Article title: Effect Of Computer-Based Tests On The Academic Performance Of B.Sc. (Ed.) Physics Students At The University Of Agriculture, Makurdi

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**EFFECT OF COMPUTER BASED TEST ON THE ACADEMIC PERFORMANCE OF
B.Sc. (Ed.) PHYSICS STUDENTS AT THE UNIVERSITY OF AGRICULTURE,
MAKURDI.**

BY

TACHIA, Joseph Mfeuter.

(14/29469/UE)

**PROJECT SUMMITTED TO THE DEPARTMENT OF SCIENCE EDUCATION,
FEDERAL UNIVERSITY OF AGRICULTURE MAKURDI, IN PARTIAL FULFILMENT OF
THE REQUIREMENT FOR THE AWARD OF BACHALOR DEGREE IN SCIENCE
EDUCATION IN (B.SC.ED) PHYSICS.**

MAY, 2018.

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ABSTRACT:

The aim of this study was to determine the effect of computer based test (CBT) on the academic performance of B.S.c (Ed.) physics students at the University of Agriculture, Makurdi. The results of 100L students who wrote their examinations with paper-and-pencil test (PPT), from 2011/2012 to 2013/2014 academic sessions and those that wrote with CBT from 2014/2015 to 2015/2016 academic sessions were analyzed. The raw scores of students' result were used for this research. The population of this study was six hundred and thirty nine (639) registered students in B.sc (Ed.) Physics, which is the total number of 100L students' who registered and wrote their examinations from 2011/2012 to 2015/2016 academic sessions at the University of Agriculture, Makurdi (UAM). For the purpose of this study, the descriptive survey design was used. The purposive sampling technique was used for the selection of the sample from the population. The results were analyzed using the Students T-test. The findings of this research show that, there is no significant effect of CBT on the academic performance of B.sc (ED) Physics at the University of Agriculture, Makurdi.

CHAPTER ONE

Introduction

Education is the transfer of knowledge from one individual to another or from one entity to another; it can be in the form of a formal, informal or semi-formal setting. Basically there is always a teacher/instructor and the learner.

The Dictionary of Education (edited by C.V. Good, 1973), defined education as the aggregate of all the processes by which a person develops abilities, attitudes and other forms of behavior of practical values in the society in which he/she lives; the social process by which people are subjected to the influence of selected and controlled environment (especially that of the school), so that they may obtain social competence and optimum individual development.

There are several ways of evaluating the students' abilities base on the set objectives. Some of these ways are; tests, assignments, examination, project etc.

Also there are different methods/modes employed to examine students' performance and one of such ways is the computer base testing (CBT) which is the focus of my research, amongst several others ways like the paper and pencil (PPT).

1.1 Background to the Study

Computer Based Test (CBT) is one of the modern technological inventories in an Educational system. It's a mode of test administration whereby questions are administered to learners via computer or any other electronic means who responds by filling in right options or in the space provided.

CBT, is defined as tests or assessments that are administered by computer in either stand-alone or dedicated network or by other technology devices linked to the internet or World Wide Web(www) most of them using multiple choice questions (MCQs), (Sorana-Daniela and Lorentz, 2007). CBT has been in used since 1960s to test knowledge and problem solving skills. Computer based assessment systems have enabled educators and trainers to author, schedule, deliver, and report on surveys, quizzes, tests and examinations. There are two main types of computer based test. The most familiar type is where candidates fill in their responses on a paper form, which is fed into a computer optical mark reader. This reads the form, scores the paper, and may even report on the test reliability. The second type of CBT is where computers provide an assessment interface for students: they input their answers and receive feedback via a computer.

In a summary, the background of this study is to ascertain whether this mode of test administration, CBT which has come to stay really affects the academic performance of students' in B.Sc. (Ed) Physics. And to proffer possible recommendations based on the findings.

