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CHALLENGES OF TEACHING AND LEARNING COMPUTER SCIENCE IN SECONDARY SCHOOOLS IN FCT ABUJA

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Abstract
This study is based on a total of eighty five people were used. A total of eighty questionnaires and six 96) research questions and hypothesis were raised and tested.Some related literature reviews were used. Questionnaires and oral interview were used to collect relevant data. A case study type of research design was used, due to the in-depth search for the problems facing the teaching and learning of computer science in secondary schools. The finding shows that the problems facing the teaching and learning are, lack of qualified teachers capable of handling the subject, attitude of both the teachers, ministers of education and students to the subject, lack of practical classes, "lack of relevant materials, and equipments, the appreciation attitude of students.The teaching of computer science in secondary schools is necessary since Computer Education is relevant to the technological needs and interest of our society as a result of its numerous areas of applications such as Medicine, Education, Transport, Office automation, Sports, banking and Business etc.Thus the findings leads to the conclusion that lack of appreciation of falling standard in Computer Science Education are dependent on identified problems above and if adequate attention is focused at solving the problems, the problems facing the teaching and learning of Computer would be eradicated in our Nigeria educational system.

Introduction

The manipulation of data, called data processing can "involve computation such as adding, subtracting, multiplying and dividing as well as storing and retrieving data. Once the data has been entered into the computer, it is then ready to be processed. However, the computer must be told how to process the data by set of instructions called computer program. This is a set of detailed instructions that directs the computer to perform a particular test. When a computer carried out these instructions, we say that the computer executes or runs the program.

The problem of counting had been with man, since creation and he has been out for tools to aid him. Some of the tools include the stones, pebbles, tally sticks, Abacus, Napier rod etc, until he came about the punch card, then the modern electronic computer in the last century. The computer as we know it today, is an electronic device that accepts data in a prescribed form, processes it and produces the result at a very fast speed (C.S. French 1989). The result of the computer operation is known as information. The applications of computer transcend political, religious, economic, social line etc.

Computer Science has contributed immensely to the field of medicine. Agricultural industry and the entire life of mankind all over the world. Hence, the emphasis on the teaching and learning of Science both in the developed and developing countries in which Nigeria is not an exception, this is to make the country to meet up with the rest of the world technologically.

It has come to better the lots of man in diverse respect, especially in the educational sector where the use of Computer Aided Instruction (CAI) has changed the learning and teaching process. It is crystal clear that we cannot fully say all that computer stands to achieve in the areas of education especially as it related to the secondary schools where computer is studied as a subject.

There is no gain saying that the introduction of this all important concept had a number of problems in terms of hindrances even though there is a greater prospect in this innovation. Therefore the study seeks to establish the problems facing the teaching and learning of computer science in secondary schools.
This study is primarily designed to show the problems facing the teaching and learning of Compute Science in Secondary Schools. Numerous factors have been militating against the effective teaching and learning of computer science in our secondary schools. These problems include lack of qualified teachers, inadequate materials and updated computes hardwares. If the curriculum and syllabuses are well designed to teach the subject, all these we seek to find during the course of the research.

Hypothesis

The following hypothesis will be tested during the course of carrying out these research study.

1. The availability of a well equipped laboratory as well as having practical classes have no significant effect on the problems facing the teaching of computer science.
2. The qualification of teachers has no significant effect on the problems of teaching and learning of computer science.
3. The improvement in the teaching methods has no significant effect on the problem facing the teaching and learning of computer science.

Brief History

Although the computer is a relatively recent innovation. Its development rest on centuries of research, though, and discovery. Advances in information processing technology are responses to the growing awareness of computer and a need to find better, faster, cheaper and more reliable methods of handling data. The need for numerical calculations and aid has made man to seek the solution with metal and manual effort. The limitations of this developed devices lead to continual development of new counting and calculating machines up to the invention of computer.

