

# **ESSENCE OF COMPUTER SCIENCE EDUCATION IN NIGERIAN SECONDARY SCHOOLS**

By

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## **Abstract**

In recent times, critical opinion has appeared concerning the use of computers by secondary school students. In this study, it examined the essence of computer science education in Nigerian secondary schools. The world is now in the computer age, hence there is need to keep abreast of time through promotion of the introduced computer science education especially in Nigerian secondary schools. Technology has struggled to find its way into the classroom in all sorts of ways, from projectors and televisions to computer laboratory and students' laptop. Along with improving the way students are taught in the classroom, it is also vital that students learn to use computers to improve their own work and prepare for careers in a world where computers have become as common as the pencil. In this paper importance of computer science education and the need for computer science education in secondary schools were discussed, ways of promoting computer science education in secondary schools were also detailed and recommendations made.

**Keywords:** Essence, Secondary Schools, Computer, Computer Science Education

## **Introduction**

In the globalized world, technology has become the in-thing as countries and organizations devise means of gaining a competitive edge over the others. In view of this, secondary school education system in Nigeria needs to be tailor-made to suit this endeavor.

Computer is playing vital role in modern life. Computer science education has great importance because the use of computer has reached almost all spheres of life.

We live in a fast-moving world where almost everything must come instantly to us. In this computer era, we depend on the computer to help us complete tasks, and to solve problems. Computers are used in various fields like business, pharmacy, music, education, engineering, defense, transportation, and cooking as they help to ease certain tasks, provide information faster, and speed up the work. Wherever you go whether it is a mechanic's shop or a fast food restaurant, some form of technology and computers are being used. It may be a computerized cash register or the machine that cleans out your engine but it is a computer and everyone needs basic computer skills to function in today's job market.

Development in science and technology has brought into lime light the indispensable roles of computer in the area of information technology as a new instructional system. The incursion of the electronic computer system into the educational parlance, according to Sherman (2005) provides the wherewithal to solve teaching and learning problems even more rapidly and accurately than hitherto conceived. This has eventually made the computer system the doyen of humanity as it continues to exert greater acceptance.

Computer, according to Jayesimi (2004) has become the "nowology" in our society and possibly futuristic years ahead. In schools, computers are widely used, and the need for computer technology and literacy in the educational system has become more relevant.

Computer has been found to be an effective device for presenting an instructional programme. According to McCormik (2003) computers can be used to diversify, develop and improve the pedagogical relation of teaching and learning. Also, technological development can only be enhanced through proper acquisition of scientific knowledge which can only be realized through relevant training in Science, Mathematics and Computer Science Education. It was in this light that the Federal Government of Nigeria launched the National Policy on Computer Literacy at primary, secondary and tertiary level of education in 1987 with the following general aims:

- For the computer to transform the school system, as there is increased merger between computer technology and communication.
- To equip the individual or student with thorough understanding of the concept of computer in order to fit into the next century.

Learning about the computer basics followed by a practical experience of using a computer is the key to computer science education. As computers are widely used today, acquiring computer science education is the need for every secondary school student. By computer science education, we mean learning how the basic concepts related to a computer work, gaining the basic knowledge of computer operation, knowing about the basic components of a computer, the basic concepts behind the use of computers and knowing some of the elementary computer applications.

Computer science education is therefore the effort to make the generality of the people computer literate. Computer literacy means the ability to tell the computer what you want it to do and understands what the computer does (Ajibade, 2006). To be computer literate amounts to be able to read, write and speak the language of the computer. One can also define Computer science education as the amount of knowledge and skills acquired by an individual to perform a given task using a computer system. Expectedly, the knowledge and skills acquired in this area may be very high, high, low or very low, depending on the individual's exposure to computer facilities. Computer science education is of paramount importance to national development and it is on this premise that the government of Nigeria sought to introduce computer studies in the educational system from primary through to tertiary institutions. Today, computer technology in schools is one of the most far-reaching and fast growing developments in education. Like maize in a plantation during a storm, countries all over the world are bending towards the fad of computer science education (Joseph, 2004 & Macaulay, 2005).

