SCHOOL EXAMINATION METHODS AND STUDENTS' PERFORMANCES IN NIGERIA
(COMPUTERAND PAPER BASED EXAMINATION IN FOCUS)

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ABSTRACT

This work compares students' academic performances in examinations in Nigeria using computer based examination (CBE) and paper based examination (PBE). The data for this work was gathered with the aid of questionnaire form Federal University of Technology Akure (FUTA) which is structured to examine the view of students about certain factors that influences their performances based on the type of examination. Multiple regression and Analysis of Variance (ANOVA) were used to analyze the data and the results revealed that students can maximize their time and attempt more question on Paper Based Examination than Computer Based Examination. It was also revealed that students read better when preparing to write Paper Based Examination than Computer Based Examination, since the computer based examinationsare mostly objectives. Again,in Paper Based Examination, Lecturers covers more curriculum than Computer Based Examination.It is recommended that students should be giving more training on how to use Computer before giving themComputer Based Examinationand it will help them to perform better in their academic performances.

Keywords; Computer based exam, Paper based exam, Information Technology, Multiple Regression Analysis

Introduction

The advancement in Information Technology (ICT) and its application in man's everyday life has ingrained in our educational system with the introduction of computer studies into the

primary and secondary school curriculum and use of projectors, computers and other social media platforms like goggle classroom, zoom, to teach at higher institutional level. Examination or Test is the act of testing pupils or candidates with questions, these questions which are usually designed in such a way as to contain everything the students or pupils have been taught in class, which are usually used as criteria to judge the ability or performance of the students and how well they understand all what they have been taught. Performance is the ability of the child or students to retain and be able to transfer acquired knowledge in the appropriate situation. Performance of a student is ascertained when he or she is able to understand what is taught by the teacher and is able to explain or write when evaluated (Ozumba, 2011). The advent of technology in test/examination, given to students led to the advent of Computer based examination (CBE) as against the previous traditional method called Paper Based Test (PBT) or Written Examination.

Computer Based examination(CBE) are test usually 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 question while the Paper Based Examination (PBE) is the conventional method of writing exams, which students answer question on a piece of paper with the use of pen or pencil. Information technology has significantly transformed the method of assessment, in many academic domains, educational measurement has been moving from Paper Based examination (PBE) to the use of Computer-Based Examination(CBE). As part of e-learning trend, Computer Based Examinationbecome more prevalent than paper-based exam in the domain of educational assessment as changes are made in assessment methodologies reflect practical changes in pedagogical methods. Hence, the Computer Based Examination became dominant in different types of examinations such as standardized tests(e.g., GRE, GMAT, and SAT), accounting professional certifications (likeICAN, ACA, CPA, CIA, and CMA) and college examinations **(Bull, 1999; Conole & Warburton, 2005).** There are two main types of computer based examination. 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 computer based examination is where computers provide an assessment interface for students; they input their answers and receive feedback via a computer, (Peter et al., 2004).Manyinstitutions adopting this technology in other to move with the trend without putting the students' performance into consideration, its effects on their reading ability, assimilation skillsand the effect on the Teachers/Lecturers which have to modify their questions to fit the new model and communicate fluently via exam questions and answers provided.

Paper Based Examination may be administered either verbally or on paper or in a predetermined area that would require the test taker demonstrate or perform a set of skills. Paper-based test vary in style, for example in a closed book test, the test taker is required to rely upon

memory to provide answers to the questions provided whereas in an open book test, a test taker may use one or more supplementary tools such as a reference book or calculator when responding. A test may be administered formally or informally. An example of an informal test is a reading test administered by a parent to a child. A formal test might be a final examination administered by a teacher in a classroom or an I.Q. test administered by a psychologist in a clinic. Formal testing often results in a grade or a test score. A test score may be interpreted with regards to a norm or criterion, or occasionally both. The norm may be established independently, or by statistical analysis of a large number of participants. An exam is meant to test a person's knowledge or willingness to give time to manipulate that subject. A standardized test is any test that is administered and scored in a consistent manner to ensure legal defensibility. Standardized tests are often used in education, professional certification, psychology (e.g., MMPI), the military, and many other fields.

