

The Importance of the Use of Computer on Students' Learning Process and its Impact on their Academic Performances

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Abstract: *This research investigates the importance of computer use in enhancing science students' understanding of the subject matter in Nigeria. The objectives of this study are to find out the importance of computer/Computer assisted instruction (CAI), contributions of computer/CAI in teaching/learning science, and problems of using computer/CAI in teaching/learning science. The methodology adopted is the use of questionnaires which was administered on a total of sixty-five students of Federal Government College, Azare. The findings of this work demonstrate that the use of computer/computer assisted instruction (CAI) in teaching and learning science changes the teacher's role from expert to facilitator since the students' problem solving and critical thinking skills are tremendously stimulated by the teacher. It is also confirmed that it makes the students to develop keen interest in science subjects as it takes care of individual differences, promotes their understanding and rate of retention of what is being taught thereby leading to high academic performances.*

Keywords: computer, CAI, teaching, learning, academic performance

1. Introduction

Traditional patterns of science education have remained largely unchanged in most developing countries, Nigeria inclusive. Very often, science instructions in schools have lacked a clear focus and have been provided by teachers ill-prepared to deal with science content. The natural curiosity of children, especially in primary schools, eager to understand their surroundings, is often diminished by instruction that discourages inquiry and discovery. In secondary and tertiary schools, science instruction becomes increasingly text book centered. Even though laboratory experiences (or demonstrations) usually are included, students are rarely encouraged to use scientific methods to solve problems relevant to their perception of the world.

Today, micro-computers are common tools in all areas of life, of which education is not an exception. Computers are playing increasingly important role in education, for both the teachers and the students. Their use enables each student to develop at his or her own pace, and makes the whole learning process more flexible. Many teachers, especially in the developed nations like the United States of America, United Kingdom, Japan, and Canada incorporate the computer into the learning process for easy illustration and comprehension of the lessons.

It is against this background that this research work is prompted. It tends to highlight the need for Nigeria to fully incorporate computer assisted instructions in its public schools as this will enhance the teaching-learning process to a very great extent.

2. Problem Statement

This study is an investigation into the importance of computer in teaching and learning science in secondary schools using Federal Government College, Azare as a case study. Computers have been used in schools, especially in

the advanced countries like the United States of America and United Kingdom to facilitate teaching and learning. Even in the developing nations like Nigeria, computers are now used in secondary schools for effective teaching and learning. However, the problems to its effective usage in developing nations include lack of adequate computers (instructional technology) in our schools, lack of motivation in studying science due to lack of practical teaching leading to low students' achievements, inadequate funding of the educational sector, lack of steady electricity, and shortage of properly trained teachers.

3. Objectives of the Study

The study intends to:

- Find out the importance of computer/computer assisted instruction (CAI) in teaching generally.
- Find out the contributions of computer/computer assisted instruction (CAI) in teaching/learning sciences in secondary schools.
- Expose the problems of using computer/computer assisted instruction (CAI) in teaching/learning sciences in secondary schools.

4. Research Questions

The following research questions have been advanced for this study:

- 1) What are the importance of computer/computer assisted instruction (CAI)?
- 2) What are the contributions of computer/computer assisted instruction (CAI) in teaching/learning science?
- 3) What are the problems of using computer/computer assisted instruction (CAI) in teaching/learning science?

5. Use of Computers in Teaching and Learning

There are several ways with which the computer can be used in teaching and learning, the most popular of which is the use of computer application to teach as well as computer assisted instruction (CAI). The use of a Microsoft office application (PowerPoint) in classrooms to replace the traditional chalkboard pattern makes learning more efficient. The teacher makes his research and take some short notes which he can eventually present to the students to aid their understanding of the subject matter [1]. In the use of computer assisted instruction, instructional materials are often developed in form of computer programmes for learners. The piece of information necessary for particular learning may be presented in bits. Each bit may appear on the Visual Display Unit (VDU) of the computer for the learners to study. The bit is then followed by questions to be answered by the learner to test his mastery of the subject matter. The degree of accuracy with which the learner responds will determine whether the learner is to proceed to the next bit, review the bit or go back to study some other bit earlier presented. This, therefore, makes computer assisted instruction excellent for drill and practice [2]. Generally, when computer is used in the learning-teaching process, the learner can process faster in comprehending the subject matter since the computer is doing the teaching while the student is learning. CAI can be used both at school and in the home thereby offering flexibility to both the students and the teachers [3].

