computer hardware. The basic parts of a computer‘s hardware consist of the following- Input devices, system unit (Arithmetic and Logic Unit, Control Unit and Memory), Output device and Peripherals. The features and functions each of these devices will be discussed fully in this Unit.

2.0 LEARNING OUTCOMES

At end of this unit you will be able to:

1. Identify input and output devices.
2. Articulate the functions of storage devices.

3.0 MAIN CONTENTS

3.1 Input Devices

An **input device** is a piece of hardware used to provide data to a computer used for interaction and control. It allows input of raw data to the computer for processing. Here‘s a list of some input devices used in computers and other computing devices:

- **Keyboard** – one of the primary input devices used to input data and commands. It has function keys, control keys, arrow keys, keypad and the keyboard itself with the letters, numbers and commands. Keyboards are connected to the computer through USB or Bluetooth. A laptop keyboard is more compact than a desktop keyboard to make the laptop smaller and lighter. Smartphones and tablets use on-screen keyboard to input messages and select commands.
- **Mouse** – an input device used to control the cursor and coordinates. It can be wired or wireless. It allows the user to do the following:
  - Move the mouse cursor
  - Select
  - Scroll
  - Open or execute a program
  - Drag-and-drop
  - Hover
  - Perform other functions with the use of additional buttons
  - A laptop uses a touchpad as the mouse. A smartphone and tablet use a touchscreen as primary input device and the user‘s finger is used as the mouse.
- **Microphone** – an input device that allows users to input audio into their computers. Here are some uses of the microphone:
  - Audio for video
  - Computer gaming
  - Online chatting
  - Recording musical instruments
  - Recording voice for dictation, singing and podcasts
  - Voice recorder

- Voice recognition
- VoIP – Voice over Internet Protocol

- **Digital Camera** – is an input device that takes pictures digitally. Images are stored as data on memory cards. It has an LCD screen that allows users to preview and review images. Digital cameras have become popular over film cameras because of the following features:

- LCD screen – allows users to view the photos and videos immediately
- Storage – can store thousands of pictures
- Picture development – allows users to choose and pick which pictures to develop
- Size – takes up less space and can be easily carried

- **Scanner** – is an input device that reads an image and converts it into a digital file. A scanner is connected to a computer through USB. There are different types of scanners:

- Flatbed scanner – uses a flat surface to scan documents
- Sheetfed scanner – like a laser printer where paper is fed into the scanner
- Handheld scanner – the scanner is dragged over the page to be scanned
- Card scanner – for scanning business card

- **Touchscreen** – is an input device that allows users to interact with a computer using their fingers. It is used widely in laptop monitors, smartphones, tablets, cash registers and information kiosks. Most common functions of touchscreens are as follows:

- Tap
- Double-tap
- Touch and hold
- Drag
- Swipe
- Pinch

- **Barcode Reader** – also known as barcode scanner or point of sale (POS) scanner, is an input device capable of reading barcodes.
- **Webcam** – is an input device connected to the computer and the internet that captures still picture or motion video.
- **Biometric devices** – is an input device used to input biometric data into a computer. Here are the types of biometric devices:

  - Face scanner
  - Hand scanner
  - Finger scanner
  - Voice scanner

- **Stylus** – is a pen-shaped input device used to write or draw on the screen of a graphic tablet or device. Initially it was just used for graphic tablets and PDAs, but now, it has become popular on mobile devices as a replacement for the user‘s fingers. It‘s used for more accurate navigation and to keep oils from user‘s fingers off the device screen.

SELF ASSESSMENT EXERCISES 1

3. List and describe four common input devices

3.2 Output Devices

Computer output devices receive information from the computer, and carry data that has been processed by the computer to the user. Output devices provide data in different forms, some of which include audio, visual, and hard copy media. The devices are used for display, projection, or for physical reproduction. Monitors and printers are two of the most commonly- known output devices used with a computer.

Computer output devices are all peripheral hardware, and are connected to a computer by cables, or by wireless networking.

Reasons for Having an Output Device

A computer can still function without an output device. However, without an output device, there's no way to determine what the computer is doing. There is no indicator of errors, nor of the need for additional input. For example, if you detach your monitor from your computer, the computer will still function, but it's not going to be very helpful.

Examples of Output Devices

Monitor – This is the most common computer output device. It creates a visual display by the use of which users can view processed data. Monitors come in various sizes and resolutions.

Common Types of Monitors

- Cathode Ray Tube – this uses phosphorescent dots to generate the pixels that constitute displayed images.
- Flat Panel Screen – this makes use of liquid crystals or plasma to produce output. Light is passed through the liquid crystals in order to generate pixels.

  All monitors depend on a video card, which is positioned either on the computer motherboard or in a special expansion slot. The video card sorts out the computer data into image details that the monitors can then show.

Printer – this device generates a hard copy version of processed data, like documents and photographs. The computer transmits the image data to the printer, which then physically recreates the image, typically on paper.

Types of Printers

- Ink Jet – this kind of printer sprays tiny dots of ink onto a surface to form an image.
- Laser – this type utilises toner drums that roll through magnetized pigment, and then transfers the pigment onto a surface.
- Dot Matrix – dot matrix printers utilise a print head to set images on a surface, using an ink ribbon. These printers were commonly used between 1980 and

Speakers – SPEAKERS are attached to computers to facilitate the output of sound; sound cards are required in the computer for speakers to function. The different kinds of speakers range from simple, two-speaker output devices right the way up to surround-sound multi-channel units.

Headset – this is a combination of speakers and microphone. It is mostly used by gamers, and is also a great tool for communicating with family and friends over the internet using some VOIP program or other.

Projector – this is a display device that projects a computer-created image onto another surface: usually some sort of whiteboard or wall. The computer transmits the image data to its video card, which then sends the video image to the projector. It is most often used for presentations, or for viewing videos.

Plotter – this generates a hard copy of a digitally depicted design. The design is sent to the plotter through a graphics card, and the design is formed by using a pen. It is generally used with engineering applications, and essentially draws a given image using a series of straight lines.

Input/Output Devices

Input/Output devices don‘t only produce output, but can also be used as storage and input devices. The computer transmits data to the drive, where it is saved and can be later accessed.

Examples of I/O devices are CD drives, DVD drives, USB drives, hard disk drives (HDDs), and floppy disk drives.

CDs and DVDs are two kinds of optical disc which save data in a digital format. Data is written onto the disc using a laser writer that embeds the data directly into the disc‘s coating.

A floppy disk is a magnetic storage device. A layer of magnetised material is placed within a proactive plastic casing. The computer then embeds the data into the magnetized material, by using a writing head.

SELF ASSESSMENT EXERCISES 2

1. List and describe four output devices

3.3 System Unit

The System Unit of computer which is main functional parts of the computer and is made up of Central Processing Unit (CPU), Control Unit, the Main Memory and Arithmetic and Logic Unit (ALU). When you boot a typical personal computer by placing a disk in the drive and turning on the power, the CPU causes a program to be transferred from the disk into the high speed internal memory, where the program takes control of the CPU. The CPU shifts data back and forth between internal memory and the disk (external memory) in order to process data. Data cannot be processed directly while stored on the disk, data must be brought into internal memory to be totaled, compared, displayed, printed, and so forth. Eventually, the program gives up control of the computer and ceases to operate. When this happens, you must tell the computer what to do next.

No matter what directions you give the computer, the same pattern is followed. a program is transferred into high-speed memory, where it takes over control, process the data and finally terminates. This three-part process is called program execution or a program run. Programs are run on the CPU under control of a control unit, main memory, and an arithmetic/logic unit.

The arithmetic logic unit (ALU) does all the computing. It can add two numbers, subtract, multiply, and divide. It can compare two numbers to determine which is larger, move data from one place to another and keep track of time. The ALU works exclusively on encoded binary numbers. It takes its orders from binary encoded instructions stored like any other information in the main memory. The control unit is the supervisor of the CPU; fetches numbers from the memory and interprets them as

instructions. The control unit treats each instruction and then directs the flow of information through t1-ALU, input/output devices and the main memory.

Microprocessor: In every personal computer, the control unit and ALU are combined into a single component called chip. Because this component is so small, it is called a microprocessor. The microprocessor is also in other devices that behave like computers./ Devices like automatic cars, calculators, digital watches, and electronic diaries have microprocessors.

Basic Building Blocks: The functions of a central processing unit are performed electronically-that is, its operations are in form of electrical signals (called pulse trains) flowing from one component to another, rather than moving parts. The component parts of a central processing unit are designed as electronic circuits: this implies that a central processing unit is a collection of electronic circuits (remember integrated circuits!). Data and instructions are transmitted between the various parts of the processor or between the processor, memory and peripherals by means of pulse trains. Various tasks are performed by passing pulse trains through _electronic switches' called gates. A gate is an electronic circuit which may have provision for receiving or sending several pulses in a particular way. There are three basic types: the AND, OR, and NOT gates. These are the basic electronic circuits from which those that perform complex calculations are made. Before we describe these gates further, let us talk about logic, which is often used to explain how gates work.

Boolean Logic: In the mid-1800s, George Boole developed a new type of arithmetic logic that today bears his name: Boolean algebra. Boolean algebra allows us to solve complex 51 mathematical and logical problems by manipulati0n of only two conditions: true or false (0 or 1). The computer is a two-state device (using binary 0 or 1), making Boolean logic (based on two states, true or false) ideals for use on computer. Most of the modern digital computers are based on Boolean logic. Boolean logic basically requires only tree basic logic blocks or gates: AND, OR and NOT. Each gate normally performs some simple function (or operation), and for

this reason gates are often called logic elements. All of the functions performed by a computer are implemented through a combination of these three basic building blocks.

This is not to imply that making a computer is simple. In actual fact, a simple function or operation of the computer might involve thousands of these three logic blocks. What is important, however, is the fact that a computer is basically constructed from these three building blocks. In order to construct a larger function of operation such as square root, for example, instructions called microcode would be written for the actual AND, OR, and NOT logic to implement the function. The microcode is then converted into an electrical circuit. The product is what is normally referred to as firmware.

Logic Diagrams: In logic diagrams, gates are represented by symbols; and arrowhead lines, labeled by letters, represent inputs and outputs. Of course, it is much easier to express logic in tabular form (Tables 2.2.1, 2.2.2 and 2.2.3). This form of table is known as a table. It represents the output (result) function of all the input combinations. We will be looking at the

_and‘, _or‘ and _not‘ gates.

3.4 Storage devices

A **storage device** is a piece of computer hardware used for saving, carrying and pulling out data. It can keep and retain information short-term or long-term. It can be a device inside or outside a computer or server. Other terms for storage device is storage medium or storage media. A storage device is one of the basic elements of any computer device. It almost saves all data and applications in a computer except for hardware firmware. It comes in different shapes and sizes depending on the needs and functionalities.

Types of Storage Devices. There are two different types of storage devices:

	Primary Storage Device	**Secondary Storage Device**
Size	Smaller	Larger
Data Retention	Temporary	Permanent
Location	Internal	Internal / External
Examples	RAM, Cache Memory	Hard disk, Compact Disk Drive, USB storage device

Examples of Storage Device

Magnetic Storage Device – one of the most popular types of storage used.

Floppy diskette – A normal 3 ½ inch disk can store 1.44 MB of data.

Hard drive – An internal hard drive is the main storage device in a computer. An external hard drive is also known as removable hard drive. It is used to store portable data and backups.

Magnetic strip – Magnetic tape drive stores video and audio using magnetic tape, like tape and video tape recorders.

Super disk – A disk drive and diskette that can hold 120 MB and 240 MB of data. Cassette tape – A magnetic storage device used for audio recording and playback. Zip diskette – Like a floppy diskette but more advanced.

Optical Storage Device – uses lasers and lights as its mode of saving and retrieving data.

Blu-ray disc – A digital optical storage device which was intended to replace the DVD format.

CD-ROM disc – An optical storage device that is read-only or cannot be modified nor deleted.

CD-R and CD-RW disc – CD-R is a recordable disc that can be written to once, while CD-RW is a rewritable disc that can be written to multiple times.

DVD-R, DVD+R, DVD-RW and DVD+RW disc – DVD-R and DVD+R are recordable discs that can be written to once, while DVD-RW and DVD+RW are rewritable discs that can be written to

multiple times. The difference between the + and – is in the formatting and compatibility.

Flash Memory Device – is now replacing magnetic storage device as it is economical, more functional and dependable.

Memory card – An electronic flash memory device used to store digital information and commonly used in mobile electronic devices.

Memory stick – A memory card that is removable.

SSD – Solid State Drive – A flash memory device that uses integrated circuit assemblies to save data steadily.

USB flash drive, jump drive or thumb drive – A small, portable storage device connected through the USB port.

Online and Cloud – is now becoming widespread as people access data from different devices.

Cloud storage – Data is managed remotely and made available over a network. Basic features are free to use but upgraded version is paid monthly as a per consumption rate.

Network media – Audio, Video, Images or Text that are used on a computer network. A community of people create and use the content shared over the internet.

Paper Storage – method used by early computers for saving information.

OMR – stands for Optical Mark Recognition – A process of capturing marked data of human from forms like surveys and tests. It is used to read questionnaires with multiple choices that are shaded.

Punch card – A piece of hard paper used to contain digital information coming from the perforated holes. The presence or absence of holes in predetermined positions define the data.

SELF ASSESSMENT EXERCISES 3

1. How many types of Storage devices do we have ? Name them
2. Highlight five examples of Storage devices.

4.0 CONCLUSION

In this Unit, you must have learnt that input devices are equipment used to get instructions into the computer. Some common input devices are; keyboard, mouse, light pen, and voice input.

The keyboard contains alphabetical keys in the original layout known as the QWERTY. Mouse is a simple device that moves a pointer around the computer screen and enables simple commands to be sent to the computer screen. Light pen is attached to a computer; this attachment resembles a pen at the end of a length of electric cable, and read specially coded data called barcodes. Voice input means speaking to the computer. It provides the directness and –user friendliness|. Multimedia is the combination of sound and images with text and graphics. To capture sound and image data, special input devices are required.

Output devices are equipment whereby the output of a computer can be viewed, heard or printed. Some common output devices are Cathode Ray Tube (CRT) Monitor, Printers,

Microfilm, and Voice output. The most common form of display monitor is the CRT. They can output either text or pictures or both in monochrome. Printer is the most common output device which produces a permanent record in print. Voice Output is a specialist application using computer speech output. The most common multimedia output is sound including music. The System Unit of computer which is main functional parts of the computer and is made up of Central Processing Unit (CPU), Control Unit, the Main Memory and Arithmetic and Logic Unit (ALU).

5.0 SUMMARY

Computer Hardware comprises of all physical and tangible parts of the computers. These include; input devices, output devices and Central processing Unit. The examples of input devices include keyboard, mouse, light pen, and voice input. Also, output devices are equipment whereby the output of a computer can be viewed, heard or printed. Some common output devices are Cathode Ray Tube (CRT) Monitor, Printers, Microfilm, and Voice output. The most common form of display monitor is the CRT. The System Unit of computer which is main functional parts of the computer and is made up of Central

Processing Unit (CPU), Control Unit, the Main Memory and Arithmetic and Logic Unit (ALU). However, the smooth running of these devices depends solely on well written programmes called software. The next Unit is fully dedicated to the discussion of software.

6.0 TUTOR-MARKED ASSIGNMENT

1. Name the basic parts of the computer
2. Name one device that could be input or output device
3. What are the differences between main memory and secondary memory?

7.0 REFERENCES/FURTHER READINGS

Ajayi, I. A.,and Ekundayo, I. O., and Haastrup, T. (2009). The application of information and communication technology in Nigerian secondary schools Retrieved 25th September 2010 from http:// www.academicjournals.org/INGOJ ISSN 1993–8225 Burke

Ojajuni J.O (2008). Basic Concepts of Computing. Published by Unique Educational Publishers. ISBN: 978-8047-14-9

Olatokun, W., Agbonlahor, R., Adeniran, S., and Olatunji, A. (2007). Computer Studies for Schools, Ibadan: HEBN Publish Plc.

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

UNIT 3 COMPUTER SOFTWARE

1.0 INTRODUCTION

In its most general form, software, in contrast to hardware, is the invisible part of a computer system. It refers to all programs that can be used on a particular system. More specifically, the term software is applied to all those programs which, in some way, can assist all users of a particular type programs written to solve the problems of any particular user. Software is generally categorized as either Systems software, or Applications software/Software Package. The features and examples of each of this software as well as programming language are given in this Unit. A programming language is an artificial language designed to express computations that can be performed by a machine, particularly a computer. Other related information as regard the programming language are fully discussed in this Unit.

2.0 LEARNING OUTCOMES

At the end of this Unit, you should be able to:

1. Identify different types of software.
2. List various types of programming languages

3.0 MAIN CONTENT

3.1 Systems software

System software is a type of computer program that is designed to run a computer‘s hardware and application programs. The two main types of system software are the operating system and the software installed with the operating system, often called utility software. In some cases, the operating system and utility software depend on each other to function properly.

Some system software are used directly by users and other system software works in the background. System software can allow users to interact directly with hardware functionality, like the Device Manager and many of the utilities found in the Control Panel.

Examples of system software include:

- The BIOS (basic input/output system) gets the computer system started after you turn it on and manages the data flow between the operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer.
- The boot program loads the operating system into the computer's main memory or random access memory (RAM).
- An assembler takes basic computer instructions and converts them into a pattern of bits that the computer's processor can use to perform its basic operations.
- A device driver controls a particular type of device that is attached to your computer, such as a keyboard or a mouse. The driver program converts the more general input/output instructions of the operating system to messages that the device type can understand.

