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COMPUTER FAMILIARITY AND ACADEMIC ACHIEVEMENT OF UNDERGRADUATES IN INTRODUCTION TO ECOLOGY COMPUTER-BASED TEST AT FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

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Abstract
The significance of ICTs in the transformation of several aspects of living in the contemporary societies can never be over-emphasized. Educational testing has been experiencing a transition from analogue to digital testing known as Computer-Based Test. Despite the low level of ICT compliance in Nigeria, several institutions of learning have been adopting the innovative testing mode as to improve the quality of assessment. The challenge remains how relevant is computer familiarity for a valid electronic testing? This study was aimed at determining the effect of computer familiarity on students' achievement in Biology in Federal University of Technology Minna. Descriptive survey design was adopted for the study. The participants were 1,130 first year science students purposefully sampled from the population 5,576 first year students who were enrolled in Introductory Ecology course of Federal University of Technology Minna. Three Instruments, BIO121 Test, Computer Familiarity Scale were used for data generation which were validated with reliability indices of .78 and .86 respectively. The data were analyzed with descriptive statistics and inferential statistics precisely independent t-test. The results revealed that the students had moderate achievement in BIO121 CBT, had more computer familiarity, there was significant difference between first year male and female students' mean familiarity scores and there was significant difference between less and more computer familiar Students' mean achievement scores. The study concluded that computer familiarity is paramount to the academic achievement in CBT. It was recommended among others that students should have adequate practical orientation on CBT before any testing exercise.

Key words: Computer Familiarity, Academic achievement, Computer-Based Test.

Introduction
For decades, computers have been in use for teaching and learning in several institutions of learning across the world. More recently, the reform extended beyond classroom instruction to the assessment and evaluation normally tagged as electronic testing or Computer-Based Test (CBT). As an innovative mode of testing, CBT can be referred to as the utilization of computers in administering and responding to test items in an internet or intranet medium (Oduntan, Ojuawo & Oduntan, 2015). In a simple form, CBT is any test or examination written with computers instead of traditional paper and pen. The innovative testing arrived Nigeria very recently with a record of tertiary institutions to have been the pioneers. For example, in 2008, the University of Ilorin Covenant University, Open University, Federal University of Technology Minna, to mention but a few were among the first universities to adopt the conduct of CBT in Nigeria (Adinaja, 2017).

Among the examination bodies in Nigeria, Joint Admission and Matriculation Board (JAMB) recorded the first large scale CBT in the year 2008 during its annual Unified Tertiary Matriculation Examinations (UTME) in the year 2008.The major motives behind this transition from PPT to CBT were, first, the clarion call of the United Nations Educational, Scientific and Cultural Organization(UNESCO) in the year 2008 for member countries to implement Information and Communication Technology(ICT) in all aspects of human endeavour, education inclusive. Secondly, studies revealed that Nigeria has been battling with incessant examination malpractices in institutions of learning for a long time and CBT was perceived to be a way forward to eradicating such menace being a more credible, accurate, speedy and objective means of testing compared to the traditional PPT that was bedeviled by such examination malpractices.

In objective activity, psychometricians emphasize much on the validity of the scores generated and the

test measures what it is set to measure (Kolawole, 2010). Terherdoost (2018) described types of validity to contain construct, face, content, criterion and discriminant and consequential validity types. Consequential validity which in most cases is ignored in research reports is another important type of validity that deserves serious attention in educational testing. It entails determining the extent to which a test is free of causing any harmful effect or disadvantage to test takers in a test (Terherdoost,2018). In normal circumstances, testees have the right to be treated and served with equity during and after any testing. This is because, any differential or biased treatment in such situations may warrant a threat to the validity of such test. For instance, in any CBT, getting familiar with computers before testing is deemed relevant performance.