The national programme on Computer Science Education as put in place by the Federal Government of Nigeria was received with open arms and regarded as a technological innovation in educational practice in Nigeria institutions of learning.

Computer Science Education was perceived as a new instructional system that was designed to improve the quality of teaching and learning and to aid technological and socio-economic development.

### **Need for Computer Science Education**

The need for computer science education in secondary schools lies in the potential of computer to aid in instruction. Computer can be used to evaluate students' performance and direct students forward for appropriate learning activities. Elkhalm (2009) stated that computer might also be used to handle the extremely complex programs that are necessary for more individualized learning. At the primary and secondary level of education, students can explore and generate learning through computer programs. At the tertiary

level, computer can be used to store the daily/weekly observation of experiments in science. In addition, the need for computer science education in Nigerian secondary schools lies in the potentials of computer instructional purposes and its utility value. The computer is tireless and relentless, evaluating teacher which has several modes of instruction at its disposal such as sound, sight and touch. According to Baugher (2003) in Language, a computer can present words to be spelled, sound to be made, instructions to be followed, images and symbols to be responded to, by touching. Its patience, memory and endless capacity for details are assets that defy competition from ordinary teacher.

The computer can present diagnostic test, provide branched programmes to accommodate individual needs, and furnish prescriptive assignments that might refer the students to a textbook, a laboratory experiment or a consultation with the instructor. Fajola (2002) assets that the computer is diligent and consistent in its mode of operation, as it does not suffer from tiredness or lack of concentration like human beings. Computer performs multi-functional roles in teaching and learning processes at all levels. At the primary and secondary levels of education students can explore and generate learning through computer programme.

Likewise, most external examinations are computer based, (e.g. the U.T.M.E exam). Through Computer Science Education, students can operate and access the computer which makes it easier for them when they come across any computer based examination, they can freely answer the questions being set without panicking. Computer science education has failed to take off in majority of Nigerian secondary schools; this has created fear among stakeholders that technological development may be a pipe dream for the country. Given this scenario, it is necessary for this study to examine ways of promoting computer science education in Nigerian secondary schools among others.

### **Importance of Computer Science Education in Secondary Schools**

The following are some of the importance of computer science education in Nigerian secondary schools:

#### **It creates access to the internet**

Computer is necessary for research in secondary schools. Jeremy Harmer (2007) writes that students and teachers can find practically any kind of information they want on the Internet. They can access newspapers, encyclopedias, history sites, film guides, lyrics, and broadcasting associations like the British Broadcasting Corporation (BBC). Research help students to understand better the assignments which were given to them as homework, as many students look on the Internet for technical words, which are critical for understanding the text. They look in dictionaries or googling to find adequate explanation of the words.

In addition, depending on the students' area of interest, they are obligated to do projects. For instance, biology students look for certain information for their projects like how the human body or code Deoxyribonucleic Acid (DNA) works. They can find helpful results of elaborated illustrations and satisfying explanations. Computer access opens up many more research opportunities. Students can easily search for journal articles and online books, making it easier to find the information they need to complete their assignments. Online tutorials, blogs from experts and study websites can help students who are struggling by explaining information using simple and clear language. Some websites even make it easier for students to cite sources by providing quick tutorials on all major style guides or allowing a student to plug in source information and then auto-formatting it.

Although students might be able to find other ways to get information -- such as going to the library, going to a professor's office hours or calling a friend. Using a computer is generally much quicker than driving to a resource or to a meeting and through computer science education students can learn how to use the computer to access the internet. The ready availability of online information and tools can help students work more quickly, making the learning process less frustrating. Web and phone applications designed for college students can help students manage their course load and work more efficiently by reminding them of upcoming deadlines, offering study tips and tracking grades.

It has been pointed out that the Internet can be motivating for students with learning disabilities (Cunningham and Andersson 2007) and that it is possible to support students with "special educational needs" through the use of the interactive chalkboard in the classroom (Gray & Carol, 2007).