Ancient China was the first country in the world that implemented a nationwide standardized test, which was called the imperial examination. The main purpose of this examination was to select able candidates for specific governmental positions. The imperial examination was established by the Sui dynasty in 605 AD and was later abolished by the Qing dynasty 1300 years later in 1905. England had adopted this examination system in 1806 to select specific candidates for positions in Her Majesty's Civil Service, modeled on the Chinese imperial examination. This examination system was later applied to education and it started to influence other parts of the world as it became a prominent standard (e.g. regulations to prevent the markers from knowing the identity of candidates), of delivering standardized tests. Written examinations had been unheard of before 1702 for European education. "The Chinese examinations were described repeatedly in Western literature on China of the seventeenth and eighteenth centuries. Standardized testing began to influence the method of examination in British universities from the 1850s, where oral examination had been the norm since the Middle Ages. In the US, the transition happened under the influence of the educational reformer Horace Mann. This shift decisively helped to move education into the modern era, by standardizing expanding curricula in the sciences and humanities, creating a rationalized method for the evaluation of teachers and institutions and creating a basis for the streaming of students according to ability, both World War I and World War II demonstrated the necessity of standardized testing and the benefits associated with these tests. Tests were used to determine the mental aptitude of recruits to the military. The US Army used the Stanford–Binet Intelligence Scale to test the IQ of the soldiers. After the War, industry began using tests to evaluate applicants for various jobs based on performance. In 1952, the first Advanced Placement (AP) test was administered to begin closing the gap between high schools and colleges.

Generally, advantages of Computer Based Examination systems over traditional Paper based examination have been demonstrated in several comparative works and as mentioned

by(Peter et al., 2004) but Computer Based Examination is not just an alternative method for delivering examinations, it represents an important qualitative shift away from traditional methods such as paper based exams. Computer Based Examination also provides several advantages such as proposing a solution to mechanize the assessment process (Triantafillou, Georgiadou, & Economides, 2008); reducing paper consumption which indirectly reduces greenhouse gases and energy consumption (DeRosa2007) assisting students to evaluate their strengths and weaknesses (Kaklauskas et al., 2010);and providing quantitative improvements in assessment for academics and tutors (Singleton, 1997). These improvements can be noticed in reducing preparation, time and cost, enhancing the examination security,easy analysis of the result, keeping records for item analysis and reliability of scoring, increasing efficiency(Halcomb et al., 1989; Karay et al., 2015; Lee & Barua, 1999; Zakrzewski & Bull, 1998), and providing instantaneous feedback to students.Moreover, the Computer Based Examination offer enormous scope for innovations in testing and assessment and measure complex form of knowledge and reasoning which is not possible through traditional methods (Bodmann&Robinson, 2004).Disadvantages associated with computer-based assessments include, Computer crashes are more difficult to resolve than broken pencils. There is the potential that an entire testing session, along with all students' responses, could be lost. Back-up procedures are essential, both in terms of storing student responses and having alternative means to administer the test (Education Commission of the States, 2010; Bridgeman, 2009; Rabinowitz & Brandt, 2001). Kyllonen (2009) stated: "Computers add an extra layer of complication, require extra reviews, advanced set ups, and tryouts." There are significant start-up costs for assessment systems that have previously been implemented only in paper and pencil format, including hardware, software, and network purchases, connectivity, item banking, staff training, and technical support (Education Commission of the States, 2010; Kikis-Papadakis&Kollias, 2009; Kozma, 2009; Kyllonen, 2009; Lee, 2009; Gamire& Pearson, 2006; Bennett, 2003). Computer-based assessments can lead to equity issues if some students have more access to computers and greater computer literacy skills than others. Research suggests that students with more computer skills perform at higher levels on computer-based tests than students with lower levels of computer skills (Csapó et al., 2010; Education Commission of the States, 2010; Thompson & Weiss, 2009; Gamire& Pearson, 2006; Paek, 2005; Poggio et al., 2005). Many schools lack the technical support needed to keep computerized systems functioning properly and equipment running smoothly (Education Commission of the States, 2010; Buško, 2009; Bennett,2003). Most schools don't have the capacity to test all students on computers in one session. Therefore, administration of computer-based assessments usually involves significant changes to existing teaching schedules, as well as room, student, and personnel assignments. Examination Bodies like JAMB, WAEC NECO,NABTEB and Schools must decide how many testing sessions are needed, how many and which students will test during each session, and the specific dates and times of the testing window (Buško, 2009; Kozma, 2009; van Lent, 2009; Rabinowitz& Brandt, 2001).