Early Counting Devices

a. **Finger:** our forefathers were using their fingers and toes for counting. It helped them in simple additions and subtraction. This method became difficult when counting large numbers of items (Francisca Okeke (2003).
b. **Stones:** Stones aided in counting very well. The stones were arranged in piles of tens with or without being coloured. These coloures were used to differentiate pies. However these methods became tedious because of the awkwardness of the stones and increasing return it gave. (Intro to computer by francisca Nonyelum Okeke 2003).
c. **The Abacus:** This is the earliest calculating device and it was developed around 500BC in China. It comprises several rows of beads which slide on sticks or wire mounted on a rectangular frame. The abacus can be used in addition, subtraction, multiplication and division. (Intro to Computer by Francisca Okeke 2003).
d. **Napiers Rod or Bone:** This was made of ivory rods. John Napier, a Scot Mathematician and Politician developed the Napier's rod or bone in 1617. He invented the logarithms, which made multiplication and division more easily done as addition and subtraction respectively. (Introduction to Computer Francisca Nonyelum Okeke 2003).
e. **The Slide Rule:** After the invention of Napier's rod, William Oughred invented the slide rule, a calculating device that was based on the principles of Napier's Logarithm in 1962. (Francisca Nonyelum Okeke 2003).
f. **Mechanic Devices:** After some centuries, the first machines for helping with calculations were invented. These machines were mechanical because they had parts that moved. The power, which caused the movement, was provided by the person using the machine.

The first amongst them is PASCALINE, named after the inventor a French man called Blaise Pascal, in the year 1642 (C. S. French 2000).

i. **Pascal Adding Machine:** This machine was based on the decimal system. Pascaline used a series of eight rotating gear or notched wheels. Each wheel stood for the number of tens. This

was the start of input, processing and output circle. He has to his honour the popular PASCAL PROGRAMMING LANGUAGE. (C. S. French 1989).

ii. **Leibnite Calculating Machine:** In 1671, Goltfried Von Leibnites, a German Mathematician invented a calculating machine, which was able to programme through multiplication and division, his machine was a step nearer to the concept of input, processing and output circle. (C. S. French 1989). Then came the development of punched cards.

iii. **Punched Card:** The punched cards were developed in 1804 by Joseph Jacquard, a French man who wanted to automate the operation of a weaving machine and in the process make use of a number of cards with holes punched in and joined together. (Derson, R. G. 2000).

iv. In 1933, Charles Babbage, and English Mathematician, a man widely known today as the "father of computer" invented the "Difference Egine". He went further to develop a more challenging complex machine called "***Analytical Engine"***, this was steam – powered and was designed to receive instructions and input from coded, punched cards. It would, add, subtract, divide, multiply, store and print result automatically (Introduction to computer and basic programming F. N. Okeke 2001).

v. Finally in 1986, Dr. Herman Hollerith an American built an electro mechanical data processing machine which was used to sort census data by the US government, a punched card tabulating machine. This marked the beginning of the computer age.

Computers are now classified today according to their size, memory capacity, processing capability, price rank and speed of operation.

Classification of computers

a. **Super computers:** These are the largest, faster, efficient computer and more expensive computer. It "performs up to 1 billion computations per second. Scientists in weather forecasting, oil explorations etc. use these for complex calculations. Examples are CRAY e – MP and CRAY 2.

b. **Mainframe Computers:** These computers are large but smaller than super computers. It also has a variety of peripheral devices, such as printers, plotters, and terminals etc. mainframe computers usually need a specialized environment in which to operate, with dust, temperature and humidity carefully controlled. The size of internal memory is usually more than 32megabytes of storage. It process large amounts of data at high speeds – millions of computations per second. It is used mostly in large establishments such as banks, hospitals, universities etc. examples are IBM 360/370 systems, NCR – 8800 systems. (Computer Science C. S. French 2000).

c. **Mini Computers:** Developed in the 1970s for specialized task. They are smaller, less powerful and less expensive than mainframes. Minis as they are often called are easier to operate and install and they require less floor space. The internal storage capacity is usually between 8 – 32 megabytes of memory. Examples are PDII, HEIVLETT PACKARD 3000 etc. (Computer Science C. S. French 2000).

d. **Micro Computers:** These are computers whose central processing unit (CPU) is based on a micro processor. They are the most popular of computers. They are very small from desktop to palm size. They are easy to use and can be linked with mainframe and mini computers. Internal memory capability ranges between 640 kilobytes to 16 megabytes. Examples are Pentium I, II, III & IV, IBM, APPE Macintosh etc.

