VOL. 07 NO. 8,
FEBRUARY, 2025
E-ISSN 3026-8893
P-ISSN 3027-1061

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of Education Research and Library Practice (JERLP)

An Evaluation of Computer Science Education Student's Performance in Colleges of Education in the North-East Geopolitical Zone

Njoku Christian Chimere; Oladimeji Adegbola Isaac, PhD; & Lasis Ismail Olalekan, PhD

[1,2] Department of Computer Science, Aminu Saleh College of Education, Azare, Nigeria. [3]Department of Computer Science, Crescent University, Abeokuta, Nigeria

Corresponding Author: chrisnjoku821@gmail.com

DOI: https://doi.org/10.70382/ajerlp.v7i8.018

Abstract

The impact of Computers in tertiary education is enormous as technology is gradually becoming the key on which countries, organizations and institutions of learning are gaining competitive age over others. This paper, look at the evaluation of computer science education students' performance in Colleges of Education in the north east zone, Nigeria. The purpose of this paper is to assess students' learning outcome in line with the minimum standards objectives of computer science education of the Nigeria Certificate in Education (NCE) program, study the adequacy of laboratory equipment and facilities and examine the mode of teaching used in the implementation of computer science education minimum standard objectives. A total number of 42 Staff and 300 students from the six state colleges of education in the north east zone was used alongside the computer department examination officers of those colleges. The sample used in the study is 342 Results for three sessions from the schools was computed to find out the performance of the students and to find out those who qualify for further studies. Four point scale was used to

assess staff and students opinion on laboratory equipment and facilities, and their opinions on methodological approaches used in instruction delivery, an item is accepted if its mean is 2.5 and above, while items are rejected if its mean is less than 2.5. Hypothesis is tested using Independent Sample T-Test computed using Statistical Package for Social Sciences. The findings shows that equipment and facilities are to be improved upon, students are not giving adequate practical hours, and methods used in teaching and learning needs improvement. It was therefore, recommended that adequate equipment and facilities, including power sources should made be made available in the Colleges. Also lecturers should be motivated and encouraged.

Keywords: Computer Science Education, hardware and software, Performance, Laboratory equipment and facilities, Methodological approaches

Introduction

Computer Science Education has become a very important tool in a globalized world as its use has reached all spheres of life. This is more important as technology has become the key on which countries, organizations and institutions of learning are gaining competitive age over others. Computer Science is a key enabler for discovery and innovation in most other fields of endeavor, making it a very relevant course of study. The major aim of teaching Computer Science as noted by Annaraja (2015), is to enable students to obtain knowledge needed for further study of Computer Science and related technology and to understand its application. In addition, it helps the learners acquire the skill of practical utility, develop the capacity to think further and apply those skills in real life situations. People now depend on the computers and other digital devices to complete tasks and solve problems of all kinds in this 21st century. Computer Science Education is a course of study in Colleges of Education whose aim is to acquire computer skills and its application in teaching and learning (Isyaku, 2016). Its introduction into the educational sector has made teaching and learning easy, comfortable and has taken education beyond boundaries (Okafor, 2018). Technological development is only possible through the acquisition of scientific knowledge which can only be realized through relevant training in Science, Mathematics and Computer Science Education. This has also been pointed

out in the philosophy of the Nigeria Certificate in Education Minimum Standards for Computer Science, 2012 as edited.

> *"Nigeria cannot afford to ignore the role which computer literacy plays in achieving the national goal of technological development. Hence she has resolved to introduce computer education in primary and secondary schools. For meaningful teaching of computer science in our primary and secondary schools, there is a need to produce professional teachers in the discipline. Hitherto, has been provision for the training of computer scientists in the universities and the polytechnics but little attention was paid to the training of teachers in computer education. There is an urgent need for the Colleges of Education to offer computer studies as a subject in the programme of professional preparation of teachers"*

Computers have in no doubt transformed and altered the ways we live and do things especially in education. It has changed the way we teach, learn, evaluate learning objectives and disseminate information. Due to its crucial nature in national development, the federal government moved to introduce it into the education system from primary to tertiary institutions. NPE (2004) stated that Nigeria cannot afford to look down on the role computer literacy plays in the achievement of national and technological development, even as global education system has fully embraced this technology. Computer is diligent and consistent in its operation to perform several roles in teaching and learning at all levels of education. Computer scientists are trained in the universities and polytechnics, however, little attention is given to training of teachers in computer education (NCCE, 2012). Hence, Nigeria decided to introduce computer education in primary and secondary schools in order to produce professional teachers in the discipline.