Computer familiarity can be defined as accessing and getting used to and manipulating computer (Zhang et al, 2016). For a testee to be less computer familiar or to have little knowledge of computers in any CBT could face challenges with performance as a result of the possible influence of the difficulty to operate computers. In such situation, it can be inferred that that consequential validity of such test could be threatened. It is in line with this that the American Educational Research Association (AERA), American Psychological Association (APA) and National Council on Measurement in Education (NCEM) (2014) prescribed in Evaluation Standards that any mode of test administration must be correlated to ensure equivalence before full implementation at any given time and place. Studies from this perspective have been yielding different results and mostly were from foreign countries. This study therefore was conducted in Nigeria as to have picture of how the variables of the study might be as regards CBT.

Several studies were carried out to investigate the effects of computer familiarity on students' achievement over the years. As asserted by Michael (2012), little is known about effect of computer familiarity on performance as the concept seems relatively new in research. This confirms the assertion of Leeson (2006) who noted that among the variable responsible for mode effects is computer familiarity. Adebayo, (2015) noted that some candidate failed CBT form of UTME examination not because of their inability to respond to the items of the tests correctly, rather, because of their incompetence in the use of computer. Computer competency is sometime used interchangeably with computer familiarity,

Literature Review on CBT, Computer Familiarity and Academic Achievement

Studies abound on the performance of students in CBT modes of test over the time. Numerous studies reported high performance of students across grade levels, subjects and disciplines. To cite some of the reports, Dolan, *et al.* (2005) conducted a research on the effect of computer-based read-aloud on test performance of students with learning disabilities in a high school. It was evident from the results that there was a significant increase in scores on the CBT-TTS. In the same dimension, Jalali (2012) investigated the effects of the types of TOEFL (P & P vs. CBT) on Iranian EFL learners' performance on TOEFL. The students performed better on the CBT than on the PPT. Kapoor and Welch (2011) investigated students' performance on paper and pencil (PPT) and computer-based test (CBT) on a large-scale statewide Mathematics assessment. Analyses conducted at grade levels five and eight indicated average grade eight students' performed excellently in CBT. Adaramaja (2020) conducted a comparative study with undergraduates in Nigeria and eventually discovered that the participants did better in CBT test than PPT with no gender differences in the performance. All these reports confirmed the fact that CBT has been yielding positive results right from the early years of implementation within and outside the Nigeria.

On the issue of computer familiarity however, studies conducted revealed that computer familiarity has effect on students' academic achievement. For example, Stowell and Bennett (2010) in their study found a significant main effect of computer familiarity on student achievement in analytical and quantitative subtests and a significant interaction between computer familiarity and test mode on the quantitative subtest. Weir *et al.* (2002) in their studies reported that the use of computers led the respondents to achieve significantly higher scores in CBT than in PPT mode of the test. In another development, Goldberg and Pedulla, (2002) discovered a significant main effect for computer familiarity on the Analytical and Quantitative subtests and a significant interaction between computer familiarity and test mode on the Quantitative subtest confounded the main effect for that subtest. Which means there was strong relationship between the two variables. This indicates that anyone intending to compare students' achievement in CBT and PPT modes must take cognizance of both possibilities, that testees might be disadvantaged by unfamiliarity with computers, or advantaged when using them (Weir, *et al.*, 2002). To

noted that CBT practice improved NCE scores and the students with more practice in CBTs had higher scores on the NCE than those with less practice in CBTs.

On the contrary however, Zhang et al (2016) also found that use and access to computers have no effect on students' mathematics performance. Which simply means despite the fact that the students were exposed to computers beforehand, their performance was not advantaged as a result. Similarly, Al-Amri (2007) in an investigation discovered that computer familiarity had no effect on medical students' achievement in CBT L2 reading context. In the same vein Clariana and Wallace(2002) in a study found that computer familiarity had no significant effect on students performance. In another astonishing results, Papanastasiou (2002) reported that computer use has negative effect on students' performance in science. His results in science test revealed that the frequency with which students used computers in the classroom was negatively related to their science achievement in a number of countries, including the United States, Hong Kong, and Cyprus. It can be attributed to the racial and cultural differences being that those countries mentioned were all American and Asian countries with quite different background as hinted by Michael (2012) where he maintained that gender, race, ethnicity, general computer familiarity, test anxiety, computer anxiety, test type, subject matter, poor ability and interface are responsible for inconsistencies of results in mode effects studies.