How Computer Science came into Secondary School Curriculum

The policy of the government to introduce computer came with the inauguration of the National Committee on Computer Education in December 1987 by the then Minister of Education (Aminu 1987).

Before this time the subject had not been taught in any of the government secondary schools. Very few private schools however were offering it. Without uniform standard and it was not made examinable. In 1988, the National Computer Committee recommended an immediate production of syllabus in line with the standard procedure for the production of it in different subjects at the secondary school level. (Interim Report for the National Computer Policy, 1988). One was finally produce some 10 years later and made available

to computer teachers, but surprisingly many serving teachers are not aware of any computer syllabus. (Institute of Education OAU 2000).

The Need and the Application of Computer Science

With reference to the definition of computers as electronic devices that are capable of accepting data into the memory and perform the operations to produce the result at a very fast speed (C. S. French 2000), the knowledge of computer can be applied in many area such as:

Business Applications

Computers are used in almost every field of business. With the knowledge of computer science, you can process information in a fraction of the time it would take to perform the same type of calculation manually, using a computer. Business activities like controlling inventory levels, billing customers for services and products, calculating payroll and taxes paying for inventory and supplies are being done better with the aid of computer. Computerized robots are used to paint, weld fastens and attached parts along the assembling line.

Online banking would not be possible without a computer and even if a computer is present, a computer literate is needed to operate it. (Computer users year book, 1999).

Office Automation

Today many companies are employing computers to stream line officer operations, perform word processing, electronically handle mail and messages and handle electronic voice storage and forwarding.

Computer through the use of television like device can hold meetings to employees can watch and hear the other speakers. Automated office computer systems allow the works to access data through computers. Authorized users get information almost instantly. All these would not work effectively if the workers were not computer science literates. (Computer users year book, 1999).

Health Care

Computers help doctors to their jobs faster and more accurately. In hospitals, computer keep records, monitor patients, schedule operations, order suppliers, bill patients, and pay employees. Only a few years ago, twenty-four hour nursing care was needed for a critically ill patient, but now computers are being used in intensive care and coronary care units to analyze patient's statistics. This computerized monitoring system frees the nurse from constant watch over the patient. The computers provide an immediate alarm if something goes wrong, allowing the nurse to react promptly. (Francisca Okeke 2003). These doctors and nurses have to be taught computer science to be able to operate this computer. Therefore there is need for the effective and normalizing computer as a subject in secondary school curriculum so that they are being taught at an early stage.

Computer in Education

Computers have also has a great impact on education, one of society's largest activities. They are used for student instruction as well as for processing administrative data for schools. Computers first used in classrooms in 1960s were used to drill students on state and capitals and multiplication facts (Francisca Okeke 2003). Computer Assisted Instruction (CAI) is still used for teaching by drilling. They are used to stimulate real – word situations for the students. This has a greater impact on the student than just reading about a subject

Computers in the Home

Some system can sense when a person enters or leaves a room. Computer now run lights so that electricity is not wasted when someone leaves the room the light goes out. A personal robot can serve food, greet guest and vacuum the carpet. These invention were made by person(s) who have had knowledge of computer science and became enthusiastic to make or produce these things.

Sports

Computers are used to analyze and design new plays, and handle the day to day business operation of any sports franchise, for example a special tennis computer called computer tennis, records the important plays of a match then the data is used to determine how a player can improve.

Transportation

Computers have affected almost every kind of transportation many airlines use computers to develop, fight plans as well as control the path of an airplane through a computer literate operator.