Additionally, system software can also include system utilities, such as the disk defragmenter and System Restore, and development tools, such as compilers and debuggers.

SELF ASSESSMENT EXERCISES 1

1. List four examples of system software.

2. What is the importance of systems software to applications software?

3.2 Applications Software

Application software is a program or group of programs designed for end users. These programs are divided into two classes: system software and application software. While system software consists of low-level programs that interact with computers at a basic level, application software resides above system software and includes applications such as database programs, word processors and spreadsheets. Application software may be bundled with system software or published alone.

Application software may simply be referred to as an application. Different types of application software include:

Application Suite: Has multiple applications bundled together. Related functions, features and user interfaces interact with each other.

Enterprise Software: Addresses an organization's needs and data flow in a huge distributed environment

Enterprise Infrastructure Software: Provides capabilities required to support enterprise software systems

Information Worker Software: Addresses individual needs required to manage and create information for individual projects within departments

Content Access Software: Used to access content and addresses a desire for published digital content and entertainment

Educational Software: Provides content intended for use by students

Media Development Software: Addresses individual needs to generate and print electronic media for others to consume.

Depending on the level of language used there are different types of application software:

1) Word processing software

This tool is used to create letters, word sheets, type papers etc.

Eg: MS Word, MS Works, AppleWorks

2) Spreadsheet Software

A tool used to compute number intensive problems like forecasting, budgeting etc.

Eg: MS Excel, Quattro Pro, Lotus 1-2-3, MS Works

3) Desktop Publishing Software

This tool is used to create illustrative worksheets, banners, newsletters, signs, gift cards etc.

Eg: MS Word, MS Publisher, Adobe PageMaker

4) Database Software

Used to store data like text information, memberships, address etc. which helps users to sort information accordingly.

Eg: MS Access, FileMaker Pro

5) Communication Software

Allows to connected computers to communicate each other using audio, video or chat-based medium.

Eg: MS Net Meeting, IRC, ICQ

6) Presentation Software

Used to create multimedia stacks of cards/screens

Eg: MS PowerPoint, Hyper Studio, Flash, Super Card, HyperCard

7) Internet Browsers

This tools allows one to surf the web, read their emails and also create web pages.

Eg: Netscape Navigator, MS Internet Explorer

8) Email Programs

This software is mainly used to send and receive emails.

Eg: MS Outlook, Netscape Messenger, Eudora, AOL Browser

As technology and the number of users keep evolving, the types of application software also keep changing with better modifications to perform better virtual tasks to solve real world problems.

SELF ASSESSMENT EXERCISES 2

1. What is an application software?
2. List five examples of application software

3.3 Programming Language

A programming language is an artificial language designed to express computations that can be

performed by a machine, particularly a computer. However, computer language is used to write or code computer programs. For this reason, computer languages are also called computer programming languages or simply programming language; there are various levels of programming languages: these include machine language, assembly language and high level languages. A programming language's surface form is known as its syntax. Most programming languages are purely textual; they use sequences of text including words, numbers, and punctuation, much like written natural languages. On the other hand, there are some programming languages which are more graphical in nature, using visual relationships between symbols to specify a program.

The syntax of a language describes the possible combinations of symbols that form a syntactically correct program. The meaning given to a combination of symbols is handled by semantics (either formal or hard-coded in a reference implementation). Programming language syntax is usually defined using a combination of regular expressions

Machine Language: Generally speaking, there is only one language the computer can run without modification and this is called machine language. Machine language programs are nothing more than long sequences of binary digits that have meaning to the computer. Writing a complex program in such a language is terribly complex and tedious and one can make a lot of mistakes.

Because of the difficulty with machine language programming, some intermediate codes and high level languages have been developed to enable the programmer to write in a way that resembles his thought process rather than elementary steps of machine language. Generally, machine language is the only language the computer can run without modification.

Assembly Language: The most immediate step from machine language is the symbolic

assembly language. A computer cannot execute this directly, the program would still have to be translated. The program that translates assembly program to machine language is called an **assembler.** Writing assembly language still requires understanding some machine language.

Programmers must still specify both operations and storage locations. Programming in assembly language is still a tedious task. This has led to the development of English-like languages called high-level languages.

High-level Languages: High-level languages are designed so that a programmer's attention can focus on the problem itself, rather than on the details of computer operations. There are many different high-level languages used for programming. Examples of programming languages are FORTRAN, COBOL, PASCAL, C, C++, BASIC, LOGO, JAVA, Modula-2, Ada and PL/1.

The purpose of high-level languages is to establish easy communication between the computer and the programmer. High-level languages are much easier to learn and understand than assembly language. High-level languages may also have different dialects. The version of BASIC on one microcomputer may differ a little from the version on another, and this may also differ from the one on a mini-or mainframe computer. The differences may be small, and you may not notice them. However, the differences mean a lot for your program to work properly.

Programs written in other languages such as FORTRAN, COBOL, BASIC and Assembly Language must be translated into machine language before they can be used to control the computer. This requires the use of translators.

Translators: is a program that takes as input a program written in one programming language and produces as output a program in another language. A translator reads an input program referred to as the source program, and converts the lines in the source program one by one into another language. The converted program is called the object code. This object code may be in the intermediate form, such as assembly language. A translator

is a powerful tool for increasing the productivity of a programmer. Instead of giving detail instructions in machine language, the programmer can focus on the problem itself and give several directions in a programming language. The translator fills in the details, and contains the proper results in a shorter time. There are two types of high-level language translators- compilers and interpreters.

Compilers and Interpreters: The program that translates the high-level language into a language the machine understands is called a compiler. A compiler reads the source program and generates machine code (called object code), and saves it in a file. The object code is then loaded in the memory for execution. A compiler translates a high-level language by reading the source program and generating an object code. Examples of high-level languages with compilers are COBOL.

Another translator worth mentioning is the interpreter. The **Interpreter** reads the source program directly, line by line, and generates the machine codes necessary to carry out the instructions as they proceed through the program. An interpreter reads the source program line, and generates machine code.

Compilers produce fast, compact and efficient machine language programs. They are the translators most frequently used by professional programmers. However, the compiling steps takes extra time and attention. Compiled programs run much faster than interpreted programs.
Interpreters are good for novice programmers and for professionals testing new programs. Errors can be corrected and the program reinterpreted again and again until the program is correct. BASIC, LOGO and some other high-level languages are usually interpreted. COBOL, FORTRAN, PASCAL and C are usually compiled.

SELF ASSESSMENT EXERCISES 3

1. List three examples of programming language

2. How does the computer understand a programming language?

4.0 CONCLUSION

In this Unit, you must have learnt that system software is collection of computer program written by computer manufacturers for the control and efficient performance of their computers. However, the application software consists of a number of programs designed to perform specific tasks for users. Software are written in a special language called programming language.

5.0 SUMMARY

Generally, software, in contrast to hardware, is the invisible part of a computer system. Software are the essential instruction that enable hardware to function properly. Examples of system software include the Operating System, the Bootstrap Loader, the diagnostic Routine, and Basic-Input-Output-System. Similarly, the syntax of a language describes the possible combinations of symbols that form a syntactically correct program.

6.0 TUTOR-MARKED ASSIGNMENT

1. What is the importance of systems software to applications software?
2. List three examples of operating systems
3. What are the essential features distinguishing each generation of programming languages from the others?

7.0 REFERENCES/FURTHER READINGS

Ajayi, I. A., and Ekundayo, I. O., and Haastrup, T. (2009). The application of information and communication technology in Nigerian secondary schools Retrieved 25th September 2010 from http:// www.academicjournals.org/INGOJ ISSN 1993–8225

Mitchell, J. C. (2002) *Concepts in Programming Languages*, London: Cambridge University Press.

Pierce B. C. (2002) *Types and Programming Languages*, New York: The MIT Press.

Scott, M. L. (2005) *Programming Language Pragmatics*, London: Morgan Kaufmann Publishers

Olatokun, W., Agbonlahor, R., Adeniran, S., and Olatunji, A. (2007). Computer Studies for Schools, Ibadan: HEBN Publish Plc.

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

UNIT 4 SOFTWARE CLASSIFICATION

1.0 INTRODUCTION

Computer software, or just software, refers to one or more computer programs and data held in the storage of the computer for some purposes. Generally, software are classified into two, Type I and Type II. In this Unit, the classifications of software according to their functions are fully discussed.

2.0 LEARNING OUTCOMES

At the end of this unit you will be able to:

1. Classify a given software into either Type I or Type II
2. Articulate the features of each types of software

3.0 MAIN CONTENT

3.1 Type I Application

Although type I applications vary considerably, below are listed some characteristics they

usually share:

i. Type I applications generally stimulate relatively passive involvement on the part of the user. The involvement we are referring to here is intellectual involvement. Type I applications generally do not require a high degree of intellectually active involvement. Although users are usually required to respond in some way, the responses generally do not involve higher-order, complex cognition.

A good example of Type I software is any one of the many programs designed to drill children on math facts. Typically, problems are generated at random and displayed on the computer screen. The user types the answers and the computer checks the user‘s response and provides some feedback about correctness. Such drill and practice programs (often called CAI, or computer-assisted instruction) can be highly useful and have a valuable role in educational computing.

2. In Type I applications, the type of interaction between user and machine is predetermined by the developers of the software and the contribution of the user must conform to a highly limited repertoire of acceptable responses. With math drill and practice software, for example, the only time the user plays a role is when the machine stops and waits for an answer. At that point, the only acceptable response is a single number.

3. Type I applications are usually aimed at the acquisition of facts by rote memory. Once again we emphasize that drill and practice to develop rote memory can be very important. We find fault with such applications only if they are the only educational computing applications used.

4. With Type I applications, everything the software is capable of doing can usually be observed in a very short period of time, frequently in 10 minutes or less. The math drill and

practice software described above may be capable of generating problems at several difficulty levels using more than one computational process. The student can usually sample everything this software is capable of doing in 5 minutes or so Type I applications make it easier, quicker, or otherwise more efficient to continue teaching the same things in the same

ways as we have always taught them, but Type II applications make available new and better ways of teaching. When classifying a specific piece of software, the characteristics given for each type in the preceding discussion above should be used only as aids. Final determination about the category depends on adherence to one or the other of these definitions. Another aid to classification is the fact that certain kinds of educational software tend to fall consistently into one or the other category.

Typical type I software

Drill and practice Software designed to allow the user to practice a skill that has already been acquired is called drill and practice software. This software may drill the student on math facts, sight vocabulary, parts of speech, names of states, or other skill dependent primarily on rote memory. In support of Type I classification, note that the program has all five of the common characteristics of type I software discussed previously: (i) relatively passive user intellectual involvement, (ii) predetermined control of most of what happens on the screen, (iii) predetermined interaction between the user and computer and a highly limited repertoire of acceptable user responses, (iv) a goal of acquisition by rote memory, and (v) all capabilities of the software evident after only a few minutes of operation.

Tutorial software: Whereas drill and practice software is designed to provide a way to practice a skill that has already been learned, tutorial software is designed to teach the skill in the first place. Most available tutorial software falls into the Type I category, although there is really no reason why Type II tutorial software could not be written. (It would be Type II if it use new better methods of teaching the material, methods that would not be possible without the computer).

Other examples of Type I tutorial programs include any of the commercial programs available to tutor students in preparation for taking the Scholastic Aptitude Test and the

programs intended to orient users to the use of a specific computer or specific software. These tutorial programs, like most such programs, take the user through a series of steps by emulating traditional methods of lecture, demonstration, and student trial activities, and most could be easily transported into workbook format without significantly changing the overall methodology or diminishing the effectiveness of the instruction.

Assessment Software: Assessment software seems to be growing in popularity. This class of software is designed to: (i) administer, (ii) score, (iii) summarize, and/or (4) interpret the results

of standardized tests. The first three of these functions represent Type I applications by definition, since they are intended to make it more convenient, more accurate, or less time consuming to administer a test that was originally developed for minicomputer implementation. Some characteristic of type I or Type II applications are difficult to apply to this class of software because such characteristics were developed for use with educational software designed for direct teaching. As always, the final determination of category depends not on consistency with the characteristics, but on adherence to the definitions of Type I or type II applications. Some of the fourth type of assessment software, designed to interpret the result of standardized testing, is in a class by itself. This kind of software would be classified as Type II since it is intended to make the judgments of the most knowledgeable experts in a field available to anyone who has access to a computer and the software.

Software intended to perform this function falls into a category known as expert systems.

Expert systems are yet to fulfil their initial high expectations. Most authorities agree that no expert systems have yet been developed that do an acceptable job of emulating the judgment of educational or psychological experts.

Administrative Applications: Administrative applications include software for producing,

calculating, coordinating, or compiling registration information; attendance records; graphics; student grades; room, teacher, or school schedules; mailing labels; filings; or other secretarial tasks to aid administrative activity.

It is obvious from the foregoing that the use of a piece of software can determine whether the application falls into the Type I or Type II category. For example, although word processing used properly to teach composition skills is a type II application, word processing as a secretarial substitute for typewriting is a Type I application.

Computer- Managed Instruction: Computer- Managed Instruction (CMI) is a mixed bag of applications designed to perform tasks or combinations of tasks such as organizing student data, monitoring student's progress, testing student mastery and prescribing further instructions or remediation, recording student progress, and selecting the order of instructional modules to be completed.

The term computer-managed instruction is a good one, because only human beings, not computers, can be mangers and because no direct instruction takes place. Regardless of terminology, CMI should probably be considered a Type I application, for it is usually used to make it more efficient to teach something as it has always been taught.

SELF ASSESSMENT EXERCISES 1

List three examples of Type I application software.

b. Type II Application

Type II applications

Type II application software provides new and better ways of teaching and learning available to teachers and students. If the use of the computer improves teaching or learning and if it would be impossible (or extremely difficult) to teach or learn in this manner without the use of the

computer, then the application in question is most likely a Type II application.

Type II applications, like Type I applications, vary considerably. However, some characteristics are shared by most type II applications. Generally, these characteristics are in contrast to those listed for type I applications:

i. Type II applications generally stimulate relatively active intellectual involvement on the part of the user. A good example of a type II application is the use of word processing to teach or to improve skills in composition. Compare the degree of intellectual involvement need to compose a passage with the involvement needed to respond to a type I drill and practice program, such as the math facts software described above.

ii. With Type II applications, the user, rather than the software developer, is in charge of almost everything that happens on the screen. Such is the case with word processing, for example.

3. In Type II applications, the user has a great deal of control of the interaction between user and machine, and there is an extensive repertoire of acceptable user input. For example, in word processing, the user determines when (or whether) to invoke the spelling checker, the thesaurus, and various editing aids such as global searches, placements, and l

4. Type II applications are usually aimed at accomplishing more creative tasks than are Type I applications. Writing a narrative passage using a worded- processing package is obviously a more creative task than learning the multiplication facts.

5. With Type II applications, it generally takes many hours of use before the user has seen everything that the specific software is capable of reliable published reviews of Type II software, but it is relatively easy to find good reviews of Type I software. Unfortunately, staff writers and others who prepare software reviews for computer magazines are frequently not regular users of the

software they review. In fact, they are often totally unfamiliar with the software when they begin their review, and they rely on what they find out through using the software for a few minutes before beginning to write. This may work well with Type I software, but it may take days, weeks, or even months of use before a user can take advantage of all features of a Type II application such as word processing.

Typical type II software

In our previous discussion of the characteristics of type II software, we used word processing as Word processing the use of word **processing** to teach written composition is a Type II application because it makes possible the teaching of composition in a way that is not possible without the use of the computer. The ease of revision made possible by word processing cannot be duplicated with non-computer activities. Although researchers are still attempting to determine exactly which student writing achievement outcomes are most favorably influenced by instruction employing word processing, there is little doubt that word processing results in more positive achievement gains than traditional instruction.

In addition to conforming to the definition of Type II software, word processing also possesses all the characteristics common to applications in this category. These are: (i) relatively active intellectual involvement, (ii) user control of almost everything that happens on the screen, (iii) user control of interaction with the machine and an extensive repertoire of acceptable user input, (iv) focus on creative instead of rote tasks, and (v) many capabilities that require hours, days, or even weeks to view full the example. Clearly, composing a written passage using word processing requires a high level of intellectual involvement, places the user in charge by providing a blank screen and a powerful way to place whatever text the user chooses on that screen, and is a highly creative act. In addition, full investigation of a word processor‘s capabilities cannot be accomplished in a few minutes; it may require days or weeks.

Two related Type II applications are; the use of spreadsheet and database management software.

Electronic spreadsheets are accounting ledger sheets that allow the user to create complex displays consisting of rows and columns of numbers. Electronic spreadsheets greatly simplify accounting tasks because of the ease of changing individual entries and all related entries. This is important, since entries in accounting ledgers are highly interdependent. Because of this interdependence, changing a handful of numbers may require the revision of thousands of other entries, since complex formulas may be used involving specific entries that are then used to calculate other entries. For example, if one entry represents the wholesale cost of a raw material used in the manufacture of a certain product, a change in this number requires changing numerous other numbers, such as tax paid on each item, percentage of profit, and commissions to be paid to salespeople.

1. Electronic spreadsheets allow the user to enter formulas that are then used to calculate other entries. When the user changes any of the involved entries, the program automatically and almost instantaneously changes all affected entries. Thus, managers may pose complex hypothetical business scenarios that can be answered with only a few key- strokes. These same scenarios might require dozens of accountants days, weeks, or of a spreadsheet that has been used to enter student grades. The spreadsheet automatically totals the points earned and, in the final column, assigns a grade based on a user-entered formula.