Despite, the advantages available in computerized examination administration, it was shown that, it does not mean that Computer Based Examinations are intrinsically better than paper based examination(John et al, 2002) as Computer Based Examination have some limitations such as lacking underlining or making notations on computer screen, looking at the computer screen for a long time, and anxiety from changing the exam mode from PBE to CBE (Butler, 2003).Better expression of ideas and thought, use of initiatives and experience when answering the questions are some of the major benefits of paper based examination.Karadeniz (2009) studied the impact of paper based, web based and mobile based assessment on students' achievement. A group of 38 students were experimented for 3 weeks. Significant differences were found between the scores achieved by the students in second week but not in first week. The paper revealed that students had positive attitude towards web based and mobile based assessment due to ease of use, comprehensive and instant feedback. Moreover, most favored tests were web based and the least favored were paper based. Calarina and Wallace (2002) investigated to confirm several key factors in computer based examination versus paper based examination assessment. Factors of the study were content familiarity, computer familiarity, competitiveness, and gender.

Institutions across the globe are migrating toward the use of Computer Based Examination (CBE) to test students' knowledge. Johnson and Green (2004) reviewed the assessment mode, the behavior as well as perception of the students being assessed because the assumption of comparability between CBE and PBE without proper investigation within that particular testing context is inappropriate. Some test takers reported that, it is more difficult to navigate back to about grades, attitudes about convenience, control and validity. Some examinees have a general anxiety about the computer itself, while others are more concerned about their level of computer experience. It is also perceived that the grades given on CBE does not show the true capability of the students as the marks do not reveal to the examiners their strength and their weakness, thereby calling the attention of the examiner on students' performance based on the CBE and PBE. This study aims at comparing the students'performance inboth CBE and Paper Based Exam using multiple regression, the descriptive statistics of computer based examination and paper based examination, it also look at the advantages of CBE and PBE, Comparing the performance rate of the students in CBE and Paper Based Exam, Determining the students' level of preparation for CBE compared to Paper Based Exam, Comparing the cost of maintenance of Computer Based Examination and Paper Based Exam and Examine the duration of results delivery in Federal University of Technology Akure, Ondo State, Nigeria.

2.0 Material and Method

Study Area

Federal University of Technology Akure also known as FUTA was founded in 1981 by the Nigeria government with the intention of creating universities that specialized in producing graduates with practical as well as theoretical knowledge of technology. The institution boasts of over seven (7) schools offering about 40 departmental courses in various disciplines which include; School of Agriculture, School of Engineering and Engineering Technology, School of Sciences, School of Management Technology, School of Earth and Mineral Sciences, School of Environmental Technology, School of Postgraduate Studies. FUTA is located at the heart of Ondo state, a south-western state in Nigeria. This great institution is ranked 9th among the best university in Nigeria.

Sources of Data

Due to the nature of this research work, structured questionnaires were given to Students across various level of Federal University of Technology Akure, Ondo State in comparing their academic performances on computer based examination and paper based examination for three Academic sessions. (2017/2018, 2018/2019,2019/2020 sessions)

Method

Model Formulation: Multiple regressionsmodel involving two or more independent or explanatory variables that based on the principle of minimizing the sum of the squares of the residuals (e_i), each residual is the difference$e_i = y_i - \hat{y}$.

Where $y_i$is the observed value and

$y_i = a + b_1x_{i1} + b_2x_{i2} + b_3x_{i3} \ldots\ldots + b_mx_{im}$is the prediction value.

Where

y_i =dependent variable (CGPA)
a_i= intercept
x_1= independent variable 1 (Computer Based Examination)
x_2= independent variable 2 (Paper Based Examination)

To get the intercept we have

$$\sum_{a=1}^{n} {e_i}^2 = \sum (y_i - a - b_1x_{i1} - \cdots \ldots b_mx_{im})^2$$