Meanwhile, the NCCE (2012) minimum standards in computer science education clearly stipulated some objectives to be achieved such as: to teach computer studies at the primary and secondary school levels; write computer program and process data with maximum speed and accuracy; demonstrated reasonably high level of competence in preparation for further studies in computer science education; motivate pupils' interest in the study of computers by appropriately using ICT teaching/learning strategies; and apply the use of computer as an aid in

daily life activities (NCCE, 2012). These objectives are only attainable with the provision of effective teacher education programme. Though the role of computers in the improvement, production, promotion of competency and efficiency and facilitation of teaching and learning cannot be over emphasized, it still does not attract much attention from policy makers in this part of the world. Also, students' performances in computer science education keeps going down in most Colleges of Education. The NCCE minimum standard objectives are quite admirable, however, there are a lot of barriers to the achievement of these objectives. These include inadequate practical time as stipulated in the minimum standard, cost of hardware and software components, lack of refresher courses and sponsored conferences in computer science and related fields, lack of internet facility and connectivity in the computer laboratories, and lack of teachers' competence and quality training. Hence, this study is aimed at examining the factors responsible for the poor performances among students in Colleges of Education looking at the level of computer science education curriculum implementation.

Objectives of the Study

The objectives of this paper are as follows:

i) To assess students learning outcome in line with the minimum standards objectives of computer science education of the NCE program
ii) To study the quantity of laboratory facilities and equipment provided for the implementation of NCE computer science in line with the requirements in the minimum standard and
iii) To examine the mode of teaching used for the implementation of computer science education minimum standard objectives.

Research Questions

The following research questions will be used in the development of this paper.

1. What is the competence level of the students based on their learning outcome, which shows their readiness for further studies in computer science education?
2. What is the level of adequacy of laboratory equipment facilities and manpower for achieving the NCE computer science education minimum standard objectives?
3. What are the delivery approaches adopted for the achievement of the NCE minimum standard objectives?

Research Hypotheses

The following research hypothesis were made in this study, and they are:

1. No significant difference between lecturers and students opinion on adequacy of laboratory equipment and facilities for achieving NCE Computer Science Minimum Standard Objectives in Nigeria.
2. There is no significant difference between lecturers and students opinion on the methods of delivery for the achievement of NCE Computer Science minimum Standard objectives in Nigeria.

Review of related studies

Computer science education, when applied appropriately under a conducive learning environment tends to be important in supporting teaching and learning. So many studies have also supported this fact and many have also found factors which tends to hinder the successful implementation of this course of study in most schools in Nigeria, thereby leading to the poor performance of students in this field of study.

A study by Dung et al, (2023), to evaluate the NCCE Computer Science Minimum Standards Objectives in Federal Colleges of Education in the six geopolitical zones in Nigeria, reveals that a few number of students qualify for further studies to the universities from our NCE awarding institutions in Nigeria. In addition, there is no adequate provision of facilities and equipment to implement the NCE Computer Science minimum standard objectives in Nigeria. Furthermore, they found that manpower need for achieving the minimum standard objectives needs improvement and the methods employed in teaching the students' needs improvement especially practical hours. In a study by Oladimeji et al, (2018), Computer Science Education in Nigerian Secondary Schools – Gap between Policy Pronouncement and Implementation, found that inadequate functional computers, unstable electricity, inadequate qualified computer science education teachers especially in areas such as operating systems, computer networking, programming and technicians to repair computer facilities are barriers to effective implementation of computer science education curriculum in Nigeria. Similarly, Arikpo and Odinko (2019), Evaluation of Computer Studies Curriculum Implementation at the Upper Basic Level of Education in Cross River State, Nigeria, found that 70% of the students have not acquired skills using the computer system, also that 70% of the resources such as printers and computers were inadequate. They observed that overcrowded classes, lack of incentive from

government, finance to maintain the laboratory, qualified and shortage of teachers, power failure are some of the barriers militating against proper implementation of Computer Science Education Curriculum in Cross River State. In a study by Bamidele and Bakare (2015), in which discussion was on the implementation of the computer science education curriculum in public secondary schools in Osun State, Nigeria, the study revealed that there has been low implementation of the computer science curriculum. It further revealed that lack of facilities and the poor attitude of stake holders accounted for the low implementation of computer science education curriculum.