Domestic studies on the subject matter are lacking. But it is interesting to know that Research ICT Africa (2012) discovered that in Nigeria possession of computers especially at homes was very poor, and males possess and use computers more than females. In the same vein, Anunobi and Mbagwu (2009) reported in a survey that male students visit and use internet more frequently than females. It is expected that frequent use of computer leads to more familiarity with computers which can enhance performance.

Statement of the Problem

Nigeria is one of the African countries coming up interms of ICT development. Researches revealed that Nigeria is still lagging behind in ICT compliance as many secondary schools and tertiary institutions are faced with inadequate computers and internet facilities for teaching and learning (RIA, 2012;). Amidst this situation, CBT was gaining attention in educational institutions for effective assessment with little concern for the need of testees to have much familiarity with computers in order to have smooth and valid assessments. The available research reports on CBT especially in Nigeria did not cover the effects of computer familiarity on students' achievement in subject areas indicating that computer familiarity was not well studied (Michael, 2012).The results of gender differences in academic achievement in CBT remains inconclusive. In addition, Biology is one of the subjects not adequately studied in terms of CBT comparability studies despite its relevance as a root of science disciplines (TEA, 2008). In order to ensure valid e- testing in our learning institutions, there is every need to study and confirm effects of computer familiarity on achievement in CBT. Therefore, this study was embarked upon to survey the level of student's familiarity with computers and to confirm the effect of computer familiarity on students' academic achievement particularly in Biology as a science course.

Aim and Objectives of the Study

The aim of this study was to examine the effects computer familiarity on 100 level students' achievement in Introduction to Ecology CBT in F.U.T. Minna. Specifically, the study examined: -

1. Level of computer familiarity of 100-level students in F.U.T. Minna.
2. Difference in 100 level students' academic achievement in Introduction to Ecology CBT based on the levels of computer familiarity.
3. Gender difference in the students' academic achievement in Ecology CBT.
4. Gender difference in the students' levels of computer familiarity.

Research Questions

The following research questions are raised and answered to achieve the stated objectives:

1. What is the level of computer familiarity of first year students in F.U.T. Minna?
2. What is the level academic achievement in Introduction to Ecology of first year students?
3. What is the difference between male and female first year students' achievement in Introduction to Ecology CBT?

4. What is the difference between male and female first year students' computer familiarity levels?
5. What is the difference between less and more computer familiar 100-level student's achievement in Introduction to Ecology?

Hypotheses

Ho_1: There is no significant difference between male and female students' achievement in Introduction to Ecology CBT.

Ho_2: There is no significant difference between male and female students' levels of computer familiarity.

Ho_3: There is no significant difference between the less and more computer familiar students' achievement in Introduction to Ecology CBT.

Methodology

The design adopted for the study was descriptive survey design which entails that the participants were appraised in their level of computer familiarity before the Introduction to Ecology CBT. The study comprised all 5,184 100 level undergraduates in Federal University of Technology Minna, Niger State, 2019/2020 session. But the target population were all 1,228 first year students offering Introduction to Ecology (BIO121) from 17 Departments under five schools in Federal University of Technology Minna, Niger State. All the 1,228 students (589 males 639 females) made up the sample of the study. The instruments used for data generation were Introductory Ecology Test (IET) which was validated by the department of Biological Sciences, F.U.T. Minna. and Computer Familiarity Scale (CFS) containing 25 items adapted from Computer Literacy Questionnaire (Son and Robb,2017) which was validated by the authors. The drafted CFS was trial tested using 100 level Biology Education students from the University of Ilorin. The reliability coefficient obtained using Cronbach Alpha measure of internal consistency was 0. 86, As a result, the instrument was adjudged to be highly reliable (Kolawole, 2010). The CFS was administered to the students a week before the BIO121 CBT to assess their level of computer familiarity. After the conduct of e-test, data were collected and coded for analysis. Finally, results from 1,130 (553 males and 577 females) were obtained due to attrition and were analyzed with descriptive statistics and independent t-test using Statistical package for social Sciences (SPSS) 23.00

Results

Research Question One : What is the level of academic achievement of first year students in Introduction to Ecology CBT and PPT modes of testing in F.U.T. Minna?