2. Spreadsheets can also be used for a variety of teaching tasks. These would be classified as Type II uses for the same reasons that word processing is so classified.

Database management software is another Type II application somewhat similar to word processing and electronic spreadsheets. Data-system. Once dates are correctly entered, the user can then search the date for all cases conforming to some predetermined criteria or combination of criterion. For example, a social studies class might research data about tropical rain forests. Once the date are found and entered in the data base, it is then possible to search the file for all cases of tropical rain forests that conform to some criterion (such as all rain forests between certain

latitudes, or with a given range of annual rainfall, or with certain flora or fauna).

Programming languages: Controversy continues over the issue of whether or not there cognitive benefits to be gained by teaching a programming language to children and, if so, what these benefits are. Although final determination of category depends on the resolution of this controversy, we believe for two reasons that computer programming should be considered a Type II activity. Reasons are as follows:

First, benefits are involved in learning to program (although we feel these benefits have been exaggerated by some advocates). **Second,** the benefits are unique to computer programming and are not easily available through non-computer activities.

In addition, programming a computer possesses all the characteristics unique to Type II applications. These are:

(i) programming requires a high level of intellectual involvement as the user attempts to supply the code to accomplish some task;

(ii) the user is completely in charge of determining what will happen on the screen, since a computer language, like a word processor, provides a blank screen and a powerful way to enter and revise whatever code the user chooses;

(iii) the user is in charge of the interaction with the computer and there is great flexibility in and an extensive repertoire of acceptable user input (all commands provided by the specific language);

(iv) programming is a highly creative problem solving act; and

(v) the full capabilities of a programming language cannot be viewed in only a few minutes.

Simulations: Computer simulations make available experiences that are too expensive, too dangerous, or otherwise unavailable to students. Thus, simulations are type II applications almost by definition.

Some of the most sophisticated and complex simulations have been developed for use by the

military. Examples of these simulations are any of the complex computer flight simulators currently in use. The cost and safety advantages of filing simulators over actual flight are obvious. A single actual flight in a modern jet fighter is dangerous and cost thousands of dollars for the fuel alone. The same flight in a jet simulator is completely safe and involves only the cost of the computer and software, which can be used for years. In addition, flight simulators make it possible for trainers to systematically confront trainees with a wide variety of flight conditions, such as severe weather, equipment malfunctions, and attack by enemy planes or ground weapons.

Generally, educational simulations are not as well developed as are highly complex and sophisticated simulations like flight simulators. Nevertheless, we believe that simulations represent one of the most exciting potentials in education. Although scarce, some excellent educational simulations are available. Examples include controlling the ecology of a small pond, designing a machine for a factory, managing the fossil fuel reserves of the United States, leading a wagon train across the Oregon Trail, controlling osmosis in a living cell, and operating a hot dog concession at high school football games for a year. (Sunburst Communications markets many excellent educational simulations).

In the cell membrane example, users are shown minimum and maximum concentrations of substances that can move into and out of a or decrease concentrations as the cell –lives. When this simulation is started, concentrations vary due to cell metabolism, and the user must adjust these concentrations to keep them within acceptable limits. Care must be taken, because allowing one substance to diffuse into the cell can have unexpected and potentially catastrophic effects on concentrations of other substances. The user attempts to keep the cell–alive as long as possible. This software makes an experience available that is not available in real life due to the

small size of the cell and to the difficulty in controlling exactly what will diffuse across the cell membrane in a real laboratory.

Most of the qualities of typical Type II software are present in simulations. In the cell membrane simulation, for example, (i) active intellectual involvement is required for the user to avoid altering one concentration in such a way that another reaches a lethal level, (ii) the thing within acceptable levels, and (iii) the simulation is complex enough that a user would probably never see all possible combinations requiring all possible solutions.

Two characteristics of most type II software may not be applicable to some simulations. For example, (i) in many simulations, most of what happens on the screen is predetermined by the software developer instead of the user (although it could be argued in our example that the manipulation of the various concentrations is completely controlled by the user). Also (ii) the developer of the simulation predetermines the nature of the interaction as well as acceptable responses. Again, it could be argued that the user- chosen concentrations in the cell simulation can range over extremely wide numerical common qualities. Still, the user is restricted to numbers alone, and they must fall within the predetermined acceptable range. Therefore, these two common qualities of Type II software do not seem to apply to educational simulations. However, the simulations are one of the most exciting and promising applications in educational computing.

SELF ASSESSMENT EXERCISES 2

List three example of Type II application software

4.0 CONCLUSION

In this Unit, you ought to have learnt that computer Software is generally classified into two- Type I and Type II. While Type I applications generally stimulate relatively passive involvement on the part of the user, the Type II application of software provides new and better ways of teaching and learning available to teachers and students. Some examples of

Type I include Drill and practice ,Tutorial software, Assessment software, Administrative software, and Computer- Managed Instruction. Similarly, some of the examples of Type II are word processing, spreadsheet and database management software.

5.0 SUMMARY

The software applications are classified into two- Type I and Type II. Type I applications generally stimulate relatively passive involvement on the part of the user, and Type II application of software provides new and better ways of teaching and learning available to teachers and students. Programming a computer possesses all the characteristics unique to Type II applications, some of which include- requirement of a high level of intellectual involvement as the user attempts to supply the code to accomplish some task; and the fact that the user is completely in charge of determining what will happen on the screen, since a computer application, like a word processor, provides a blank screen and a powerful way to enter and revise whatever code the user chooses.

6.0 TUTOR-MARKED ASSIGNMENT

1. List three examples of Type I and Type II application software

7.0 REFERENCES/FURTHER READINGS

Olatokun, W., Agbonlahor, R., Adeniran, S., and Olatunji, A. (2007). Computer Studies for Schools, Ibadan: HEBN Publish Plc.

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

MODULE 3 COMPUTER AND INSTRUCTIONAL PROCESSES

UNIT 1 COMPUTER USAGE IN EDUCATION PROCESS

1.0 INTRODUCTION

We are now in the age of computer revolution which has to a large extent, widened the gap between the developed and developing nations originally created by the industrial revolution. The computer has the potential to become education‘s single most useful teaching and learning tool.

However, the value of any tool does not depend solely on the qualities of the tool itself. If the tool is to be useful, a necessary (but not sufficient) requirement is that the tool‘s users must choose to apply the tool to important tasks.

Therefore, as a teacher, you need to know the kinds of teaching and learning task to which the computer tool can be best applied. In this Unit you will be exposed to the general overview of computer usage in education as well as the teaching capacity of computer.

2.0 LEARNING OUTCOMES

At the end of this Unit, you should be able to:

1. Articulate the uses of computer in teaching and learning processes
2. Articulate the teaching capacity of computer.

3.0 MAIN CONTENT

3.1 Overview of Computer usage in Education

The use of computers as a teaching tool has been widely accelerated and significantly influenced by external technological, economic, demographic, and social/political developments. Computer use in education is more closely identified as a technology concerned with the integration of computer technology into the teaching and learning process. Teacher's acceptance of computers has accelerated because educators of all disciplines learn, as much as they can, to understand how the computer can assist them in meeting their teaching objectives. Proper use of educational technology offers the opportunity to enhance student learning, increase teacher productivity, and develop more effective schools. The opportunity to use the new, powerful personal computers along with the research coming from the study of artificial intelligence and cognitive science will influence the use of advanced scientific and mathematical concepts.

Computers are one of the most valuable resources in a classroom because they serve so many useful functions. With computers and the internet, students today have a wealth of information at their fingertips that can help them develop their research and communication skills while preparing them for a future career in a workforce that is increasingly reliant on computer technology.

One of the most common applications of computers in education today involves the ongoing use of educational software and programs that facilitate personalized online instruction for students. Programs like iReady use computers to assess students in reading and math. Students then work on interactive reading and math lessons that are designed to target the specific academic needs identified during diagnostic testing. Educational software like this makes it easier to differentiate instruction so that lessons meet each student‘s unique learning needs. These tools also provide a wealth of useful data and resources that teachers can use to work with their students in the classroom and maximize learning. Online assessments are more efficient than traditional paper testing because it allows for more immediate feedback and data.

Computers also have an important role beyond primary and secondary education classrooms. Thanks to computers and technological advancements, higher education is now more accessible

than ever. Many colleges and universities offer online classes, and some even offer degree programs that can be completed exclusively online. Online classes and online degree programs make it easier for single parents or students with heavy workloads to continue their education from the comfort of their own home and at their own pace.

Benefits of Computers in the Classroom

The benefits of using computers in the classroom go beyond more efficient assessment and opportunities for online learning. Mobile devices and technologies are an inevitable part of society, but that does not mean that students naturally understand how to use those technologies appropriately. Using computers in the classroom gives teachers an opportunity to teach digital citizenship skills that demonstrate ways to use technology correctly and responsibly.

Computers also help maximize student engagement. Modern students are regularly exposed to technology outside of the classroom. Most use and enjoy smartphones and other mobile devices, which is why they are more likely to engage in the learning process if it involves something to which they are already accustomed and enjoy.

Teachers' Use of Computers in the Classroom

Computers have revolutionized the teaching profession in multiple ways. Teachers use computers to record grades, calculate averages, manage attendance and access data on student performance in online programs and assessments. Computers have also made it easier for teachers to vary their instructional delivery. Instead of lecturing at the front of the room for an entire class period, teachers can incorporate technology into their lessons to keep students engaged while appealing to a variety of learning styles. From using computers to create presentations on a topic to showing video clips that complement the lesson at hand, technology helps teachers make the content easier for students to understand.

Disadvantages of Computer use in Education

While the benefits of using computers in education are plentiful, it also has some disadvantages. Some worry that computers are distracting because they provide students with temptations like

games, videos or chats that can take them off task. It‘s true that some students might be lured off task by these tempting features, but luckily there are settings available that can help teachers and parents set restrictions to help minimize distractions.

Another disadvantage of computers in the classroom is over-reliance on technology. Critics argue that spell check and other computer features that automatically correct errors in spelling and punctuation make students too lazy to learn and apply the rules themselves. These features, however, help point out where students went wrong and offer valuable learning opportunities that can help students enhance their understanding of appropriate spelling and punctuation. The benefits of using computers in the classroom outweigh any disadvantages that may accompany it.

The instructional role computers have assumed in the classroom has taken two forms: computer-managed instruction (CMI) and computer-assisted instruction (CAI), which is sometimes referred to as computer- based instruction.

Computer-Managed Instruction: The primary purpose of computer-managed instruction (CMI) is to help both the instructor and the student in the management of records. Specifically, teachers use it for handling student records, diagnosing and prescribing materials, monitoring students and relevant instructional materials. Students can take tests on the computer or input information into a personal portfolio. Moreover, computers can diagnose the learning needs of students and prescribe optimal sequences of instruction for them. Essentially, computer-managed instruction but it may contain instruction programs or activities; that is, the programs can provide activities that focus on identified student needs.

Some computer-managed instruction packages will include instructional objectives, instructional activities, corresponding test items, and instructional support. In such systems, computers often are used for testing students‘ competency mastery; for recording each student‘s mastery progress; for diagnosing weaknesses, recommending remedial work if necessary, and indicating when the student is ready to move on to the next step; and for providing needed additional practice.

Teachers who have become proficient with the appropriate computer-managed instructional software can manage instruction with these computers and maintain sophisticated records on students. Indeed, as teachers develop lessons and test items for the units they teach, they can be programmed into the computer for random selection when the time comes for use. Moreover, teachers will find word processing programs useful in producing course outlines, handouts, and tests. Furthermore, teachers will find the use of database information systems in collecting and recording information and spreadsheet information extremely useful in recording grades and calculating end-of-term grades.

Computer-Assisted Instruction: Computer-assisted instruction (CAI) usually serves one individual student at a time, as part of the instructional activity. The major strength of computer-assisted instruction is that it is interactive: Information, questions, and other stimuli flow from computers to students, but then the students can provide input that shapes the next computer output.

With computer-assisted instruction, acquisition of information and development of skills is accomplished through the use of a computer system and a computer software program. The computer system usually consists of a CPU, a data-storage system such as a disk drive or hard drive, a monitor or display unit called a cathode ray tube, and a keyboard. Programs may be designed to fit individual needs at any desired ability level, pace, or degree of complexity. The four main types of programs for computer- assisted instruction are drill-and-practice, tutorial activities, simulation, and games.

Drill-and-practice programs are the lowest level of computer use. They lead students through a series of examples to increase dexterity and fluency in a skill. That is, they contain exercises that repeatedly put the student into contact with quantities of information, facts problems, and relationships for the purpose of learning and mastering concepts and skills or committing material to memory. Drill-and-practice is used predominantly for math drills, foreign language drill, vocabulary building, and the like.

Tutorial programs are designed to emulate a human tutor: The computer acts as the teacher. The computer initially presents new information; depending on student responses, it may present additional or supplemental information. The initial presentation and follow-up responses to the student may take the form of written explanation and descriptions, questions and problems, or graphics and visual illustrations. Tutorials are generally more sophisticated than drill-and-practice programs.

Simulation programs call on the students to role-play and model reality. Essentially, students confront real-life situations. That is, they make decisions while emulating or interacting with –real-life‖ or –close-to‘ life situations and processes in order to learn from their responses. Simulations are especially helpful and thought provoking when they ask students to make decisions concerning situations or processes involving risks or dangers. Students can now conduct experiments; experience past events, current happenings, or future possibilities; and consider what-if problems through simulations.

Gaming programs engage students in activities where they must follow specific rules that differ from those of real life in order to reach a specific goal. Attaining the goal usually entails competition-group against group against group, as in volleyball; individual against individual or machine, as in chess; or individual against a standard, as in bowling. To be challenging, goals should have a roughly 50 percent probability of success. Whatever form of computer-assisted instruction is used, it is usually appealing to students. Programs involve students and give them some control over the rate of their learning. Moreover, they can often improve instructional effectiveness and efficiency.

Although there are definite advantages associated with computers as instructional tools, some educators criticize them because of what they consider characteristic limitations. For one thing, computers are still expensive; critics suggest that Naira spent on hardware, software, and maintenance would be better spent for more teachers, higher salaries, or

other instructional materials. Some fear that computers may replace teachers. Others fear that they stifle creativity, limit social interaction, emphasize narrow facts at the expense of broad generalizations, limit the imagination, and dehumanize instruction.

The use of computers is also criticized because of perceived instructional limitations and problems, such as the limited range of objectives being taught by computers. Most computer-based instruction cannot effectively teach affective, motor, or interpersonal skills. Even in the cognitive domain, current programs tend to teach at the lower levels of knowledge and understanding. Copyright problems, the poor quality of some software programs, and incompatibility among software programs also can limit their effectiveness. Further, some teachers fear using computers because they are too complex to understand.

Additionally, logistical environmental concerns may limit the use of computers. For example, having to deal with issues like placement of the computes, supervision of users, maintenance, and acquisition of supplies, may cause some teachers not to bother using computers as instructional tools.

The introduction and use of technology in schools and classrooms will not automatically increase student learning. To accomplish this end, educators must rethink how schools are organized and rethink curriculum and instruction. Teachers and administrators must know how to use the hardware and software. More importantly, they must know how to use these tools to create appropriate learning experiences for students. As teachers gain easier access and receive training in the use of the Internet and as technology resources expand through electronic networking, instructions will be enhanced and we should see students becoming more active, confident, motivated, and achieve at higher levels.

SELF ASSESSMENT EXERCISES 1

1. List two challenges posed by the use of computer in teaching and learning.
2. List two benefits to students when computers are used in Education in education

3.2 Teaching Capacity of computer

Computers have some unique teaching capabilities that can be practically exploited to achieve great educational effectiveness. They provide powerful intellectual tools for calculation, for word processing, for designing some technological artifacts or artistic creations. These potentialities can be exploited to shift educational emphasis from the teaching of routine skills to the teaching of more sophisticated thinking skills of the kind that has become increasingly important in the technological society.

Computers can be used to design special learning environments that can significantly foster students' leaning, even with the absence of any formal instruction. They can be used to act as private non-human tutors available to any student at any time or place of his or her choice. They can be flexibly adapted to the student's individual capabilities and rate of learning. Most importantly, they can be superb teachers (sometimes superior to human teachers) if the teaching programme incorporated into the computers had originally been designed by the best available talents. By incorporating the techniques of artificial intelligence, computers can increasingly act as non-human tutor with genuine subject matter experts and human-like intelligence.

Computers can potentially be used to provide detailed diagnostic information about an individual student's existing knowledge, thinking skills, and learning capability; such diagnostic information can greatly help teachers or students to advise appropriate activities for teaching or learning. Computers, used in conjunction with modern communication technologies, can be connected together, whereby individuals may readily communicate and interact with each other.

Computers can be very effective agents for distributing good education on a large scale. Educational programmes and methods incorporated into computers can penetrate almost everywhere, especially as computers become increasingly available. The educational programmes

may be used effectively not only in schools but also in less formal environments such as homes, offices, museums and community centres. They can greatly help and supplement human teachers, but may be quite effective even in the absence of such teachers. Computers can potentially make excellent instructions available to students. The instruction prepared for delivery by computers can be repeatedly used, readily modified and cumulatively improved to remedy observed deficiencies or to reflect changing circumstances.

The increasingly widespread availability of computers is likely to foster greater popular interest in their use and thus enhance people's motivation to understand the quantitative and analytical modes of the things required for their effective use. Such motivation can potentially be exploited by deliberately designing computers to be readily usable by people in all walks of life, to provide such people with appealing opportunities to engage in quantitative thinking, and thus to promote greater mathematical and scientific literacy. Computers can greatly facilitate many of the burdensome record-keeping and administrative tasks carried out by teachers.