**Figure 1: Image of an internet** Source: All about ICT (2015)

### **Exposes students to Computer programs**

Computer programs are another reason why computer science education is essential for secondary school students. If college typed essays are required from students for example, the legibility of writing can be improved in Microsoft word office programs. Students type their essays making them neat, nice, readable and more presentable. Furthermore, specialized programs assist secondary school students perform their assignments with higher proficiency for instance with Microsoft Excel office and SPSS Economics and Mathematics students can produce various charts and graphs showing different statistics. Computer science education is therefore important for secondary school students as it helps them meet up with school requirements in record time and be ready for next class.

### **It expands knowledge**

People who read a lot on the Internet increase their wisdom and expand their creativity. For example, students who have to write essays must have many ideas to develop their thoughts. Reading articles on various topics help secondary school students to have the information and develop their individual point of view. This makes them to think creatively thereby writing good essays. Moreover, students get their knowledge from news, taking for

instance, people who read current information, which are uploaded, have knowledge about latest events from all over the world, which is helpful with their studies enabling them to be active during class conversations. Computer science education for secondary school students is important because it helps them to acquire skills in writing good essays and they are also effective during classes.

### **Games and simulations are guaranteed**

In secondary schools games and simulations promote cognitive development, specifically in the area of visual intelligence, where certain computer activities—particularly games—may enhance the ability to monitor several visual stimuli at once, to read diagrams, recognize icons, and visualize spatial relationships (Greenfield, Nelson & Isaac 2005). In recent years, there have been dramatic changes in the computer-supported technology. More powerful computers and sophisticated programs are used in secondary schools. According to White (2004) these changes in technology have increased the capability of using more visual aids in the classroom that attract secondary school students.

Therefore, many studies like software/CD-ROM programs are now available to support teaching strategies in secondary school classroom. Rice and Wilson (2006) states that “those programs allow secondary school students to engage in activities, such as simulations and problem solving that encourage them to construct their own knowledge and conduct their own research” Likewise, Berson (2002) points out how simulations and games can reinforce constructivist learning in the classroom. According to Berson (2002) simulations facilitate the development of secondary school students' problem-solving skills and place students in the role of decision maker. Also Berson points out the practicality of simulations which allow students to engage in activities that would otherwise be too expensive, dangerous, or impractical to conduct in the classroom (Berson, 2002). Simulations and games are also among the most frequently used computer applications.

A newer study was conducted by Pye and Sullivan (2001) which showed that games and simulations are still among the most common computer-based instructional strategies after the Internet. A study conducted on college students in an economic course, showed that the experimental group, which received instruction using computer simulations, demonstrated greater development in critical thinking skills and content knowledge than those who did not (Grimes & Wiley, 2003).



**Figure 2: Image for gaming**  
**Source: Milwaukee Area Technical College (2012)**

### **Uses multimedia / hypermedia**

Multimedia/hypermedia provides secondary school students with visual support in order to develop mental models of the problems they are trying to solve. Multimedia/hypermedia refers to the combination of sounds, graphics, texts, and images with a single information delivery system (Rose & Fernlund, 2007). The origin of the word hypermedia comes from the term “hypertext” which was used first by Ted Nelson in the early 1960s. Nelson, later, defined the term and began using the word hypermedia (Braun, Fernlund, & White 2004). With multimedia/hypermedia, secondary school students can create individual or group presentations to develop skills in information retrieval and communication, or they can create presentations that promote evidence of understanding of subject content and their own perspectives (Rice & Wilson, 2006).

There are a number of multimedia software programs such as Authorware, Hypercard, Hyperstudio, or Linkway which help secondary school students to create productions that include video and audio clips of various subject topics. Likewise, concept mapping, clustering, mind maps, and other types of graphic organizers can be used effectively in classes today. These visual learning symbols, pictures, and other representative techniques allow the students to go deeper into ideas and concepts (Chandler, 2003). The integration of multimedia technologies in many subjects has made it possible for secondary school students to become more involved in their studies and create multimedia applications as part of their project requirements.