The Problem Facing the Teaching and Learning of Computer Science

Opinion and findings of some educationists and writers shows that, they have different views on the problems leading to falling standard in the teaching of computer in Nigeria today. Such problems include:

a. **Lack of Qualified Staff**

This is the greatest problem that has affected the effective teaching of this subject. It is often said that the quality of education is determined by the quality of teachers. The quality of any teaching therefore depends on the quality of teachers, (Popoala, 1999). This means that a highly qualified teacher certainly impact high standard of education to the students but the problem remain that sufficient well-equipped or highly qualified and competent computer teachers is lacking in secondary schools today.

b. **Method of Teaching**

The method of teaching computer is just as important as the subject itself, (Tanner and Tanner 1998). Computer has become a popular demand because of its services to human beings. But a person(s), nation and organization to be fitted in the development and industrial world the citizenry must be computer literate. Therefore, proper methodology is very essential for this objective. A teacher who is not qualified to teach computer can never know the various techniques used for teaching the subject to the understanding of the students. Hence, so many teachers have their crooked methods of teaching computer which has discouraged many undecided students from computer by magnifying that the subject is esoteric and that only special and decided students can learn it.

c. **Insufficient or Lack of no Laboratory**

Computer is a science, which should be taught practically. Each student should be able to operate the computer, on their own. This method is the best method of teaching computer. The American Educational Research Association, Collier Macmillan (1960) – teachers do not make their lesson practical. Practical would only be performed if these computers are available and each student would able to enjoy practical very well if a laboratory is provided by the school for the purpose.

d. **Teaching Aids**

Teaching aids are used to aid teaching and learning activities. They help to make teaching and learning interesting and meaningful. They aid motivation and retention. Therefore, the importance of teaching aids in the understanding of some computer concepts cannot be over emphasized.

e. **Computer Curriculum**

Some educationist equally talked about this and how it affects the teaching of computer. They also have identified curriculum sequentially devoid of consideration of the psychological nature of the student as a major contribution in curriculum at times, the teacher teaching computer will be confused and will not actually know where to start the teaching from and where to end and this eventually will lead to poor teaching which will not help matter, but lead the students to perform bad or poorly in computer science (Ezeokoli M. C., 1989).

f. **Lack of Funding from Ministries of Education and Government**

Government make up more than 80% of fund required for school maintenance. The maintenance of laboratory equipment and purchase of these computer hardware can only be done successfully by government. In some schools, maintenance of these is at the mercy of the priority of the principals of the schools. Without unit fund nor practical science can be taught well and science is the bedrock of technology. The government should contribute 80% of the finding required to maintenance of subject in an institution, (Amaechina 1995).

g. **Student Attitude to the Subject**

The student's attitude to the subject determines if learning would occur during teaching, (Ezeokoli M. C., 1989). He said that if the student attitude to the subject is satisfactory i.e if they are interested and have zeal to study or even listen to their teachers while he is teaching, then, most of the problems facing the teaching of computer science are solved.

Population of the Study

The population of the study comprised of all teachers and students in all secondary schools in the capital territory Abuja. The schools are seventy six in numbers. A total of 22,160 students there constitute the population. Table 3.1 below gives the distribution of population by local government.

	Local Government	**No. of School**	**Computer Teachers**	**Students**
1	Bwari	9	3	4426
2	Gwagwalada Area Council	15	12	8920
3	Kwali Local Government	12	4	4608
4	Abaji Local Government	12	9	3930
5	Municipal Area Council	11	19	5616
6	Kuje Local Government	17	12	3660
	Total	**76**	**54 teachers**	**32,160 students**

Sample and Sampling Techniques

The sample for the study consisted of all SS 1, SS 2 and SS 3 students and teachers in two boys, two girls and a mixed school. All the schools were selected by stratified random sampling procedure. The students are 5616 in number and teachers are 19 in number. A total of 65 students therefore institute the sample for the study.

Method of Data Collection

The researcher visited the five (5) schools chosen and had direct contact with the respondents. The questionnaires were distributed to the selected respondents and relevant explanations were made. The researcher after which collected from the respondents after they have completely answered the questions.

Method of Data Analysis

The data collected were analyzed using purely simple percentages. Percentages were used to analyze various responses on each question. The numbers of respondents having the same view or a question were grouped together and their percentage score in relation to the total respondents found. From the scores or percentage a deductive inference is then made.

Chi-square was used for testing of the hypotheses and the formulae is given as

$$X^2 = \frac{(O - E)^2}{E}$$

Where X2 = Chi-Square

O = Observed frequency

E = Expected frequency

Distribution and Return of Questionnaire

Seventy questionnaires were distributed and sixty-five were returned. Fifteen questionnaire were distributed to the teachers and the same fifteen returned.