Tools for educational research

Computers can be powerful research tools in education. The recent past has seen very fruitful applications of computers in the basic studies of human thought processes relevant to education.

Computers, available as tools for students, can help them carry out many relatively simple tasks which they traditionally spent years learning to do unaided (e.g. making arithmetical computations, manipulating symbolic expressions in algebra, implementing the syntax rule in complex programming). Various resulting implications may usefully be explored. Computers can be used to design learning environments that can foster student learning even in the absence of any formal instruction. Such learning environments have been designed for various educational levels (e.g. LOGO computer language and turtle geometry for use by quite young children, computer environments for learning to troubleshoot electronic circuits, and others).

Computers can provide learning environments where students have access to real data (e.g. data about populations and demographic trends, and economic data about various countries) and can they use computers to facilitate computations with such data. Besides, such learning environments could also be exploited to teach students useful knowledge about modern computer-implemented databases and techniques needed to work with such databases. Computers can be very profitably used to create learning environments 'simulating laboratory situations. Such laboratories may simulate real situations that might be encountered in an actual laboratory.

However, the simulation has the following advantages: It is usually much less expensive than a real laboratory. It allows the quick exploration of many possibilities and the systematic variation of many relevant parameters; it allows active exploration without danger or harm to students; and it allows students to focus their attention on centrally important issues without being distracted by many logical details of real experiments. Effective learning is greatly fostered when students are actively involved and learn by doing.

Computers also permit the design of learning environments that help students acquire mental models to deal with complex phenomena or devices. Computer tools, such as word processors, spreadsheets and programming languages can be used by students for writing activities, for entering and manipulating data obtained in science and social studies activities, or for exploring number patterns. Each computer software tool has a variety of uses in the classroom. Today, through the use of technology tools, students can create their own learning micro-worlds as well as share data and concepts with the global community.

Traditionally, human teachers in face-to-face contact have implemented most educational tasks, predominantly with students, even when the teachers faced students in large classes and had little time to give them individual attention. But modern information technologies permit educational tasks to be approached from a more efficacious point of view. Effective education can be provided not only by human teachers but also by books, movies, audio and video

technologies, and computers acting as private non-human tutors in other capacities.

Each of these instructional means, including the human teachers, has some unique strength and some appreciable limitations. However, better educational effectiveness can be realized by careful design, which uses an optimum combination of such instructional means to attain desired educational goals. Such an instructional design would judiciously aim to exploit the unique capabilities for each instruction means and try to minimize its limitations.

Human teachers would then be used to maximum advantage in those situations where their unique capabilities are most valuable. Education would then become less synonymous with schooling, with more education effectively provided in homes and other information setting. Therefore, now that we have the technology tools that can promote alternative learning strategies, we will produce citizens who are equipped academically to be educated participants in today‘s and tomorrow‘s world.

But, it seems apparent that school system sometimes buy computers in response to parental pressures or because they want to gain prestige. They think that by this; they would be said to be at the forefront of new trends. Therefore, their reason for acquiring computers is not because they have a vision of the educational goals the computers will help them achieve or of how the change process can be handled in a way that maximizes the potential benefits of using microcomputers in instruction while minimizing negative effects. The historical innovations in education have revealed that changes must not be undertaken just for change‘s sake.

It is an error to yield to the temptation of acquiring technology without planning for its use. In fact many innovations introduced in schools have failed, because teachers were not

prepared ahead of the introduction of such innovation. The computer is neither a complete teacher nor a panacea for educational problems. The teacher clearly has a central role in assuring that Computer-Assisted Instruction is balanced by one kind of experiences.

The feverish rush towards acquiring microcomputers means that many teachers now have computers available to them as tools which they have little or no knowledge about.

Further, the fact that major expenditures are being made on computer hardware at a time when the finances of many schools are at a low ebb has led many systems to skimp on teacher training and support services. However, it is important to make teachers more familiar with computers and their use. Teachers must know some of the potentialities and limitations of computers. They must also be encouraged to use it to teach and also upgrade their level of computer literacy above that of their students.

The education of teachers should make them adequately knowledgeable about the educational application of computers. They should also be well informed about new educational approaches made possible by computers and recent insights into human thought processes, and about new educational goals needed to prepare students to function in a technological society. Computers should also be exploited as teaching tools in the actual education of teachers. This might not only improve the education of teachers, but also make them directly familiar with the educational applications of computers.

SELF ASSESSMENT EXERCISES 2

List five teaching capacities of computer.

4.0 CONCLUSION

In this Unit you ought to have learnt that computer use in schools has become widespread,

from primary schools through the university level and in some preschool programs; and that computers can be a powerful tool in a teacher‘s repertoire. Software has gradually improved in quality and variety and is now available for all subject areas and grade levels. The newer software permits a variety of student responses, with branching to appropriate levels of instruction based on the correctness of students ‘responses. Similarly, computers can greatly expand the types of instruction received by students; improve on current teaching modes, and free teachers to increase their personal attention to students. Computers have some unique teaching capabilities that can be practically exploited to achieve great educational effectiveness. They provide powerful intellectual tools for calculation, for the word processing involved in writing, for designing some technological artifacts or artistic creations. Computers can be used to design special learning environments that can significantly student leaning foster, even with the absence of any formal instruction. However, the education of teachers should make them adequately knowledgeable about the educational application of computers.

5.0 SUMMARY

The computer has the potential to become education‘s single most useful teaching and learning tool. There is no doubt that computers can greatly expand the types of instruction received by students; improve on current teaching modes, and free teachers to increase their personal attention to students. Effective learning is greatly fostered when students are actively and learn by doing. Computers also permit the design of learning environments that help students acquire mental models to deal with complex phenomena or devices. The capacity of computers notwithstanding, the education of teachers should make them adequately knowledgeable about the educational application of computers.

6.0 TUTOR-MARKED ASSIGNMENT

1. What will you consider to be the challenges posed by computer to the teaching and learning processes?

2. State three advantages of the use of computers in education

3. List and discuss three capacity of computers in education.

7.0 REFERENCES/FURTHER READINGS

Olatokun, W., Agbonlahor, R., Adeniran, S., and Olatunji, A. (2007). Computer Studies for Schools, Ibadan: HEBN Publish Plc.

Orimolade, J. S. (2004). *College Computer Science.*Lagos: Data Analysis and Processing Services

Roy D .P. (2005). *Educational Communication and Technology*. Retrieved on 29th September, 2010 from http://halshs.archives- ouvertes.fr/docs/00/19/05/47/PDF/A41_Pea_87b.pdf

UNIT 2 Mode of Computer Lesson Presentation

1.0 INTRODUCTION

There are three modes of computer lesson presentation; Computer could serve both as a tool, a tutor and a tutee. Each mode has its own purpose and application. The various modes were fully discussed to enable you know how computer could be used in teaching and learning. This discussion will also equip you with the knowledge that will enable you appreciate computer in its ramification.

2.0 LEARNING OUTCOMES

At the end of this unit, you should be able:

1. Identify the three modes of computer lesson presentation
2. Articulate the features and functions of each of the modes

3.0 MAIN CONTENT

3.1 Computer as tutor

The computer is one of the wonder of human ingenuity, even its original design in the 1950‘s carry out complicated mathematical and logical operation. With the invention of the micro computer (now also referred to PCs or personal computers), the PC has become the tool for programmed

instruction.

Educators saw much use of the PC. It has become affordable to small business, industries and homes. They saw its potential for individualization in learning, especially as individualized learning is a problem since teachers usually with a class of forty or more learners. They therefore decided strategies to use computer to break the barriers to individualized instruction.

> *It should be made clear , however, that the computer cannot totally replace the teacher since the teacher shall continue to play the major roles of information deliverer and learning environment controller.*

Computer-assisted instruction (CAI)

The computer can be a tutor, in effect relieving the teacher of many activities in his/her personal role as classroom tutor. It should be made clear, however, that the computer cannot totally replace the teacher since the teacher shall continue to play the major roles of information deliverer and learning environment controller. Even with the valuable computer and CAI software, the teacher must:

- ensure that students have the needed knowledge and skills for any computer activity.
- decide the appropriate learning activity
- plan the sequential and structured activities to achieve objectives.
- evaluate the student‘s achievement by ways of tests the specific expected outcomes.

On the other hand, the students in CAI play their own roles as learners as they:

- receive information
- understand instructions for the city mother activity.
- retain/keep in mind that information and rules for the computer activity.
- apply the knowledge and rules during the process of computer lading.

During the computer activity proper in CAI, the computer, too, plays its role as it:

- acts as a sort of tutor (the role traditional played by the teacher)
- provides a learning environment.
- delivers learning instruction.
- reinforces the learning through drill-and- practice.
- provides feedback.

Today, educators accept the fact that the computer has indeed succeeded in providing an individualized learning environment so difficult for a teacher handling whole class. This is so, since the computer is able to allow individual students to learn at their own pace, motivate learning through a challenging virtual learning environment, assist students through information needed during the learning process, evaluate student responses through immediate feedback during the learning process, and also give the total score to evaluate the student‘s total performance.

CAI Integrated with Lessons

The computer is a tutor in this new age of learning. It does not replace the teacher, although it assumes certain roles previously assigned to teachers who now has to take the new role of facilitator and guide.

CAI should not stop with the drill and practice activities of students. In effect, CAI works best in reinforcing learning through repetitive exercises such that students can practice skills or knowledge in various subject areas. Common types of drill and practice programs include vocabulary building, math facts, basic science, and history or geography facts. In these programs, the computer presents a question problem first and the student is asked to answer the question/problem immediately. Immediate feedback is given to the student‘s answer. After a number of practice problems and at the end of the exercise, the students get a summary of his overall performance.

The question arises: when and how should teachers integrate drill and practice programs with their

- Use drill and practice programs for basic skills and knowledge that require rapid or

automatic response by students (e.g. multiplication table, letter and word recognition, identification of geometric shapes, etc.).

- Ensure that drill and practice activities conform to the lesson plan/curriculum.
- Limit drill and practice to 20-30 minutes to avoid boredom.
- Use drill and practice to assist students with particular weakness in basic skills.

In integrating computer programs in instruction, use tutorial software associated with cognitive learning. While practice exercise or learning is still the heart of each tutorial, the tutorial software should:

- be able to teach new content/new information to students (in as much as CAI provides on old or already learned content)
- provide comprehensive information on concepts in addition to practice exercises.
- can effectively be used for remediation, reviewing, or enrichment.
- allow the teacher to introduce follow-up questions to stimulate student‘s learning.
- Permit group activity for cooperative learning.

Simulation Programs

Simulation software are constructivist in nature. These simulation software:

- teach strategies and rules that apply to real-life problems/situations.
- ask students to make decision on models or scenarios.
- allow students to manipulate elements of a model and get the experience of the effects of their decisions.

An example of such software is SimCity in which students are allowed to artificially manage a city given an imaginary city environment. Decision-making involves such factors as budget, crime, education, transportation, energy resources, waste disposal, and business/industries available. (Note: software may or may not be available in local computer shops. Still concept learning is helpful).

Instructional Games

While relating to low-level objectives (e.g. basic spelling or math skills), instructional games add the elements of competition and challenge.

An example is GeoSafari which introduces adventure activities for Geography History and Science. The program can be played up to four players to form teams. Learning ounces can be achieved along simple memorization of information, keyboarding skills cooperation and social interaction.

Problem Solving Software

These are more sophisticated than the drill and practice exercises and allow students to learn and improve on their problem solving ability. Since problems cannot be solved simply by memorizing facts, the students have to empty higher thinking skill such as logic, recognition, reflection, and strategy-making. ***The Thinking Things 1*** is an example of a problem solving software in which the team learners must help each other by observing, comparing.

Multimedia Encyclopedia and Electronic Books

The Multimedia Encyclopedia can store a huge database with texts, images, animation, audio and video. Students can access any desired information, search its vast contents, and even download/print relevant portions of the data for their composition or presentation. An eyewitness Children‘s Encyclopedia.

Electronic books provide textual information for reading, supplemented by other types of multimedia information (sounds, spoken words, pictures, animation). These are useful for learning reading, spelling and word skills. Examples are Just Grandma and Me animated books, storybook which offer surprises for the young learner‘s curiosity.

The computer is a tutor in this new age of learning. It does not replace the teacher, although it assumes certain roles previously assigned to teachers who now has to take the new role of facilitator and guide.

Computer activities are not also the end-all of learning since they have to confirm to the lessons/curriculum. Integrating computer exercises is the new task of the teacher who can find in

the computer and computer software an alternative medium to the traditional classroom practice of delivering information and supporting learning activities.

3.2 Computer as Tool

The second mode of computer application is as a tool according to Taylor. Tool application involves using computer as an instructional material. Computer as a tool performs tasks that should augment our performance as human. It is similar to the use of instructional tools like pen, pencil, slide rule, typewriter and others.

It equally involves the use of word processing computer program to type and edit papers. This mode of computer usage is widely used in schools today. Almost all the schools nowadays use computer in doing one thing or the other. Examples are working out students' results, typing examination questions and keeping records. As a tool, the computer takes the role of an assistant or a helper.

The computer can help the teacher or learner in performing routine tasks such as writing, calculating, filing or presenting information. In that case, the computer serves as a tool. Teachers may employ computers as labour saving devices to produce instructional materials and manage their instructions. Learners may also employ the computer to help with their school work. Examples of such use include word processors, graphics packages, presentation software spreadsheets and databases.

When computers are used as a tool in work places, they are often used to help the worker. For example, societies prepare document using word processors, business people store customers' records in database, accountants use spread sheets to calculate balance sheets, teachers use computers to teach in order to augment their lessons.

To function as a tool, the classroom computer need only have some useful capability programmed into it such as statistical analysis, super calculation, or word processing. Students can then use it to

help them in a variety of subjects. For example, they might use it as a calculator in mathematics and various science assignments, as a map-making tool in geography, as a facile, tireless performer in music, or as a text editor and copyist in English.

Because of their immediate and practical utility, many such tools have been developed for business, science, industry, government, and other application areas, such as higher education. Their use can pay off handsomely in saving time and preserving intellectual energy by transferring necessary but routine clerical tasks of a tedious, mechanical kind to the computer. For example, the burdensome process of producing hundreds or even thousands of employee paychecks can be largely transferred to the computer through the use of accounting software. The tedious recopying of edited manuscripts of texts or even music can be relegated to the computer through word or musical notation processing software. The laborious drawing of numerous intermediate frames for animated cartoons can be turned over to the computer through graphics software; or the fitting of a curve to experimental data can be done by the computer through statistical software.

To use the computer as tutor and tool can both improve and enrich classroom learning and requires neither student or teacher to learn much about computers. By the same measure, however, neither tutor nor tool mode confers upon the user much of the general educational benefit associated with using the computer in the third mode, as tutee.

SELF ASSESSMENT EXERCISE 1

1. List two ways computers can be used as tool.

3.3 Computer as Tutee

The third mode of computer usage is as tutee. Computer as a Tutee or a Learner means you can give it a set of instructions, commands and tasks to carry out. For example, in Microsoft Excel where teachers usually use it to input students' examination mark, it is troublesome to sort it out

manually. So, you can just simply create a program or instruction to sort a set of numbers where you teach the computer how to compare the value of the numbers and then sort them. Another example is the robots where you actually give it a set of instructions or behaviour in order to interact with different conditions. Computer as a Tutee indirectly will develop high critical thinking among learners. Using computers as learners enables the teachers to emphasize on solving important problems rather than boring rote learning. Also in teaching with the computer, the child learns more deeply and learns more about the process of learning than he or she does from being tutored by software written by others. It gradually changes the learning experience. Apart from that, computers make a good tutee because of its innocence, patience, rigidity and its capacity for being initialized and starting over from scratch.

Using computer as a tutee requires organization, logical thinking and problem-solving skills. Examples include; computer programming, hypermedia authoring and web page development. For you to teach the computer, you must learn how to write computer programs. To use the computer as tutee is to tutor the computer; for that, the student or teacher doing the tutoring must learn to program, to talk to the computer in a language it understands. The benefits are several. First, because you can‘t teach what you don‘t understand, the human tutor will learn what he or she is trying to teach the computer. Second, by trying to realize broad teaching goals through software constructed from the narrow capabilities of computer logic, the human tutor of the computer will learn something both about how computers work and how his or her own thinking works. Third, because no expensive predesigned tutor software is necessary, no time is lost searching for such software and no money spent acquiring it.

Learners gain new insights into their own thinking through learning to program, and teachers have their understanding of education enriched and broadened as they see how their students can benefit from treating the computer as a tutee. As a result, extended use of the computer as tutee can shift the focus of education in the classroom from end product to process, from acquiring facts to manipulating and understanding them.

As you try to write programs of your own, you will probably find yourself benefiting from teaching the computer to teach someone else. For example, to write a good drill or tutorial, you must consider each of the following questions:

1. What kinds of questions should you ask, and how can you formulate these questions clearly enough that the learner's focus will be exactly where you want it to be?
2. What is the correct answer, and how can you recognize its many variations?
3. What are the incorrect answers that could be given?
4. What feedback will you provide for both correct and incorrect answers?
5. What will you do after the learner gives the correct answer?
6. What sort of remediation will you provide if the answer is incorrect?
7. What can you do to enable the learner to have all the necessary information to make a response?
8. How long should be learner be allowed to continue, and who should terminate the learning session?
9. How should information regarding the learner's performance be stored (if at all), and to whom should this information be given?