Finding the values of the slopes (b) is tricky for $k > 2$ independent variables this is where matrix algebra will be applicable. In this research, since our $k = 2$ we have the slopes as

$$b_1 = \frac{(\sum x_2^2)(\sum x_1 y) - (\sum x_1 x_2)(\sum x_1 y)}{(\sum x_1^2)(\sum x_2^2) - ((\sum x_1 x_2)^2)}$$

$$b_2 = \frac{(\sum x_1^2)(\sum x_2 y) - (\sum x_1 x_2)(\sum x_1 y)}{(\sum x_1^2)(\sum x_2^2) - ((\sum x_1 x_2)^2)}$$

Intercept (a) with two independent variables will give us

$$a = \bar{Y} - b_1 x_1 - b_2 x_2$$

$$y_i = a + b_1 x_{i1} + b_2 x_{i2} + b_3 x_{i3} \ldots\ldots + b_m x_{im}$$

3.0 Results and Discussion

Figures 1 to 4 below depict the summary of the descriptive statistics of thestudents' performance on the computer based examination and paper based examination in the Federal University of Technology (FUTA) Akure, Ondo State, Nigeria.

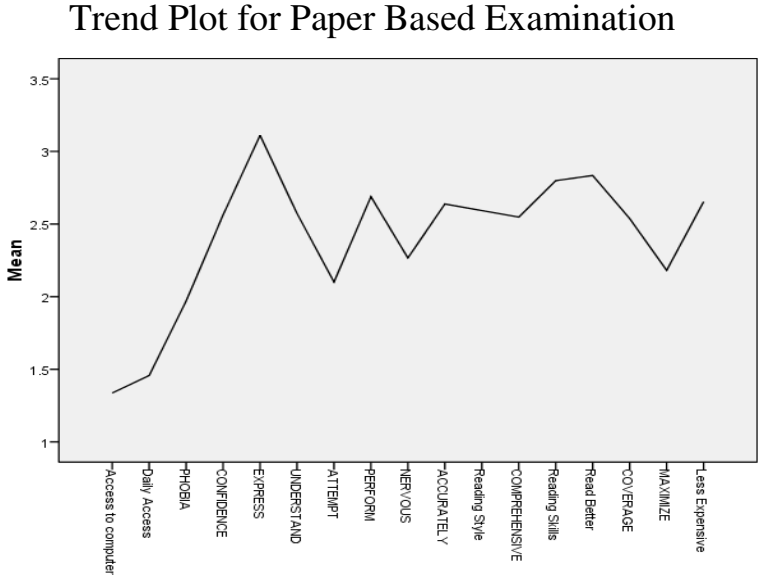

Figure 1: **Summary statistics of paper based examination in FUTA**

Trend Plot for Computer Based Examination

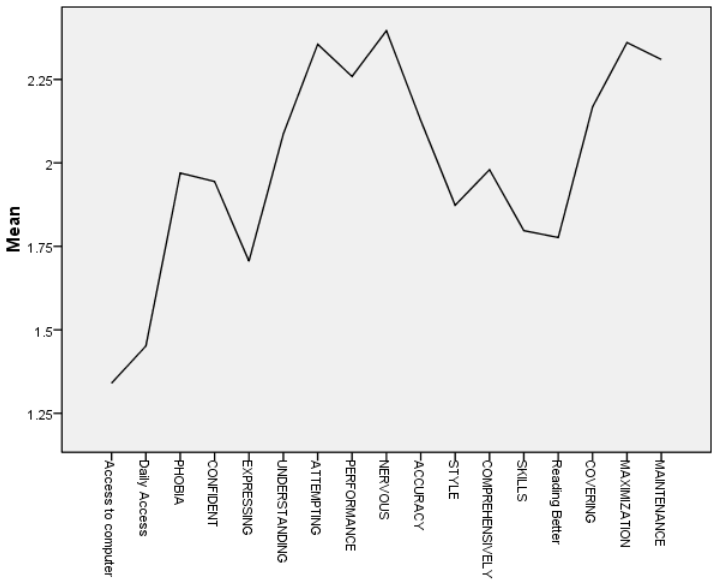

Figure 2: **Summary statistics of computer based examination in FUTA**

Bar Charts for Paper Based Examination

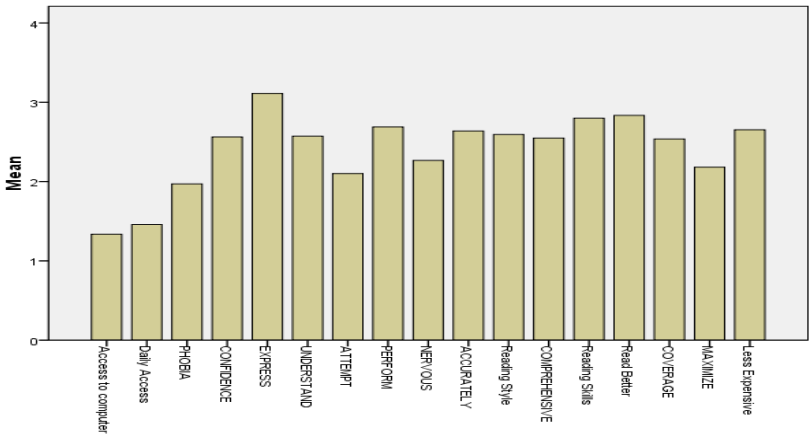

Figure 3: **Summary statistics of paper based examination in FUTA**

Bar charts for computer based examination

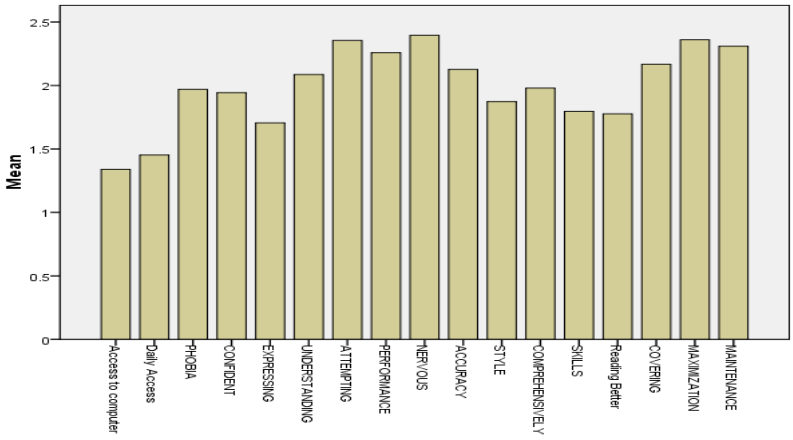

Figure 4: **Summary statistics of computer based examination in Futa**

Table 1: Data summary of the total population.

Statistics

	GENDER	MARITAL STATUS	AGE	RELIGION	CGPA	EDUCATIONAL LEVEL
