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RESEARCH ARTICLE

EVALUATION OF STUDENTS ACADEMIC PERFORMANCE IN JAMB CHEMISTRY TEST UNDER THE COMPUTER BASED TESTING AND PAPER PENCIL MEDIA IN DELTA STATE UNIVERSITY.

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Abstract

The study focused on evaluation of students' academic performance in JAMB chemistry test under the computer based testing and paper pencil media in Delta State University. Five research questions were raised and answered; five null hypotheses were formulated and tested to guide the study. Review of literature covers the conceptual framework, concept of computer based testing and paper pencil testing and empirical findings related to the study. Ex post facto methods were used, 10 % of the total populations were used which is 2098 students result scores for both years. The instrument used is chemistry JAMB raw scores for 2012 and 2015 result. Experts from JAMB and Department of Guidance and Counseling (measurement and Evaluation) in Delta State University validate the instruments. The reliability was done by JAMB experts with a reliability coefficient of 0.83 for paper pencil test and 0.87 for computer based testing. The analysis of data was carried out using the mean to calculate the research questions and Z-test statistic was used to calculate the hypothesis. The findings revealed that there was a significant difference between the students' academic performance in computer based test and paper pencil testing in JAMB chemistry for Delta State University. The results showed that students perform better with the use of computer based testing than the paper pencil media in Delta State University. From the findings, the study generally recommends the use of computer based testing since students performed better and 100 percent elimination of all form of examination malpractice.

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Introduction:-

It is generally recognized that examinations determine the extent to which educational goals have been achieved as well as the extent to which educational institutions have served the needs of community and society (Shah, 2002). Examinations are not limited to measure educational or societal goals and needs but blend in a way of coping with the educational system (Havens, 2002). Rehmani (2003) opines that, examinations play a significant role in determining what goes on in the classroom in terms of what, and how teachers teach and students learn and can have impact on both teaching and learning. Wikipedia used test or examinations as alternative terms of assessment and

defined it as; test or an examination (or exam) is an assessment indeed to measure a test-takers knowledge, skill, aptitude, physical, fitness or classification in many other topics.

Due to the inclusion of ICT in education, it is required to re-consider and review or change the traditional examination methods. Electronic assessment tools had reduced the burden of teachers and ease in the conduct of examinations purposefully. Computer-based examinations can be used to promote learning that is more effective by testing a range of skills, knowledge and understanding. Accessing and managing of information and managing and developing communication skills are possible to assess online which cannot be assessed in regular essay based examinations (Brown, Race, & Bull, 1999). The key reason in determining whether an assessment program is good depends on whether the assessment tasks are relevant to the aims and intended learning outcomes for the course, not forgetting the attitudes and skills that are to be tested.

In recent time, Joint Admission and Matriculation Board (JAMB) and some of the tertiary educational institutions in Nigeria introduced Computer Based Testing (CBT) as a new assessment mode. This is a sharp departure from the traditional paper-and pencil mode of testing. The trail blazing tertiary educational institutions in Nigeria in the use of these innovation include university of Ilorin, University of Benin, University of Lagos, National Open University of Nigeria (NOUN), to mention but a few.

However, they popularly emerged through the post UME (university matriculation examination) and university main examination in Nigeria recently the Joint Admission and Matriculation Board (JAMB) conducted the 2013 edition of the Unified Tertiary Matriculation Examination (UTME) with the traditional paper and pencil test and Computer Based Testing (CBT).

With this innovation in the country, the Federal Ministry of Education has introduced a curriculum for senior secondary school students starting with the 2011/2012. The new curriculum is broadly divided into three categories; one of such categories is technology, thereby making computer studies as a compulsory subject for the senior secondary school students. With the introduction of technology into the senior secondary school curriculum is a way of trying to change the traditional mode of examination methods. However, this will cut the burden of teachers and help the conduct of examination purposefully. Computer based examination can be used to promote more affective learning by testing a range numbers of skills, knowledge and understanding. Also accessing and managing of information and developing communication skills are possible to assess online which cannot be assessed in regular paper pencil based examinations (Theolow; Lazarus; Albus & Hodgson, 2010).