CAI strategy of teaching can be seen as an able companion and a helper to science teachers. There is no doubt about this, since with CAI programmes students can go through lessons taught in the class several times, which invariably increases their mastering of the taught concept. In this case, the teacher does not need to over-work himself repeating taught lessons many times to achieve the desired result [4]. CAI's tutorial mode makes students' grasp of science concepts to be high irrespective of students' strength and ability. This is because the learner will possibly practice the subject matter as much as he can to enhance his mastering of the subject [5].

Furthermore, the use of computers in teaching is crucial to improving classroom learning. Three (3) areas in which the use of instructional technology (computer systems) affects learning has been identified to be – curriculum, instruction and assessment [6]. In the area of curriculum, advanced technology has the potential to significantly expand the breadth and depth of the curriculum. With the Internet, for example, students can access information far beyond the scope of their traditional textbooks. Curricula can be individualized and adapted to students' specific learning styles. Instructional technology has the power to enhance overall knowledge accumulation, instead of just focusing on content mastery. The use of instructional technology changes the teacher's role from expert to facilitator or coach. This implies that instruction is no longer limited in the classroom or school building. With regards to assessment, instructional technology will focus more and more on building feedback loops directly into the learning process. Students can obtain frequent and accurate feedback, make corrections to their work, and structure learning experiences around their

individual needs. Assessment can be monitored by offsite instructors, plus it can be ongoing and cumulative [6].

In similar vein, computer technology has made the mastery of knowledge easier as it enhances individual critical thinking skills and encourages team work through electronic communication like the Internet. The use of computer no doubt breaks a lot of barriers that the teaching-learning process faced in the past [7].

Use of Computers in the Enhancement of Science Education, its Constraints and Students' Achievement

Computer assisted instruction for a long time has been used in advanced countries like the United Kingdom to advance its education. It is seen to be very effective as its programmes use tutorials, drills and question-and-answer sessions to present a topic and to test the student's comprehension. Rapid communication plus increased access to Information Technology in the home, at work, and in educational establishments, could mean that learning becomes a truly life-long activity. Statistics have shown that in 1996, an average of 96 and 13 computers were available in each secondary and primary schools respectively across England [8].

Realizing the importance of science to development, Africa has been eager to develop its scientific human power to attain a measure of self-reliance in the production of goods and services, by expanding its educational facilities, and setting up curriculum development and research centres, as well as developing policies on science education [9]. However, beyond the passionate rhetoric and such interesting interventions, science education appears to be experiencing problems that could lead to a crisis. In Africa, the Dakar Declaration indicates large socio-economical obstacles against efforts towards human power development in the field of science and a poor state of science education [9].

Six (6) major factors that militate against the use of computer in Nigeria schools has been identified. Among these were curriculum, finances, technological base, environmental requirements, power requirement, and human resources. The science curriculum currently used in Nigerian schools is believed to have been designed for traditional teaching and learning method. This made room for the relatively low priority given to the use of CAI in our schools [10].

CAI improves problem-solving and critical thinking skills of students in science classes. They further argued that, CAI can go miles in getting rid of the prevalent 'pedagogy of poverty' in science classrooms and at the same time, empower all students with the thinking skills that will help them help themselves if effectively used [11].

6. Methodology

The main tool used for data collection is the use of questionnaire administered to sixty-five (65) students of the Federal Government College, Azare. This sample was drawn from the senior secondary students that are majoring in the

sciences – Physics, Chemistry, Biology, and Computer. Each question in the questionnaire contains three (3) options – yes, no, uncertain. Each student is expected to choose any of these options in response to each of the questions in the questionnaire. Table I presents the summary of the questions and responses obtained from the students.

Table 1: Questionnaire analysis

no	Questions	Responses			
		Yes	No	Unc.	Tot.
1.	Is computer use in teaching educationally effective?	65 100	- -	- -	65 100
2.	Is computer assisted instruction excellent for drill and practice?	49 75.4	10 15.4	6 9.2	65 100
3.	Can computer help the students in doing assignments and solving mathematical problems?	63 96.9	2 3.1	- -	65 100
4.	Does computer use in learning enable students to learn at their own pace?	61 93.8	4 6.2	- -	65 100
5.	Can the use of computer in teaching help students to attain high academic performances?	55 84.6	10 15.4	- -	65 100
6.	Can computer use in teaching promote the students' rate of retention of what is being taught with it?	58 89.2	7 10.8	- -	65 100
7.	Can the use of computer in teaching make students develop keen interest in the subject being taught?	57 87.7	6 9.2	2 3.1	65 100
8.	Does the use of computer enhance problem-solving and critical thinking skills of students?	54 83.1	8 12.3	3 4.6	65 100
9.	Is the present state of our classrooms conducive for the effective use of computer in teaching science?	8 12.3	57 87.7	- -	65 100
10.	Are the power supply systems in our schools adequate for the effective use of computers in teaching?	6 9.2	55 84.6	4 6.2	65 100
11.	Do our schools have enough computers for effective integration of the use of computers in teaching?	6 9.2	59 90.8	- -	65 100
12.	Are you capable of handling the computer/CAI in learning science?	9 13.8	56 86.2	- -	65 100

7. Results and Discussion

The findings of this research will be discussed based on the importance of computer/CAI, contributions of computer/CAI and the problems of using computer/CAI.

