THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

NCE Students' Attitude to Computer Aided Learning: A Study of Business and Computer Students in (North-Central) Nigerian Colleges of Education

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Abstract:
Information and Communication Technology(ICT) has transformed to indispensable infrastructure for all-round development of countries. Use of Computer Assisted Learning (CAL)by students is increasing, especially in developed countries. This is especially true in distance education. Education delivery in Nigerian Colleges of Education is yet toregister significant progress in the use of Computer assisted learning. This study examines the attitude of Business Education and Computer Education students of Colleges of Education(in the North-Centralzone of Nigeria) on use of CAL.The research is composed of learning-methods-comparison experiment, which was conducted on Business Education and Computer Education students in Federal College of Education, Kontagora, and a survey, which was conducted on students infour Colleges of Education in the North-central Nigeria. The experiment was used to study the performance of Business and Computer students with respect to CAL usage. Collected test data was analyzed using mean, standard deviation and t-statistics. Result shows that while Computer students' performance was significantly higher with use of CAL for learning than with use of book the performance of Business students was not significantly different. In the survey, 182 students drawn from four colleges responded to 26-item questionnaire on students' attitude to CAL. Mean, Standard deviation, t-test, F-test, and ANOVA statistics were used to analyze the collected data. Results show that majority of students have positive disposition to CAL. Also, while there were significant differences between male and female students as well as between Business Education and Computer Education students on attitude to CAL usage, no significant differences were found based on college differences. Factors identified as contributing to low level of CAL usage in the colleges include: Unfavorable disposition of government to Colleges of Education in Nigeria, and poor funding of Colleges. Among recommendations made is that: Colleges of Education should be well funded and equipped to enable use of CAL and other e-learning technologies in vogue for more effective education delivery in Nigerian colleges of Education.

Keywords: E-learning, computer assisted learning, computer based instruction

1. Introduction

Colleges of Education in Nigeria constitute the third tier of higher educational institutions; the first two being Universities and Polytechnics. Colleges of Education are teacher-training institutions established with mandate to train and equip teachers for the Universal Basic education programme of the country. The Colleges generally run three (3) year courses of study in diverse disciplines and award the National Certificate in Education (NCE). Graduates of Colleges of education are the main source of manpower for Primary and Junior Secondary schools teaching positions in Nigeria. Students of Colleges of Education, otherwise known as NCE students, occupy a crucial position in the country's education system – being potential source of Nigeria's basic education manpower. The quality of Education and training they receive determine, to a great extent, the quality of education that is provided in Pre-primary, Primary and Junior Secondary Schools. This implies that education and training needs of NCE students deserve utmost attention at all times. Teaching and learning methods in Colleges of Education should evolve to enable it benefit from advantages of up-to-date Education technologies.

Today, ICT is the apex of Education technology. The Internet, the World Wide Web, audio-visuals, e-mails, e-learning, computers, mobile phones etc. - all component of Information and Communication Technology, play vital role in enhancing education and promoting productivity.The need for Nigeria to close the digital gaps that separates it from more advanced countries is more prominent now given the trend of Education delivery systems in those countries – essentially being anchored on Information Technology. According to the Nigerian National Policy on Information Technology (2004) Information Technology is the bedrock for national survival and development in a rapidly changing global environment. There is no questioning the truth of the fact that ICT awareness campaigns of various forms has been ongoing in Nigeria for many years. A direct result of this is the familiar sight of people engaged with the use of ICT tools and products such as; smart phones, computers, the Internet, e-banking etc. in schools, offices, stores, streets, and work places.