Computer and related technologies offer powerful tools to meet the new challenges of designing and implementing assessments methods that go beyond the conventional practices and help to record a broader repertoire of cognitive skills and knowledge. According to Bodmann and Robinson (2004) computer-based tests offers several advantages over traditional paper-and-pencil or paper-based tests. Technology based assessment offer opportunities to measure complex form of knowledge and reasoning that is not possible to engage and assess through traditional methods. The link between observation and interpretation through computer based technologies makes it possible to score and interpret multiple aspects of student performance on a lot of tasks chosen for cognitive features and compare the results against profiles that have interpretive value (Pellegrino, Chudowsky, and Glaser, 2001). Computer based assessment technique is becoming more and more common because of its relevance and direct approach towards testing. According to Conole (2005), computer assessment testing items are written to test particular levels of ability they have the potential to deliver more accurate and reliable results than traditional tests. Traditional methods of assessment are being replaced by automated assessment, all over the world gradually but it is not clear yet to what extent these changes will be fruitful to the academicians and administrators.

Computer Based Testing (CBT) offers several benefits over traditional paper and pencil based test. Technology based testing provide opportunities to measure complete form of knowledge and reasoning that is not possible to engage and test through traditional method (Bodmam & Robinson, 2004). However, the JAMB Executive Registrar, Professor Dibu Ojerinder announced that from 2015, Computer Based Testing (CBT) will be used to conduct all Unified Tertiary Matriculation Examination (UTME). He noted that the aim of the e-testing was to make sure 100 percent elimination of all form of examination malpractice that had been a major challenge in the conduct of paper pencil examination in the country (Vanguard, 8th November, 2012). With the total elimination of paper pencil examination in JAMB, the Federal Ministry of Education will also introduce same in other examination body in

Nigeria such as National Examination Council (NECO), West African Examination Council (WAEC), and National Teachers Institute (NTI) among others (Olawale & Shatil, 2010).

Past research on students towards Computer Based Testing (CBT) has show that students of age or gender difference enjoyed online testing, felt comfortable with taking tests by computer and tended to prefer it to traditional paper and pencil testing (Glasnapp, Poggio & Yang, 2005). Some studies purported that students are more engaged and motivated when taking tests item presented on-screen and not paper pencil format (Johnson & Green, 2004).

Age has played a considerable part as regards to education, like entry age of students to a school; hence, age could be a predictor to success. Gender is the properties that distinguish organism based on their reproductive roles as female or male (Abubakar & Uboh, 2010). Age has been reported to have significant influence on performance of students, it help the mental ability in thinking.

The gender (sex) of a student has great influence on the academic performance. Chemistry has been viewed by the public as a subject meant for more of the boys than girls. They have supported it that males have a learning edge over the females. Hence, males are regarded as the dominant and even superior sex in the science subjects and the females in the Arts. Many studies have been conducted to determine the factors that influence students academic performance, Baker & Maclyntyre, (2003). Kissau, (2006) & Bosede, (2010) asserted that the gender (sex) and location of school determine the student academic performance in some subject area. The results of these studies differ with some favouring the males and some the females.

Wikipedia (2013), CBT also known as e-assessment as computerized testing defines a Computer Based Testing and computer administered testing as a method of administering tests in which the responses are electronically recorded assessed or both. As the name implies, Computer Based Testing (CBT) makes use of a computer or an equal electronic device such as cell phone. Computer Based Testing (CBT) system enables educators and trainers to author, at schedule, deliver and report on surveys, quizzes test and examinations. Computer Based Testing (CBT) may be a standalone system or a part of a virtual learning environment, possible accessed via, the World Wide Web. Virtual learning environment work over the internet and provides a collection of tools such as those for assessment (particularly of types that can be marked automatically such as multiple choice test item papers).