N Valid	199	199	199	199	199	199
Missing	2	2	2	2	2	2
Mean	1.35	1.01	1.36	1.15	4.76	1.67
Median	1.00	1.00	1.00	1.00	5.00	1.00
Mode	1	1	1	1	4	1
Std. Deviation	.479	.100	.577	.458	1.439	.954
Variance	.229	.010	.333	.209	2.070	.910
Minimum	1	1	1	1	1	1
Maximum	2	2	4	5	7	5
Sum	269	201	271	229	948	332

Table 2: Showing the frequency of the gender of the population

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	129	64.2	64.8	64.8
	Female	70	34.8	35.2	100.0
	Total	199	99.0	100.0	

Missing	System	2	1.0		
Total		201	100.0		

INTERPRETATION: since the number of males which is about 129 is more than females which is about 70, this means that we have more male respondent than females.

Table 3: Showing the frequency of the total population based on CGPA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1.5	1	.5	.5	.5
	1.5-2.5	10	5.0	5.0	5.5
	2.5-3.0	28	13.9	14.1	19.6
	3.0-3.5	51	25.4	25.6	45.2
	3.5-4.0	44	21.9	22.1	67.3
	4.0-4.5	36	17.9	18.1	85.4
	4.5-5.0	29	14.4	14.6	100.0
	Total	199	99.0	100.0	
Missing	System	2	1.0		
Total		201	100.0		

INTERPRETATION: This shows that we have more students whose CGPA is at 3.0-3.5 and the lowest CGPA is less than 1.5.

Table 4: Showing the total population based on educational level.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100L	113	56.2	56.8	56.8
	200L	55	27.4	27.6	84.4
	300L	20	10.0	10.1	94.5
	400L	6	3.0	3.0	97.5
	500L	5	2.5	2.5	100.0
	Total	199	99.0	100.0	
Missing	System	2	1.0		
Total		201	100.0		

INTERPRETATION: We have more respondent in 100L and less respondent in 500L.