It can be said that there is positive development generally when we talk about ICT awareness and adoption in Nigeria because it is increasing with the passage of time. People are getting more and more engaged with ICT. Unfortunately, the Nigerian Education delivery system has not recorded significant changes that align with this development trend. Teaching and learning in most Nigerian Colleges of Education today is still chiefly done in the traditional ways with little use of Computer and Information technologies. Creation and usage of Computer-based instruction are celebrated world-wide as enhancers of Education delivery. Literature has it that lots of research efforts have been put in to the study of Computer Assisted learning (CAL) usage in educational institutions. Gambari, Shuaibu & Shittu (2013) studied Students' perception on CAL usage in Mathematics in 6 Secondary Schools. Results show that majority of students had positive perception on the use of Computer Aided Instruction for studying Mathematics. Fazal, Sheeba, & Mobashir (2012) studied medical students' perception of computer assisted teaching and learning of anatomy in a scenario where cadavers (corpses) are lacking. Their results indicate that students deemed use of CAL in teaching of anatomy asgood and useful for supplementary purpose only. In a quasi-experimental study, Mudasiru& Adedeji (2010) examined the "Effects of Computer Assisted Instruction (CAI) on Secondary School Students' Performance in Biology" and arrived at results findings, which show that students exposed to CAI performed better than their counterparts that were taught using conventional classroom instruction. Alasoluyi (2015) found that CAI usage by secondary school students in study of Economics helped in enhancing learning and making performance better.

In this work the researchers' main aim is to investigate the attitude of NCE students (teachers in the training) towards Computer assisted learning. The research is made up of two parts. In the first part a study-method-comparison experiment is conducted on NCE students in order to get at least a glimpse of the effects of CAL on more advanced students - NCE students are at post-secondary level of studies, hence they are more matured and advanced in education. In the second part of the study NCE students of two departments, namely Business Education and Computer Education, drawn from four colleges of Education in North-Central Nigeria, Namely: Federal College of Education (FCE) Kontagora, FCE Okene, College of Education (COE) Zuba, and COE Akwanga, were surveyed upon using a standard questionnaire in order to investigate their attitude on CAL.

2. Concept of Computer Assisted Learning (CAL)

Computer-assisted learning (CAL) is any use of computers to aid or support the education or training of people, (Dictionary of Computing, 2019). According to Olorunosebi (2016) CAL is the use of electronic devices/computers to provide educational instruction and to learn. Other terms used to describe this application of computers include computer-aided (or -assisted) instruction, CAI, computer-based learning, CBL, and computer-managed instruction, CMI. It is the use of instructional tools presented and managed by a computer. Computer-assisted learning is similar to the experiential model of learning. Learning occurs when we immerse ourselves in a situation in which we are forced to perform. We receive feedback from the computer output and then adjust our thinking-process if needed. We learn by doing, failing, and practicing until we do it right. CAL serves this purpose.

Computer is the most suitable, reliable and versatile medium for individualizing instruction. Many research works in recent years reported thebenefits and advantages of computer usage in the teaching and learning process at all levels of education. Shafaei (2012) studied the effectiveness of Computer Assisted Language Learning(CALL) in English language learning, findings revealed that majority of learners found CALL system helpful in improving their language skills.CAL increases Learning Efficiency: according to Olorunosebi (2016) "with CAL students are better able to pick up concepts or skills faster and with less effort and also retain what they have learned longer". Mahvish, Hadia & Mudasir (2017) remarked that:"CAL brings positive effects on users by increasing their knowledge in a far better and joyful ways." CAL forces active participation on the part of the student, which contrasts with the more passive role in reading a book or attending a lecture, (Rishu, 2017). Gambari, Shuaibu & Shittu (2013) asserts that CAL has several potential benefits, which include self-paced learning, self-directed learning, use of various senses and variety of media.

2.1. Purpose of the Study

This study is intended to gain knowledge of NCE students' perception and general attitude on computer assisted learning (CAL)in the context of present-day ICT founded conceptual change. The study was designed to assess students' study performance with respect to usage of CAL on the one hand and to have a general knowledge of NCE students' attitude to CAL, on the other hand.

2.2. Research Questions

- Is the average performance of students that studied through use of CAL higher than that of students that used book?
- Are there differences in the attitude of students towards Computer Aided Learning?

2.3. Research Hypothesis
   Tests of the following Hypotheses were used to guide this study.
- There is no significant difference between the mean scores of Computer students who used book for study and those that used CAL.
- There is no significant difference between the mean scores of Business students who used book for study and those that used CAL.
- There is no significant difference between the students' attitude to CAL based on college differences.
- There is no significant difference between the students' attitude to CAL based on gender difference.
- There is no significant difference between the students' attitude to CAL based on differences in the students' course of study.