Martins and Omeneke (2016), Current Status and Problems Facing the Implementation of Computer Education in Nigeria, observed that computer education has not been well implemented in Nigerian tertiary institutions. It was discovered that most tertiary institutions have computer science programmes but emphasis is on theory rather than practical, denying learners the computer skills required in the work place. The study enumerated the impediments to implementation of computer education in Nigeria to include mismanagement of huge resources, lack of infrastructural facilities, shortage of qualified personnel, cost of acquiring hardware and software, training and instructional emphasis on theory rather than practical and dearth of research on computer education. In addition, Suleiman and Adepoju (2015), observed that lack of motivation, inadequate textbooks, non-commitment by the school managers, lack of incentive to motivate teachers, non-availability of instructional materials and facilities, and unqualified teachers as barriers to effective implementation of computer studies.

Methodology

This study used descriptive survey for design. This is a systematic and structured approach to collecting data from a sample of individuals or entities within a larger population, with the aim of providing a detailed and accurate description of the behaviours, opinions, or attitudes that exists within the target group (Surveyplanet, 2022). Purposive sampling technique was employed in this paper, since the students were at liberty and in position to provide the required information. The study population is seven (7) staffs from the Department of Computer Science Education of one college of Education from each state within the northeast zone of Nigeria, i.e one (1) College of Education from each of the six (6) states in the north east zone in Nigeria and fifty (50) students from Department of Computer Science

Education each from one (1) College of Education, from each state among the six (6) states in the north east zone, Nigeria.

The examination officers of each of the institutions also responded to the questionnaire dealing with learning outcome. Therefore, three hundred (300) students, forth – two (42) lecturers, and Six (6) examination officers participated in this study. The sample size of this study is therefore three hundred and fourth two (342) comprising lecturers and students. Questionnaires were used to collect data in this study. The first phase of the questionnaire is an open-ended type where examination officers from each computer department is to respond by given a summary of students learning outcome for three academic sessions. Data was collected in the remaining phases using four (4) point's scale. Each item has components such as Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (S|D), having the following points: 4, 3, 2, 1 respectively. An item is accepted or rejected as the points are summed up and divided by 4 which gave 2.5. Therefore, if an item has a mean score of 2.5 and above, it is accepted, it is rejected if its mean is less than 2.5. The hypothesis is tested using Independent Sample T-Test computed using Statistical Package for Social Sciences (SPSS).

Data Analysis

Research questions were analyzed using frequency counts and percentages while hypothesis were tested using Independent T-Test statistical analysis.

Research question 1: What is the competence level of the students based on their learning outcome, which shows their readiness for further studies in computer science education?

Table 1: *Exam Officers response to learning outcome of students for three sessions from six colleges of education within the north east zone of Nigeria*

Summaries for the Colleges	2020/2021	2021/2022	2022/2023	TOTAL
(4.5 – 5.0) Distinction (A)	5	6	12	23
(3.5 – 4.49) Credits (B)	32	36	27	95
(2.4 – 3.49) Merit (C)	79	84	93	256
(2.0 – 2.39) Pass (D)	94	76	51	221
(1.0 – 1.99) L. Pass (E)	75	68	85	228
(0.5 – 0.99) Fail (F)	15	30	32	77
Total Number of Students	300	300	300	900

Table 1 above presents the learning outcome of Computer Science Education students for three (3) academic sessions, showing their level of preparedness for further studies in

computer science education. The table shows that students with A are 23, those with B are ninety five (95), those with C are two hundred fifty six (256), while those with D are two hundred and twenty one (221), those with E are two hundred and twenty eight (228) and those with F are seventy seven (77). Therefore, the total number of students with the required grade for further studies are three hundred and seventy four (374) representing 41.6% of the entire students of computer science from the overall number nine hundred (900). This shows that small number of the students are prepared for further studies.

Research question 2: What is the level of adequacy of laboratory equipment, facilities and manpower for achieving the NCE computer science education minimum standard objectives?