These are questions that must be answered by both teachers who program, the computer and those who work without computers. However, when teachers program a computer to teach something, they learn how to teach more effectively.

SELF ASSESSMENT EXERCIES 2

1. What are the major advantages of the use of computer as tutee?

4.0 CONCLUSION

The application of computer in education involves three modes and each of the modes is important

for the smooth running of educational system. The use of computer is so important that there is no field of work or establishment that will not employ the services of the computer. The application requires a lot of organization, logical thinking and problem-solving skills. As a teacher, you need to make effective use of the computer in the teaching and learning processes; hence, you also need to be very familiar with these modes of computer usage in educational system.

5.0 SUMMARY

In this unit, you have actually learnt how computer could be used in our education system as tutor (teacher), as tool (assistant) and tutee (learner).

6.0 TUTOR-MARKED ASSIGNMENT

1. State the modes of using computer in our educational system
2. Outline the five levels that are involved in the application of computer as tutor.
3. List three ways computer could be used as a tool.
4. Who was the brain behind the modes of computer?

7.0 REFERENCES/FURTHER READING

Dent, C. (2001). The Computer as Tool: from Interaction to Augmentation. Downloaded on 18th Sept. 2010 from http://www.burningchrome.com.8000/vedent/slis/otherpapers.

Timothy J.N; Donald A.S.; James D.L. James D.R. (2006) Educational Technology for Teaching and Learning. Pearson Education Ltd.

UNIT 3

THE USE OF NETWORK AND INTERNET FOR INSTRUCTION

1.0 INTRODUCTION

The interconnectivity among various computers is described as networking. This arrangement provides scores of educational resources for your teaching and learning activities. The networks are of three folds-Local Area Network, Wide Area Network and International Network (Internet). In this Unit, you will learn about the use of networks in teaching and learning. You will equally be exposed to some terminologies related to Networks and Internet.

2.0 LEARNING OUTCOMES

At the end of this unit you will be able to:

1. Identify types of Network and how they could be used in teaching and learning.
2. Define terminologies related to Internet.

3.0 MAIN CONTENT

3.1 Networks

Network is the system of connecting two or more computers together. As a result of this connection, stand-alone computers (computers with full resources like input unit, processor and output units) can share resources and files with each other. It affords the possibility of communicating with each other. Connections are made in two ways- Local Area Network (LAN) or Wide Area Network (WAN).

Local Area Network: A local Area Network is the system of connecting hardware, software and communication channels (cables and accessories that connect equipment together) in a close range such as in building. The Local Area Network allows the movement of data between mainframe computers and personal computers. Personal computers can be connected to one another or to mainframe computer in order to share resources such as printers and files. The distance between devices in a LAN system may be few meters if in a building or some more considerable meters if in the same city. With this system, telephone lines are not used for linking of computers, rather communication channels such as cables are used.

Wide Area Network: Wide Area Networks are more sophisticated compared with LAN. With Wide Area Networks, it is possible to have a system of interconnection of mainframe, microcomputers and other peripheral devices. Connection from several buildings is possible. More than this, equipment can be located in different towns, countries and even continents. The use of telephone line and wireless radio communication equipment are employed in transfer of instructions, sending and retrieval of data it is impossible to transfer data directly through radio or telephone line, modems (Modular Demodulator) are used to achieve this. A modem is placed at the end of the telephone line before it is linked with the computer. When sending out data, it is changed to telephone readable form by the modem at the sending end and changed back to computer readable from by the modem at the receiving side before going to computer.

Self Assessment Exercises 1

1. What do you understand by the word LAN and WAN?

3.2 INTERNET

The internet (also called International network) is a global collection of many different types of computers and computer networks that are linked together. It can also be called a network connection of many computer network based on a common addressing system

and communications protocol called TCP/IP (Transmission Control Protocol/Internet Protocol). Just as a telephone enables you talk to someone on the other side of earth who also has a phone, the internet enable a person to exchange information with another computers and computer user anywhere in the world. Some call it the internet superhighway. As a road allows travel through different parts of a country, so the internet allows information to travel through different interconnected computer network.

Origin and design of internet

The idea of the internet began as an experiment by the United State of America (USA) Department of Defense on the 1960‘s with the primary goal of helping scientist and researchers from widely dispersed (remote) areas to work together by sharing scarce and expensive computers and their files. This need for Internet arose when it became apparent that there was a need for a bomb proof communications system during the cold war of the mid 60‘s. A concept was designed to link computers together throughout the US with such a system in place, large sections of the country are reached and massages could still got through.

The internet was actually an emergency communications system operation by the military department of defense‘s Advanced Research Project Agency (ARPA). The whole operation was referred to as ARPANET. In time ARPANET computers were installed at every university in the U.S. that had defense related funding. Gradually, the Internet had gone from a military pipe-line to a communication tool for scientists.

As more scholars came online, the administration of the system was transferred from ARPA to the National Science Foundation. Years later, business began using the Internet and the administrative responsibilities were once again transferred. At this time on one party operates the internet there are several. Today the internet has turned the whole world into a global village as far as information in all aspect of human endeavour is concerned.

Internet offers a collection of information of information with topic ranging from business to science and technology. It also possesses materials on arts and research material for students, entertainment, sports, shopping, dictionaries, encyclopaedias, and maps. In addition, it offers other services and resources as stated below.

Some Important Internet Languages

Modem: A modem is a small device connected to a computer of installed inside it, which converts the digital signals from your computer into a form that can be sent down a telephone line.

Internet service provider (ISP)- An ISP is a company that sells you a connection to the internet.

www- World Wide Web. The World Wide Web or the web makes looking round the internet easy. The web consists of screens, each screen is called a page, each page contains words, pictures, sometimes animation, and all kinds of sound and music.

Web Browser- This is the software programme that allows you have access to the world wide web. It displays web pages on the computer screen and allows you to follow hot links, download information etc. Examples of web browsers are: Microsoft internet explorer (part of Microsoft windows). Netscape navigator (part of netscape communicator suite of programmes), opera, neoplanet, and Firefox-Mozilla.

URL- The address of a website is what is referred to as URL (Uniform Resource Locator). Example of a ULR.\ is http://www.clipart.com

SPAM- This is an unsolicited commercial e-mail found in your mail box.

LINK- This is a word or phrase emphasized in a hypertext document that acts as a pointer to related information. Links in a web browser are usually underlined and are in different colours from the rest of the text.

Search Tools- Two main search tools are used in the internet. They are Search Engines and Directories. Though they perform the same operation, they are created differently.

Search Engines- The search engines is a lot of index of millions of web pages and their addresses. A programme called robot, spider or crawler visits every link on a web site, copies the text of the page to its index together with address details. This process is done frequently to update the index. When a user keys in a request, the engine list pages that match the request. Examples of search engines are: Google (developed by Stanford University), Excite, AltaVista, KotBot and Lycos.

Directories- A directory search for information like search engine. The difference between it and search engine is that a directory is manually compiled, whereas the search engine index is created by computer. If a web designer submits the details of web page to be included in a directory, a short description will be added. This is reviewed by human editor and examines the web sites. If seen suitable, the details of the web site will be included in the directory. Known directories are yahoo and LookSmart.

HTML- Hypertext Markup Language is the language in which the computerized instructions behind the things you see on the web are written.

ICON-it is a small abstract graph representation of an objective or idea.

http: Hypertext Transfer Protocol. This is the protocol or set of rules used by web servers. Another popular protocol is ftp or File Transfer Protocol.

Internet offers a collection of information with topics ranging from business to science and technology. It also possesses material on arts and research material for students, entertainment, sports, shopping, dictionaries, encyclopedias, and maps. In addition, it offers other services and resources.

E-mail (Electronic Mail)- E-mail is a common resources provided by internet. It is a worldwide system for sending and receiving messages through electronic system. E- mail is like the way you send a written latter to somebody you know through the post-office system. It is a system where a mail is sent through the computer network. As soon as you send this electronic letter, it travels from your computer, usually through a device called a modem, which connects your computer to internet via the telephone network. Unlike the regular mail system, e-mail may reach its destination, even on other countries and continents in minute or less except some part of the network is congested or out of order. The speed of e-mail and the world makes it a popular form of communication.

It is inexpensive but convenient to send mail through e-mail. All that will require is the normal charge for using the system if one uses the cybercafé or the normal charge for someone who is connected to the internet. It also gives the opportunity to send multiple copies to several people. E-mail has the following advantage. It is not necessary to pay for packing and posting as the case with the postal system. All one needed to do is to pay the telephone charges if using personal system or pay for time in a cybercafé. There are different rate for different distances in the postal system but whatever the distance in an internet system, the charge remain the same. Another benefit of e-mail is that, it is possible to send several copies of a particular document to several recipients without using envelops and addresses. It is also possible to have only a display of a message on screen without printing a hard copy of it. This saves time and money. However, a printed copy may be required sometimes. Lastly, a user can design a text to his taste by using desired fonts when using Outlook Express. It is also possible to add graphics in such a situation.

Research- the internet is provided with special tools that assist in searching for information. Users can make research on the following: companies producing a product, information for projects, excerpts from journals etc.

Business connection- Business connections can now be done with anyone or any company in any part of the world through the use of internet, contact such and then proceed to make arrangement for order and payment.

Registration and checking of results- Most examination bodies now make their candidates to register through the completion of forms on the internet, Results after examination can also be checked on the Internet. Example is West African Examination Council (WAEC), National Examination Council (NECO) and Joint Admission and Matriculations Council (JAMB).

Education- Several learning material are available on the internet. Some software companies offer training on their products via the internet. Likewise, some educational institutions are doing the same.

Learning also takes place via the Internet using various devices like the Computer and Android phones. Before the COVID-19 Pandemic, the National Open University of Nigeria had commenced the use of the ZOOM App to lecture students at scheduled times in the conveniences of their houses and offices, some even take their lectures while on transit. This gave the university an edge over all other institutions during the popular lockdown by our government to prevent the spread of the deadly virus. This is because while the other university students where idling away the time, the NOUN students were busy taking lectures and as such there was no need to extend the semester unnecessarily.

The COVID-19 Pandemic however, brought the method of teaching via the Internet to the limelight because several other individuals, organisations and institutions were forced to adopt the same approach of E-Learning. This time various other media of E-Learning instructions were adopted. Some of these media includes;

1. WhatsApp,
2. Telegram
3. Moodle
4. Edmodo

5. Microsoft team
6. Google Classroom
7. ClassDojo
8. Zoom
9. Udemy
10. Educreations
11. Kahoot
12. Evernote
13. ItunesU
14. Khan Academy
15. Coursera
16. Lynda
17. Education City
18. Go Noodle
19. Educadium
20. Ruzuku

And a host of others.

Advertising- Organisation advertises their products on the internet. This can be done by having a web-site. Prospective customers can visit the site to view the product.

Online transmission of programmes- the invention of internet has made it possible to watch entertainment and religious programmes live.

Benefits of the internet:

1. You can create a website on the internet for yourself or your business.
2. You can search for information on any topic dealing with humanity and nature.
3. You can carry out research project.

4. You can apply for admission, scholarship or employment with any institution that is hooked to the internet in any part of the world.
5. You can carry out business transactions with any company that is hooked to the internet. You can also advertise your business.
6. You can choose or make friends from any part of the world.
7. You can play games, watch latest films and musical videos.
8. You can read current news on the internet from international media organization
9. You can send and receive e-mail text messages
10. You can have live chat and take part in discussion group with any body/group in any part of the world.

Similarly, Internet can play an important role in education. As it is an enormous information base, it can be harnessed for the retrieval of information on a wide variety of subjects. The Internet can be used to refer to information on various subjects to be taught to the students. Moreover, computers facilitate an electronic format for storage of information, thereby saving paper. Homework and test assignments submitted as soft copies save paper. Electronically erasable memory devices can be used repeatedly. They offer a robust storage of data and reliable data retrieval. The computer technology thus eases the process of learning.

As there are advantages in using the INTERNET, so also are a number of disadvantages in using it. The advantages in using the Internet definitely outweigh the disadvantages. Here are some disadvantages inherent in the use of the INTERNET.

1. On the INTERNET, you can access and download data and program files from a remote computer. The files so copied, if infested with computer viruses may destroy what you have on your computer. Ensure that you have anti-virus software installed on your computer before you attempt to download program and data files from the Internet onto your system.

2. A lot of unwholesome things exist on the INTERNET. The availability of computer phonographic materials on the INTERNET is one of the unwholesome things.

3. Once a user understands how to surf the INTERNET efficiently, it becomes an addictive activity and once it becomes addictive, other activities of the user will start to suffer.

4. Your privacy could be infringed on as an INTERNET user. An unauthorized person for example, could read your mail.

SELF ASSESSMENT EXERCISES 2

1. What do you understand by Internet?
2. List four advantages and disadvantages of Internet.

4.0 CONCLUSION

In this Unit, you ought to have learnt that network can be used for teaching and learning due to the provision of abundant educational resources that can be shared among the users. The network can be in form of LAN, WAN and Internet. You were also exposed to the advantages and disadvantages of Internet. The benefits of the Internet were also discussed.

5.0 SUMMARY

To be able to use network for teaching and learning, you need the knowledge of LAN, WAN and that of Internet. More so, benefits of Internet as well as advantages and disadvantages of internet will go a long way to assist you in the process of teaching and learning. However, the next Unit presents information on issues on computer usage in education.

6.0 TUTOR-MARKED ASSIGNMENT

1. How do you think network could promote the teaching and learning processes?
2. What are the benefits derivable from the use internet in the teaching and learning processes?

7.0 REFERENCES/FURTHER READINGS

Eke, A. (2006). *Welcome to Computer Science*. Los Angeles: Acena Publishers

Eyitayo, A. O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studies for Beginners 1*, Ibadan: Bounty Press Limited

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Roy D .P. (2005). *Educational Communication and Technology*. Retrieved on 29th September, 2010 from http://halshs.archives- ouvertes.fr/docs/00/19/05/47/PDF/A41_Pea_87b.pdf

Smith, H. (2000). Internet provision of enrichment opportunities to school and home. *Australian Educational Computing, 15 (2),* 20-5.

UNIT 4 ISSUES IN COMPUTER USAGE IN EDUCATION

1.0 INTRODUCTION

A life without computers would seem almost unimaginable for many. The importance of computers is evident today. Knowledge of computer would also enhance progress in one's profession and job. Today, computers are a part of almost every industry. They are no more limited to the software industry. They are widely used in networking, information access, data storage and the processing of information. Introducing computers in education lays the foundation of most of the major competitive careers. However, there are issues that users of computers in education must be at home with. These issues include computer crime and virus as well as packages for instructional presentation. Therefore, this Unit aimed at acquainting you with this knowledge.

2.0 LEARNING OUTCOMES

At the end of this unit, you will be able to

1. Articulate issues in computer usage in education.
2. Identify packages that could be used in instructional presentation

3.0 MAIN CONTENT

3.1 Computer crime and Virus

Computer crime includes all activities in which a computer is used in a criminal act. Such crimes include information destruction, theft of service, theft of information, physical destruction,

alternation of data, theft of money, and software piracy.

As the number of people who use computers increases, the probability of computers being used for criminal purposes increases. As far as can be determined, computer crime is relatively limited, although experts indicate that reported computer crime is relatively limited, although experts indicate that reported computer crime represents only a small percentage of total computer crime. Even though perpetrators are generally authorized insiders who take advantage of the system, unauthorized individuals who gain entrance to computer systems have also created damage.

SELF ASSESSMENT EXERCISES 1

1. What are the common crimes in the use of computer?

3.2 Packages for Instructional Presentation

By looking into the workplace now, we can see the need for skilled labour capable of using technology on the job. Many of our students will use technology in occupations that will require little or no training, such as using scanners in supermarkets. Other students will need to know how to use word processors to meet employer needs.

Database management software is used by financial, management, and engineering personnel to solve problems generated on the job. If the students have an understanding of what this software can accomplish and how its application can save time, energy, and money, they will be able to make greater contributions to productivity more quickly than their predecessors could.

We are in a transition period in which educators can choose to ignore or to embrace the responsibility of teaching with and about technological tools, tools that can be used to increase personal and nationals 'productivity. If the decision is to take up this responsibility; if it

is appropriate to infuse technology into our classrooms, we have another issue to confront: Do we teach computer literacy only as an independent subject, or do we expect students to learn how to use computer applications as learning tools across the curriculum?

Many educators believe that if we consider computer use in the same way that we think of reading and writing, we will create a population that is more computer literate. By teaching the computer and other technological tools as part of our normal curricula and then asking students to use these tools to complete educational activities, we develop students who are better prepared to use technology in later life. Just as we teach them how to use a computer.

Because the computer has such a wide variety of educational uses, the process of learning how to use the computer as learning and problem-solving tool takes a number of years. Educators and researchers are still learning how and when this can best be done, but there is no doubt that it is necessary.

There are some packages that are commonly use in the presentation of educational instruction, these include Microsoft Word, Microsoft excel and Microsoft Power Point.

Word Processing is the art of using Computer to type, edit either a memo, letter and to document words in a most presentable and neat form into appropriate file which can be printed at any time there is the need for it. Some of the advantages of word processors are-

1. The use of Computer allows for neat job.
2. It makes typing pleasurable.
3. There is room for corrections such that does not leave any scar on the document.
4. With the use of computer, text could be formatted to suit the user‘s taste.
5. It allows Mail merging operation thereby relieving the secretary of the problem of having to type a particular document a number of times.