3. Research Methodology

3.1. Research Type
   Experiment and Survey are used in this research to enable a reliable assessment of students' attitude on CAL. The experiment was adopted to enable appraisal of literature's position that CAL usage enhances learning while survey was used to collect data on 26-item CAL attitude assessment questionnaire from target population in four Colleges of Education.

3.2. Experiment Goal Definition
   The goal of the experiment was to analyze two different methods of study for the purpose of evaluating study effectiveness with respect to the methods of study in the perspective of researchers in the context of blocked Subject-object study.
The experiment is used as a way of testing whether students' use of CAL for study yields better learning outcome than their use of traditional (book or hand-out) method of study. Going by the literature When students effectively use CAL to study a topicthey are expected to know it better than when they study the same topic using only printed media such as hand-outs or books, (Olorunosebi, 2016;Rishu, 2017;and Shafaei, 2012).In this experiment we compared the study outcome of students that used CAL to study with that of students that used book to study same topics.

3.2.1. Description of Studymedia
   The content in both media (i.e. Book and CAL) was made up of textualexpositionand explanation of concepts under same topics. For computer students "Introduction to Object Oriented Programming" was the topic treated in both study media whereas "Introduction to Production" was the topic that was treated in both media for business education students.

3.2.2. Traditional (Book Method)
   Comprehensive notes on the topics of studywas prepared by the researchers in the form of regular hand-outs that students could use for study. The notes consist of expository paragraphs that introduce and explain concepts, examples that elaborate concepts, and lists of items. The notes content were presented in such a way that the reader would go through each section beginning from concept definition to explanation and elaboration. Elaboration here include such things about the concept as significance, uses, relationship with other familiar concepts and ideas. Ten (10) objective review questions were scattered in the text at the appropriate places. The hand-out was prepared on Microsoft word. All texts were typed in "Times New Roman" of 12 points and 1.5 spacing value in order to make the text very readable. Headings and sub-headings were bolded and headings were typed with font size of 14 points to further add to the material's readability. The notes were only 4 pages long on A4 size paper with margins set to moderate.

3.2.3. Computer Assisted Learning (CAL Method)
   The Computer AssistedLearning software for studyof same topicsthat were treated in the handouts were developed by the researchers using the three most common front-end web technologies: HTML, CSS, and JavaScript. The choice of these trio for the development of the CAL program was simply to make it runnable on all computers that haveany of the commonly available web browsers such as Google chrome, Mozilla fire fox, or Internet explorer, etc. installed. There would be no need to install any other special software on a computer in order to use the CAL.
For each course same information is contained in both instructional media (i.e. hand-out and CAL). In essence whatever a student read on the paper is what he/she will also read if he/she used the CAL program. Appendix ii explains the learning strategy implemented by our CAL.

3.2.4. Experiment Setup
   Forty (40) computer students and ninety-nine (99) businessstudents were engaged in the experiment. All students were informed inadvance aboutthe experiment. Four venues were set-up for the experiment: the computer lecture room, the business lecture hall, and the computer laboratories of the two departments. Lecture rooms werefamiliar studyand learning venues for the students and each isof 80-sit capacity. The computer science laboratory had 75 functioning computer systems while Business studies computer center had 87. All classes and the laboratories were

cleaned and tidied prior to the experiment. Adequate number of handouts (books) were produced on the topics selected to be studied by both categories of students and the CAL programs were installed on the computers in the two laboratories.

3.2.5. Experiment Process

In each of the two departments under study, the students were divided in to two groups using random allocation. Each group had equal number of students. The groups were labelled "A" and "B". Members of group A were put in the lecture class and handouts were given to them. They were instructed to sit in the class to study the handouts carefully in their usual studying manner.

Members of group B were put in the computer labs and each of them was allocated a computer that had the CAL program. The students were instructed to start the CAL program for their learning session.

After one and a half hour all students were done with the study. They were treated to light-food refreshments. Thirty minutes later they were all invited in to the lecture class to write test on the topics they had studied. Test papers that contained multiple choice questions were administered to them. All questions were answered on the question paper. The test scripts were marked and the scores data recorded as presented on tables 1, 2, 4and 5.

3.3. Research Question 1

Is the average performance of students that studied with CAL higher than that of students that used handouts?