Questions one (1) to four (4) were raised to address the research question 1 which seeks to find out the importance of computer/CAI in teaching and learning. The research findings show that CAI is educationally effective which is asserted by all the respondents. This assertion is in line with [8] which stated that CAI is very effective as its programmes use tutorials, drills and question-and-answer sessions to present a topic and to test the students' comprehension. The affirmation of CAI being excellent for drill and practice, doing assignments/mathematical problem solving, and enabling students to learn at their own pace corresponded with the findings of [2] and [5] when they said that the learner will possibly practice the subject matter as much as he can to enhance his mastering of the subject matter. Figure 1 shows a bar chart representing the students' responses on

the research question one (1) which seeks to ascertain the importance of computer/CAI in teaching/learning of science.

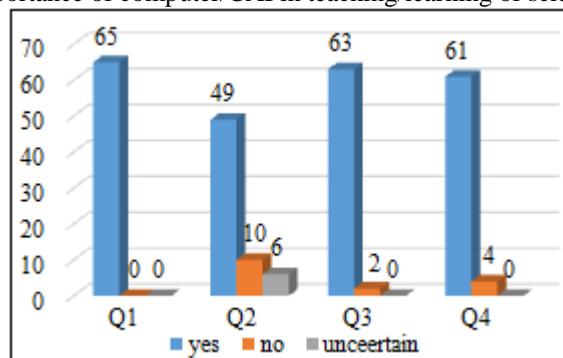


Figure 1: The importance of computer in teaching/learning

Pertaining to questions five (5) to eight (8) which are raised to address the second research question that seeks to find out the contributions of computer/CAI in teaching/learning science. A vast majority asserted to the questions. Therefore, computer use in teaching/learning helps students to comprehend lessons easier than the conventional method thereby leading to high academic performance. This assertion as held by 55 (84.6%) of the respondents is in line with the research findings of [5] which opines that CAI students' grasp of science concepts is usually high irrespective of age and ability. Likewise, the findings of this research show that 58 (89.2%) of the respondents are of the opinion that the use of computer in the teaching/learning process enhances students' understanding and retention of taught topics. This assertion is in line with the findings of [4] which stated that the use of CAI has helped to take care of all categories of learners which means comprehension of lessons are made easier leading to retention of taught topics. Furthermore, [6] stated that the use of computers is crucial to improving of classroom learning outcomes. Pertaining to students developing keen interest in science due to the use of computers in the teaching/learning process, 57 (87.7%) of the respondents asserted to this opinion. This finding is in line with that of [8] which stated that rapid communication plus increased access to IT anywhere makes learning a truly life-long activity. On whether the use of computer enhances the students problem solving and critical thinking skills, 54 (83.1%) of the respondents affirmed this fact. This finding is in line with [7] and [11] which states that computer/CAI enhances the students' critical thinking skills. Fig. 2 displays in bar chart the responses to research question two (2) which seeks to appraise the contributions of computer/CAI in teaching/learning science.

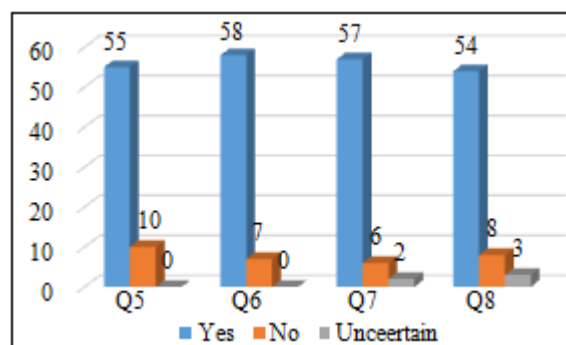


Figure 2: Contributions of computer/CAI in teaching/learning

Questions nine (9) to twelve (12) centered on the problems of using computer/CAI in teaching/learning science leading to the affirmation of the following problems:-

- That the present state of our classrooms is not conducive for computer use in teaching, a view held by 57 (87.7%).
- That the power supply system(s) in our schools are not adequate for the effective use of computers in teaching, a view held by 55 (84.6%) of the respondents.
- That our schools do not have enough computers for the effective integration of the use of computers in teaching science, a view held by 59 (90.8%) of the respondents.
- That many of our science students cannot effectively handle the computer/CAI in learning science, a view held by 56 (86.2%) of the respondents.