6. It allows the production of as many copies of the document as the owner will need and each appears as the original.
7. It has the capability of storing text for as long as it will be needed.
8. Document can be enhanced with graphics (pictures).

Microsoft Excel is a powerful electronic worksheet program for entering data, organizing data, calculating data, analyzing data and reporting financial and other documentary data. It has five main features:

1. Worksheets for entering, analyzing, and calculating data.
2. Charts for representing data graphically.
3. Databases for managing large amounts of information.
4. Macros for automating tastes and customizing Microsoft Excel.
5. Advanced formatting and Graphics for creating printed and outline reports.

A worksheet is a document that can turn disorganized information into well ordered data. Data is organized into lettered columns and numbered rows forming a grid of cells. You can enter all kinds of dates and times. You can move and copy cells on worksheet by dragging them with mouse.

Microsoft PowerPoint is an application software or package that creates presentations of different kinds, and can also animate a presentation created. It comes in different versions therefore their operations differ from one another slightly. Creating a new presentation can be done in several ways.

1. By working with the Auto content wizard- This will give a set of suggested contents and designs that can be chosen from.
2. By working with existing presentation- This is a system whereby a set of suggested existing presentations are given to be selected from, and then modified to one‘s taste.
3. By working with the template- This will give a set of suggested designs without the contents.
4. By working with a blank presentation- This has no suggested designs nor are contents,

therefore presentations created beginning with a blank background on the hard disk.

SELF ASSESSMENT EXERCIES 2

1. List three packages that can be used for instructional presentation

4.0 CONCLUSION

There are issues that users of computers in education must be at home with. These issues include computer crime and virus as well as packages for instructional presentation. Therefore, from this unit you have been exposed to some of these issues as well as packages that can assist you in the presentation of your instructions in the classroom.

5.0 SUMMARY

The knowledge of computer crimes and virus will not only assist you on how to use computer in teaching and learning processes, but also inform you on how to combat the menace. The information on the packages for the instruction will equally equip you with varieties of presentation modes of your instructions.

6.0 TUTOR-MARKED ASSIGNMENT

1. What effect do you think that computer crime will have on the use of computer in education?
2. In what ways do you think computer virus could influence the use of computer for teaching and learning?
3. What are the uses of PowerPoint presentation in education?

7.0 REFERENCES/FURTHER READINGS

Eke, A. (2006). *Welcome to Computer Science*. Los Angeles: Acena Publishers

Eyitayo, A. O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studiesfor Beginners 1*, Ibadan: Bounty Press Limited

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Roy D .P. (2005). *Educational Communication and Technology*. Retrieved on 29th September, 2010 from http://halshs.archives- ouvertes.fr/docs/00/19/05/47/PDF/A41_Pea_87b.pdf

MODULE 4
COMPUTER BASED INSTRUCTIONS

Unit 1 Developing Computer Science Scheme of Work for Secondary School Education
Unit 2 Lesson Notes for Science/Information Technology

UNIT 1 COMPUTER SCIENCE SCHEME OF WORK IN SECONDARY EDUCATION

1.0 INTRODUCTION

The translation of the school curriculum into action is the sole responsibility of the classroom teacher. The computer science teacher needs to plan on how to implement the computer science curriculum at the secondary education level. At the planning stage, the computer science teacher needs to prepare and arrange his work in accordance with the time to execute such work. The development of computer scheme of work in secondary education level requires the teacher to understand the processes involved. Therefore, this unit will expose you to the required skills needed for developing the scheme of work

2.0 LEARNING OUTCOMES

By the time you complete this unit, you should be able to

- State and explain the importance of scheme work
- Outline the processes involved to developing computer science scheme of work.
- Develop a two weeks computer science scheme of work.

3.0 MAIN CONTENTS

3.1 Importance of Scheme of Work

1. What is a scheme of work?

A scheme of work is a document which summarises the content of a course of instruction, and which divides the course content into manageable portions for logical and organised teaching and assessment. Syllabus documentation may not always be arranged into a sequence which provides well for incremental learning, for a journey through the course materials in a way which makes sense to the teacher and the learners alike; part of the function of the scheme of work is to provide this structure. The scheme of work will also consider formative and summative assessment, and will build in appropriate time into the course design for related elements such as revision before final examination-based assessments.

Any scheme of work will need to take into consideration external limiting factors. For most courses, these will include the length of the course, the number of sessions per week, the length of those sessions, and calendar-related aspects such as timings of vacation periods and of examination and other fixed assessment dates. The challenge to the teacher in writing a scheme of work is to meaningfully and logically break down the curriculum content into an ordered sequence which will satisfy the logistical parameters into which the teaching is being delivered while offering the best learning experience to those studying the course being offered.

A scheme of work for an entire course, particularly a programme of study which extends over two or more academic years, may be a departmental endeavour; either colleagues will collaborate in producing a single document, or the workload will be subdivided, with individuals being responsible for their teaching portion. To some extent a scheme of work is a personal document, as it will inevitably reflect the approach and teaching style of the individual educator. In addition, those new to teaching may find more experienced colleagues' schemes of work somewhat less

detailed, as there is a tendency to internalise aspects of one's teaching and planning style over time (Capel, Leask, & Younie, 2016). A good scheme of work should operate on several levels at the same time: as a guide to the teacher to the sequence of lessons for a particular course; as an expression to the teacher and others of confidence in understanding and interpreting the curriculum from which the scheme of work has been derived; and as a commitment to the aims and objectives contained within the scheme of work and the relevant curriculum documentation (Musingafi et al, 2015).

2. What must a scheme of work include?

Much like lesson plans, as discussed in the previous chapter, many institutions will have a standard scheme of work template which they expect their teaching staff to use. There is much sense in adopting such standardised formats because their familiarity makes them straightforward to complete when compared to bespoke offerings. Of the list below, sections 1 and 2 might be in a general information section on the first page, with sections 3 to 9 inclusive being presented in a session-by-session table format for ease of reference. The final point - section 10 - might be incorporated into a footer.

1. **General course information.** This opening section would contain items such as the title of the course, the level (and/or the awarding body if the course is certificated). This section might also usefully include the length of the course in weeks, the teaching location, the length of each class, plus any pertinent knowledge about the class being taught.

2. **Aims, objectives, learning outcomes.** Course-wide aims and objectives can be usefully summarised and/or referenced back to the syllabus guidance documentation. Where aims and objectives refer to specific elements of the course, then this can be noted too, so that it is clear which objective is being addressed in which sessions.

3. **Course content.** The course content should be broken down into individual sessions. It is sensible to identify the sessions, either by week number, date of teaching or session number. It is useful to make reference here back to the syllabus

documentation, so that it is clear where the scheme of work

links to the course requirements.

4. **Learner activity.** If the course content section itemises what the learners are being exposed to, and now it related to the wider syllabus, then this section indicates what the learners are doing activity-wise to demonstrate their engagement with that learning.

5. **Teaching and learning methods.** Though the bulk of the detail will be in the itemised running order element of the lesson plan, an indication of the principal teaching and learning method/s being used in each session is useful. This is in part so that the scheme of work informs lesson plan writing, and so that the teacher can both vary the approaches being taken to the topic area under investigation in that week, and can also work to provide diverse and non-repetitive experiences for the learners.

6. **Assessment methods.** As with teaching and learning above, though the detail is in the lesson plan, a word or two on the key assessment tools being used in each session is useful at the scheme of work level of planning. Where there is an end-of-course assessment being worked towards, there should be an element of logical and progressive working towards those summative assessments evident from the scheme of work.

7. **Homework/set texts.** Where key reading is associated with a particular session's work, or where homework is set either in preparation for or as a subsequent activity to a develop the learning from a particular lesson, this should be indicated.

8. **Resources.** Where key, specific or perhaps even unusual resources are being employed in a particular session, note these on the scheme of work. This acts as an aide-memoire, as well as a note to others that there is a special resource requirement for this session.

9. **Contextual learning opportunities.** Where there are session connections to wider learning prospects, then these should be noted. Again, this provides a handy summary of the diversity of opportunities available in the scheme of work, and it also

indicates how carefully the course has been planned.

10. Date of last revision. While core content may not change much over several years in a given teaching area at a particular level, curriculum guidelines and awarding body protocols are subject to frequent change. It is perhaps useful to indicate in the document itself when it was last updated.

The level of detail for each element may be mandated by the learning provider; in this case, is it wise to follow the institutional guidelines on detail. Where there is latitude given on detail, it may be wise, particularly for those relatively new to education, to err on the side of caution and make the scheme of work as detailed as they can. The detail will feed directly into lesson planning, so this is not extra effort so much as bringing work forward slightly in time.

3. Why do we use schemes of work?

One reason why we use schemes of work is that they organise learning more effectively than syllabus content alone might indicate. Subject areas, or elements of wider topic areas, may not fall neatly into a single lesson-length. Some topics may require input over several individual lessons. Links between topics may need to be considered, as do the ways in which learning may need to be stepped up from foundational principles towards more-involved or detailed knowledge and understanding. The scheme of work allows a teacher to tailor the content specified by the syllabus to their strengths as educators, and perhaps also to the particular class groups being taught. A teacher is not merely a deliverer of educational content; it is within the role of the teacher to mould, shape, select and sequence the learning which they are providing, and the scheme of work provides a means of doing this.

A useful gift to learners at the beginning of any course is access to a copy of the scheme of work. This does not need to be the whole document; often a simple week-by-week breakdown of the topic areas under investigation is sufficient. However, this gives learners a roadmap to what they are to cover from the outset of the course, and can be referred back to later in the course so that learners

might appreciate the distance that they have travelled in the subject area during this particular course. Though there may be a focus in the scheme of work, and in learners' minds also, of the subject-specific content of the course, there is a balance to be drawn between subject skills and knowledge, and the embedding of other skills. A well-conceived scheme of work will be able to provoke learners to address a variety of relevant wider learning -related approaches, as well as the intellectual skills which might support them, at an appropriate level and complexity of engagement. Though a scheme of work is an outline of an entire course, that does not mean that it is meant to be wholly prescriptive and inflexible in terms of its operation. A scheme of work is a living document, and session order for example, can be altered mid-presentation if a revised version better fits with the learning styles prevalent with a particular class, or if unmissable new opportunities become available. It may be prudent to build sufficient leeway into the course at the scheme of work level to be able to incorporate moving sessions around, or substituting one topic due to be taught later in the course presentation for another, if circumstances make this a better option for the learners. A scheme does not have to be a one-document-fits-all classes piece of planning.

4. How does a scheme of work fit into a wider learning process?

As has been noted above, the scheme of work is derived from curriculum or syllabus documentation, and interprets it for the allied purposes of teaching and learning. A significant aspect of the function of the scheme of work is to organise and analyse the syllabus content, subdividing it into manageable chunks for session-by-session tuition. Lesson plans may then be written, taking this breakdown of session content into consideration.

As with planning at the level of the individual lesson, the scheme of work should provoke feedback. The scheme of work is open to revision, not merely from presentation to presentation, but within and during the course also. Many reassessments will perhaps be relatively minor in nature, making shifts in emphasis or reallocating time to topic areas requiring more input than others, for example. Some, though, may need more substantial revision - these kinds of changes might be triggered by a change in teaching personnel, the use of different classrooms with different resources available, and updates to curriculum paperwork. The bulk of these will occur between presentations, and will

usually be subject to a long lead time in respect of notice to make updates.

There is perhaps a temptation to consider devising and compiling a scheme of work as a subject and topic-oriented exercise, but it is just as important to think about how the subject will be delivered, and not to focus exclusively on the content and sequencing of each lesson within the broader planning document (Haynes, 2007). There is value also in considering the contexts in which learning takes place. Such considerations might include class composition, school-wide contexts, locally- available resources, the industrial and business networks in the area, and the geographic locality.

The scheme of work is a central planning tool, and the key mechanism by which a teacher organises and prepares for teaching and learning at the whole-course level. The scheme of work also demonstrates and evidences to oneself and others a thorough understanding of the syllabus aims and objectives, and from that, the approaches to teaching and learning which will be adopted throughout the delivery

1. The importance/usefulness of the scheme of work is strongly tied to purpose it serves and this include: It can be used as a guide to know what is to be covered within a given period
2. The scheme of work helps you to select appropriate instructional materials that may facilitate effective teaching and learning of a given topic and when a particular topic is to be taught.
3. There is continuity in the students'learning. This is because each topic leans on the learning of previous ones.
4. The topic outline/objectives in the scheme will help you to evaluate the students.
5. Headteachers, principals and school supervisors can use it to determine the extent of topic coverage in a class by the teacher.
6. If there is a change of subject teacher, the scheme of work enables the succeeding teacher to know exactly where his/her predecessor has covered and where to start from.

Schemes of Work are used widely in school as planning tools. The exact design of the schemes can

vary, but most seem to capture key information about the subject and how it will be delivered. Whatever the design, it is better to adopt a standardised, but flexible, template. They should not be seen as rigid modes of delivery that restrict creativity.

SELF ASSESSMENT EXERCISES 1

State five importance of the scheme of work.

3.2 Developing Scheme of Work in Secondary Education Computer Science

The syllabus/curriculum indicates the content or main topics to be taught but do not specify in most gases the sub-topic or give details of the works to be covered by the teacher. The computer science teacher is therefore expected to use the curriculum in working out a detailed plan showing what he/she will teach or cover each week of the term. a scheme of work is seen by many authors as:

1. Units or list of sub-topics drawn from major/broad topics in the syllabus/curriculum.
2. A detailed outline showing the topics the teacher intends to cover in a particular order. These detailed outlines are usually drawn from the syllabus and it contains the assessment or evaluation of the student as well as teaching resources.
3. The listing of a series of topic to be taught in the classroom within a term and the order in which they are to be taught.

The contents of computer science at the secondary school levels arrange in a hierarchical order with lower concept learning to the understanding of the higher one.

The computer science teacher is therefore, expected to present his/her lesson in a logical sequence according to a well structured timetable and this should be belief into the scheme of work. The scheme of work should clearly show; the objectives of each topic, instructional materials or teaching resources, teaching method/technologies, and evaluation guide students‘ activities.

The scheme of work, therefore, is a guide for teachers teaching a subject. It is a proposed statement of activities the teacher has tabulated and is to be accomplished within a specified period of time. The

teacher has the right to change, supplement and vary the content of the scheme according to the needs and abilities of their students. New innovations in the subject by the teacher are welcome and should be sue in modifying the scheme of work.

The importance/usefulness of the scheme of work is strongly tied to purpose it serves and they include:

1. The teacher use it as a guide to know what he/she is expected to cover within a given period.
2. The schemes of work help the teacher to select appropriate instructional materials that may facilitate effective teaching and learning of a given topic and when a particular topic is to be taught.
3. There is continuity in what the topic lean on the learning of previous ones.
4. The topic outline/objectives in the scheme will help the teacher to evaluate his/her student.
5. Head teachers, principals and school supervisors used it to determine the extent of topic coverage in a class.
6. If there is a change of subject teacher, the scheme of work enables the succeeding teacher to know exactly where his/her predecessor has covered and were to start from.

Similarly, the following steps are necessary when developing scheme of work.

Step I: Undertake a careful study of the prescribed computer science syllabus/curriculum.

Step II: List out the broad topics in the syllabus/curriculum

Step III: Develop your sub-topics from the broad topics

Step IV: Allocate periods to the topics depending on the length of the term and the time allocated to the subject

Step V: Adjust or modify the period in which certain topics are to be taught so as to enhance efficiency.

Step VI: Sequence of the topics should be from simple to complex, known-to unknown, concrete idea-to-abstract one.

Step VII: Each topic should have evaluation guide.

4.0 CONCLUSION

In the unit, the concept of scheme of work has been discussed. The students have been exposed to how to develop computer science scheme of work. For Secondary Education Teachers of Computer Science should get hold of the curriculum for each year of secondary school and study it properly. It is only a teacher who it knowledgeable about the curriculum that will produce a valid scheme of work.

5.0 SUMMARY

The scheme of work is obtainable from the National Curriculum. The scheme of work provides supporting information about planning and teaching the subjects and form important documentary evidence about course delivery. Moreover, schemes of Work are also extremely flexible teaching guides that can be molded to take account of local teaching needs and resources. However, from the scheme of the lesson note could be prepared. The next Unit centred on the lesson plan.

6.0 TUTOR-MARKED ASSIGNMENT

(1) Outline the steps involve in develop scheme of work

(2) Why is scheme of work necessary to you as a computer science teacher?

7.0 REFERENCE/FURTHER READINGS

Capel, S. A., Leask, M. and Younie, S. (eds) (2016) Learning to teach in the secondary school:

A Co

Dent, C. (2001). The Computer as Tool: from Interaction to Augmentation. Downloaded on 18th Sept. 2010 from http://www.burningchrome.com.8000/vedent/slis/otherpapers.

Haynes, A. (2007) *100 ideas for lesson planning*. London: Continuum International Publishing.

Musingafi, M.C.C; Mhute, I; Zebron, S; & Kaseke K.E (2015). Planning to Teach: Interrogating The Link among the Curricula, the Syllabi, Schemes and Lesson Plans in the Teaching Process. Journal of Education and Practice 6 (9), 54-59.

Timothy J.N; Donald A.S.; James D.L. James D.R. (2006) Educational Technology for Teaching and Learning. Pearson Education Ltd.

