

ISSUES AND INSIGHTS INTO THE USE OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) IN SCIENCE AND TECHNOLOGY EDUCATION

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Abstract

This paper attempts to examine the issues and insights affecting the use of Information Communication Technology in Science and Technology Education. Information Communication Technology is the use of computing and telecommunication to provide rapid and easy electronic storage, processing and transferring of information. The paper critically analyses the different forms of application of information Communication Technological materials in the effective teaching of Science and Technology Education. The paper further discusses the challenges and expectations of Information communication Technology in Science and Technology Education problems and prospects of Information Communication Technology in our national context, and offers suggestions to remedy some of the problems faced, are discussed.

Introduction

Science and Technology as affected almost every sphere of human endeavour, thus the need for the awareness of Information Communication Technology (ICT). Information Communication Technological knowledge is even more important in the teaching profession today in a developing economy such as ours.

However, one of the major obstacles inhibiting the successful realization of national Information Communication Technology literacy is the dearth of competent teachers. In addition, the newness of computers to the classroom make technological applications novel to teachers without technical background, hence the need for appropriate enlightenment in the use of Information Communication Technology by Science and Technology Education teachers.

Information Communication Technology is the use of computing and telecommunication', to provide rapid and easy electronic storage, processing and transferring of information. It can also be seen as a generic term to cover the acquisition, processing, storage and dissemination of information (textual, numerical, pictorial and vocal). The American glossary defines it as the application of computers and other technologies to the acquisition, organization, storage, retrieval and dissemination of information.

The Computer

According to the definition given by Sippl et al (1972), the computer is a device capable of accepting information, applying prescribed process to the information and supplying the results of these processes. A computer is therefore an electronic device which accepts data as input, processes it, stores it and brings out information as an output, as and when required. Fig 1 below is a simple model of the computer processes.

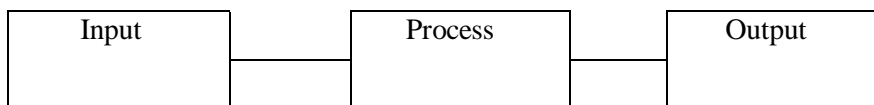


Fig. 1 Computer process

Indeed, it is the interaction of the arithmetical, memory and control components which are embodied in the computer that distinguishes it from other adding machines like (the calculator),

In a nutshell, the insight tells us that the computer consists of not just one machine but a series of related machines. Figure 2 below, displays the basic elements for computing.

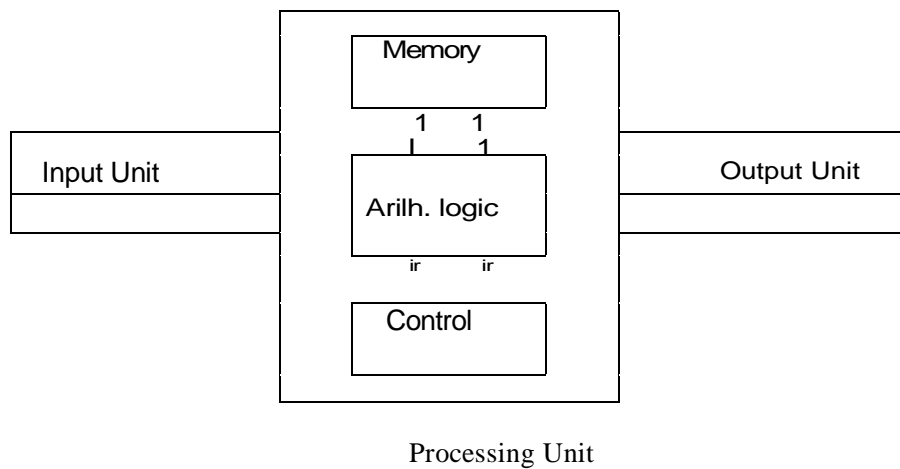


Fig. 2 Basic filaments for Computing.

These three elements; input unit, processing unit and output unit constitute what is known as the configuration and their physical appearance can collectively be termed hardware.

The Input Unit

According to Richard (1989), 'It is essential that data should be fed into the computer in a readable (but, where original data are not in this form, the input unit is available to conduct the translations into an acceptable form. The most common media, the input unit use to achieve this objective is punched cards, card reader, perforated paper tape, to mention but a few.

The Processing Unit

The processing unit is made up of the control unit, arithmetic and logical unit and the memory.

The Control Unit

According to Abrams and Stein (1973), "the control unit sequences the operation of the computer system and thus has been described as "The nerve centre of the computer. The prime function of the control unit is to interpret instructions stored in the memory and give signals to the rest of the computer, causing various functions to be performed.