Table 2: Academic Achievement Profile of First Year Students in F.U.T. Minna

	CBT	
Achievement Levels	**Frequency**	**Percentage**
Low	12	1.1
Moderate	764	67.6
High	354	31.3
Total	1130	100.0

Results in Table 2 showed the achievement profile of the participants in CBT . The achievement scores were categorized into three, high achievement(Upper 25% of 40 total score), moderate achievement (Middle 50% of the 40 total score) and low achievement (lowest 25% of the 40 total score).The results indicated that there were 12 students (1.1%) with low achiement, 764 students (67.6%) with moderate achievement and 354 students (31.3%) with high achievement. Thus, the 100 level students in F. U. T. Minna achieved moderately in BIO121 CBT.

4. What is the difference between male and female first year students' computer familiarity levels?
5. What is the difference between less and more computer familiar 100-level student's achievement in Introduction to Ecology?

Hypotheses

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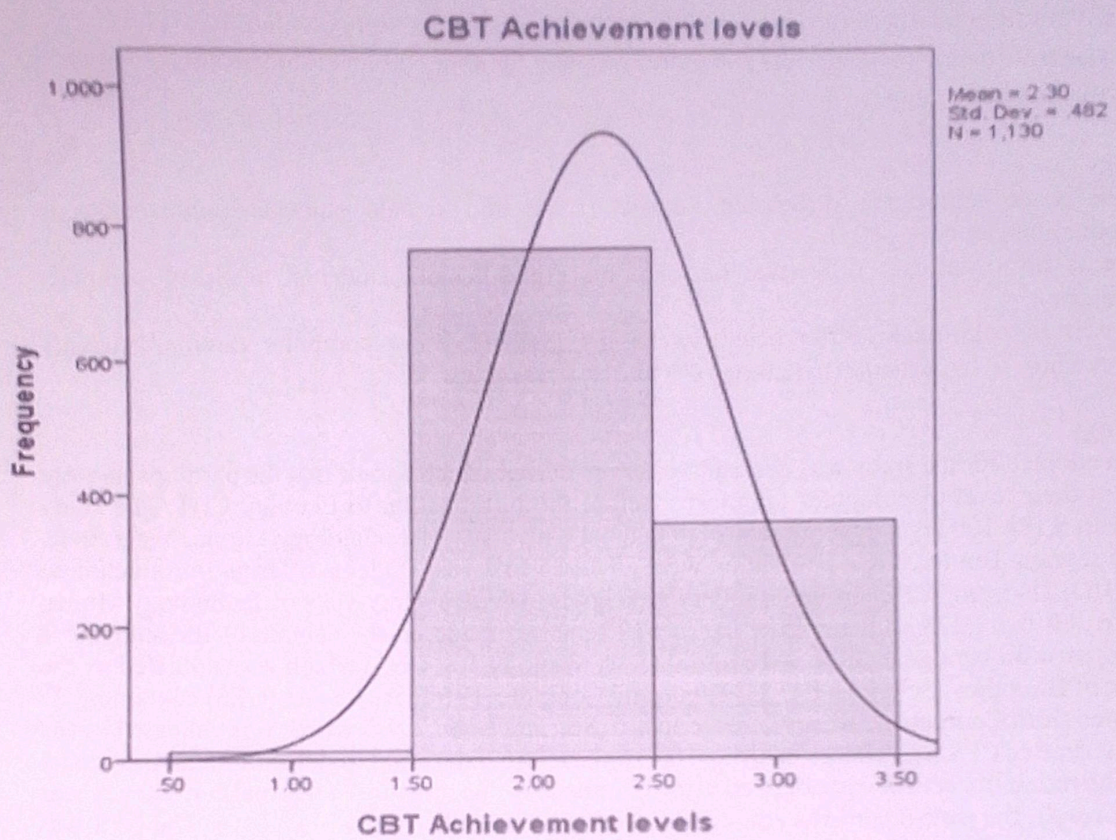

Figure 1: Achievement Levels Histogram of First Year Students in BIO121 CBT

Figure 1 was a histogram showing the level of achievement in **Introductory Ecology**CBT. It indicated that most scores converged within the median scores in the distribution giving it a closely bell shaped curve. Which simply revealed that the moderate achievers had the highest frequency.