Karadeniz,(2009). Paper and pencil test are standardized test, they are an instrument for assessing individual differences along one or more given dimensions of behavior commonly used in quantitative educational research projects to measure factors such as school achievement, aptitude, self concept, attitudes, personality and is the most widely used procedure for collecting information in educational research. . Clariana, and Wallace (2002) Paper-and-pencil instruments refer to a general group of assessment tools in which candidates read questions andrespond in writing. This includes tests, such as knowledge and ability tests, and inventories, such as personality andinterest inventories.Because many candidates can be assessed at the same time with a paper-and-pencil test, such tests are an efficientmethod of assessment. (Lim, 2006).

A good example of Computer Based Testing (CBT) for assessment is Examsoft, Softest, been switch from a paper pencil based test to a Computer Based Testing (CBT). In the early years of Computer Based Testing (CBT) many fairly basic design issues battled testing companies and states as they sought to transfer paper and pencil test into a computer based platform (Thompson, Quenomoen & Thurlow, 2006). Many people believe that Computer Based Testing (CBT) may be more efficient to administer than the traditional paper pencil based test, and new test designs may have the potential to improve the assessment of students with disabilities. For example some accommodation can be embedded in Computer Based Testing (CBT) and there may be less variability in how some accommodations are delivered (such as a screen reader may deliver the read aloud accommodation more consistently than a human reader).

Computer Based Testing (CBT) offer many new possibilities for successful assessment. If Computer Based Testing (CBT) were integrated in learning and assessment educators demanded more effective, flexible interactive, customized and just in time online instructional aide assessment systems. Research exploring the role of ICT in the teaching, learning and assessment process concludes that online learning and assessment are importing pedagogical developments in higher education. Computer-based testing is an effective teacher's tool, which aims to optimize teaching and testing goals and techniques especially in shorter times and particularly for high-stake tests (Pino-Silva, 2008).

Hricko and Howell, (2005) as well as Warburton, (2006) emphasized the importance of Computer Based Testing (CBT) and explained that schools have maintained the level of education for hundreds of years without the use of computer based technologies but the dominance of ICT in the past two decades adds values to this process than frustrating it or even preventing it. Due to the dominant impact of technology, the process is gradually shifting from the traditional pencil and paper method to Computer Based Testing (CBT). It should be noted that good teaching will lead to good performance of students in computer based assessment. Assessment is a tool to successful teaching and learning (Osadebe, 2014).

There is need to do a comparative study of paper pencil test and computer based testing of students performance in order to know which media students perform better. In this way it would be possible to find out whether paper pencil test students academic performance are high or either computer based testing students academic performance are high. This research was carried out to compare students academic performance in JAMB chemistry under paper pencil media and computer based testing in Delta state university.

Research Questions:-

This research work is aimed at answering the following questions.

1. What is the difference between students academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta state university?
2. What is the difference between male students academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta state university?
3. What is the difference between female students academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta state university?
4. What is the difference between students age 15-18 academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta state university?
5. What is the difference between students age 19-25 academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta state university?

Hypotheses:-

In the light of the above stated research question the following null hypothesis were formulated to guide the study.

- i. There is no significant difference in the academic performance of students in JAMB Chemistry test between the media of paper pencil test and computer based testing in Delta state university.
- ii. There is no significant difference in the academic performance of male students in JAMB Chemistry test between the media of paper pencil test and computer based testing in Delta state university.
- iii. There is no significant difference in the academic performance of female students in JAMB Chemistry test between the media of paper pencil test and computer based testing in Delta state university.
- iv. There is no significant difference in the academic performance of students age 15-18 in JAMB Chemistry test between the media of paper pencil test and computer based testing in Delta state university.
- v. There is no significant difference in the academic performance of students age 19-25 in JAMB Chemistry test between the media of paper pencil test and computer based testing in Delta state university.

Method:-

The ex-post facto research method was adopted for the study. This method was deemed suitable because it enables the researcher to collect raw score data that can be used to compare the students academic performance in JAMB chemistry test under the computer based testing and paper pencil media in Delta State University. The method is considered the most appropriate since the study present comparison of students academic performance under computer based testing and paper pencil media. The independent variables are the computer based testing, paper pencil media and the dependent variable is students academic performance.