Score (s)	Frequency (f)	Product (s x f)
2	1	2
3	2	6
4	5	20
5	2	10
6	3	18
7	2	14
8	2	16
9	2	18
11	1	11
Totals	**20**	**115**

Table1: Data On Group A (Book)Computer Studies

Score (s)	Frequency (f)	Product (s x f)
4	2	8
5	2	10
6	2	12
7	3	21
8	4	32
9	4	36
10	3	30
Totals	20	149

Table2: Data on Group B (CAL) Computer students' Results

Tables 1 and 2present the scores data of students that used book to study and that of students that studied with CAL respectively.

Variable	Mean (X)	Std. Deviation	Sample size(n)
Book	5.75	1.9324	20
CAL	7.45	2.3813	20

Table 3: Descriptive Statistics on Computer Students' Results

The descriptive statistics of Computer students' results in Table: 3 indicates that the mean score (7.45) of students that used CAL to study is greater the mean score (5.75) of students that used book. This is an indication that CAL usage yielded higher study outcome than the traditional book usage. But how reliable is this?

3.3.1. Hypotheses I

There is no significant difference between the mean scores of Computer students that used book for study and those that used CAL.

To test this hypothesis, t-test was used to determine the level of difference between mean scores of the two groups. The result of the analysis is shown in table 4.

Variable	Mean (X)	Std. Deviation	Sample size(n)	df	t-value	P-value
Book	5.75	1.9324	20	38	2.416	0.0206
CAL	7.45	2.3813	20			significant

Table 4: T-Test for Difference on Computer Students' Scores Based on Study Method Difference

In table4, the P-value (0.0206) is smaller than alpha value (0.05) -evidence that t is in rejection region. On this basis Hypothesis one is rejected. This means that the difference in the mean scores of computer students is significant. In other words, CAL produced better learning result than book.

Score (s)	Frequency (f)	Product (s x f)
1	1	1
2	3	6
3	6	18
4	10	40
5	8	40
6	7	42
7	7	49
8	8	64
Totals	50	260

Table 5: Data on Group A (Paper)Businessstudents' Results

Score (s)	Frequency (f)	Product (s x f)
0	1	0
1	1	1
2	2	4
3	7	21
4	4	16
5	12	60
6	2	12
7	8	56
8	12	96
Totals	49	266

Table 6: Data on Group B (CAL) Business Students' Results

Variable	Mean (X)	Std. deviation	Sample size(n)
Book	5.20	1.9272	50
CAL	5.45	2.1602	49

Table 7: Descriptive Statistics on Business Students' Results

From Table: 7 the mean score (5.45) of students that used CAL to study is greater than the mean score (5.20) of students that used book. Also here, CAL yield higher study outcome than book.

3.3.2. Hypotheses II
There is no significant difference between the mean scores of Business students that used book for study and those that used CAL for study.
To test this hypothesis, t-test was used to determine the extent of difference between the mean scores of the two groups. The result of the analysis is shown in table 8.

Variable	Mean (X)	Std. deviation	Sample size(n)	df	t-value	P-value
Book	5.20	1.9272	50	97	0.861	0.3911
Cal	5.45	2.1602	49			

Table 8: T-Test for Difference on Business Students' Scores Based on Study Method Difference

In table: 8 the P-value (0.391) is greater than alpha (0.05) - evidence that t is not in rejection region. On this basis Hypothesis II cannot be rejected. This means that the difference in the mean scores of Business students' results is not significant. In other words, CAL did not yield significantly better learning outcome than book.

3.4. Interpretation of Experiment Results
Results of data analysis of the study-method-comparison experiments have clearly shown that study with CAL yielded better results than paper-based study. Even though the results of Business students did not differ significantly as that of Computer students the fact that CAL users recorded higher average test scores in both cases is a good indicator that usage of CAL yields better results than paper-based study when students learn on their own.

4. Survey
Survey method was conducted in order to gain a better insight in to the students' perception of CAL in broader sense.

4.1. Research Instrument
The researchers developed a questionnaire for this research with due respect to established protocols.

4.2. Sample
Computer Education (CSC) and Business Education (BED) students of four Colleges of Education in the North-Central zone of Nigeria constitute the population of this study. Random sampling technique was used to administer questionnaire to the students. A total of 280copies of questionnaires were administered - 70 copies per college. Care was taken to ensure even distribution among students of the target departments in each college. A total of225 completed questionnaires were returned of which 45 were adjudged unacceptable by the researchers and therefore removed. Data collected from the remaining 182 samples whose distribution is shown in table 9 were analyzed.