1.2 Statement of the Problem

The importance of education cannot be overemphasized now that the world is greatly moving to civilization. The need for formal education is increasing because of increasing pressure to meet up with the new technological inventories around the globe. As a result, the number of students admitted at different level of learning

institutions has been increasing by the day; as well they have been serious advancement in the technology to improve even in the academic system. Most learning institution especially the high institutions have move from the traditional mode of test administration to embrace the new technological inventories in the area of test administration which is the CBT. Students prefer CBT instead of PPT as they think that CBT would be interactive, exciting, accurate, secure, credible, and smooth (Sorana-Daniela, B. and Lorentz, J. 2007). Again, CBT has several competitive advantages over the traditional mode of testing. Such as less cost, more security, and high level of accuracy. Furthermore, it minimizes the required efforts to accomplish tasks, and time for test preparation, marking, scheduling, recording and analyzing the results as cited by (Terzis, V. and Economids, A. A.

2011). However, CBT seems to have some effects on the performances of students. Some of these perceived effects could be time inappropriateness in the test administrations, illiteracy of some students, errors in chemical formulae and some equations, poor co-ordinations and several other possible reasons that are traceable to these perceived effects.

1.3 Purpose of the Study

The purpose of this research is to ascertain whether CBT affects students' academic performances especially in the B.Sc. (Ed.) Physics. And to use the research findings to make some useful suggestions to improve the CBT mode of test administration.

1.4 Research Question

- i. What is the effect of CBT on the academic performance of BSc (Ed.) Physics students?

1.5 Research Hypothesis

The following was the hypothesis of this study:

- i. Computer Base Test (CBT) has no significant effect on the academic performance of BSc (Ed.) Physics students.

1.6 Significance of the Study

This study is important because it seeks to investigate if CBT has effects on academic performance of students' and to seek possible ways of improving students' performance. The educational planners will find this study significant in making useful choices on what modes of test administration to be used. It can also be helpful to the curriculum planners to make relevant provisions in some areas that will make students acquainted with new technologies employed in the educational sector while designing curriculum. The study is significant to the students whose performance over time has been affected as perceived by the researcher. They will benefit particularly from the right choices made by the academic and curriculum planners as stated above. Researchers can also find this study crucial for further studies.

1.7 Delimitation/Scope of the Study

This study is only limited to University of Agriculture Makurdi (UAM), in the college of Agricultural and Science Education and specifically B.sc (ED) Physics as the course option.

1.8 Operational Definition of Terms

Definition of terms

1. Computer Based Test (CBT), is defined as tests or assessments that are administered by computer in either stand-alone or dedicated network or by other technology devices linked to the internet or World Wide Web(www) most of them using multiple choice questions (MCQs), (Sorana-Daniela and Lorentz, 2007). In other words, Computer Base Test (CBT) is where computers provide an assessment interface for students; they input their answers and receive feedback via a computer, (Peter et al., 2004).
2. Perceive; according to Oxford Advance Learner's Dictionary by A. S. Hornby (2006) means to notice or become aware of something.
3. Effect is a change that something causes in something else (A. S. Hornby; 2006).
4. Academic Performance simply means the measure of how well or badly a student carried out a given task.

CHARTER TWO

Literature Review

Literature review deals with referring to books, reports, scholarly books, journals, electronic resources, dissertations etc. It produces an understanding of the previous work that has been investigated in such an area under study. Literature review also provides a rationale to justify the study and identify other areas of educational problems that need to be investigated. According to Adikwu O. et al (2013), literature review means making an extensive searching, reading and assessment of all available materials written in relation to the topic of investigation. The literature review enables the reader to gain further insight from the study.

2.1 Theoretical Review

2.1.1 Constructivism Theory

Constructivist theory is the theoretical framework of Jerome Bruner, who is of the opinion that, learning is an active process in which learners construct new ideas or concepts on their current or past knowledge. When learners encounter something new, they reconcile it with previous knowledge and experience. They may change what they believe, or they may discard the new information as irrelevant. To be active creators of their knowledge however, the learner selects and transforms information, constructs hypothesis, and makes decisions, relying on a cognitive structure. In the classroom, the constructivist view of learning means encouraging

students to use active techniques such as experiments and real-world problem solving using authentic data if possible, and to create knowledge and reflect on their understanding.