The population of the study was made up of 11,831 students raw score for 2012 JAMB Paper pencil test and 9,158 students raw score for 2015 JAMB Computer based test making a total population of 20,989 students raw score that wrote Chemistry JAMB for Delta State University (Source: Joint Admission and matriculation board office)

The sample chosen for the study was ten percent (10%) of students population that did chemistry as one of their paper in the various years and media. A total sample of 2,098 students raw score, 1,183 students from paper pencil test and 915 students from computer based test, the sample are not the same students who took JAMB 2012 and JAMB 2015. The method use for selection was systematic sampling techniques. This involved the students raw scores are drawn at specified intervals from the lists containing all the raw scores of the students results. The first

“n” scores and afterwards, every n^{th} score in the lists is drawn. The n^{th} is 10^{th} which at every 10^{th} score the researcher picks a sample to use.

The instrument for the study was JAMB Chemistry raw score for 2012 paper pencil test and 2015 computer based test in Delta state university. The JAMB Chemistry raw score were used to compare the students academic performance between paper pencil test and computer based test media for different year students.

The JAMB result scores for the different years 2012 and 2015 actually measure what they intended to measured. Experts from JAMB office and Department of Guidance and Counseling (measurement and evaluation) in Delta State University, check the JAMB Chemistry raw scores before it was used to analyze the comparison of students academic performance in paper pencil test and computer based test media.

Chemistry paper pencil test and computer based testing by JAMB 2012, 2015 was standardized achievement instruments prepared by trained experts of unified tertiary matriculation examination, and so they are a reliable instrument. The reliability index of the instrument for each year was 0.83 and 0.87, Croubach Alpha reliability techniques were used, and the high reliability index indicates that the instrument was reliable. The psychometric property for chemistry were only shown to the researcher, was told to only copy the reliability Indies of the instrument, and were not given a copy of the document since they consider it private.

The researcher visited JAMB office to collect 2012 paper pencil test result scores and 2015 computer based test result scores in Chemistry for students that took Delta State University as their first choice of course of study. The results of both years (2012 and 2015) were scored based on the students academic performance. The data collected using the instrument were analyzed so as to enable the researcher to answer the research questions and test the hypotheses. The data analyses were carried out using the statistical package for social science (SPSS). The mean was use to answer the research questions and Z-test was use to determine the hypotheses at 0.05 level of significance.

Results:-

Research Question 1:-

What is the difference between students' academic performance in paper pencil test and computer-based testing in chemistry JAMB for Delta State University?

Table 2:-Analysis of difference between students academic performance in paper pencil test and computer based testing in chemistry JAMB for Delta State University.

Medium	Mean	N	Std. Deviation	Std. Error Mean
PPT	47.0330	1183	17.45067	.50736
CBT	49.4787	915	14.79947	.48926

Table 2 shows that computer based testing is higher than paper pencil test. This is as a result of the computer based testing mean of (49.48) which is higher than the mean of the paper pencil test (47.03)

Research Question 2:-

What is the difference between academic performance of male students in paper pencil test and compute- based testing in chemistry JAMB for Delta State University?

Table 3:-Analysis of academic performance of male students between paper pencil test and computer based testing in chemistry JAMB for Delta state university.

Medium	Mean	N	Std. Deviation	Std. Error Mean
Ppt male	46.9106	671	17.88991	.69063
Cbt male	50.1939	521	14.26274	.62486

The result of table 3 shows that the male students in computer-based test perform better than the male students that did paper pencil test. The computer-based test has a mean of (50.19) and the paper pencil test has a mean of (46.91) which make the computer-based test higher than the paper based test.

Research Question 3:-

What is the difference between academic performance of female students in paper pencil test and computer-based testing in chemistry JAMB for Delta State University?

Table 4:-Analysis of students academic performance of female students between paper pencil test and computer based testing in chemistry JAMB for Delta state university.