S/N	College	Bed Students	Csc Students	Total
1	FCE Kontagora	24	38	62
2	FCE Okene	22	23	45
3	COE Zuba	16	16	32
4	COE Akwanga	27	16	43
	Total	**89**	**93**	**182**

Table 9: Study Sample Distribution

4.2.1. Instrument Validation
In order to validate the questionnaire Cronbach's alpha coefficient was used to test its internal consistency. The data was analyzed using Microsoft Excel. On Excel platform it is easy to carry out most statistical tests and calculations on the collected data including the Cronbach alpha. The Cronbach alpha value of data from our 26-item questionnaire was calculated to be '0.77'. As a rule of thumb, literature advocates that the Cronbach alpha value of an internally consistent questionnaire be equal to or greater than 0.7, (Nunnaly, 1978 in Janko, 2015).

4.2.2. Results
This study uses the method of Gambari, Shuaibu & Shittu (2013) to analyze the data. The questionnaire contains 26 items, as reflected in table 10. The mean of each item(X) and the criterion means (3.00) were calculated and used to measure the level of agreement and or disagreement. It was agreed that if the item means (X) is greater than criterion mean (3.00), the option is positively rated (agree); if otherwise, the option is rated negatively (Disagree).

4.2.3. Research Question2
Are there differences in the attitude of students towards Computer Aided Learning?

S/N	Statement	SD	D	U	A	SA	Mean
1	My level of computer competence (SD=very low… AS=very high)	8 (4.40%)	14 (7.69%)	38 (20.88%)	60 (32.97%)	62 (34.07%)	3.85
2	I can attribute my academic performance to my computer usage competence level	12 (6.59%)	16 (8.79%)	37 (20.33%)	55 (30.22%)	62 (34.07%)	3.76
3	I assimilate faster when taught with ICT resources	12 (6.59%)	22 (12.09%)	42 (23.08%)	38 (20.88%)	68 (37.36%)	3.70
4	There is a strong relationship between my comp. literacy and my academic success	11 (6.04%)	18 (9.89%)	31 (17.03%)	48 (26.37%)	74 (40.66%)	3.86
5	Students exposed to CAI activities do better in academics	22 (12.09%)	16 (8.79%)	39 (21.43%)	50 (27.47%)	55 (30.22%)	3.55