Research Question Two: What is the level of computer familiarity of first year students in F.U.T. Minna?

Table 3: Computer Familiarity Profile of First Year Students in F.U.T. Minna

Computer Familiarity			
Range of Scores	Label	Frequency	Percentage
1-75	Less	213	18.85
76-125	More	917	81.15
Total		1,130	100

Table 3 shows the levels of computer familiarity of the First Year Students in F. U. T. Minna. It shows that 213 students (18.85%) were less computer familiar and 917 students (81.15%) were more computer familiar. Which indicates that majority of the students were more computer familiar.

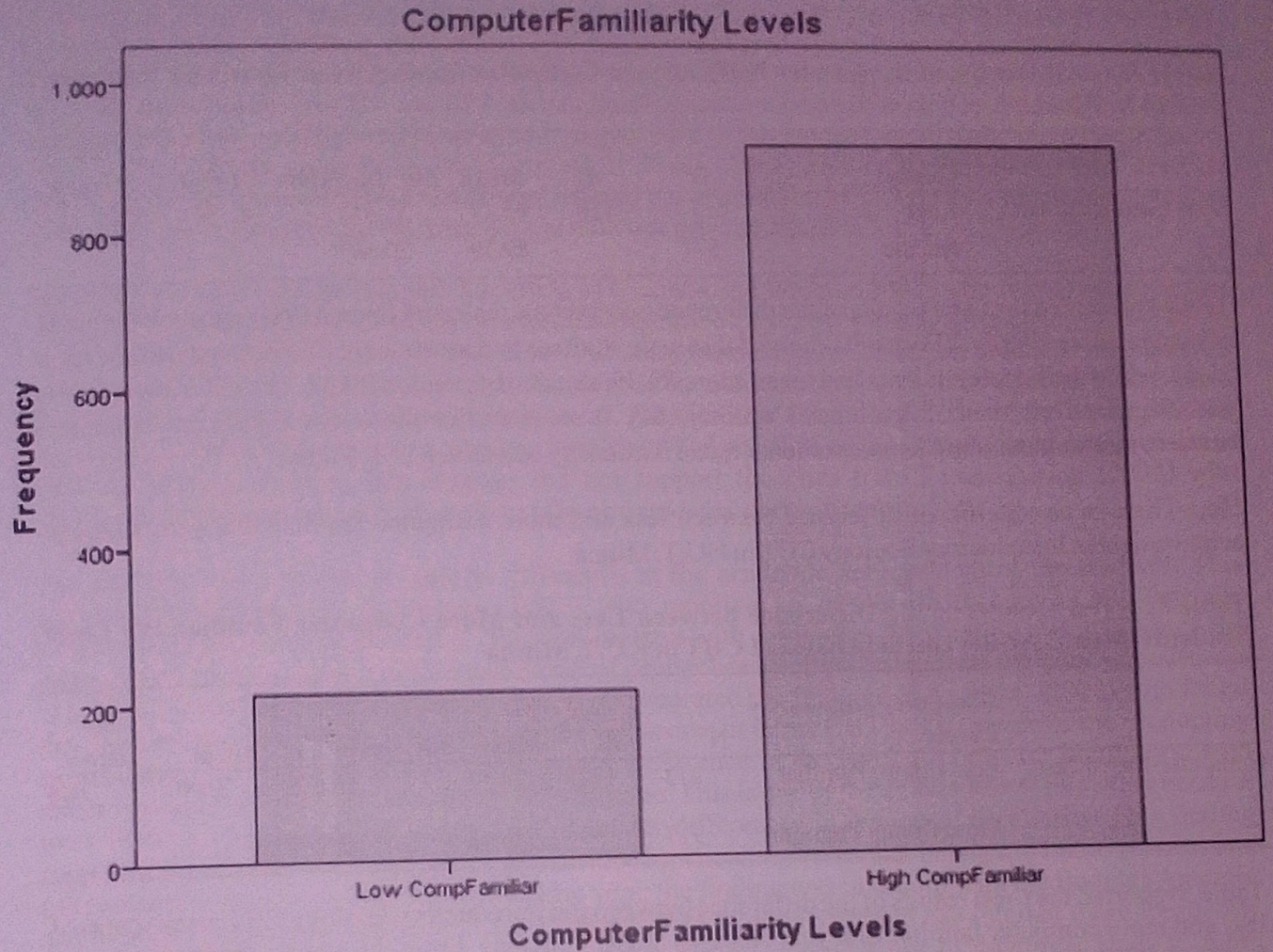

Figure 2: Bar Chart of Levels of Computer Familiarity of First Year Students in F.U.T. Minna

Figure 8 showed First Year Students' level of computer familiarity in F. U. T. Minna. It indicated that the students were more computer familiar as the chart by the right direction was taller indicating more computer familiar students, while the short bar was indicating less computer familiarity students.

Ho_1: There is no significant difference between male and female first year students' achievement in BIO121 CBT in F.U.T. Minna

Table 3: t-Test Results of the Gender Difference in Academic Achievement of First Year Students in BIO121 CBT in F.U.T. Minna

	Gender	N	df	Mean	Std. Deviation	t-Cal	Sig-2tailed
Computer-Based Test	Male	553	1128	2.2839	.48235	-1.280	.201
	Female	577		2.3206	.48176		

Table 3 reported the t-test results of the difference between the BIO121 CBT mean scores of male and female first year students in F.U.T. Minna. The results revealed that male students had mean score 2.29, standard deviation .49, while the female students had mean score 2.32, standard deviation .48. The t (1,128) = -1.280, p> 0.05, therefore, the null hypothesis was accepted. It revealed that there was no significant difference between first year male and female students' mean achievement scores in BIO121 CBT in F.U.T. Minna.