Table 2: *Students opinion regarding the adequacy of lab equipment, facilities and manpower for achieving NCE computer science education minimum standard in the north east zone.*

SN	Sufficiency of Laboratory facilities	SA	A	D	SD	Mean	Remark
1	There is enough licensed softwares for computer education use	85 (28.3)	100 (33.3)	50 (16.7)	65 (21.7)	**2.68**	Agreed
2	There is internet connectivity in the department	47 (15.7)	55 (18.3)	109 (36.3)	89 (29.7)	**2.20**	Disagreed
3	There is enough hardware facilities such as printers, projectors, scanners, interactive smart boards and photocopying machines	70 (23.3)	105 (35.0)	50 (16.7)	75 (25.0)	**2.56**	Agreed
4	Laboratories are having adequate functional computers, enough space and air conditioners	67 (22.3)	102 (34.0)	57 (19.0)	74 (24.7)	**2.54**	Agreed
5	Classrooms are available for teaching and learning	103 (34.3)	94 (31.3)	46 (15.3)	57 (19.0)	**2.81**	Agreed
6	Every lecturer is having at least a core i7 laptop	73 (24.3)	57 (19.0)	90 (30.0)	80 (26.7)	**2.41**	Disagreed
7	There is stable power supply and an alternative power source in the department	52 (17.3)	58 (19.3)	110 (36.7)	80 (26.7)	**2.27**	Disagreed
8	Each computer in the laboratory is having its UPS and stabilizer	75 (25.0)	79 (26.3)	72 (24.0)	74 (25.7)	**2.51**	Agreed
9	There is sufficient well motivated lecturers, and teacher-student ratio is 1:25	94 (31.3)	101 (33.7)	57 (19.0)	48 (16.0)	**2.80**	Agreed
10	There is a lab technician, cleaner, and computer operators	84 (28.0)	93 (31.0)	58 (19.3)	65 (21.7)	**2.65**	Agreed
	Overall mean					**2.54**	

Table 2 above is on students' opinion on sufficiency of laboratory facilities for better performance and achievement of NCE minimum standard in the north east zone of

Nigeria. Ten items were made available to the students who are participating in the research. Out of the ten items, they disagreed with three (3) of the items while seven (7) was agreed upon. The items that were agreed upon include availability of licensed software, enough hardware facilities, sufficient functional computers, good space and air conditioners in the laboratory, available classroom, each computer having a UPS and Stabilizer, sufficient well motivated lecturers and class ratio of 1:25, and availability of lab technicians, cleaners and computer operators. The items disagreed on were presence of internet connectivity in the department, every lecturer having a core i7 laptop, and availability of stable power supply and an alternative power source. The total mean is 2.54, according to the students opinion, this means that to an extent, the laboratory facilities and adequate but not as expected and recommended by the minimum standard.

Table 3: Lecturers opinion on Sufficiency of laboratory equipment facilities for the achievement of NCE minimum standards

SN	Sufficiency of Laboratory facilities	SA	A	D	SD	Mean	Remark
1	There is enough licensed softwares for computer education use	9 (21.4)	13 (31.0)	8 (19.0)	12 (28.6)	**2.45**	Disagreed
2	There is internet connectivity in the department	5 (11.9)	8 (19.0)	14 (33.3)	15 (35.7)	**2.07**	Disagreed
3	There is enough hardware facilities such as printers, projectors, scanners, interactive smart boards and photocopying machines	10 (23.8)	12 (28.6)	12 (28.6)	8 (19.0)	**2.57**	Agreed
4	Laboratories are having adequate functional computers, enough space and air conditioners	10 (23.8)	14 (33.3)	11 (26.2)	7 (16.7)	**2.64**	Agreed
5	Classrooms are available for teaching and learning	12 (28.6)	13 (31.0)	8 (19.0)	9 (21.4)	**2.66**	Agreed
6	Every lecturer is having at least a core i7 laptop	11 (26.2)	13 (31.0)	11 (26.2)	7 (16.7)	**2.26**	Disagreed
7	There is stable power supply and an alternative power source in the department	8 (19.0)	7 (16.7)	15 (35.7)	12 (28.6)	**2.11**	Disagreed
8	Each computer in the laboratory is having its UPS and stabilizer	5 (11.9)	8 (19.0)	16 (38.1)	13 (31.0)	**2.19**	Disagreed
9	There is sufficient well motivated lecturers, and teacher-student ratio is 1:25	6 (14.3)	9 (21.4)	14 (33.3)	13 (31.0)	**2.48**	Disagreed
10	There is a lab technician, cleaner, and computer operators	10 (23.8)	10 (23.8)	12 (28.6)	10 (23.8)	**2.48**	Disagreed
	Overall mean					**2.41**	

The table 3 above is on the lecturers' opinion on the sufficiency of laboratory facilities for better performance and achievement of the NCE computer science minimum standard in the north east zone of Nigeria. Ten items were made available

to the lecturers who participated in the research, out of which three (3) items were agreed upon and seven (7) disagreed on including sufficiency of manpower. The items agreed on include sufficient hardware facilities, laboratories having functional computers, enough space and air conditioners and available classroom for teaching and learning. The overall mean of 2.41 shows that there is inadequate laboratory facilities in these schools going by the lecturer's opinion. However, there some available facilities to an extent though not sufficient to achieve the NCE computer science program and meeting the minimum standard in the study area.