S/N	Statement					Mean
6	Business Education students will not differ from computer students in understanding when they learn using computer	24 (13.19%)	12 (6.59%)	34 (18.68%)	39 (21.43%)	73 (40.11%)	3.69
7	Business student do better on the key board than computer students	44 (24.18%)	27 (14.84%)	26 (14.29%)	24 (13.19%)	61 (33.52%)	3.17
S/N	Statement	SD	D	U	A	SA	Mean
8	I enjoyed learning by using computer facility	7 (3.85%)	10 (5.49%)	24 (13.19%)	31 (17.03%)	110 (60.44%)	4.25
9	Computer aided instruction facilitates better learning in computer class than in business education class	9 (4.95%)	21 (11.54%)	31 (17.03%)	50 (27.47%)	71 (39.01%)	3.84
10	My understanding of computer has been of advantage in understanding of new concepts	9 (4.95%)	12 (6.59%)	28 (15.38%)	51 (28.02%)	82 (45.05%)	4.02
11	Computer aided instruction makes learning cumbersome and uninteresting	60 (32.97%)	18 (9.89%)	49 (26.92%)	31 (17.03%)	24 (13.19%)	2.68
12	I can excel in my academics without CAL	50 (27.47%)	27 (14.84%)	26 (14.29%)	36 (19.78%)	43 (23.63%)	2.97
13	My understanding of computer has been of advantage in my ability to learn faster	10 (5.49%)	20 (10.99%)	25 (13.74%)	36 (19.78%)	91 (50.00%)	3.98
14	I prefer receiving instruction from lecturers than CAL	26 (14.29%)	30 (16.48%)	38 (20.88%)	34 (18.68%)	54 (29.67%)	3.33
15	CAL looks somewhat abstract and difficult	47 (25.82%)	35 (19.23%)	33 (18.13%)	33 (18.13%)	34 (18.68%)	2.85
16	Computer students are at advantage when learning with CAL	11 (6.04%)	15 (8.24%)	27 (14.84%)	39 (21.43%)	90 (49.45%)	4.00
17	New concepts are better taught with CAL	19 (10.44%)	24 (13.19%)	38 (20.88%)	35 (19.23%)	66 (36.26%)	3.58
18	I prefer the former method of instruction than CAL	47 (25.82%)	33 (18.13%)	26 (14.29%)	41 (22.53%)	35 (19.23%)	2.91
19	I am not satisfied with CAL as it goes with scientific innovations	54 (29.67%)	32 (17.58%)	25 (13.74%)	37 (20.33%)	34 (18.68%)	2.81
20	ICT based instruction have positive impact on students learning and understanding of content	24 (13.19%)	11 (6.04%)	34 (18.68%)	53 (29.12%)	60 (32.97%)	3.63
21	CAL as a new method of learning makes learning faster, easier and lively	13 (7.14%)	13 (7.14%)	25 (13.74%)	39 (21.43%)	92 (50.55%)	4.01
22	I can do better in my academics without CAL	48 (26.37%)	21 (11.54%)	28 (15.38%)	42 (23.08%)	43 (23.63%)	3.06
23	If I have my way I would rather study using CAL only alone	32 (17.58%)	23 (12.64%)	42 (23.08%)	50 (27.47%)	35 (19.23%)	3.18
24	CAL will be better used in pure science classes	29 (15.93%)	28 (15.38%)	43 (23.63%)	38 (20.88%)	44 (24.18%)	3.22
25	I prefer the traditional learning method than CAL	50 (27.47%)	23 (12.64%)	36 (19.78%)	42 (23.08%)	31 (17.03%)	2.90
26	I am not satisfied with CAL as it requires knowledge of science	56 (30.77%)	30 (16.48%)	30 (16.48%)	31 (17.03%)	35 (19.23%)	2.77

Table 10: Number and Percentage of NCE Students' Attitude on Computer-Assisted Learning

From the results in table 10, it can be seen that over 50% of respondents have favorable or positive attitude to CAL going by their responses to over 92% of the positive statements (1-8, 10, 13, 16, 17, 20, 21, 23 & 24). Thus, higher proportion of students feel and believe that: they have high level of computer competence (67%); academic progress is attributable to computer competence level (64%); learning is faster with ICT tools (58%); academic progress correlates with computer literacy level (67%); students that use Computer Aided Instruction perform better than those who do not (57%); all students have comparable proficiency in CAL usage (61%); they enjoy using Computer facilities to learn (77%); computer literacy aids in learning new concepts (73%) and quick learning (69%); computer students are at advantage in terms of CAL usage (70%); new concepts are better taught with CAL (55%); ICT use has positive impact on students' learning (62%); CAL is easy to use, fun, and lively (71%); they would rather study with use of CAL only (47%); and that CAL use is better in pure science classes (44%).

As for the negative statements (11, 12, 15, 18, 19, 22, 25, & 26), it can also be observed that the proportions of students that disagree is more than that of those that agree in more 95% of the cases even though none is able to make it

up to 50%. Thus, 42% of students disagree that CAL makes learning cumbersome and uninteresting while 30% agree to it. 41% disagree that they could excel in academics without CAL against 43% that agree to it. 44% of students disagree that CAL looks abstract where 37% that agree to it. 43% disagree to preferring traditional method of instruction to CAL while 41% agree to it. 47% of students disagree to their dissatisfaction with CAL as it goes with scientific principles while 39% agree with it. 37% disagree to doing better in academics without CAL while 46% agree to it.

From the foregoing analysis it is clear and easy to see that, in general, larger proportion of NCE students in this study have positive attitude or disposition to use of CAL.

4.2.4. Hypotheses III

There is no significant difference in the students' attitude to CAL based on college difference.

One way ANOVA statistics was used to test this hypothesis. In order to achieve this; the mean, sum of squares, mean squares, F-statistics, and p-value were computed using the collected data. The result of the analysis is shown in table, 11.