Constructivism modifies the role of the teacher so that teachers help students to construct knowledge rather than reproduce a series of facts. The constructivist teacher provides tools such as problem-solving and inquiry-based learning activities like the computer-based instructions setup so that students can formulate and test their ideas, draw conclusions and inferences, and convey their knowledge in a collaborative learning environment. The teacher must understand the students' preexisting conceptions and guide the activities to address this knowledge and then build on it. Constructivist teachers may encourage students to assess how the activity is helping them by administering a test via computer-based test system. Students we become expert learners as they continually make use of this mode of testing.

The CBT system of test administration is assumed to be self-directed learning (SDL), which is supported by the educational philosophy of constructivism. According to constructivism theory, computer-based testing is an active information process because knowledge generation is accomplished through individual experience, maturity and interaction with one's environment. Due to this point of view, the educational philosophy of constructivism is distinguished from objectivism in that the learner is regarded as a passive recipient of information

(Rovai, 2004).

2.2 Conceptual Review

2.2.1 Computer Based Test (CBT)

CBT has emerged as one of the recent “innovative” approaches to assessments most pursued by higher institutions. CBT is lauded as the answer to having cheaper and speedier test delivery for institutions and district-wide assessments. It is also seen by some as an avenue toward greater accessibility for students with disabilities. According to Christine Hui, L.C (1990), Computer-based test/Computer-classification test are terms used synonymously. They refer to using the computer to administer a test that is identical in length, item content and sequence to the conventional PPT.

CBT seems to have advantages over PPT, both for institutions that run the assessment programs and for the students’ who participate in them. These advantages are recognized by the U.S. Department of Education, which in one of its major initiatives (Race to the Top Assessment Program), encouraged the development of CBT. There currently is strong interest in CBT and advocates have identified many positive merits of this approach to assessment including: efficient administration, student preference, self-selection options for students, improved writing performance, built-in accommodations, immediate results, efficient item development, increased authenticity, and the potential to shift focus from assessment to instruction, according to (Becker, 2006; Salend, 2009; Thompson et

al., 2002) as cited in Thurlow, M. et al (2010). CBT also allows new ways of assessing students that move beyond the traditional multiple choice and constructed response items. For example, innovative assessments are now being developed that enable students to manipulate data and role play. However, this research work is aimed to investigate if computer-based test has any effect on students’.

2.3 Empirical Review

The following literatures were reviewed by the researcher.

Dammas, A.H. (2016) carried out a research to ‘*Investigate students’ attitudes towards Computer Based Test (CBT) at Chemistry Courses*’ which was conducted in Jeddah-Saudia Arabia. He sampled 60 undergraduate students who wrote the exams on CBT and his findings show that; the majority of his respondents to the questionnaire have positive attitude towards CBT. Statistically about (83.7%) of students said they were competent with the use of computer due to their prior experience. Regarding the test administration, they reported that there are some errors in the chemical equations, formulas, construction in the sections, and inadequate time. According to this report, a great success was recorded because 83.7% of the sample space used had a prior experience. In a case where students who have not been so much expose to such facilities, their achievement cannot certainly experience this kind of great success. And again, complains of some errors in the chemical formulas, equations, construction in the examinations could be another hindrance for a successful achievement of students in such courses.

Oduntan O.E et al (2015) in his study '*A comparative Analysis of Student Performance in Paper Pencil Test (PPT) and Computer Based Test (CBT) Examination System*' conducted in Ogun, State of Nigeria; observed that students generally are becoming interested in the use of modern method of assessment which is the CBT. This was ascertained from the analysis of the data collected from students who wrote the PPT and CBT examination in the Unified Tertiary Matriculation Examination (UTME) in the year 2013 and 2014. The further analysis was performed and the number of students who scored 200 and above, those who scored between 150 and 199 and those who scored less than 150, the result shows that, four (4) students who wrote the PPT exams of the UTME scored 200 and above while that of the CBT is five (5) students, thirty four (34) students who wrote the PPT exams of UTME scored between 150-199 while of CBT is thirty three (33) students and twelve (12) students scored below 150 in both the PPT and the CBT exams of UTME. The result also showed that, the conducive environment provided by students' and receiving of results immediately after examinations have been taken is an advantage of the new system. However, he concluded that, there is need for basic training on general use of computer before exposure to CBT mode of assessment to aid the effectiveness of the computerbased test. From the analysis it was clear that the performance of students when they wrote the computer-based test were better than the performance of the same students who wrote the paper-based

test. It can therefore be said that computerbased test should be encouraged and enhanced at various levels of educational assessment.