Research question 3: What are the delivery approaches adopted for the achievement of the NCE minimum standard objectives?

Table 4: *Students' view on delivery approaches adopted for the achievement of the NCE minimum standard objectives*

SN	Methods of delivery	SA	A	D	SD	Mean	Remark
1	Practical demonstration is used in teaching	87 (29.0)	93 (31.0)	58 (19.3)	62 (20.7)	**2.68**	Agreed
2	Students go on excursions to acquire more knowledge	37 (12.3)	40 (13.3)	120 (40.0)	103 (34.3)	**2.03**	Disagreed
3	Problem solving and inquiry methods are used in teaching	75 (25.0)	88 (29.3)	70 (23.3)	67 (22.3)	**2.57**	Agreed
4	E-Learning, Computer Aided Instruction and Blended learning methods are used	68 (22.7)	110 (36.7)	52 (17.3)	70 (23.3)	**2.58**	Agreed
5	We have at least 5 hour practical sessions in a week	41 (13.7)	45 (15.0)	110 (36.7)	104 (34.7)	**2.07**	Disagreed
6	Among other methods of delivery, Seminar approaches are adopted	101 (33.7)	98 (32.7)	49 (16.3)	52 (17.3)	**2.82**	Agreed
7	We have at least 1 practical class in our course per week	100 (33.3)	101 (33.7)	48 (16.0)	51 (17.0)	**2.83**	Agreed
	Overall mean					**2.51**	

Table 4 above reveals students' view on teaching methods for the achievement of NCE computer science minimum standard objectives in the north east zone. The table presents seven (7) items to the respondents, out of which five (5) was agreed on and two (2) disagreed on. Items agreed on include the use of practical demonstration, use of problem solving method and inquiry method, use of E-learning, Computer Aided Instruction and Blended learning methods in teaching and learning, use of seminar methods and at least one practical class, while items disagreed on are students going on excursions and having about five (5) hours practical session in a week. The total mean is 2.51, indicating that to an extent, the correct approaches are adopted in teaching to achieve the NCE computer science minimum standard objectives in the north east zone. Nevertheless, there are other approaches yet to be adopted in other to achieve the computer science minimum standard objectives according to the students' opinion.

Table 5: *Lecturers' view on delivery approaches adopted for the achievement of the NCE minimum standard objectives*

SN	Methods of delivery	SA	A	D	SD	Mean	Remark
1	Practical demonstration is used in teaching	12 (28.6)	14 (33.3)	7 (16.7)	9 (21.4)	**2.69**	**Agreed**
2	Students go on excursions to acquire more knowledge	8 (19.0)	10 (23.6)	13 (31.0)	11 (26.2)	**2.35**	**Disagreed**
3	Problem solving and inquiry methods are used in teaching	11 (26.2)	14 (33.3)	8 (19.0)	9 (21.4)	**2.64**	**Agreed**
4	E-Learning, Computer Aided Instruction and Blended learning methods are used	8 (19.0)	9 (21.4)	13 (31.0)	12 (28.6)	**2.31**	**Disagreed**
5	We have at least 5 hour practical sessions per course in a week	7 (16.7)	8 (19.0)	15 (35.7)	12 (28.6)	**2.24**	**Disagreed**
6	Among other methods of delivery, Seminar approaches are adopted	13 (31.0)	15 (35.7)	6 (14.3)	8 (19.0)	**2.79**	**Agreed**
7	We have at least 1 practical class in our courses per week	15 (35.7)	13 (31.0)	6 (14.3)	8 (19.0)	**2.83**	**Agreed**
	Overall mean					**2.55**	

Table 5 above reveals the lecturers' opinion on methodological approaches for the achievement of NCE computer science minimum standard objectives in the north east zone of Nigeria. The table shows that five (5) items were agreed on, while two (2) were disagreed on. Items agreed on include the use of practical demonstration in the class, use of problem solving and inquiry methods of teaching, use of seminar approaches and having at least 1 practical class per week. The total mean is 2.55, which implies that to a great extent, correct methods are adopted in teaching so as to achieve the NCE minimum standard objectives in the area of study based on the lecturers' view. Nevertheless, there are other good methods not yet adopted as the opinion of the lecturers' suggests.