Source	Degrees of freedom	Sum of Squares	Mean Square	F	P value
Treatments	3	15.26	5.08712	2.48	0.06
Error	4728	9717.01	2.05433		insignificant
TOTAL	4731	9732.27			
			$(F_{3,4728,0.05}$	$= 2.61)$	

Table 11: Analysis of Variance for Difference in Students' Attitude Based on College Difference

The ANOVA results in table 11, indicate that mean values of students' data from each of the four colleges do not differ significantly. F statistics results show that the F value of the data (2.48) is less than the critical F value at 0.05% alpha level (2.61). Also, the p-value (0.06) is greater than alpha (0.05). These results indicate that there is no significant difference in students' attitude to CAL based on college difference. Consequently, there is no enough evidence to reject Hypothesis III.

4.2.5. Hypotheses IV

There is no significant difference between the students' attitude to CAL based on gender difference.

To test this hypothesis, t-test was used to determine the extent of difference between the mean scores of the two groups. The result of the analysis is shown in table 12.

Variable	No. of samples (n)	Degrees of freedom	Mean (X)	Variance (S²)	t-value	P-value
Male	1950	4730	3.5236	2.2804	3.189	0.00143
Female	2782		3.3886	1.8939		significant

Table 12: T-Test for Difference in Students' Attitude Based on Gender Difference

In table 12, the P-value (0.00143) is smaller than alpha (0.05) - evidence that t is in rejection region. On this basis Hypothesis IV is rejected. This means that there is significant difference between the students' attitude to CAL based on gender difference. Thus male students' attitude to CAL is significantly different from that of female students.

4.2.6. Hypotheses V

There is no significant difference between the students' attitude to CAL based on differences in the students' course of study. To test this hypothesis, t-test statistics was used and the result of the analysis is shown in table 13.

Variable	No. of samples (n)	Degrees of freedom	Mean (X)	Variance (S²)	t-value	P-value
CSC	2418	4730	3.3370	2.1160	5.269	0.0000001
BED	2314		3.5562	1.9720		significant

Table 13: T-Test for Difference on Students' Attitude Based on Department Difference

In table 13, the P-value (0.000) isextremely small –i.e. t lies in rejection region. On this basis Hypothesis V cannot be accepted. This means that there is significant difference between the students' attitude to CAL based on difference in their course of study. Thus Business students' attitude to CAL is significantly different from that of Computer students.

5. Discussion

The outcome of the study-method-comparison experiments shows that computer assisted learning yielded better study outcome than the conventional book (paper-based) study. This supports the findings of Alasoluyi (2015) and Mudasiru & Adedeji (2010) where CAL usage yielded better performance than conventional class instruction method.

The results of survey show that NCE students sampled in this study (Business and computer students in four colleges of Education in the North-Central Nigeria) have positive attitude to computer assisted learning. This results is in agreement with many previous research findings including that of Alasoluyi (2015) and Gambari, Shuaibu & Shittu (2013). CAL or CAI

usage in education has recorded huge benefits as it was reported to have made studies enjoyable and fun, it saves time, it is fun etc.

The male and female students' attitude to CAL was found to be significantly different in this study. This finding is contrary to the findings of Alasoluyi (2015), Mudasiru & Adedeji (2010), and Gambari, Shuaibu & Shittu (2013), where male and female students' perception of CAL was not significantly different. The basis for this finding was not probed into by this study. However, it might not be unconnected with fact that the students in this study are of higher age group – being students of higher studies level they might have different psychology than secondary school students. Further studies are required to shed light on these differences.

Results of this study also indicate that the attitude of Business students on CAL is significantly different from that of Computer students. Interview of students would be a good way of unravelling the cause of these differences. However, study-comparison-experiment offers a hint on this differences – computer students' performance differed from that of business students as a result of CAL usage for study.

6. Conclusion

Experiment results indicate that for computer science students the outcome was significantly higher when CAL was used for study than when Book was used, whereas in the case of business education students there was no significant difference in the outcome of both study methods under consideration. This might not be unconnected with the fact that on the average, computer science students interact with and use computers more than business education students and that the two groups studied different subjects in the experiment. In general, students' usage of CAL for study resulted in better performance as the result has indicated. NCE students that were surveyed over in the North-Central zone of Nigerias how positive attitude to computer assisted learning in their studies. This observation is partly attributable to the prevalence of usage of computers and other ICT tools in almost all aspects of our daily lives today - trend of reliance on ICT for everything.