The Arithmetic/Logical Unit (A.L.U.)

The Arithmetic/Logical Unit (A.L.U.) can perform the three basic functions of data transfer, arithmetic operations and logic operations. Stanley (2002).

The arithmetic operations include addition, subtraction, division and multiplication. The data items about to be processed are taken from main storage, as directed by the control unit and pass via the memory data register (MDR) into the data register (Accumulator) in the ALU where they are stored. The ALU will now perform the required operation(s) on the data as directed by the control unit. The results are taken from registers and placed in main storage again under the direction of the control unit. Logical operators include OR, AND, NOT, etc. and the relational operators like <, >, <=, >=<>, etc. All these operators involve comparison of two quantities, and decisions are made based on the result of the comparison.

The Memory

The computer needs a place to store data to be processed and also that upon completion of operation. This is the function of the memory. The memory unit is that part of the computer where information is stored. They include the following: Magnet tapes, etc. Others that are also relevant in the memory unit are RAM (Random Access Memory) and ROM (Read only Memory).

The Output Unit

The output unit is that section of the computer hardware that feeds the processed data to printers and other output devices which record the result in a useful form". Richard, (1989).

Classes of Computer

There are three basic classes of computers, namely: Digital, Analog and Hybrid. Digital means whole numbers; and digital computers operate on discrete signals. For example, the channel selector on a T.V the analog computer requires continuous signals. For example, thermometer and petrol dispensers (Oliver and Chapman, 1983), the Hybrid computers combine the advantages of both digital and analogue computers. They operate in programme form.

These forms of computers which are the focus of this write-up are designed to solve a wide variety of problems. Within the limitations imposed by their particular design capabilities, they can be adapted to perform particular tasks, or solve problems by means of specially written programmes. Examples are Robots, Microcomputers and Minicomputers.

Based on size and capacity, computers can be classified into three basic types: Mainframes, Minicomputers and Microcomputers. The Mainframes are the biggest and are kept in large controlled environment or rooms, and they require a staff or operator. They have the largest storage capacity called memory. These are usually owned by large firms that process very large volumes of data. Minicomputers are smaller and have less memory. They do not require any special environment like that of a Mainframe. Microcomputers are the smallest of the three. Their central processing units make use of what we call microprocessor. Unlike the others, they are mainly stand-alone computers, which, means one person to a computer at a time.

Computer and Communication

Communication is as vital as labour and capital for modern industrial growth. Transmission of information is called communication. Instant communication is so vital for an industrial establishment having branches in different parts of the world. Continuous assessment of the performance of various branches from central stations helps the management to make economic, marketing and business decision at the right time. Computer communication, through its Local Area Network (LAN), Wide Area Network (WAN) and Integrated Services Digital Network (ISDN) (Grayson 1989) can connect urban cities, and villages. Different countries are brought together through computer network and geostationary satellites. The communications speed has crossed 16 million bits per second (mbps). In a modern industrial scenario where patience is not considered a virtue, this much speed of data transmission is most essential. Through Computerized communication we do not transmit Morse codes nor any shorthand, but the whole files in its readable form. Pictures and drawings also can be transmitted as such. Digital telephone systems, satellites, car phones, teleconferences, voice mail boxes and electronic mail system are end products of computerized communication systems. We have new mobile offices. These facilities are of great help not only for industrial growth but also for day-to-day administration. People's grievances are heard in time and the project implementations are readily monitored. Thus the computer acts as a veritable tool for technological change.

Most of the organizations under public sector undertakings have computers for local operation such as salary, inventory control, administration and process management. If only there is a system of communication between these industries as far as data distribution and enquires are concerned, the effective planning and implementation of government policies would take place. Timely action would avoid a lot of wastage and costly delays,

Forms and Application of Information Communication Technological Materials in Science and Technology Education

The Computer Managed Instruction (CMI), Computer Supported Learning Aids (CSLA), Computer Based education (CBC) and the Computer Assisted Instruction (CAI) are some of the main uses of the computer in education (Agun and Imogie, 1990).

1. The Computer Managed Instruction (CMI)

It provides prescriptive and diagnostic guidance to the user. The main emphasis is on the management of instruction. The functions of the computer under these uses include data processing, which facilitates decision-making for effective administrative management. It also includes the generation of data concerning the physical maintenance of learning environment, student-teacher ratio, courses in Science and Technology Education, order of information, availability of resources and record keeping. Record may include data in testing, grading, diagnosis and the monitoring of the student's progress. When used in education, CMI provides information about career possibilities and course requirements, prediction of job market situations and industrial locations.