Hypothesis testing

Hypothesis 1: There is no significant difference between the mean response of the lecturers and students opinion on adequacy of laboratory equipment and facilities for achieving NCE Computer Science Minimum Standard Objectives in Nigeria.

Table 6: *Independent Sampled T-Test result on adequacy of laboratory facilities and equipment*

Adequacy of Lab facilities and equip.	N	Mean	Std. Dev	t	df	Sig (2-tailed)	Decision
Lecturers' view	42	2.84	.20970	-7.053	340	.001	Significant
Students' view	300	3.06	.18255	-6.361	50.084		

This table is about the results of Independent Sampled t-test results on the significant difference between the lecturers' and students' view on the adequacy or sufficiency of laboratory equipment and facilities for the achievement of NCE computer science minimum standard objectives in Nigeria. The hypothesis is therefore significant since the computed t-value is less than the significant value of 0.005. The null hypothesis is therefore rejected. There is therefore a significant difference between lecturers' view and the students' view on adequacy of laboratory equipment and facilities for achieving NCE computer science minimum standard objectives in Nigeria.

Hypothesis 2: There is no significant difference between the mean response of the lecturers and students view on the methods of delivery for the achievement of NCE Computer Science minimum Standard objectives in North east Nigeria.

Table 7: *Independent Sampled T-Test result on adequacy of laboratory facilities and equipment*

Adequacy of Methodological approaches	N	Mean	Std. Dev	t	df	Sig (2-tailed)	Decision
Lecturers' view	42	2.42	.22838	-10.472	340	.001	Significant
Students' view	300	2.78	.20849	-9.775	51.030		

Table 7 above is about the result of Independent Sampled t-test on the significant difference between lecturers and students view on the methods used for delivery for the achievement of NCE computer science minimum stand objectives in the North east, Nigeria. The hypothesis is therefore significant since the computed t-value is less than the significant value of 0.005. The null hypothesis is therefore rejected. This therefore implies that there is significant value between the two views.

Discussion

The findings of this study are as follows: only few students qualify for further studies to the universities from our Colleges of Education in the north east. In addition, there is still insufficient equipment and facilities to run the NCE programme based on the requirements of the NCE minimum standards. Furthermore, serious improvement is needed in the area of manpower in order to achieve the objectives of the minimum standard. Another issue found in this study is that methodological approaches of teaching and learning in the NCE curriculum needs to be improved upon and made more learner centered. In addition, taking the NCE computer science students on excursion enables them to acquire more knowledge, thereby making them more productive and focused in their academic work. This work equally noticed that lecturers in the state colleges of education are not properly motivated. This will certainly affect their level of input in the area of teaching. It must be noted also that students have their own problems concerning poor performance in computer science courses. Most of them have phobia for computer programming and courses with calculation. These findings are in line with the findings of Isyaku, 2016, Oladimeji, et al, 2018, Oragande, 2020, and Ononye, et al, 2020, Dung, et al, 2023.

Conclusion

This study discussed the performance outcome of NCE computer science students' performance for three consecutive sessions in line with the NCCE minimum standards objectives. Students perform better where there are adequate laboratory equipment and facilities, when they are taught by well-motivated teachers who use appropriate methodological approaches to instruct their students. In addition, students who go on excursion to IT based companies are bound to perform well based on the level of exposure. Computer science is a vocational and scientific course, therefore students should have enough time for practical exercises. Where this is done, there is every tendency that the students' performance will improve.

Recommendation

The following recommendations are hereby made;

1. The governments should endeavor to make the motivation of lecturers in the colleges a priority. They must be encouraged and sponsored to go on refresher courses as this will improve their productivity.
2. Efforts should be made to ensure that there is internet connectivity in computer science departments in the various colleges. This will enable the students to have a broader knowledge of their course of study.
3. The problem of electricity/power and alternative power sources must be taking very serious as this will also boost the performance of the students.
4. Efforts must be made to increase the practical hours of most of the courses offered in computer departments in various Colleges.
5. Apart from Student Industrial Work Experience Scheme (SIWES) programmes, provisions must be made to ensure that Computer Science

students go on excursions while in school, as this will broaden their knowledge.

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