Kocoglu and Koymen (2003) pointed out that those secondary school students who use the multimedia technology as designers have higher creative thinking skills than those who do



not. In other words, it seems that using multimedia in learning process has a positive effect on secondary school students' creative thinking skills. The current research clearly shows that multimedia technologies significantly influence secondary school students' learning by broadening their scope of learning and knowledge. In the light of above, it is said that multimedia technology can provide an alternative to the traditional teacher-centered learning and it enables these students to enjoy a richer constructivist learning environment. It can support them to become active learners rather than memorizing knowledge and displaying their ideas and information in terms of the multimedia format and use their higher order thinking skills like analysis, synthesis, and evaluation (Mai Neo & Ken Neo, 2003).



**Figure 3: Multimedia examples**

**Source: Multimedia Storytelling Institute (2014).**

Through the use of computer, shy students can learn using computer aided learning- drill and practice. Computers should be learned and used as soon as possible especially at secondary level because they will be essential for these students in the professional working place.

### **Ways of Promoting Computer Science Education in Nigerian Secondary Schools**

#### **1. Implementing full computer curriculum in secondary schools:**

This curriculum has been in place since its adoption by the government though not fully implemented, from what they are through how they may be used for general applications, as well as their impact. It is possible that this curriculum could be spread across the entire six years. Experience has shown that if presented properly they are very much within the reach of typical secondary school students. They are designed to be included in an overall investigation of how the major technologies work, how they can be usefully employed, and how they affect us individually and as a society. Many of the activities can, and should, be incorporated into existing classes, whereas other aspects cut so much across curricular lines, or lie outside of them, that they will require a separate course.

#### **2. Promoting the established "Computer Laboratories" in secondary schools:**

This is where students learn how machines work: those stressed by Steiner such as the telephone and the steam engine, plus combustion engines and electric motors, radio, TV and, obviously, computers. A strictly practical approach should be

followed in these classes, leaving theories for the normal science (physics, chemistry) classes. Teaching the fundamentals of computer - and calculator - hardware involves physical realities that involve stressing the phenomenological aspects, with very little theory. The important properties of circuits and components may be deduced from simple experiments performed by the students; that is why we are promoting these classes for secondary school students. It is believed that this laboratory experience should be part of the core curriculum for all secondary school students. Without at least a fundamental knowledge of how technology works a student has no chance to assert control over it and will be prone to the apathy discussed earlier. As the inner workings of everyday devices become more and more opaque it is essential that the educational experience shed some light on how these things operate.



**Figure 4: Image for computer laboratory**

**Source: The Cathedral and John Cannon School (2011)**

**3. Recruitment of more computer literate teachers in secondary schools:**

Teachers are the fulcrum on which the lever of educational system rests (Achimugu, 2005). Apart from students, they are the largest and most crucial inputs of educational systems that influence to a great extent the quality of educational output (Fadipe, 2003). It was stated that no educational system can rise above the quality of the teachers (Federal Republic of Nigeria (FRN), 2014). Through the availability of qualified computer science teachers in secondary schools, students will be able to attain the basic education needed in computer science and be able to explore their knowledge in a real life world.

**4. Promoting classroom activities that instigates discovery with the computer:**

Activities that afford secondary school students accurate impression of the various branches of computer and their functions should be undertaken. For instance, students will get a taste of what basic computer science is concerned with by examining the nature of algorithms. Setzer has done this in a very concrete way by using poster boards with pockets attached to sort slips of paper containing numbers inserted into the pockets (Setzer & Carvalho, 2003). Students must first sort the numbers working under the same limitations as a computer (not being able to pull out more than two numbers, compare and exchange more than just two numbers, etc.) Usually the students discover one or two of the most common methods on their own. But they generally have quite a bit of difficulty describing procedures in a formal way. By discussing these problems and looking at other sorting methods the investigation can move in a variety of directions that encompass mathematics, logic, and program design. With such an activity, the students' gain, through