7. Limitations

The findings in this study are limited to students of Computer Science and Business Education Departments of colleges of Education in North-central Nigeria as they constitute the study groups. We cannot generalize it to all students of the colleges yet since students in most other departments are not expected to be as much exposed to computer usage in their courses as computer and Business students. However, we cannot also rule out the possibility that if similar experiment is conducted on students from other departments the result would be comparable since almost all students in the colleges have a good level of awareness and interaction with ICT tools – use of smart-phones, tablets, and computers for social networking, gaming, and internet access is common among all categories of students on daily basis. Similar studies are required to be carried out in other departments to be able to determine if these findings can be generalized.

8. Recommendations

In the light of the findings of this study, it is obvious that the students of Colleges of Education in North-Central Nigeria, at least those of Business studies and Computer studies department have the required skills and knowledge that would enable them to use CAL and other ICT tools in their studies. In line with these findings we would like to recommend that:

- Federal and State Governments should stop the seeming lackadaisical or unfavorable treatment of Colleges of education in terms of attention and financing as compared to Universities and Polytechnics. Better attention and funding of Colleges of education are strategic to realization of improved teaching and learning that would be anchored on computer and ICT technologies
- Authorities of Colleges of Education and sister institutions should, as a matter of urgency, set up technical committees that would further study the CAL usage in teacher-training institutions and advice on how best to implement it.
- Governments and policy makers should make and enforce Education policies that would emphasize usage of computers and ICT in education delivery system of Nigeria in order to be in tune with prevailing global realities.
- Our Educational institutions should be well funded to enable them introduce and use the CAL technologies in vogue for better education delivery
- Lecturers, teachers and other education and training facilitators should be trained on how to design and use CAL programs to achieve better instruction in the classroom.
- Government and philanthropists should give ICT tools interventions to Educational institutions especially those that are underfunded to enable all institutions be carried on board the CAL and other ICT usage in education campaign.

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Appendix

Experiment Characteristics

The researchers conducted the experiment in the settings that are as close to natural as possible. The students engaged for this study were Part-2 NCE students, who at the time of experiment, were undergoing their Industrial attachment programme (SIWES) in Kontagora town. The SIWES programme normally takes place during long break, so students are not bothered by serious academic activities, which could influence their learning readiness. Secondly, the subject topics studied in the experiment form part of a core courses that the students would have to study when they resume schooling after their SIWES programs. This fact was made known to the students before the commencement of the experiment so they would have the zeal and motivation to learn – after all they would have to pass the course. Lastly, during the experiment the students were well entertained with refreshments, which were made up of light food and soft drinks just, to be sure they all feel at ease and at home with the learning materials.

Learning Strategy Implemented by our CAL

In our CAL we implemented what can be described as repeat-on-failure strategy, in which failure to answer a review question correctly by the user will automatically make him/her to repeat the study of the section or sub-section that contains the review question again and again until he/she answers it correctly. The strategy is similar to the common schools' rule or regulation where a student is required to repeat a class or a course of study on failure to pass the exams. Obviously, this strategy of repeat-on-failure is expected to produce a kind of forced learning.

In our CAL method a screen-full of information on a concept or sub-topic is presented to the student for study. After going through the learning content of the screen the student clicks on the "Review Question" button in order to take a short quiz on what he/she has just read. This makes the CAL program to clear the screen and display a multiple-choice-answers question to assess the learners' understanding of what has been studied on the previous screen. The student reads through the question and selects the option that he/she believe is the correct answer from the options list. If the selected answer is correct the CAL program displays a message that praises the user for his/her performance and urges him/her to click on the "next" button to continue learning the next section. If the selected answer option was a wrong on the CAL program displays a message that says he/she has chosen a wrong answer and urges him/her to click on "Repeat lesson" button, which is the only active button in the navigationpanel of the program screen. On clicking the "Repeat lesson" button the student is taken back to the previous information screen in order to study it once again. After the student is done studying it he/she is again required to answer a review question which would determine if he/she is good enough to proceed to the next learning section.