Ho_2: There is no significant difference between male and female first year students' levels of computer familiarity in F.U.T. Minna

Table 4: t-Test Results of the Gender Difference in Computer familiarity of First Year Students in F.U.T. Minna

	Gender	N	df	Mean	Std. Deviation	t-Cal	Sig 2tailed
Computer Familiari	Male	553	1128	95.17	21.619	4.594	.000
	Female	577		89.39	20.667		

Table 4 presented the t-test results of the difference between the male and female first year students' level of computer familiarity. The results showed that male students had mean score 95.17, standard deviation 21.62, while the female students had mean score 89.39, standard deviation 20.67. The t (1,128) = 4.594, $p < 0.05$, therefore, the null hypothesis was rejected. It revealed that there was significant difference between first year male and female students' mean familiarity scores in F.U.T. Minna.

Ho_3: There is no significant difference between less and more computer familiar first year students' achievement in Introductory Ecology CBT in F.U.T. Minna

Table 5: t-Test Results of the Difference between Less and More Computer Familiar 100 Level Students' Mean Achievement in BIO121 CBT in F.U.T. Minna

	Computer Familiarity Levels	N	df	Mean	Std. Deviation	t-Cal	Sig-2tailed
Computer-Based Test	Less Comp. Familiar	213	1128	24.51	7.126	3.840	.000
	More Comp. Familia-	917		26.58	7.074		

Table 5 reported the t-test results of the difference between the Introductory Ecology CBT mean scores of less and more computer familiar first year students in F.U.T. Minna. From the results, the less computer familiar students had mean score 24.51, standard deviation 7,13, while the more computer familiar students had mean score 26.58, standard deviation 7.04. The t (1,128) = 7.126, $p<0.05$, therefore, the null hypothesis was not accepted. It revealed that there was significant difference between less and more computer familiar first year Students 'mean achievement scores in Introductory Ecology CBT in F.U.T. Minna.