Adedamole A.K (2015) carried out a research titled '*The effects of computer assisted instruction on students' academic achievement and attitude in biology*' in Osun State, Nigeria. And the following were his findings. He reported that the introduction of computer-assisted instruction into SS2 has improved students' academic achievement in Biology. According to him, this finding supports previous assertion by Tabassum (2004) that students taught through computer assisted instruction as supplementary strategy performed significantly better in the sciences. This implies that the use of computer must have facilitated and improved instruction, thus improving understanding of the content of the subject and therefore improving students' academic achievements. This study, according to the researchers, is consistent with Ochogi and Ukwumunu; (2008) who submitted that the integration of computer in secondary school curriculum produces positive effect in students' learning. The study also shows no significant effect of students towards computer assisted instructions. This according to the researchers might be due to the school environment of the students, the mode of utilization or type of computer tablet issued out to the students, teacher's attitude towards the type of instructions or other unknown variables which have made the students attitude to remain significantly indifferent.

Christine Hui Li Chin (1990) researched on '*The Effects of Computer-Based Tests on the Achievement, Anxiety and Attitudes of Grade 10 science students*' at the University of British Columbia. The purpose of this study according to the researcher was to compare the achievement and test anxiety level of students taking a conventional paper-and-pencil science test comprising of multiple-choice questions and a computer-based version of the same test. The study assessed the equivalence of the computer-based and paper-and-pencil tests in terms of achievement scores and item characteristics, explored the relationship between computer anxiety and previous computer experienced on investigated the effective impact of computerized listing on the students. A sample space of 54 male and 51 female Grade 10 students participated in the study. Subjects were blocked by gender and their scores on a previous school-based science examination. They were items randomly assigned to take either the CBT or the PPT, both version of them were identical in length, item content and sequence. The result indicated that, the mean achievement scores on the science test were significantly higher for the group taking the computer-based test. No significant difference in mean scores between the sexes was observed; there was also no interaction effect between mode of test administration and gender. According to the researcher, there was however, no significant relationship between previous computer experience and the computer anxiety evoked as a result of taking the test on computer. Among the student who took the computer-based test, 71.2% said that if given a choice, they would prefer

to take the test on a computer. He concluded by saying that, the computer-based and the paper-and-pencil tests were not equivalent in terms of achievement scores. Modifications in the way test items are presented on a computer-based test may change the strategies with which students approach the items.

2.4 Summary of Literature Review

In the above research under review, the researchers were of the opinion that; the computer-based test mode of test administration should be encouraged if possible at all level of educational system. Hence there result shows that the performance of students with CBT is far better in terms of scores than that of the conventional mode of test administration.

However, my research seeks to investigate the differences in the academic performance of students' particularly in Science courses with the CBT and the conventional mode of test administration and to find out if CBT affects students' academic performances in science courses.

CHAPTER THREE

Research Methodology

This chapter describes the procedure used in carrying out this study. It comes under the following sub-topics: Research Design, Area of Study, Population, Sample and Sampling Techniques, Instrumentation, Method of Data Collection and Method of Analysis.

3.1 Research Design

The research design for this work was descriptive survey design. It was adopted because, the research only provides answer to question like, ‘Does CBT affect students’ performance?’ without really investigating the actual factors that may have constituted these effects.

3.2 Area of Study

The scope of the study is limited to B.sc (ED) Physics, a course option in the Department of Science Education, College of Agricultural and Science Education, University of Agriculture, Makurdi.

3.3 Population of the Study

The population of this study is six hundred and thirty nine (639) registered students in B.sc (ED) Physics, which is comprised of the total number of 100L students’ who registered and wrote their examinations from 2011/2012 to 2015/2016 academic sessions in the University of Agriculture, Makurdi (UAM).

3.4 Sampling Techniques

The researcher used the purposive sampling technique to gather the sample of the population for this study.

3.5 Research Instrument

There was no instrument for this research since the result used was the secondary data gotten from the Department of Science Education. The students' T-test was used with the help of statistical package for social sciences (SPSS) to analyze the raw scores from the students' results of selected academic sessions.