2. The Computer Supported Learning Aids (CSLA)

This can be used basically as a library where teachers can have access to stored information by making use of the internet. The information required is released upon the teacher's request. It is a programmable system that can work like a calculator. It has been found capable of solving difficult and time-consuming problems in engineering, computer education, mathematics and physics etc.

3. The Computer Based Education (CBE)

This is automated instructional technique in which the computer is used to assist teachers in the dissemination of instructional programme to the students through an interactive process. It is the use of computer on a time-shared basis to perform any instructional function which includes presenting materials or problem situation, guiding students' thinking, responding to students' questions, assessing students' performances, and managing student's path through course by selecting the material to be presented, assigning tasks to be performed and any combination of the functions listed above. The computer-selected instruction can be made to respond to the educational needs of both the able and the disabled learners alike.

4. The Computer Assisted Instruction (CAI)

This is the general term often used to refer to any computerized system of education. It merely stands as a term used to describe an educational environment, which is characterized by the use of Information Communication Technology to aid the teaching process.

5. Research

Using the Internet, the computer can also open up a vast source of information for the teachers. Using the appropriate equipment, teachers in Science and Technology Education can communicate with those in other countries for special projects, course materials etc. They can also tap into large libraries and data banks, gaining access to up-to-date information on a wide range of subjects that the libraries of their own school could never afford to maintain.

The Challenges and Expectations of Information Communication Technology and the Science and Technology Education

There is rapid development in science and technology in developed and developing nations. Almost all aspects of social institutions like the economy have embraced Information Communication Technology in most countries in order to meet these developing challenges. But in Nigeria, the utilization of Information Communication Technology is slowly but steadily creeping into its economic sector. As a result of this, it has become necessary that the teachers who form the labour force of this age be prepared for the technological age. Thus the application of digital systems services shall be the order of the day in this new age.

Information Communication Technologies have increasing challenges with respect to its vital functions for the Science and Technology Education teachers. These functions include:

- It links different geographical areas for increased efficiency and control.
- It also helps to integrate records produced in various sections of an organization, and ensures that all data processes required are immediately carried out on completion of transactions.
- Managing a process more rapidly, more accurately or less expensively.
- Helps in computing and telecommunication in order to provide rapid and easy electronic storage, processing and transferring of information. -
- Providing wider coverage on study as large number of students can watch study programs of different screens.

- It is also used for Data Processing, Word processing, Data Manipulation, Presentation of Data, Simulation Image Creation etc. all of which help to provide vivid experience to the teachers, thereby improving their understanding of a particular problem.
- It helps to improve the need at which information is produced.

With these functions, there will be ample career and job opportunities for the 'Science and Technology Education teachers with competent skill in Information Communication Technology. Although there is great concern that the advancement of Information Communication Technology will eliminate jobs, but in recent times, the reverse has been the case. Among the specialists created by the introduction of information are word processing operators, technical editors, micrographic specialists, system analysts, internet operators, data base administrators etc. Thus, there is evidence of job opportunity as a result of Information Communication Technology.

Problems

Since Information Communication Technology is a new innovation in the educational world, it is bound to face problems. And in order to be relevant in the scheme of education and training of students, certain problems need be discussed:

1. How to cope with the inadequacy of:
 - a. Learning and research infrastructures, modern teaching materials (both printed and non-printed).
 - b. Classrooms, workshops and laboratories been unequipped.
 - c. The propensity of poor funding of the programme etc.
2. How to educate and train professional teachers and workers capable of utilizing digitalized systems and facilities to maintain a competitive edge in all spheres of human endeavours.
3. Not enough trained staff in Information Communication Technology related courses like information science, information system analysis, design and evaluation in schools etc.
4. How to analyze the view of integrating, modifying and restructuring the school courses by introducing relevant courses that will address the changing needs and expectations of individuals, including the utilization of plans and strategies as well as possess the capability of periodically reviewing the curriculum of the schools,

Recommendations

1. The school curriculum should be reviewed to include those critical Information Communication Technology oriented courses like Internet, telecommunication, networking, databases creation, management, information policy, economics, marketing, computer application skills, management, communication,, etc.
2. There is need for enlightenment campaign for the awareness of the need or importance of Information Communication Technology in line with technological advancement of the society.
3. In-service training for teachers on the use and importance of Information Communication Technology in achieving the national objectives in education is also necessary.
4. There is need for adequate funding of our educational institutions with the necessary information technological gadget in order to meet the challenging need of the new millennium's technological breakthrough.

Conclusion

The introduction of Information Communication Technology has lead to some challenges and expectation; the need for proper planning, research and evaluation of education and teachers' development. It is now time for the education planners and administrators to play their role in implementing Information Communication Technology in our educational programmes in order to meet up with the technological advancement in this new Nigeria and the world in general.

5. **References**

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