simple examples, insights into how computers function and also a more realistic understanding of the nature of computer science is achieved. The intellectual activity in which coding an algorithm in some programming language is relatively trivial is the main problem residing in developing the algorithm. In other words, the intellectual part of computing is more important than dealing with the machine. Young people have been subjected to all sorts of myths about computers, including the impression that programmers and systems analysts have spectacular abilities. It is important that a more realistic picture needs to be painted for potential computer professionals among secondary school students, so that those who do not pursue computer science education will henceforth embark on it so as to face the challenges of the 21<sup>st</sup> century.

### Conclusions

In order to place computer science education in an adequate perspective in Nigerian secondary schools, it is absolutely necessary to have a model of the development of each child and teenager. Research has shown that it is only at secondary school age and beyond that a child is prepared to exercise pure abstract, formal, logic-symbolic thinking. So computer science education is recommended to be implemented fully using the computers only at that stage, taking into consideration again that computers require enormous selfdiscipline because of its physical characteristics. This paper has revealed that promoting computer science education in Nigerian secondary schools will help to suit the present technology that is advancing in this country and equally help to prepare the students irrespective of field of study for the future when technology must have fully taken over.

### Recommendations

For actualization of the stated objectives in our secondary schools through computer science education, the following recommendations are proffered:

1. Qualified teachers in computer subjects should be employed especially applicants with B.Sc. (ED.) in computer education to teach in secondary schools.
2. Secondary school principals and teachers should see to the implementation of computer science education curriculum in secondary schools.
3. Government should provide funds to schools for computer procurement and repairs where need be.
4. Secondary school teachers should be offered administrative and technical support through in-service training programme.
5. Secondary school students should be made to understand the importance of computer science education in their profession either by their teachers or parents for that will enhance their interest during classes.

### References

- Achimugu, L. (2005). *The agonies of Nigerian teachers*. Ibadan: Heinemann Education Publishers Limited.
- Ajibade, A. (2006). Effects of interactive instructional compact disc package on the performance of English language learners in schools of sciences in Osun State. *Unpublished Ph.D dissertation*. Faculty of Education, Obafemi Awolowo University, Ile-Ife.
- All about ICT, (2015). <http://www.allaboutict.com/ThirdTemplate/1.aspx?id=1&catid=4&ParentID=4&mid=154>.