3.6 Method of Data Collection

The raw score of students' result was used for this research gotten from the Examination Officer of the Department of Science Education and used strictly for the purpose of this study.

3.7 Method of Data Analysis

The non-parametric statistic of the sign test was used in testing the research hypothesis. The tool used to analyze the data for this research was the students Ttest with the aid of statistical package for social sciences (SPSS).

CHAPTER FOUR

Data Presentation, Analysis and Interpretation

This chapter presents the data analysis techniques and interpretation of the findings from the two modes of test administration the PPT and CBT on academic performance of 100level students. Data composed was collated and reports were produced in form of tables and qualitative analysis.

4.2 Data Presentation

The tables below present the data for the number of 100-level students who passed their examinations in some selected science courses for both PPT and CBT from 2011/2012 to 2015/2016 academic sessions. The pass mark for this study was 45%; that is anyone that scored less than 45% was considered to have failed.

Table 4.1 below presents the number of students who passed the courses with their corresponding average percentage passed (%) for the three sessions that wrote with PPT mode.

Table 4.1: PPT Summary (The number of students passed for 2011/2012 to 2013/2014 academic sessions)

Academic Sessions Courses/ Codes	2011/2012			2012/2013			2013/2014		
	Total No. Passed	No. Reg. Students	% Passed	Total No. Passed	No. Reg. Students	% Passed	Total No. Passed	No. Reg. Students	% Passed
CHM111	73	74	98.65	43	51	84.31	44	47	93.62
CHM151	69	74	93.24	50	51	98.04	45	47	95.74
CMP111	72	74	97.30	51	51	100.00	47	47	100.00
GST111	68	74	91.89	48	51	94.12	45	47	95.74
MTH111	71	74	95.95	47	51	92.16	44	47	93.62
PHY111	59	74	79.73	48	51	94.12	41	47	87.23
PHY191	56	74	75.68	51	51	100.00	45	47	95.74
STA111	72	74	97.30	51	51	100.00	45	47	95.74
CHM122	46	72	63.89	46	51	90.20	40	46	86.96
CHM152	67	72	93.06	47	51	92.16	46	46	100.00
CMP122	68	72	94.44	49	51	96.08	45	46	97.83
GST112	69	72	95.83	50	51	98.04	38	46	82.61
MTH122	69	72	95.83	49	51	96.08	42	46	91.30
PHY132	65	72	90.28	47	51	92.16	39	46	84.78
PHY142	43	72	59.72	49	51	96.08	41	46	89.13
PHY192	65	72	90.28	49	51	96.08	44	46	95.65
Courses	1032	1168		775	816		691	744	
Total Number of Registered Students							341		

Table 4.2: The cumulative total of the students passed, the total registered students and their average percentage passed.

Courses/ Codes	The Cumulative Summary for 2011/2012 to 2013/2014 academic sessions		
	Cumulative Passed	No. Cumulati No. of Passed Students	Average % ve Reg.
CHM111	160	172	93.02
CHM151	164	172	95.35
CMP111	170	172	98.84
GST111	161	172	93.60
MTH111	162	172	94.19
PHY111	148	172	86.05
PHY191	152	172	88.37
STA111	168	172	97.67
CHM122	132	169	78.11
CHM152	160	169	94.67
CMP122	162	169	95.86
GST112	157	169	92.90
MTH122	160	169	94.67
PHY132	151	169	89.35
PHY142	133	169	78.70
PHY192	158	169	93.49
16 Courses	2498	2728	91.57

Table 4.3 presents the number of students who passed the courses with their corresponding percentage passed (%) for the three sessions that wrote with CBT mode of test administration.

Table 4.3: CBT Summary (The number of students passed for 2014/2015 to 2015/2016 academic sessions).