Medium	Mean	N	Std. Deviation	Std. Error Mean
PPT FEMALE	45.5195	512	17.95874	.79367
CBT FEMALE	49.5178	394	15.00198	.75579

From the presented result of table 4 shows that the female students in computer based test perform better than the female students that did paper pencil test. The computer-based test has a mean of (49.52) and the paper pencil test has a mean of (45.52) which make the computer-based test higher than the paper based test.

Research Question 4:-

What is the difference between academic performance of students of age 15-18 in paper pencil test and computer-based testing in chemistry JAMB for Delta State University?

Table 5:-Analysis of academic performance of students between age 15-18 in paper pencil test and computer based testing in chemistry JAMB for Delta state university

Medium	Mean	N	Std. Deviation	Std. Error Mean
PPT 15-18	47.1042	768	17.65782	.63717
CBT 15-18	49.9229	597	14.18304	.58047

The result of table 5 shows that students in computer-based test perform better than the students that did paper pencil test. The computer-based test has a mean of (49.92) and the paper pencil test has a mean of (47.10) which make the computer-based test higher than the paper based test.

Research Question 5:-

What is the difference between academic performance of students between age 19-25 in paper pencil test and computer-based testing in chemistry JAMB for Delta State University?

Table 6:-Analysis of academic performance of students between age 19-25 in paper pencil test and computer based testing in chemistry JAMB for Delta state university.

Medium	Mean	N	Std. Deviation	Std. Error Mean
PPT 19-25	46.2072	415	18.19886	.89335
CBT 19-25	49.6981	318	14.55144	.81600

Table 6 shows that paper pencil test is lower than the computer based test. This is because of the paper pencil test mean of (45.21) which is lower than the mean of the computer based test (49.70).

Testing the Hypotheses:-

Decision Rule: Reject H_0 if the calculated value is greater than the critical value and accept the alternative if the calculated value is less than or equal to critical value.

Hypotheses 1:-

There is no significant difference in the academic performance of students in JAMB chemistry test under the media of paper pencil and computer based testing in Delta State University.

Table 7:-Z-test analysis of no significant difference in the academic performance of students in JAMB chemistry test under the media of paper pencil and computer based testing in JAMB for Delta state university.

Medium	N	Mean	Std. Deviation	DF	Z-Cal	Z-Crit	Level of sign	Decision
PPT	1183	47.0330	17.45067	2096	3.470	1.960	0.05	Reject

CBT	915	49.4787	14.79947					
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The result presented in table 7 shows that there is significant difference between students academic performance in paper pencil test and computer based test in chemistry JAMB for Delta state university. This is because the Z calculated (3.470) is greater than the Z critical 1.960. This implies that there is significant difference between the paper pencil test and computer based test.

Hypotheses 2:-

There is no significant difference in the academic performance of male students in JAMB chemistry test under the media of paper pencil and computer based testing in Delta State University.

Table 8:-Z-test analysis of no significant difference in the academic performance of male students in JAMB chemistry test under the media of paper pencil and computer based testing in Delta State University.

Medium	N	Mean	Std. Deviation	DF	Z-Cal	Z-Crit	Level of sign	Decision
PPTMALE	671	46.9106	17.88991	1190	3.525	1.960	0.05	Reject
CBTMALE	521	50.1939	14.26274					

From the result presented in table 8, the null hypothesis of no significant is rejected. This is because Z calculated (3.525) is greater than the Z critical 1.960. This implies that there is significant difference between the paper pencil test and computer based test in chemistry JAMB for Delta state university.

Hypotheses 3:-

There no significant difference in the academic performance of female students in JAMB chemistry test under the media of paper pencil and computer based testing in Delta State University.

Table 9:-Z-test analysis of no significant difference in the academic performance of female students in JAMB chemistry test under the media of paper pencil and computer based testing in Delta State University.

Medium	N	Mean	Std. Deviation	DF	Z-Cal	Z-Crit	Level of sign	Decision
PPT FEMALE	512	45.5195	17.95874	904	3.470	1.960	0.05	Reject
CBT FEMALE	394	49.5178	15.00198					

The result presented in table 9 shows that there is significant difference between academic performance of female students in paper pencil test and computer based test in chemistry JAMB for Delta state university. This is because the Z calculated (3.548) is greater than the Z critical 1.960. This implies that there is significant difference between the paper pencil test and computer based test.