- Baughner, L. (2003). Presentation of computer. *CAI Source Book*, Prentice Hall Inc.
- Berson, M. J. (2002). Effectiveness of computer technology in the social studies: A review of the literature. *Journal of Research on Computing in Education*, 2 (4), 486-499.
- Braun, J. A., Fernlund, R., & White, C.S. (2004). Social studies and technology: Past, present and future. In J.A Braun, R. Fernlund, & C.S. White (Eds.), *Technology Tools in the Social Studies Curriculum* (pp. 1-13). Wilsonville, OR: Franklin, Beedle & Associates.
- Chandler, H. (2003). Concept mapping & webquest in social studies. *Media & Methods*, 39(3), 1.
- Cunningham Una & Andersson Staffan (2007). *Läraren – eleven – Internet*. Stockholm: Liber AB.
- Ehman, L.H., & Glenn, A.D. (2005). Interactive technologies in the Social Studies. In J.P. Shaver (Ed.), *Handbook of Research on Social Studies Teaching and Learning* (pp. 513-522). New York, NY: McMillan Publishing Company.
- Elkhalm, Z. (2009). The computer; How is it changing our lives? *Washington D.C: A division of U.S News and World Report Inc.*
- Fadipe, J.O. (2003). Quality control in education: The teacher factor. In T.E. Ajayi and J. Fadipe (Eds.), *Skills Improvement Programme for Effective Performance of Teachers in Nigerian Schools. A Publication of National Institute for Educational Planning and Administration (NIEPA), Ondo, 128-143.*
- Fajola, O. O. (2002). Computerisation of examination results: *A Case for Consideration in Colleges of Education*. *The Coll. Rev.* 8: 151-158.
- Federal Republic of Nigeria (FRN, 2014). *National Policy on Education*. Lagos NERDC.
- Gray, E. & Carol, N. (2007). Integrating ICT into classroom practice in modern foreign language teaching in England: Making room for teachers' voices. *European Journal of Teacher Education* 30, 407-429.
- Greenfield, O. E, Nelson, P.A., & Isaac, M.C. (2005). How to promote cognitive development in children and adults. *Educational Psychology*, 5(1), 2-12.
- Grimes, K. P., & Willey, J. M. (2003). Computer simulations for college students. *Journal of Research on Social Studies*, 8, 181-192.
- Jeremy Harmer (2007). *The practice of English language teaching* Essex: Pearson education ltd. integrating ICTs into the curriculum: Analytical catalogue of key publications. *UNESCO Asia and Pacific Regional Bureau for Education*, 2 Jul. 2010.
- Jayesimi, S. B. (2004). Programming the unprogrammable. *Inaugural Lecture Series 7, Obafemi Awolowo University, Ile-Ife.*
- The Cathedral and John Cannon School (2011). Image of a laboratory. <http://www.cathedralschool.com/ThirdTemplate1.aspx?id=1&catid=4&ParentID=4 &mid=198>.
- Joseph, N. (2004). The Computer: How is it changing our lives? *Washington, D.C. A Division of U.S. News and World Report Inc.*
- Kocoglu, C., & Koymen, U. (2003). The effect of the hypertext learning environment on creative thinking of the students involving as hypertext designers. *Turkish Online Journal of Educational Technology*, 2(3). Retrieved July 22, 2004, from [http:// www.tojet.sakarya.edu.tr](http://www.tojet.sakarya.edu.tr).
- Macaulay, O. A. (2005). Computer: A tool to help children with specific learning difficulties in mathematics. *Journal Issues on Special Education*, 1(1).

- Mai, N., & Ken Neo, T. K. (2003). Developing a student-centered learning environment in The Malaysian classroom – A multimedia learning experience. *Turkish Online Journal of Educational Technology* 2 (1). Retrieved from <http://www.tojet.sakarya.edu.tr>.
- McCormick, L. (2003). Early intervention in natural environments. *Pacific Grove, CA, Brooks/Cole*.
- Milwaukee Area Technical College, (2012). [http://www.matc.edu/media\\_creative\\_arts/degrees/images/computer\\_Simulation-andGaming-AAS\\_2016-17\\_107946.png](http://www.matc.edu/media_creative_arts/degrees/images/computer_Simulation-andGaming-AAS_2016-17_107946.png)
- Multimedia Storytelling Institute(2014).[https://multimedia.journalism.berkeley.edu/wpcontent/uploads/2014/10/multimedia\\_axes\\_from\\_hands.jpg](https://multimedia.journalism.berkeley.edu/wpcontent/uploads/2014/10/multimedia_axes_from_hands.jpg)
- Pye, J., & Sullivan, J. (2001). Use of computer-based instruction in teaching middle school social studies. *The International Journal of Social Education*, 15(2), 92- 102.
- Rice, M. L., & Wilson, E. K. (2006). How technology aids constructivism in the social studies classroom. *Social Studies*, 90 (1), 28-33.
- Rose, S.A., & Ferlund, P.M. (2007). Using technology for powerful social studies learning. *Social Education* 61(3), 160-166.
- Setzer, V.W., & Carvalho, F. (2003). Algorithms and their analysis - A pedagogical introduction (in Portuguese). *Caderno da Revista do Professor de Matematica* (Vol. 4, N. 1, pp. 1-26). Brazilian Society of Mathematics.
- Sherman, E.V. (2005). *Teaching And Learning Problems*. New York: Oxford University Press. pp 211-216.
- White, C. (2004). Technology and social studies: An introduction. *Social Education*, 61,147148.