Academic Sessions Courses/ Codes	2014/2015			2015/2016			Summation for two sessions		
	Total No. Passed	No. Reg. Students	of % Passed	Total No. Passed	No. Reg. Students	of % Passed	Cumulativ No. ve Passed	Cumulati e No. of Reg. Students	Average % Passed
CHM111	53	61	86.89	73	91	80.22	126	152	82.89
CHM151	55	61	90.16	90	91	98.90	145	152	95.39
CMP111	58	61	95.08	63	91	69.23	121	152	79.61
GST111	56	61	91.80	90	91	98.90	146	152	96.05
MTH111	56	61	91.80	87	91	95.60	143	152	94.08
PHY111	55	61	90.16	82	91	90.11	137	152	90.13
PHY191	56	61	91.80	68	91	74.73	124	152	81.58
STA111	59	61	96.72	79	91	86.81	138	152	90.79
CHM122	51	60	85.00	71	86	82.56	122	146	83.56
CHM152	60	60	100.0	82	86	95.35	142	146	97.26
CMP122	53	60	88.33	80	86	93.02	133	146	91.10
GST112	52	60	86.67	86	86	100.0	138	146	94.52
MTH122	55	60	91.67	69	86	80.23	124	146	84.93
PHY132	57	60	95.00	71	86	82.56	128	146	87.67
PHY142	51	60	85.00	74	86	86.05	125	146	85.62
PHY192	56	60	93.33	81	86	94.19	137	146	93.84
16	883	968		1246	1416		2129	2384	89.30

Courses

Total Number of Registered Students

298

Table 4.4 below presents the Average percentage pass for PPT and CBT for each of the selected science courses.

Table 4.4: The average percentage pass rate for both PPT and CBT

Courses/Codes	Cumulative % Passed (%)	
	PPT	CBT
CHM111	93.02	82.89
CHM151	95.35	95.39
CMP111	98.84	79.61
GST111	93.60	96.05
MTH111	94.19	94.08
PHY111	86.05	90.13
PHY191	88.37	81.58
STA111	97.67	90.79
CHM122	78.11	83.56
CHM152	94.67	97.26
CMP122	95.86	91.10
GST112	92.90	94.52
MTH122	94.67	84.93
PHY132	89.35	87.67
PHY142	78.70	85.62
PYH192	93.49	93.84
Total: 16 Courses		

Table 4.5 and 4.6 shows the results from the analysis with the aid of statistical package for social sciences (SPSS) using the data in table 4.4 above.

Table 4.5: Group Statistics

	Mode of N	Mean	Std. Std.	Error test	Deviation Mean
%	PASS CBT	16	91.55	6.072	1.518
RATE	PPT	16	89.31	5.690	1.423

Table 4.6: Independent Sample Test

		t-test					
		t-crit. DF	Sign.	Mean	Std. Error	95% confidence (2-difference difference interval of the tails)	
						Lower	Upper
%	Equal	1.076 30	0.290	2.239	2.080	-2.010	6.487
	Pass variance rate assumed						
	Equal	1.076 29.875	0.290	2.239	2.080	-2.011	6.488
	variance not assumed						

From the table 4.5 above, where; ‘Sign.’ is the probability value; ‘Sign. (2-tails)’ is the probability (P-value) for a two tails test. ‘t-crit.’ is the critical value of the students’ t-test ; ‘DF’ represents the degree of freedom. Again where ‘N’ in table 4.4 represents the number of observations. From the results of the analysis, since the probability value, P-value is greater than the level of significance (that is, Pvalue of

0.290 < 0.05 level of significance), we accept the null hypothesis, (H_0) which says that there is no significant effects of CBT on the academic performance of students, and reject the alternative hypothesis, (H_1) which state that; there was a significant effects of CBT on the students' academic performance.

4.3 Discussions

The findings from the results above proved that there was no significant effect of CBT on the academic performance of students in the sciences. Since we accept the null hypothesis and in turn reject the alternative hypothesis. This result is consistent with the findings of Adedamole A.K (2015) whose studies prove that there is no significant effect on performance toward computer assisted instructions.

And Christine Hui Li Chin (1990) who's finding shows that there is no significant relationship between previous computer experience and the computer anxiety evoked as a result of taking the test on computer.

The following are likely factors that may have affected students' performance negatively:

1. Time: often times I heard students that took examinations with CBT complained seriously about the time as a constraints in using this mode of testing. According to some, they said that, the time given to answer the questions was too short. There was a case of a course in Physics, PHY111 with forty (40) questions to be answered within thirty five (35) minutes, and

majority of the questions were calculations that involves solving. I perceived that if time is allotted appropriately to the set questions, this will enable students' do better even with CBT.