Discussion of Findings

The study examined the effect of computer familiarity on students' achievement in Introductory Ecology CBT. The findings of the study revealed that the respondents had moderate achievement in CBT which showed a normal curve distribution. This might be due to the much computer familiarity among students and moderate difficulty of the electronic test items which might have gone a long way in influencing their achievement. The reason being that high level of computer familiarity could have eliminated any difficulty expected from unfamiliarity with computers among the testees, thereby making the test items easily accessible.

The findings also revealed that majority of the students were more computer familiar and the more computer familiar students scored higher than the less familiar students in Introductory Ecology CBT. This supported the findings of Dolan et al (2005), Kapoor and Welch (2011), Michael (2012) Jalali (2012) and Adaramaja (2020) who discovered better performance in CBT. This confirmed the assertion of Leeson (2006) that among the variables influencing mode effects is computer familiarity. The results also corroborated the finding of Stowell and Bennett (2010) who found a significant main effect of computer familiarity on the student achievement in analytical and quantitative subtests and a significant interaction between computer familiarity and test mode on the Quantitative subtest.

The findings were in line with Weir et al (2002) in their studies reported that the use of computers led the respondents to achieve significantly higher scores in CBT than in PPT mode of the test. The findings corroborated that of Goldberg and Pedulla, (2002)who discovered a significant main effect for computer familiarity on the analytical and quantitative subtests This indicates that anyone intending to compare students' achievement in CBT and PPT modes must take cognizance of both possibilities, that testees might be disadvantaged by unfamiliarity with computers, or advantaged when using them (Weir, *et al.*, 2002). The findings strengthened the discovery of Dosch (2012) where it was noted that CBT practice improved NCE scores and the students who offered nurse anesthetists university with more practice in CBTs had higher scores on the NCE than those with less practice in CBTs.

The findings however contradicted the results of Clariana and Wallace(2002) who found that computer familiarity had no significant effect on students performance.It also went against Zhang *et al.* (2016) whose findings revealed that use and access to computers have no effect on students' mathematics performance. Which simply in indicated that despite the students' exposure to computers before hand, their performance was not advantaged as a result. The findings were also parallel to the findings of Al-Amri (2007) who discovered that computer familiarity had no effect on medical students' achievement in CBT L2 reading context. The findings did not support the ones from Papanastasiou (2002) who discovered that computer use had negative effect on students' performance in science.

The findings also revealed no gender difference in the academic achievement of the students. This supported the finding of Adaramaja (2020) who reported no gender differences in the Test and Measurement course administered to 200 level students with computers. The finding was in line with the discovery of Al-Amri (2007) who discovered that gender has no effect on medical students' achievement in CBT L2 reading context in Saudi Arabia. It corroborated the findings of Anakwe (2008) who found that students' gender was not a correlate of the test scores in either CBT or PPT mode of the accounting examination. The findings also revealed gender difference in the level of computer familiarity, with males having more computer familiarity than females. This is one of the uniqueness of this study because most of the empirical studies were silent ongender differences in computer familiarity. This finding supported the finding of Research ICT Africa (2012) who discovered that in Nigeria males possess and use computers more than females. In the same vein, the finding was in accord with the findings Anunobi and Mbagwu (2009)who reported that male students in Nigeria visit and use internet more frequently than female students. As it is said, practice makes perfect, frequent use of computer leads to more familiarity with computers which could be the reason why the male respondents in this study appeared to be more computer familiar than their female counterparts.

Conclusion

From the research findings of this study earlier discussed, the researchers concluded that computer familiarity is paramount to the achievement in CBTs and as long as there is computer unfamiliarity among testees, the results are not equivalent with the ones derived from PPTs.

Recommendations

1. Students, especially first year students should have consistent orientation and computer practical classes to get more familiarity with computers before any testing activities. This is to eliminate the possible presence of computer anxiety and to enhance computer familiarity among the students.
2. Flexible and user-friendly test applications should be provided to lecturers and students so that they can have access to tutorials on e-tests even on their mobiles phones as to control for computer unfamiliarity and anxiety.
3. Government should provide adequate computers, internet facilities and test applications in both secondary and tertiary institutions to enhance smooth conduct of electronic testing in the country

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