Data Analysis and Presentation of result
The data collected in the study were analyzed here with presentation of results as follows:

Research question 1
Are there sufficient and well qualified teachers capable of handling the subject?
Table 1

Response	No. of respondents	Percentage (%)
Yes	5	33.33
No	10	66.67
Total	**15**	**100**

Interpretation
From our table above 33.33% said that there are well qualified teachers which 66.67% held a contrary view on it. This implies that in some school there are no sufficient teachers handling this course and this is a big problem facing the teaching and learning of Computer Science.

Research question 2
Are the school authorities, the state and federal ministers of education given adequate priority and support to the subject?

Response	No. of respondents	Percentage (%)
Yes	3	20
No	12	80
Total	**15**	**100**

Interpretation
From the table above 80% attested to the fact that no adequate priority and support for the subject from school authorities, the state and federal ministries of education while 20% had a contrary opinion. This implies that no support is given to the subject. Lack of support affects the promotion or success of these course.

Research question 3
Do the students themselves support and pay particular attention to studying the subject?
Table 3

Response	No. of respondents	Percentage (%)
Yes	8	53.33
No	7	46.67
Total	**15**	**100**

Interpretation
From table 3, 8 respondents representing 53.33% of the respondents agree that students pay attention to the studying of the subject while 46.67% disagreed..

Research question 4
Are relevant materials and equipments used in teaching the subject available?
Table 4

Response	No. of respondents	Percentage (%)
Yes	39	60.00
No	26	40.00
Total	**65**	**100.00**

Interpretation
From table 4 above, 60% of respondents agree that there are no relevant materials and equipments for teaching of the subject while 40% disagree. This implies that, there is a general lack of relevant material and equipment for teaching and learning of Computer Science.

Research question 5
If the computers are available, have they been up graded or still obsolete?
Table 5

Response	No. of respondents	Percentage (%)
Yes	13	20
No	52	80
Total	**65**	**100**

Interpretation
From the above table, 80% said that their computers have not been upgraded while 20% of respondents held a contrary view. This implies that the students are not being taught what is obtained in our syllabuses they are therefore far backward in Computer Science. It constitutes a problem to the teaching and learning of computer.

Research question 6
Are the students aware of the importance of the practical aspect of the subject?
Table 6

Response	No. of respondents	Percentage (%)
Yes	4	26.7
No	11	73.3
Total	**15**	**100.00**

Interpretation
From the above, the student are not aware of the importance of practical aspect of the subject, 73.3% of them are not aware while 26.7% only are aware

Research question 7
Do you make judicious use of available material and equipments present for this subject?
Table 7

Response	No. of respondents	Percentage (%)
Yes	26	40
No	39	60
Total	**65**	**100.00**

Interpretation
From the above table 40% agree that they make judicious use of the materials and equipments provided while 60% disagree.

Recommendations

The following recommendations could help in eradicating the factors discussed in this chapter. These recommendations are:

1. The government should employ qualified computer science teachers to teach the subject and there should be enough computer science teachers in all the secondary schools in Nigeria in order to supplement the unqualified teacher in that area of discipline.
2. For effective teaching of the subject computer science, adequate instructional materials, equipments or instruments are necessary. Therefore, the government should help in the provision of all the equipments e.g computer systems. These materials should be introduced in order to foster effective learning of computer and to arouse the interest or motivate the students to learn more.
3. The teachers should be oriented on the different teaching methods that should be encouraged. These methods include discovering method, laboratory method, group method where the student will be given problems to solve or activities to carryout themselves. Example, using basic programming language computer simple quadratic equation.
4. More practical should be done, where the student will be exposed to using the computer. Students should be exposed more on this aspect so as to defend their discipline outside the schools.
5. Government should try and fund these schools in terms of the equipments needed for practical work especially an upgraded computer systems.

Conclusion

Above all, it seems that the computer science teachers are single elements in the consideration of effective teaching and learning of computer sciences. The study shows there is not enough computer science teachers. For all students to be encouraged in computer science so as to raise the falling standard of computer studies, it is the responsibility of the computer science teachers, parents, schools and other educational bodies like state and federal government including the West African Examination Council and schools boards to give their massive co-operation and assistance required of them.

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