These findings are in concurrence with the findings of [10] which identified six factors that militates against the use of computer in Nigerian schools, namely curriculum, finances, technological base, environmental requirement, power requirement, and human resources. Fig. 3 displays the responses on the problems that hinders the effective use of computers in teaching/learning in our schools.

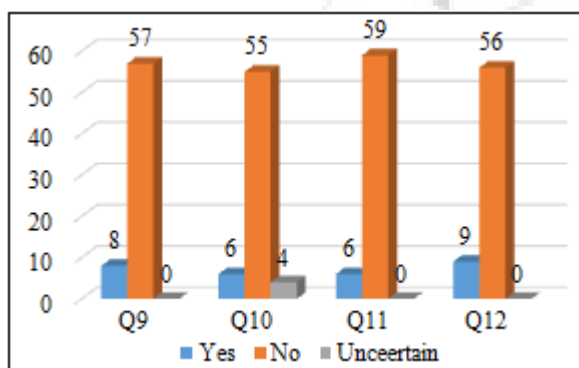


Figure 3: The problems of using computer/CAI.

8. Conclusion based on the findings

Based on the findings of this research, the researcher hereby concludes that computer/CAI use in teaching and learning is very relevant towards the enhancement of science education than the conventional method because of the following reasons:-

- It enables the students to learn at their own pace leading to easy comprehension of lessons taught as it takes care of their individual differences.
- It makes learning a truly life-long activity as it can be used even at home.
- It changes the teachers' role from expert to facilitator as the teacher would guide the teaching/learning process by stimulating the students thereby enhancing the problem-solving and critical thinking skills of the students.
- It makes the students develop keen interest in science subjects as it promotes their rate of retention of what is being taught leading to high academic performances.

It is therefore, recommended that government and all stake holders should live up to expectation by tackling the identified problems of lack of adequate classrooms in our

schools, lack of steady power supply, and lack of sufficient computers.

References

- [1] Rallies, H. (2000). Using computers in teaching and learning. Retrieved on the 10th day of January 2018. Available at <http://www.duluth.umn.edu/~hrallis/guides/computeride.as.html>.
- [2] Adesina, A. I. (2002). *Introduction to Computer (Revised Edition)*. Lagos: Kenia Publishers.
- [3] Bhalla, J. (2013). Computer use by school teachers in teaching –learning process. In *Journal of Education and Training Studies*, vol. 1, no. 2, October 2013. Retrieved on the 10th day of January 2018. Available at <https://files.eric.ed.gov/fulltext/EJ1054883.pdf>.
- [4] Ezeliora, B. (2000). Role and importance of computers in the Nigerian educational system. *Journal of the Nigerian Teachers Today*, 8 (1 – 2), 196 – 200.
- [5] Ward, M. (2002). *Computer assisted instruction and learning issues*. Retrieved on the 10th day of January 2018. Available at <http://www.computing.dcu.ie/~mward/mthesis/chapter2.pdf>.
- [6] Perelman, L. J. (2002). *School's Out*. School of Education. Stanford University, Stanford, CA.
- [7] Jebakirubai, K. (2017). Computer assisted teaching and learning in classrooms. In *Journal of Technology for ELT*, vol. 7, no. 2, April 2017. Retrieved on the 10th day of January 2018. Available at <https://sites.google.com/site/journaloftechnologyforelt/archive/october---december-2012/3-computer-assisted-teaching-and-learning-in-classrooms>.
- [8] Microsoft Encarta Reference Library (2006). *Computer assisted Instruction*. In Microsoft Encarta Reference Library DVD.
- [9] Ogunniyi, M. B. (1996). *Science, technology and mathematics: The problem of developing critical human capital in Africa*. *International Journal of Science education*. Vol. 18, No. 3, 267 - 284.
- [10] Abimbade, A. (1999). *Principles and practice of educational technology*. Ibadan: International Publishers Ltd.
- [11] Waxman, H. C. & Padron, Y. N. (1994). *Eliminating the pedagogy of poverty in mathematics and science classrooms through technology use*. Paper presented at the international symposium on Mathematics/Science Education and Technology held at San Diego, CA, July.