MULTIPLE REGRESSION ANALYSIS

Table 5: Showing the multiple regression analysis for Computer Based Examination

Model Summary Computer Based Examination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.314[a]	.098	.030	1.417

a. Predictors: (Constant),

INTERPRETATION:The R-square values show that the independent variable has 9.8% effect on the dependent variable. Which implies that; computer based examination (independent variable) affect the student's CGPA (dependent variable) slightly, which implies that computer based examination has little effect on the CGPA

Table 6: Showing the Analysis of Variance for Computer Based Examination

ANOVA[b] CBE

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	40.301	14	2.879	1.433	.141[a]
	Residual	369.599	184	2.009		
	Total	409.899	198			

a. Predictors: (Constant),

b. Dependent Variable: CGPA

INTERPRETATION

RULE: Since P value$\leq$ 0.05, we reject H_0

Hypothesis:

H_0: the independent variables has no effect on the student's performance (CGPA)

H_1: the independent variables has effect on the student's performance (CGPA)

Decision: since the significant value is greater than 0.05, we accept H_0. Hence, the factors has no effect on the student's performance

Conclusion: The factors has no effect on the student's performance

Table 8: Showing the multiple regression model for Paper Based Examination

Model Summary Paper Based Examination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.366[a]	.134	.067	1.391

a. Predictors: (Constant),

INTERPRETATION:

The R-square values show that the independent variable has 13.4% effect on the dependent variable,which implies that; paper based examination (independent variable) affect the student's CGPA (dependent variable) slightly.

Conclusion: The independent variables have no or little effect on the independent variable**.**

Table 9: Showing the Analysis of Variance for Paper Based Examination

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	54.471	14	3.891	2.010	.019[a]
	Residual	352.342	182	1.936		
	Total	406.812	196			

a. Predictors: (constant)

b. Dependent Variable: CGPA

INTERPRETATION

RULE: Since P value$\leq$ 0.05, we reject H_0

Hypothesis:

H_0: Paper Based Examination has no effect on the student's performance (CGPA)

H_1: Paper Based Examination has effect on the student's performance (CGPA)

Decision: since the significant value is less than 0.05, we reject H_0 but accept H_1

Conclusion: ThePaper Based Examination has effect on the student's performance

Conclusion:

The sole aim of every test or examination is to reveal the true performance of every student and to show how much of the lessons or courses taught have been understood by the students. Therefore, the sole aim of this research is to present the true perception of students about Computer Based Examination and Paper Based Examination, while showing how much the various test method affects their performances. Having sampled each student opinions under certain questions with the aid of a questionnaire, analysis do reflect that confidence level of students on CBE is much higher than PBE, and this may be due to the simplicity at which questions are framed on CBE than PBE. We also realized that students' express themselves better on PBE than CBE, findings revealed that students have 85.9% level of expression on PBE than CBE and this may be due to the amount of time and space accorded to the examination, also there are 82.8% level of understanding of the questions of PBE than CBE because questions are usually well spelled out and properly constructed within the framework of the curriculum. The findings show that students also attempt more question in PBE than CBE because they are able to maximize the time accorded to them while in CBE, the time accorded to them may not be as

much as the time accorded to them in CBE since the questions are mostly objectives.The level of accuracy of the answers students provide is higher in PBE as seen in Fig 2 which implies that students have more accurate answers to questions in PBE than CBE and this may be influenced by the time given to them in PBE than CBE. We can conclude that students' performance, that is, CGPA are influenced by the factors considered above and each student's performance will be largely affected if these factors are neglected by examiners when questions are prepared both on Computer based examination and Paper based examination.Again, students' level of preparation for test or examination is influenced by the volume of the topics covered in the curriculum, whichever test mode is being adopted, the examiner should aim at improving student's performance, so whatever grade that is awarded to the students would truly reflect their level of performances.Based on the findings and conclusion, we hereby recommend that certain precaution should definitely be put in place so as not to lose sight of the goal or purpose. CBE training should be given to all students and examiner's before it is being used as this we prevent students from being nervous when taking the test and examiners can better frame their question in ways that will cover the whole curriculum of the lesson. Again, Proper CBE training would help students with the ability to maximize their time and have better understanding of the form in which the questions might appear and how to attempt them, this gives them ability to attempt more question.

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