

## SCIENCE TEACHING AND LEARNING IN NIGERIAN SCHOOLS THE MICRO-COMPUTER ALTERNATIVE

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### ABSTRACT

The paper looks at the importance of science and technology education to any nation and its status in Nigerian schools. Despite Government's interest and effort in uplifting the status of science and technology education not much have been achieved as indicated by the poor performance of science students and poor quality science teachers. The paper traced this monstrous problem to, amongst others, lack of interest and motivation of both the teachers and the students by appropriate authorities. It looked into why the micro-computer alternative should be used to curtail the problems encountered in science teaching and learning.

### INTRODUCTION

Although this paper focuses on science teaching and learning, the term technology is considered since science and technology are interrelated. In realistic point of view science is the 'elder brother' of technology. Referred to as conceptual science, science is the backbone of technology, which is applied science. According to Abdullahi (1982) science is a collection of knowledge with emphasis on ideas, principles, theories, symbols and the understanding of natural objects and phenomena. It is also a process of gaining knowledge by skill and refining that knowledge acquired. Technology, however, is the derivation of pragmatic solutions to human problems from science. In the words of Mallo (2002)...technology.... includes the creation and manipulation of images, storage and retrieval of information data, creation of complex and multi-layered plans or solutions to problems taking into account a variety of design constraints and or opportunities. For industrialization to play a notable role in the socio-economic development of any nation its citizens must acquire science and technology education. They must understand the meaning and nature of science and technology. This can be effectively achieved through the formal school system. In Nigeria and many other developing countries diverse problems have hampered the growth of science and technology. Note – worthy problems that haunt science and technology education in Nigeria are the lack of interest and motivation of teachers and learners. Pragmatic or hands-on lesson preparation and delivery through the use of the computer can go a long way in motivating and arousing interest of both the teacher and the student. The student is highly motivated and exhibits elation when he or she uses the computer to learn. This is because in learning theory it is vivid that what is embarked upon practically is seldom forgotten. In the light of achieving success in science teaching and learning for consequent growth in science and technology in

Nigeria, this paper delves into finding out why the micro-computer method of teaching and learning science should be used. Hornby's (1993) definition of method as 'way of doing something' is adopted in this work. Also in the context of this research 'method' can be substituted with 'alternative'. The micro-computer alternative simply means the use of the micro-computer in teaching and learning. Micro-computer is a class of the computer. It is the smaller computer machine meant for accommodating only a user at a time. Micro-computers include Palmtop, Laptop and desktop (PC).

### **STATUS OF SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIA**

The importance of science and technology education for national development has been examined by many educationists. The effect of science and technology in developing the human race in most spheres cannot be over-quantified. In developed countries science and technology have positively influenced the socio-economic status of the people. Abdullahi (ibidem) adds that science influences the politics of a nation. This status on science and technology education was long ago acknowledged by Gowon (1968). In his opening address at the Annual National conference of Science Teachers Association of Nigeria (STAN) in Lagos in August, the then Nigeria Head of State General Yakubu Gowon said: We are living in a fast changing world in which science and technology are having an ever increasing impact. No one needs to be told today that science and technology are swiftly revolutionizing the pattern of human life and thought. In Nigeria, eminent educationists like Akpan (2001), Josiah and Okooboh (2001) and Mallo (ibidem) have hoped that government and other stakeholders pave the way for science and technology education to play the dominant role of influencing human economic, social and even cultural ways of life. On the part of Government, emphasis has been made on science and technology education (Federal Republic of Nigeria, 1985) with a view to unite, strengthen and make Nigeria self-reliant, thereby provide bright and full opportunities for its citizens. A National Policy on Science and Technology was also launched (Federal Ministry of Science and Technology, 1986) so as to achieve the much desired advancement in science and technology. The government put in place a 60:40 of Science to Humanities admission policy to guide University admissions (Anikweze, 1998). In spite of the interest and effort of Government on improving the state of science and technology education a sorry state of the school system in Nigeria exists. This is decried by many concerned Nigerians (Science Teachers Association of Nigeria, 1999, Josiah and Okooboh, ibidem and Josiah, 2004). Science teaching and learning in Nigeria have reached a sympathetic state where Government and parents point accusing fingers on each other. Akpan (ibidem) observed that the poor state of science teaching and learning is due to poor quality science teachers in schools, poor environmental conditions for schooling, science teacher stress and students' poor attitude towards science and technology studies, amongst others. In a study conducted by Josiah (2003) on the effect of attitude on secondary school Physics students' performance in Physics as a subject it was discovered that the poor performance of a Physics student in the subject is not always associated with his or her poor attitude towards the subject. This implies that other factors contribute in a science student's poor performance in science subjects. The

core science subjects include Biology, Chemistry and Physics. Cirfat and Amagon (2001) in their study on the problems of teaching Science, Technology and

Mathematics in Plateau State enumerated the problems of teaching science in schools as:

- i. Lack of interest by science teachers
- ii. Lack of teacher motivation from authorities
- iii. Lack of adequate preparation by the teacher.
- iv. Poor attitude to teaching because the job was accepted as a last resort.
- v. Lack of self development by teacher.
- vi. Lack of commitment to work.
- vii. **Ride**

The duo also enumerated problems associated with science learning to include:

- i. Peer influence on the student in choosing science and technology subjects.
- ii. Laziness on the part of the student.
- iii. Student's lack of interest in Science, Technology and Mathematics.
- iv. Lack of student motivation by teachers and authorities.