UNIT 2 LESSON NOTE FOR COMPUTER BASED INSTRUCTION

1.0 INTRODUCTION

Planning in Education is an essential and necessary panacea for successful implementation of school policies/activities one of such activity that needs to be thoroughly planned is instruction. The content of this instruction is always mapped out in the curriculum and categorized into years. The curriculum planners are directly in- charge of these mapping into years. Once the curriculum has been developed and handed over to schools, the teachers' first task is to break it into scheme of work. The next thing you do as a teacher is to organize the contents into teaching unit(s) which are handling termly, weekly or daily. In organizing the content, you are expected to determine the number of terms in an academic year, number of weeks in an academic term and lesson periods allotted to computer science in the school per week. The computer science teacher is therefore, expected to understand the meaning of termly plan, unit plan, weekly and daily plan. The computer science/information and technology lesson cannot be properly written without adequate planning. This Unit provides you with required knowledge that you need to be able to write your computer science/information technology lesson notes.

2.0 LEARNING OUTCOMES

By the time you completed this unit, you will be able to

1. Explain the meaning of unit, weekly and daily plan
2. State the features of computer science lesson plan

3. Describe the standard format for writing computer science/information technology lesson notes.

3.0 MAIN CONTENTS

3.1 Unit lesson plan

The role of a computer science teacher is not, different from that of other subject teachers. Generally, the teacher is seen as a leader in the class, and a role model to the students. He should have purpose, direction good grasp of the topic he/she intend to teach, as well as sound understanding of his/her students. When the teacher display these characteristics with a well planned and delivered lesson, he/she attracts the students' attention, love and respect.

Computer science is one of the subjects that were recently integrated into the secondary educations curriculum in Nigeria. It is one of the subject whose aim is to give the student life long skill and it is activity-based as well as students/learners- centred. The teacher can only accomplish through planning. Planning helps the teacher to break down the content of his teaching to manageable size. The sequence of thought, activities and content development of topic are well organized.

You are to prepare the unit lesson plan in computer science for a number of lessons to cover a particular topic or set of ideas that are related. The major aim of unit plan is to put the daily lesson into broader perspective. It enables you to have a deeper understanding/analysis of the content to be taught. For instance, the learning unit in the secondary school curriculum –Introduction to computer, cannot be taught effectively in two lessons.

The following consideration should guide the writing of unit lesion plan

(i) Importance of the unit, objectives of the unit, Students interest, and keys to future progress

(ii) Central idea and unifying concepts around which activities may be organized, emphasis

of certain concepts and subdivision of allocated time.

(iii) Appropriate teaching strategies, students' first contact with idea, students ability to develop ideas by themselves, are availability of resources to enhance unit understanding.

(iv) Previous concept, skills or experiences needed for the unit, modification of content to accommodate various students, remediation and enrichment techniques and further activity for the bright students.

(v) Difficult areas that require special attention, and lesson that require practical work

(vi) Required teaching materials/resources

(vii) Suitable assessment techniques

(viii) Students learning independently or cooperatively

The above considerations are very important for unit lesson planning.

Elements of unit lesson plan. A unit plan should contain the following elements:

(i) Statement of the objectives

(ii) Description of the skills and the prerequisite knowledge of the students.

(iii) Content outline to be taught, the basic skills and important ideas selected for mastery,

(iv) Selection of possible learning activities and brief statement of the teaching procedures and techniques, (This should be the mode of presentation)

(v) A list of materials to be used

(vi) Description of the assignment and evaluation instruments.

SELF ASSESSMENT EXERCISES 1

What are the elements of a unit lesson?

3.2 Weekly Lesson Plan

All teachers use lesson plans in one form or another. Some teachers merely organize the lesson of the day in their heads. Others jot down a few bullet points about what they plan to do each day. Others write detailed instructions by using lesson plan templates or guides. Depending on the experience level of the teacher or the complexity of the lesson, any one of these three methods may work.

However, creating a detailed written lesson plan can help even the most experienced teacher prepare and present a more effective lesson. High-quality written lesson plans can help you organize and communicate a strategy so that students can reach a stated learning objective. These lesson plans are also important when a substitute teacher teaches your class and are often required when you are being observed or evaluated by the principal.

As stated before, a well-thought-out lesson plan will help you to organize thoughts and instructional practices. This, in turn, will help you move students toward achieving the goal or goals behind the lesson. Most lesson plans are a part of a larger unit plan and include:

- A descriptive **lesson title**
- The relevant **unit title**
- One or two distinct **learning objectives**
- **Prior learning** required by students in order to begin the lesson
- The relevant **subject area** and **grade level** of the lesson, as well as any **cross-curriculum connections**
- The necessary **time allotted** to complete the lesson
- The **materials needed** to complete the lesson
- The instructional **procedures** used in the lesson

- Any **modifications** required for individual learning needs
- Student **assessments**
- Any **instructional notes** that will help the teacher teach the lesson

The first step in lesson planning is to identify the learning objective that will be the focus of the lesson. The objective should be clear so that the students can determine what they should know and be able to do at the conclusion of the lesson. For example

Procedures:

1. *Warm-up Activity:* Using Microsoft Office Word, a computer, and a computer projection device creates a two-column table. Then compose sentences; break each into two parts (one part containing the noun and one containing the verb), and place the two parts of each sentence into the two columns. Mix nouns and verbs in each column. Then have students use the computer to put the sentences together by dragging one part to its matching part. Your list might look like the following:

   Monkey

   Was too short

   played football for five hours Mabel

   Distance from home to market ate banana from the basket Musa

   went to the store with her dad

2. After the warm-up, divide students into groups of two or three at the classroom computer

3. After the groups are finished, ask each student to select one sentence and write it on a separate piece of paper, leaving room for an illustration.

4. When all students are finished, have each student present his or her sentence and illustration.

Timing, Materials, and Instructional Notes: Now that the procedures are identified, it's time to determine the amount of time the lesson will take and to list the materials and instructional notes. The instructional notes help the teacher prepare for the lesson and provide some transitional strategies for implementing the lesson. For example: *Time Allotted: 30 minutes Materials:*

- *Word document with a two-column table of sentence parts for warm-up activity*
- *Word document with sentence parts*
- *Sheets of paper with space for sentence and illustration*
- *Crayons Instructional Notes:*
- Before students arrive, copy the Word document with the sentence parts to each computer's hard disk drive.
- Set up the "teacher station" computer and projection device.
- Place paper and crayons on tables.
- On each computer desktop, create a shortcut to the document with the sentence parts so that the students can open it right away.
- Divide students into groups to facilitate moving from the whole-group demonstration to the small- group demonstration.

Assessing your students: The last item of the lesson is to evaluate students, based on the goal of the lesson. In this example, the learning objective is "Students will construct a complete sentence from two sentence parts." During the lesson, students are putting together parts of a sentence and illustrating that sentence. The assessment, however, should be on only the sentence itself, not the illustration. The assessment section should also include what will happen should a child receive a failing or unsatisfactory mark on the lesson.

For example:

Assessment: The teacher will observe the students presenting their finished sentences. Students will receive a "satisfactory" or "unsatisfactory" mark for their work. Students receiving an unsatisfactory mark will be given feedback and may present their sentence again.

Integrating technology into your lesson: There are many ways to integrate technology into a lesson plan. In the preceding example, computer technology was used for the demonstration and for the student work. The use of technology in lesson plans generally falls into three categories: Instructional (teacher), Demonstration (teacher and/or student), and Student Work (student).

The following chart lists ways technology may be used within each category.

Instructional	Demonstration	Student Work
Lecture including Microsoft	Use the Track Changes feature in Word	Write a story in Word

Show a short video clip with Microsoft Windows Movie Maker	Show students how to conduct a search with Explorer	Create a table in Microsoft Office Excel 2010
Use links in Word for the daily schedule	Have students use PowerPoint to demonstrate steps of the Scientific Method	Create a flyer in Microsoft Office Publisher 2010

Putting it all together: Creating written lesson plans takes time — but they are great tools for teachers. Lesson plans can guide you in organizing your thoughts, materials, and strategies to help your students meet the desired outcome. When you finish teaching a lesson, take notes to help you "fix" or improve the parts that didn't go as planned.

In this way, you can get the most out of the time you invested in creating the plan by using it again in following years.

SELF ASSESSMENT EXERCISES 2

List the features of a lesson plan

4.0 CONCLUSION

In this Unit, you have been exposed to the preparation of lesson unit and lesson plan. .

The curriculum planners are directly in-charge of these mapping into years. You also learnt that once the curriculum has been developed and handed over to schools, the teachers‘ first task is to break it into scheme of work. The next thing the teacher does is to

organize the contents into teachable unit(s) which are handling termly weekly or daily. Some features of unit lesson and lesson plan were also discussed. Similarly, there are elements that must be contained in a lesson plan, though all lesson plans may not necessarily exactly the same.

5.0 SUMMARY

The curriculum planners are directly in-charge of these mapping into yeas. Once the curriculum has been developed and handed over to schools, the teachers' first task is to break it into scheme of work. In organizing the content, the teacher is expected to determine the number of terms in an academic year, number of weeks in an academic term and lesson periods allotted to computer science in the school per week. The computer science teacher is therefore expected to understand the meaning of termly plan, unit plan, and weekly plan.

6.0 TUTOR-MARKED ASSIGNMENT

(i) Explain the meaning of unit, weekly and daily plan.

(ii) Describe the standard format for writing computer science/information technology lesson notes.

REFERENCE/FURTHER READINGS

Eyitayo, A.O., Eyitayo, O. T., & Akeju, O. M. (2004). *Computer Studies for Beginners 1*, Ibadan: Bounty Press Limited

Flowers, N., Mertens, S. B., & Mulhall, P. F. (2002, May). Four important lessons about teacher professional development. *Middle School Journal*, 57 -61.

Maduakolam, I., & Bell, E. (2003). A product-based faculty professional development model for infusing technology into teacher education. *Contemporary Issues in Technology and Teacher Education*, *3*(3), 340-352

Orimolade, J. S. (2004). *College Computer Science.* Lagos: Data Analysis and Processing Services

Owolabi, K.and Adisa, O. (2006). Basic of Computer Studies for Schools and Colleges, Ibadan: Calyxn Books

Smith, H. (2000). Internet provision of enrichment opportunities to school and home. *Australian Educational Computing, 15 (2),* 20-5.

MODULE 5

UNIT 1 PROBLEMS MILITATING AGAINST THE USE OF COMPUTER IN THE CLASSROOM

1.0 INTRODUCTION

Computer is part of our everyday lives. They have an effect on almost everything you do. The computer has the potential to become education‘s single most useful teaching and learning tool. However, the use of computer in the teaching and learning processes is faced with some challenges. Your knowledge of these challenges will assist you a great deal. More so, you may also participate in seeking the solutions to these challenges. This Unit therefore, will expose you to some of these challenges that are globally affecting the use of computer in the teaching and learning processes.

2.0 LEARNING OUTCOMES

At the end of this Unit, you should be able to identify problems militating against the global use of computer in the teaching and learning processes.

3.0 MAIN CONTENTS

By far the major factor inhibiting computer use in the classroom is the insufficient amount of computer hardware and software available due to budgetary constraints. It often takes a school three to six years to obtain even the minimum number of computers necessary for one

teacher to effectively incorporate CAI and MBLs into the curriculum. Although just one or two computers can be incorporated into classroom activities, this number will support a very limited number of strategies. Moving computers in and out of a classroom is time consuming and significantly inhibits their use. Moving students to a "computer lab" also has several constraints, the two major ones being that the typical computer lab is too small and that teachers must compete for limited lab time.

Although there are definite advantages associated with computers as instructional tools, some educators criticize them because of what theyconsider characteristic limitations. For one thing, computers are still expensive; critics suggest that dollars spent on hardware, software, and maintenance would be better spent for more teachers, higher salaries, or other instructional materials. Some fear that computers may replace teachers. Others fear that they stifle creativity, limit social interaction, emphasize narrow facts at the expense of broad generalizations, limit the imagination, and dehumanize instruction.

The use of computers is also criticized because of perceived instructional limitations and problems, such as the limited range of objectives being taught by computers. Most computer-based instruction cannot effectively teach affective, motor, or interpersonal skills. Even in the cognitive domain, current programs tend to teach at the lower levels of knowledge and understanding. Copyright problems, the poor quality of some software programs, and incompatibility among software programs also can limit their effectiveness. Further, some teachers fear using computers because they are too complex to understand.

Additionally, logistical environmental concerns may limit the use of computers. For example, the issues like placement of the computes, supervision of users, maintenance, and acquisition of supplies may cause some teachers not to bother using computers as instructional tools.

The introduction and use of technology in schools and classrooms will not automatically increase student learning. To accomplish this end, educators must rethink

how schools are organized and rethink curriculum and instruction. Teachers and administrators must know how to use the hardware and software. More importantly, they must know how to use these tools to create appropriate learning experiences for students. As teachers gain easier access and receive training in the use of the Internet and as technology resources expand through electronic networking, instruction will be enhanced and we should see students becoming more active, confident, motivated, and achieve at higher levels.

Teachers react to the use of computer in teaching in that they do not want their jobs to be taken over by the computer. Teachers are afraid that the computer will replace them. Teachers will like to fulfill the essential needs of custody and socialization instead of being a resource person and learning manager. Teachers have little time or incentive to keep up to date with developments in computing and feel unable to make proper use of computer in teaching. Teachers do not want their normal routine to be disrupted. They do not want to change the way they have been teaching to suit the use of computer. These are generalizations, but there are exceptions as it was reported during the TICCIT and PLATO experiments that teachers were most concerned with their own autonomy and their interaction with students.

Most commercially available computer assisted learning materials were of poor quality. Most of the materials were based upon the impoverished theories of learning and reflected little programming skills. The materials do not actually fulfill the set objectives for the use of computer in teaching and learning.

The reliability of any educational device is a major detriment of its acceptability in the classroom. To a teacher, an unreliable material will only led to a waste of time and embarrassment. The reliability is based on the hardware malfunctioning and program error. Apart from the reliability of the machine and software not being ascertained, cost of material is also high. The cost of purchasing the machine and cost of software are very high that it is not affordable to all parents and schools.

Computer-assisted learning has faced peculiar difficulties in the attempt to provide evidence of its contribution to the learning process. The use of computer faced the problem of not evaluating properly as it failed to meet the set objectives. Apart from these problems highlighted, other problems being faced by the use of computer in schools. They are: (1) equal access- this is because there are hardware and software shortage all schools does not have equal access to the use of computer. Rich school will have computers while poor schools will not have. Legal Issues: That as computers increasingly pervades the society, people should be educated about the ethics and legalities of computer, but this training is not forthcoming.

By far the major factor inhibiting computer use in the classroom is the insufficient amount of computer hardware and software available due to budgetary constraints. It often takes a science department three to six years to obtain even the minimum number of computers necessary for one teacher to effectively incorporate CAI and MBLs into the curriculum. Although just one or two computers can be incorporated into classroom activities, this number will support a very limited number of strategies.

Moving computers in and out of a classroom is time consuming and significantly inhibits their use. Moving students to a "computer lab" also has several constraints, the two major ones being that the typical computer lab is too small and that teachers must compete for limited lab time.

Despite the advances computers and technology have given education, there are areas which the technology has been used in a poor manner. One of the largest problems is interactive computer learning and long distance learning. Being that they range from somewhat impersonal to very impersonal, there is a loss of interaction with fellow students and faculty. Everyone wants to experience warmth, human interaction, the thrill of discovery, and solid grounding in essentials: reading, getting along with others, training in civic virtue. Only a teacher, live

in a classroom, can bring about this inspiration ... Yet, everywhere [you can] hear parents and principals clamoring for interactive computer instruction.

The use of computers in classrooms themselves also has problems, especially dealing with content viewed online. –Schools must protect students without stifling their creativity or putting too much control on what they can view. There are many ways to do this but none are fool proof.

Being that there is quite a large amount of negative feeling about computers in education, it is not possible to remove or fix all the problems. Removing computers would be a larger shift and would cause much more havoc than bringing them into use was. This would hurt the educational system more than help the problem of isolation.

The most overlooked fact is that computers should be used as an educational tool, rather than a means of education. Nothing can replace the interactions between students and teachers. Once the process of learning from a fellow person has been automated to something mechanical many things will be lost. Automated grading loses the ability to see just where a student went wrong, or what the student was trying to achieve in an answer. Online courses remove the ability to deal with truly great teachers in a personal way, and it also removes the ability to truly interact with other students. Automated education also hinders getting help when it is needed. Online books are also a problem. No one enjoys trying to read long documents and papers online. It is also not reliable. Should the internet connection be lost, or the site be removed, the book is unavailable. There should be as much human interaction as possible in education. Although computer technology surely has a place in the curriculum, the presence of [technology] remains disturbing. Educators must not succumb to the illusive rhetoric that obscures the unquestioned assumptions that the computer is essential to every classroom and that learning cannot take place without the latest version of electronic hardware.

4.0 CONCLUSION

Change is inevitable, and because of the complex nature of change in schools system computer technology, there is bound to be problems associated with its implementation. There are a lot of problems facing the implementation of computer in education system globally.

5.0 SUMMARY

In this unit, you have learnt some of the problems facing the implementation of computers in education. These problems are not only in Nigeria but in the whole world. Some suggestions were made on how to solve these problems.

6.0. TUTOR-MARKED ASSIGNMENT

(1) List 5 problems of using computer in Nigeria and the global world

(2) State ways of solving three of the problems listed in question number 1.

7.0 REFERENCES/FURTHER READINGS

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using Information and Communication Technology in Secondary Schools in Nigeria: Problems and Prospects. *Educational Technology & Society*, 8 (1), 104-112.

Enakrire, R., Onyenenia, O.G. (2007). Factors affecting the development of information infrastructure in Africa. Library High Tech News 24 (2):15-20.