Hypotheses 4:-

There is no significant difference between the academic performance of students age 15-18 in paper pencil test and computer-based testing on chemistry JAMB in Delta State University.

Table 10:-Z-test analysis of no significant difference between academic performance of students age 15-18 in paper pencil test and computer based testing in chemistry JAMB for Delta state university.

Medium	N	Mean	Std. Deviation	DF	Z-Cal	Z-Crit	Level of sign	Decision
PPT 15-18	768	47.1042	17.65782	1363	3.270	1.960	0.05	Reject
CBT 19-25	597	49.9229	14.18304					

From the result presented in table 10, the null hypothesis of no significant is rejected. This is because Z calculated (3.270) is greater than the Z critical 1.960. This implies that there is significant difference between the paper pencil test and computer based test in chemistry JAMB for Delta state university.

Hypotheses 5:-

There is no significant difference between the students academic performance of age 19-25 in paper pencil test and computer based testing on chemistry JAMB in Delta State University.

Table 11:-Z-test analysis of no significant difference between students academic performance of age 19-25 in paper pencil test and computer based testing in chemistry JAMB for Delta state university.

Medium	N	Mean	Std. Deviation	DF	Z-Cal	Z-Crit	Level of sign	Decision
PPT 19-25	415	46.2072	18.19886	731	2.885	1.960	0.05	Reject
CBT 19-25	318	49.6981	14.55144					

The result presented in table 11 shows that there is significant difference between students academic performance of age 19-25 in paper pencil test and computer based test in chemistry JAMB for Delta state university. This is because the Z calculated (2.885) is greater than the Z critical 1.960. This implies that there is significant difference between the paper pencil test and computer based test.

Discussion:-

From the findings made on students academic performance on paper pencil test and computer based testing, the following discussion were reached;

From research question 1, shows that table 2 the mean of both medium of testing shows that computer based testing is higher than that of the paper pencil test. The computer based testing having a mean of 49.48 make it higher than the paper pencil test that has a mean of 47.03, the finding shows that the students perform better in computer based testing than paper pencil test. On the other hand, hypotheses 1, table 7 shows that the Z calculated is greater than the Z critical which mean that the hypotheses is rejected. Since the calculated Z (3.470) is greater than the Z critical (1.960) the null hypotheses is rejected, this shows that there is a significant difference between students academic performance in paper pencil test and computer based test in chemistry JAMB for Delta state university. Abdul (2011) in his finding about students performance between paper pencil test and computer based test, he concluded that students performed better when they make use of computer based test than the paper pencil test, this also goes in line with Mulvanvey (2011) findings and Saad (2007).

From the mean of the respondents on research question 2 in table 3, also shows that the male students in computer based testing did better than male students in paper pencil test, this is because the mean of computer based test (50.19) is higher than the mean of paper pencil test (46.91). This shows that the male in computer based test performed better than the paper pencil test. Equally, from table 8, the hypotheses 2 show that there is a significant difference between academic performances of male students in computer based test and paper pencil test in chemistry JAMB for Delta state university. The Z calculated (3.525) is greater than the Z critical (1.960) thereby the hypothesis is rejected and there is a significant difference between paper pencil test and computer based test.

Research question 3, on table 4 shows that the mean of both medium of testing showed that computer based testing is higher than that of the paper pencil test. The computer based testing having a mean of 49.52 make it higher than the paper pencil test that has a mean of 45.52, the finding shows that the students performed better in computer based testing than paper pencil test. On the other hand, hypotheses 3, table 9 show that the Z calculated is greater than the Z critical which means that the hypotheses is rejected. Since the calculated Z (3.648) is greater than the Z critical (1.960), the null hypothesis is rejected. This shows that there is a significant difference between academic performance of female students in paper pencil test and computer based test in chemistry JAMB for Delta state university.