#### **WHY THE MICRO-COMPUTER ALTERNATIVE?**

Hornby (ibidem) defines the computer as an 'electronic device which stores information on e.g. magnetic tape, analyses it and produces information as required from the tapes'. Anakwe in Landu (2003) sees the computer as having dual purpose: the computer being used as an object of instruction where the computer itself and data processing are studied and it being a vehicle of instruction where instructions are delivered. All forms of electronic technology including some modern technology used in disseminating, receiving or retrieving information at a fast and wider space are called information and communication technology (ICT). Kayode and Kayode (2003) and Josiah, Pam and Okooboh (2003) see the computer as a modern ICT resource. This implies that there is the possibility of using the computer to teach and learn, although such is relatively new in Nigeria. Josiah, Pam and Okooboh (ibidem) discovered that only 12.9%, 15.4% and 12.9% of secondary school students in Plateau State have used the computer to learn Biology, Chemistry and Physics respectively. The study showed that software packages (CAI) such as Learning Ladder and Encyclopedia of science are not being effectively used in schools. The shocking revelation, in this ICT age, is that the importance of using the computer for teaching and learning is yet to be realized in Nigeria. The micro-computer can be used for teaching science subjects in schools. Science teaching with the computer has been noted to respond positively in terms of facilitating the student's performance and interest (Etukudo, 2003). It improves the way in which the subjects are taught and the effectiveness and quality of learning. According to Ajewole, Ogunlusi and Bajulaiye (2003) teaching that is based on computer assists the teacher to develop programmes using facilities within the computer system. The teacher can develop interactive teaching materials that are based on the under listed framework:

- i. Concept content with details
- ii. Presentation of the concept content with the details on the monitor.

- iii. Interaction between the student and the computer system.
- iv. Structure the link between student's activities.

Software packages have been developed for use in the computer for teaching and learning. These are categorized into two: Computer – Aided Instruction (CAI) and Computer – Managed Instruction (CMI). These are automated instructional techniques developed for the computer-Aided Learner (CAL) and Computer – Managed Learner (CML). In using CAI the teacher is substituted by the Micro-computer. A CAI instructional programme via an interactive process on computer is presented to the student. The micro-computer administers diagnostic tests, scores those tests, prescribes the next appropriate step and monitors the progress of each student from the beginning to the end of a course outline. With a multi-purpose CAI (Abimbade, 1999) the student is able to study independently at his or her pace according to their entry behaviour or performance. Below is a dialogue extract for CAL called CALCHEM (Hooper, 1977): In this section, you will be asked to decide which quantities you are going to measure in order to find  $E^*$ . First read page 1 of B901L in the viscard then type Z

Can you measure  $E^*$  directly? (Answer yes or no) *No* Correct.

To find  $E^*$ , you look at relationships involving  $E^*$  with

- a) Other quantities which can be measured, or
- b) Other quantities which themselves can be related to measurable quantities. Do you know of any relationship involving  $E^*$ . If so name them.

#### **The Arrhenius equation**

Yes.

We have seen that  $E^*$  can be found using the Arrhenius equation.

What do you actually measure?

#### **Rate constant and temperature**

Yes, well done. You need to measure the rates of the reaction at different temperatures, but what do you actually measure to find the rate?

#### **Concentration**

Yes, measure the change in concentration with.... (complete)

#### **Time**

Good.

The system CALCHEM is developed for students. CALCHEM is Computer-Assisted Learning in Chemistry and according to Jones, Scanlon and O'Shea (1987) it can be used in a variety of science subjects. As seen from the CALCHEM dialogue the student using such software package learns with interest and motivation. There are many such systems for science learning. The programmes (packages) consist of a dialogue, which is a linked sequence of question-answer-comment between the substituted teacher (micro-computer) and the learner. Information fed back to the student is designed to locate any errors or misconceptions and to correct these for the student. The use of CMI is to schedule courses and/or subjects, keep inventory, record students attendance and store and retrieve students information, among others. It improves educational efficiency by keeping record of the students' experiences and needs. Learning material is stored in the micro-computer system to guide the learner.

## RECOMMENDATION/CONCLUSION

Despite the colossal impact and widespread use of micro-computer software packages for teaching and learning of science subjects such an impact is yet to be felt in Nigeria. Government should come out with a policy on computer literacy to improve the use of software packages in teaching and learning.

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