Ohiwerei, F.O, Azih, N. and Okoli, B (2004). European International Journal of Science and Technology. ISSN 2304-9693.www.eijst.org.uk

UNIT 2 PROBLEMS MILITATING AGAINST COMPUTER-BASED INSTRUCTION IN NIGERIAN SCHOOLS

1.0 INTRODUCTION

Nigeria like any other nation in the world also use computer in the process of teaching and learning. However, aside the global challenge of the computer usage in education, Nigeria is faced with series of problems. This unit present to you some of the problem faced Nigeria in the use of computer for instructions in her schools.

2.0 LEARNING OUTCOMES

At the end of this unit you should be able to articulate the problem militating against computer-based instructions in Nigeria schools.

3.0 MAIN CONTENT

Despite the perceived importance of computer-based instructions in teaching and learning by policy makers, schools administrators and, teacher trainers and teachers themselves, very little progress had been made in the area of computer-based instructions in Nigerian schools. Various factors are responsible for this development. Some of them are highlighted below:

1. Lack of Enough Computer Desktops and Laptops: These facilities are still not affordable by many students and teachers. Some interventions like that of EKO project and a few others notwithstanding have not been able to make noticeable impact.

Interestingly too most of these interventions affects only the public schools. Private schools do not benefit; and hundreds of thousands of the students attend private schools.

2. Lack of Qualified Teachers to Teach ICT in Schools. The quest for information and communication technology in Nigeria today is on the high side and the number of qualified information and communication technology teachers is on the very low side. Presently, there are few tertiary institutions offering undergraduate and post graduate programmes in Computer Science Education. In essence only very few Nigerians are qualified to teach Computer Science as a subject in the secondary schools. Since teachers are key in the implementation of any policy, lack of enough trained teachers definitely is a wheel in the progress of computer-based teaching in the schools in Nigeria. There is however hope in the years to come. This is because of the digital literacy policy signed by Mr. President late last year. By the time so many teachers are trained and digital literacy becomes a condition for being registered with Teachers Registration Council, so many of our school teachers would have attained the digital literacy skills to facilitate in the computer-based instructions in schools.

3. Lack of Electricity. Nigeria being a developing nation cannot boast of twenty four hours electricity supply to its citizens. The institutions are directly connected to Power Holdings Company of Nigeria, yet no regular supply of electricity to the institutions. Many of the institutions also do not have the ability to either purchase, maintain or fuel a high capacity generator for the purpose. Consequently, both the teachers and students are handicapped and may not be able to offer the computer lesson.

The schools situated in the areas are the worst hit. In rural Nigeria most inhabitant do not have access to electricity, thereby denying rural secondary schools opportunity to benefit from the use of electronic equipment such as radio, television, video recorders and computers. The few Internet access available in Nigeria is found in urban centers. These environmental realities are difficult to manage because fans, sealed rooms and stable

electricity are lacking in many urban homes and rural areas.

4. Fear of the Unknown. Some teachers are afraid of becoming irrelevant due to the introduction of computers in different aspects of education. This fear could affect the zeal with which the goal of computer-based instruction is supported and pursued by the teachers, which in the case are the drivers.

5. Lack of Internet or Slow Connectivity. Most of the schools lack Internet connectivity. The few schools especially Private schools that could afford it also have the problem of instability in the network because of the low broadband width. This is a serious challenge to the implementation of computer-based instruction in Nigerian Schools.

4.0 CONCLUSION

The peculiarities of Nigerian school problems in the use of computers for instruction have been discussed in this Unit. These problems range from lack of necessary skills among the teachers to that of electricity that is not steady.

5.0 SUMMARY

In this unit, you have learnt some of the problems facing the implementation of computers in education.

6.0 TUTOR-MARKED ASSIGNMENT

1. List 3 problems of using computer in Nigeria and the global world

7.0 REFERENCES/FURTHER READINGS

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using Information and Communication Technology in Secondary Schools in Nigeria: Problems and Prospects. *Educational Technology & Society,* 8 (1), 104-112.

Aduwa-Ogiegbean, S.E., & Iyamu, E.O.S. (2005). Using Information and Communication Technology in Secondary Schools in Nigeria. Educational Technology & Society 8 (1), 104-112.

Enakrire, R., Onyenenia, O.G. (2007). Factors affecting the development of information infrastructure in Africa. Library High Tech News 24 (2):15-20.

Ohiwerei, F.O, Azih, N. and Okoli, B(2004). European International Journal of Science and Technology. ISSN 2304-9693.www.eijst.org.uk

APPENDIX

SOLUTION TO THE SELF ASSESSMENT EXERCISES

MODULE ONE

UNIT 1

SELF ASSESSMENT EXERCISES 1

3. Which aids did people use for counting in the early time?

Answer
Aids used for counting in early time are: Fingers, pebbles, grains of corn, …

4. Can you explain the steps used in finger counting?

Answer
The following are the steps used in multiplying numbers between 5 and 10 using fingers:

(i) Take away 5 from the first finger and raise up the number of fingers representing the difference;
(ii) Take away 5 from the second finger and raise up the number of fingers representing the difference;
(iii) Add the number of fingers raised to represent the values of ten position;
(iv) Multiply the number of fingers not raised to represent the unit position.

For example to multiply 7 by 8:
1st step; 7-5 = 2; raise two fingers on the first hand
2nd step; 8-5 = 3; raise three fingers on the second hand;
3rd step; Adding the results of 1st and 2nd steps gives 2+3 =5 (ten position of the product)
4th step, Multiplying the number of remaining fingers not raised in the first hand with the ones not raised in the second hand gives; 3x2 =6 (unit position of the product)
Therefore the required product is 56

SELF ASSESSMENT EXERCISES 2

1. What is the name of the first device used for counting?

Answer: ABACUS

2. What did John Napier develop in 1617?

Answer: NAPIER'S BONES

SELF ASSESSMENT EXERCISES 3

1. Who is the father of computer?

Answer: Charles Babbage

2. What did Hermann Hollerith use his machine to process?

Answer: For processing census data

MODULE ONE

UNIT 2

SELF ASSESSMENT EXERCISES 1

1. What is ENIAC?

Answer: Electronic Numerical Integrator and Calculator

2. What factors made the Electronic Computers possible?

Answer:

(i) Information such as words and numbers can be put in binary form;
(ii) Electronic devices have been invented to enable words and numbers be represented in binary form

MODULE ONE
UNIT 3
SELF ASSESSMENT EXERCISES 1

(2) What are the features of the first generation?

Answer
The features of First Generation Computers are:

- Vacuum tube technology
- Unreliable
- Supported Machine language only
- Very costly
- Generate lot of heat
- Slow Input/Output device
- Huge size
- Need of A.C.
- Non portable
- Consumed lot of electricity

SELF ASSESSMENT EXERCISES 2

3. State the features of the second generation of computers

Answer:
The main features of Second Generation are:

- Use of transistors
- Reliable as compared to First generation computers
- Smaller size as compared to First generation computers
- Generate less heat as compared to First generation computers
- Consumed less electricity as compared to First generation computers
- Faster than first generation computers
- Still very costly
- A.C. needed
- Support machine and assembly languages.

4. What are the disadvantages of the second generation of computers

Answer:

Advantages of the second generation computers include the following:

1. Due to the presence of transistors instead of vacuum tubes, the size of electron component decreased. This resulted in reducing the size of a computer as compared to first generation computers.
2. Less energy and not produce as much heat as the first generation.
3. Assembly language and punch cards were used for input.
4. Low cost than first generation computers.
5. Better speed, calculate data in microseconds.
6. Better portability as compared to first generation

SELF ASSESSMENT EXERCISES 3

3. List examples of third generation of computers.

Answer:

Examples of the third generation computers include:

- IBM-360 series
- Honeywell-6000 series
- PDP(Personal Data Processor)
- IBM-370/168
- TDC-316

4. List three disadvantages of third generation computers

Answer:
Disadvantages of the third generation computers include:

i. IC chips are difficult to maintain.

ii. The highly sophisticated technology required for the manufacturing of IC chips.

iii. Air conditioning is required.

SELF ASSESSMENT EXAMINATIONS 4

2. What are the features of fourth generation computers?

Answer:
The features of Fourth Generation include:

- VLSI technology used
- Very cheap
- Portable and reliable
- Use of PC's
- Very small size
- Pipeline processing
- No A.C. needed
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available Some computers of this generation were:
- DEC 10
- STAR 1000
- PDP 11
- CRAY-1(Super Computer)
- CRAY-X-MP(Super Computer)

SELF-ASSESSMENT EXAMINATION 5

3. What are the features of the fifth generation of computers

Answer:

The features of Fifth Generation include:

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing
- Advancement in Superconductor technology
- More user friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates.

4. List examples of computers in this generation

Answer:

Examples of the fifth generation computers include:

- Laptop
- NoteBook
- UltraBook

MODULE 2
UNIT 1
SELF ASSESSMENT EXERCISES 1

2. What hardware components is the computer made of?

Answer: The computer is made up of the following hardware components

- Central processing unit (CPU)
- Memory
- Mass storage device (slower, cheaper, long-term memory)
- Input device
- Output device

SELF ASSESSMENT EXERCISES 2

3. Give three examples of analogue devices

Answer:

Thermometers, Speedometers and petrol dispensers at the petrol station.

4. Give three examples of digital devices

Answer:
IBM 360/370; PDP 11/34, the various IBM PC compatible and Apple microcomputers often seen in offices and schools

MODULE TWO
UNIT 2

SELF ASSESSMENT EXERCISES 1

1. List and describe four common input devices

Answer:

(i) **Mouse** – an input device used to control the cursor and coordinates. It can be wired or wireless.

(ii) **Microphone** – an input device that allows users to input audio into their computers.

(iii) Digital Camera – is an input device that takes pictures digitally. Images are stored as data on memory cards. It has an LCD screen that allows users to preview and review images.

(iv) Scanner – is an input device that reads an image and converts it into a digital file. A scanner is connected to a computer through USB.

(v) Touchscreen – is an input device that allows users to interact with a computer using their fingers. It is used widely in laptop monitors, smartphones, tablets, cash registers and information kiosks.

(vi) Barcode Reader – also known as barcode scanner or point of sale (POS) scanner, is an input device capable of reading barcodes.

(vii) Webcam – is an input device connected to the computer and the internet that captures still picture or motion video.

(viii) Biometric devices – is an input device used to input biometric data into a computer.

SELF ASSESSMENT EXERCISES 2

2. List and describe four output devices

Answer:
Monitor – This is the most common computer output device. It creates a visual display by the use

of which users can view processed data.

Printer – This device generates a hard copy version of processed data, like documents and photographs. The computer transmits the image data to the printer, which then physically recreates the image, typically on paper.

Speakers – Speakers are attached to computers to facilitate the output of sound; sound cards are required in the computer for speakers to function.

Headset – This is a combination of speakers and microphone. It is mostly used by gamers, and is also a great tool for communicating with family and friends over the internet using some VOIP program or other.

SELF ASSESSMENT EXERCISES 3

3. How many types of storage devices do we have, name them ?

Answer:

Two (2); (i) Primary storage device and (ii) Secondary storage device

4. Highlight five (5) examples of storage devices.

Answer:
Magnetic Storage Device, Floppy diskette, Hard drive, Magnetic strip, Super disk, Optical Storage Device, Blu-ray disc, CD-ROM disc, Flash Memory Device, Memory card…

MODULE TWO
UNIT 3
SELF ASSESSMENT EXERCISES 1

1. List four examples of system software.

Answer:

Compilers, debuggers, Disk Fragmenter, Boot program, System Restore,..

2. What is the importance of systems software to applications software?

Answer:
It runs the Computer's hardware and application programs. It therefore enables user to interact directly with hardware functionality like device manager and other utilities found in the control panel.

SELF ASSESSMENT EXERCISES 2

1. What is an application software?

Answer:
Program or group of programs designed for end users

2. List five examples of application software

Answer:
MS Word, MS Excel, MS Publisher, MS Poer point, MS Access, MS Outlook.

SELF ASSESSMENT EXERCISES 3

1. List three examples of programming language

Answer:
FORTRAN, PASCAL, COBOL, C++, JAVA, VISUAL BASIC, …

2. How does the computer understand a programming language?

Answer:
Through a compiler or an interpreter

MODULE TWO

UNIT 4

SELF ASSESSMENT EXERCISES 1

List three examples of Type I application software.

Answer:

Drill and practice, Assessment Software, Tutorial Software, Computer managed instruction

SELF ASSESSMENT EXERCISES 2

List three example of Type II application software

Answer:
Electronic Spreadsheet, Database management software, Programming Languages, Word Processing Software, …

MODULE THREE

UNIT 1

SELF ASSESSMENT EXERCISES 1

11. List two challenges posed by the use of computer in teaching and learning.

3.3

Answer:

Challenges posed by the use of computers in teaching and learning include the following:

(i) Distraction of students through games, videos and chats
(ii) Over reliance on technology

2. List two benefits to students when computers are used in Education

Answer:

When computers are used in education, the following are some of the benefits to students:

(i) Helps to maximize students' engagement;
(ii) Gives teachers the opportunity to teach the skills that demonstrate ways to use technology responsibly.

SELF ASSESSMENT EXERCISES 2

List five teaching capacities of computer.

Answer:

The following are teaching capacities of computer:

(i) They provide powerful tools for calculation;

(ii) Computers can act as private non-human tutor available to students anytime;

(iii) Computers can be used to design special learning environment that can significantly foster students' learning even with the absence of any formal instruction.

(iv) They can be flexibly adapted to students' abilities and rates of learning;

(v) They can be superb teachers if the teaching programmes is well designed by an expert.

UNIT 2

SELF ASSESSMENT EXERCISES 1

1. List two ways computers can be used as a tool.

Answer:
Computers can be used as tools in the following ways:

(i) As an instructional materials like pen, pencil, slide rule, Typewriter, ..

(ii) Writing, calculating, etc

(iii) Word processor, graphic package.

SELF ASSESSMENT EXERCISES 2

1. What are the major advantages of the use of computer as tutee?

Answer:
The major advantages of the use of computers as tutee are as follows;

(i) Indirectly develops high critical thinking skills;

(ii) In it, the teacher lays emphasis on solving important problems rather than being rote learners;

(iii) The child learn more about the process of learning.

UNIT 3

SELF-ASSESSMENT EXERCISES 1

1. What do you understand by the word LAN and WAN?

Answer:
LAN stands for Local Area Network.

WAN stands for Wide Area Network

SELF ASSESSMENT EXERCISES 2

1. What do you understand by The Internet?

Answer:

The Internet is a global collection of many different types of computers and computer networks that are linked together.

2. List four advantages and disadvantages of Internet

The advantages of the Internet include:

(i) Website creation

(ii) Use of the Internet for research;

(iii) Application for admission, jobs;

(iv) Accessing information on any topic;

(v) Business transactions;

(vi) Access to current news.

The disadvantages include the following:

(i) Virus infection on the device used;

(ii) Unwholesome materials like pornography etc;

(iii) Addiction to the Internet;

(iv) Infringement on users' privacy.

UNIT 4

SELF ASSESSMENT EXERCISES 1

2. What are the common crimes in the use of computer?

Answer:

The following are some of the common crimes in the use of computer;

(i) Information destruction;
(ii) Theft of information;
(iii) Software piracy;
(iv) Theft of money;
(v) Impersonation

SELF ASSESSMENT EXERCISES 2

2. List three packages that can be used for instructional presentation

Answer:

(i) Microsoft Word;
(ii) Microsoft excel;
(iii) Microsoft Powerpoint.

MODULE FOUR

UNIT 1

SELF ASSESSMENT EXERCISES 1

State five importance of the scheme of work.

Answer:

The importance of the scheme of work is as follows:

7. It can be used as a guide to know what is to be covered within a given period
8. The scheme of work helps you to select appropriate instructional materials that may facilitate effective teaching and learning of a given topic and when a particular topic is to be taught.
9. There is continuity in the students'learning. This is because each topic leans on the learning of previous ones.
10. The topic outline/objectives in the scheme will help you to evaluate the students.
11. Headteachers, principals and school supervisors can use it to determine the extent of topic coverage in a class by the teacher.
12. If there is a change of subject teacher, the scheme of work enables the succeeding teacher to know exactly where his/her predecessor has covered and where to start from.

UNIT 2

SELF ASSESSMENT EXERCISES 1

What are the elements of a unit lesson?

Answer:
The following are the elements of a unit lesson:

(vii) Statement of the objectives

(viii) Description of the skills and the prerequisite knowledge of the students.

(ix) Content outline to be taught, the basic skills and important ideas selected for mastery,

(x) Selection of possible learning activities and brief statement of the teaching procedures and techniques, (This should be the mode of presentation)

(xi) A list of materials to be used

(xii) Description of the assignment and evaluation instruments.

SELF ASSESSMENT EXERCISES 2

(i) List the features of a lesson plan

Answer:

The following are the features of a lesson plan:

(i) A descriptive **lesson title**

(ii) The relevant **unit title**

(iii) One or two distinct **learning objectives**

(iv) **Prior learning** required by students in order to begin the lesson

(v) The relevant **subject area** and **grade level** of the lesson, as well as any **cross-curriculum connections**

(vi) The necessary **time allotted** to complete the lesson

(vii) The **materials needed** to complete the lesson

(viii) The instructional **procedures** used in the lesson

(ix) Any **modifications** required for individual learning needs

(x) Student **assessments**

(xi) Any **instructional notes** that will help the teacher teach the lesson