From the means of the respondents on research question 4 in table 5, also, shows that the students of age 15-18 in computer based testing did better than students of age 15-18 in paper pencil test, this is because the mean of computer based test (49.92) is higher than the mean of paper pencil test (47.10). This show that the students of age 15-18 in computer based test performed better than the paper pencil test. Equally, from table 10, the hypothesis 4 shows that there is a significant difference between academic performance of students of age 15-18 in computer based test and paper pencil test in chemistry JAMB for Delta state university. Mulvanvey (2011) concluded that the middle school age students prefers computer based testing than the paper pencil test. The Z calculated (3.690) is

greater than the Z critical (1.960) thereby the hypothesis is rejected and there is a significant difference between paper pencil test and computer based test. Okoh (2011) in his findings shows that the younger students tend to be more focused on their academic than the older one therefore performed better than the older one.

From the last research question 5, shows that table 6 the means of both medium of testing shows that computer based testing is higher than that of the paper pencil test. The computer based testing having a mean of 49.70 make it higher than the paper pencil test that has a mean of 46.21, the finding shows that the students performed better in computer-based test than paper pencil test. On the other hand, hypothesis 5, table 11 shows that the Z calculated is greater than the Z critical which means that the hypothesis is rejected. Since the calculated Z (2.885) is greater than the Z critical (1.960) the null hypotheses is rejected, this shows that there is a significant difference between students academic performance of age 19-25 in paper pencil test and computer based test in chemistry JAMB for Delta state university. Mulvaney (2011) concluded that the middle school age students prefer computer based testing than the paper pencil test. Chua (2012) in his finding between computer based test and paper pencil test, that the computer based testing are more stable, motivate students, reliable to test, reduced testing time.

Conclusion:-

The study for ascertaining the comparison of students academic performance in JAMB chemistry test under the computer based testing and paper pencil media. It specifically determined which of the two media students perform better. The following conclusions are drawn based on data analyzed in the study. First, the students performed better in computer based test than the paper pencil test, this is as has a result that the students are more motivated, fearless and confident when using computer for examination, also the male and female students performed better when using computer based testing than the paper pencil medium.

The age of students also show that the students performed better in computer based test than the paper pencil test. From this it will be a thing of joy if the government, examination bodies should make computer based test a must for all students as the media of testing or assessing the students than the old method that is the paper pencil test. Therefore, the bright prospect of effective use of CBT in the system depends significantly on the coping capacity and hoped that the implementation of the suggested measure will go a long way in making these possible.

Recommendations:-

Based on the findings of the study the following recommendations were made;

1. The use of computer based testing with ICT for the assessment of students in the universities in Nigeria should be made a must for all. Computer based assessment with ICT has a lot of advantages. It is more reliable and produces result immediately after the assessment. It checks examination malpractice. Students are able to answer question confidently. It makes students to be conscious of time and the results are published immediately they finish taking the exam.
2. The power supply problem should be given first order priority in the development agenda of Federal Government of Nigeria by pursuing the power sector reforms to its logical conclusion. In addition after the power generation should be improved significantly, dedicated lines to power CBT centers in higher educational institutions in Nigeria.
3. Computer based testing should be use to assess students in post UME in all the university and also the general course that students takes in year one should be computer based mode of assessing the students. If possible the entire year one course should be computer based testing than the paper pencil mode that is commonly used in the universities.
4. They should be computer course in Nigerian basic school system should be given greater attention especially in areas not connected to the national grid. In addition computers should be provided for all government secondary school to promote computer literacy among the students as entrenched in the National policy of Education.
5. All higher teachers should be trained in test construction. Those without professional teaching qualification should be assisted to undergo post graduate diploma in higher education programme.
6. Import duties on CBT equipment for higher educational institutions should be drastically reduced or possible duty free. This is to make sure that the equipment and spare parts are readily available in the country.
7. The state and Federal government should specially fund CBT centers in public higher educational institutions or directly construct them in proportion to the enrolment capability of their higher educational institutions should be assisted in this regard through the education trust fund(ETF).

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