2. Prior knowledge: This could possibly be another factor to be put in consideration. Some students' are coming to meet the CBT mode of test administration for the first time in the examination hall. Such students' may know answers to the questions but because they have not been used to CBT that may also affects their performances. Whereas other students' that have the prior knowledge may find it easy. Dammas, A. H. (2016) carried out a research to investigate students' attitudes toward chemistry courses, and his findings were that, there is a relationship between prior computer experience and performance. I submit that a proper orientation program be organized and a CBT demo played for students' to watch and to acquaint with this mode or better still school authorities should organized some practical lessons on how to use CBT in form of a pre-examination just to make students be familiar with the CBT mode of test administration.
3. Errors in equations and formulae: This could be one of the possible factors that may have affected the students' performance on the CBT mode of test administration. Any little change(s) in some chemical equations/formulae may completely be different from what it was originally meant for.

4. Inadequate facilities: There is a great need to improve the school infrastructures and other facilities to have a smooth and successful conduction of examinations using CBT mode. In UAM where is my case study there is only one center where CBT examinations are been conducted for a population over four thousand students. This makes it too congested, and the number of systems that are in good state are always less by a great ratio to the number of students who are to use them for examination purposes. If adequate facilities are provided and good infrastructures are put in place, students will have a conducive environment to take their examinations, this I suggest will improve the CBT mode of testing.
5. Poor co-ordination: Students often complain of the poor mode of coordination during the examinations. Some complain bitterly how the have to struggle on the queue just for them to go into examination hall. This may be one of the factors that may have affected their performance with CBT. A good time table showing when each Department/Course Option will have a course to write on CBT will go a long way to address the issue of poor coordination during examination and hence will improve this mode of test administration.

CHAPTER FIVE

Summary, Conclusions and Recommendations

This chapter summarizes the whole research process. A brief summary of the whole study is given. It also provides a summary of the main findings of the study, conclusions of the study, recommendations and suggestions for further research.

5.1 Summary

This study was carried out in the University of Agriculture, Makurdi (UAM) in the College of Agricultural and Science Education specifically in B.sc(ED) Physics to ascertain if CBT affects students' academic performance in sciences. A research question guided this work alongside with a hypothesis. The students t-test was used as the convenient statistical tool with the help of SPSS to test the hypothesis at 5% level of significance. The results from the analysis prove that there was no significant effect of CBT on the academics performance of students in science courses.

5.2 Conclusion

In conclusion, the researcher suggests that, adequate time should be allotted to questions accordingly to enable students perform better; also a practical lessons should be organized to make students acquainted with CBT mode. Attention should be given to ensure that all the chemical formulae/equations are correctly written to avoid errors, a good and conducive environment should be provided with the necessary facilities to enhance this mode of testing. The researcher also suggests

that, a proper plan should be drawn on how examinations are to be conducted to avoid unnecessary congestion. Further research can also be carried out to investigate the factors that may have been affecting students' academic performances.

5.3 Recommendations

The researcher recommends that, school authorities and examiners in particular should look at modalities to identify these factors and improve the CBT mode of test administration. Again more attention should be given to the fresh students' that is 100L and direct entry since their majority that uses CBT.

○ Educational implications

Constructivist theory of learning as was propounded by Jerome Burner, submits that, learning is an active process in which learners construct new ideas or concepts on their current or past knowledge. That is to mean, when learners encounter something new, they reconcile it with previous knowledge and experience. The implication of this study was that, students' prior knowledge on a subject is a key to his success. Hence the study suggests that prior knowledge could be one of the possible factors that affected the academic performance of students'.

○ Limitations

The study was only limited to determining if CBT affects students' performance, the study did not investigate to know these perceived factors that could have possibly affected students' performance. It was also limited to only B.sc(ED) Physics out of many course options in the Department of Science Education and in the University at large.

Suggestions for Further Studies

The researcher suggests that further studies be carried out in these areas:

- To ascertain whether CBT affects the students' academic performances in other courses or course options and Department at large.

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