

# Testwiseness, Digital Accessibility and Attitudinal Disposition to Computer-Assisted Testing among Undergraduate Students in North-West, Nigeria

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# ABSTRACT

The purpose this study was to determine whether undergraduate students' testwiseness and access to digital devices are key factors critical to enhancing their attitude towards Computer-Assisted Testing (CAT) in some selected Universities in the North-west geo-political zone of Nigeria. It also examined if a significant difference existed in undergraduate students' attitude to CAT in Universities in the North-west Nigeria. These were with a view to improving the CAT outcome directed towards certifying the quality in education by the Nigerian universities. The study adopted a descriptive survey research design. The sample consisted of an intact class of 5,880 Part I undergraduate students selected from federal and state-owned Universities in the North-west. A self-developed instrument tagged: "Undergraduate's Testwiseness Digital Accessibility and Attitude Inventory (UTDAAI)", was used to collect data. Data were analysed using Stepwise Multiple Regression and independent t-test statistics. The results revealed that testwiseness and digital accessibility are not significantly combined to influence undergraduate students' attitude to CAT in Universities in the North-west Nigeria. However, there existed a positive significant relationship between testwiseness and digital accessibility. Further, there was no significant sex difference in undergraduate students' attitudinal disposition to CAT in Universities in the North-west Nigeria. The study concluded that testwiseness was not a most potent predictor of students' attitude to CAT irrespective of their access to digital devices in the University. It was recommended that Universities' Management should invest considerable resources in developing rapid response digital intervention initiatives to support the learning, teaching and assessment transition for undergraduate students in the country.

Keywords: computer-assisted testing, digital accessibility, testwiseness

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#### INTRODUCTION

The goal of any achievement test is to obtain examinees' best maximum and highest level of performance. In addition to the trait, knowledge or proficiency that is to be measured, any other factors may affect an examinee's performance on an achievement test especially Computer-Assisted - Testing (CAT). Thus, to evaluate test results properly, one should not only be aware of the existence of extraneous variables, but also be able to make appropriate allowances for such factors in interpreting the results (Ibrahim, 2020; Ibrahim, 2017).

Testwiseness (TW), otherwise known as test-taking skills or strategies (Afolabi, 2012), test sophistication, test familiarization (Ibrahim & Yakasai, 2020), test-taking orientation, or test-wisdom (Ibrahim, 2020), is a complex phenomenon that is reflected in test performance and accounts for some systematic variance in test scores. But, for the purposes of the present discussion, the definition proposed by Millman et al., (1965) cited in Ibrahim (2016) will be adopted as the standard, since it is probably the most quoted. These authors defined TW as "a subject's capacity to utilize the characteristics and formats of the test and/or the test-taking situation to receive a high score" (p. 253).

Conceptually, TW is concerned with the skill in test-taking. It is the ability of a test taker to utilize the characteristics and format of a test or testing situation to improve his or her test scores. It tends to increase the chances of gaining more marks beyond what knowledge alone could achieve (Afolabi, 2012; Schumacher, 2001; Samacki, 1979). As a definitional addendum, Ibrahim (2016) noted that TW is logically independent of the examinee's knowledge of the subject matter for which the items are supposedly measures. Likewise, testwise students are believed to have considerable skill at test-taking such that even when they lack the specific knowledge of the questions asked, they are still able to convey ideas that might earn them some points. According to Ibrahim (2017), this implies that they would have undue advantage over others in testing situations, and thus introduce error variance into test scores. Studies (Ibrahim & Yakasai, 2020; Ibrahim, 2017; Ibrahim, 2016; Afolabi, 2012; and DeMars, 2010) seem generally agreed that testwiseness is logically independent of the examinee's knowledge of the subject matter which the items are designed to measure. Basically then, testwiseness suggests a cognitive ability or abilities that one may employ on a variety of tests, regardless of the nature of the tests' subjective content.

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In some instances, due to the interrelated nature of learning and test-taking strategies, learning and test-taking strategies could be investigated interactively, hence this study. It is well known that there exist some examinees with substantial knowledge of a particular subject, yet unable to perform well in the test. Similarly, there are examinees who have no knowledge of the subject matter, but possess the ability to respond advantageously to items containing extraneous clues and, therefore, to obtain credit without knowledge of the subject matter being tested. Thus, any test or item that contains any of the extraneous characteristics may allow examinees to substitute testwiseness for knowledge. The assumption, as Ibrahim (2016) claims, is that success in achievement tests depend on testwiseness and strategic foundations. This means if test takers cannot identify what is expected from them, they cannot reflect their actual academic ability. Furthermore, a number of authors have offered definitions of CAT (Bartram & Hambleton, 2005; Mills et al., 2002; Wainer et al., 2000), as Computerized Adaptive Testing (CAT) is a form of computer-based test that adapts to the examinee's ability level. For this reason, it has also been called tailored testing. In other words, it is a form of computer-administered test in which the next item or set of items selected to be administered depends on the correctness of the test taker's responses to the most recent items administered.

Operationally, CAT is a kind of Computer-Based Test (CBT) which adapts to the ability levels' of the participants. Basically then, in CAT, examinees' responses to earlier items determine which subsequent items should be administered to them. For instance, if an examinee answers the item correctly, the next item will be more complicated. On the other hand, if the examinee answers the item wrongly, the subsequent item will be easier. This process will continue until the examinee's ability level is estimated. This shows that regardless of ability, students who are test wise can outperform students of equal ability who lack testwiseness in CAT. Hence, since CATs are multiple-choice questions (MCQs), testwiseness is an individual examinee's ability to improve his or her test score by recognizing and utilizing cues in the test multiple choice items, format or testing situation (Hosseini et al., 2014). In this regard, testwiseness is independent of the subject matter for which the items are supposed to measure (Tavakolia & Samian, 2014). Suffice to say that as test takers' responses to former items is a determinant of subsequent items to be answered subsequently, it could be therefore deducible that test takers may not possess the knowledge to answer correctly most of the items in CAT, but they could depend on their testwiseness and substitute testwiseness for knowledge of the subject matter

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culminating in a higher performance. While test content has been found not to be a largely determining factor in the use of testwiseness strategies, test method is known to be largely influential factor. Generally, in CAT, an item bank is used. This item bank includes a large number of test items which have different difficulty levels and the test items will be selected from it (Ibrahim, 2020).

On students' attitudinal disposition to CAT, Boo and Vispoel (2012) explored the comparability of scores obtained from computer and paper-and-pencil versions of the Iowa Tests of Educational Development and the examinees' attitudes about these two modes. The results of this study revealed that examinees preferred the computerized tests to paper and pencil tests. Besides, Mojarrad et al., (2013) compared paper and pencil reading comprehension assessment to computer-based assessment. An attitude questionnaire was given to examinees to investigate their attitudes towards computerized testing. The findings indicated that examinees' reading comprehension scores across testing modes were not significantly different. Furthermore, most of the students prefer to take the test on computer.

Whereas, access to digital devices have been identified as key factors critical to enhancing examinees' performances in CAT. Ibrahim and Iliyasu (2021) investigated the digital divide in access to CAT in Nigeria, as a result of the COVID-19 pandemic. The sample comprised of sampled 557 undergraduate students in Nigeria Universities. From the survey, a significant relationship between the testwiseness and the digital divide in accessing CAT exists; significant differences in students' access to CAT during the pandemic exists, and significant differences in access to digital tools between students in government universities and their private universities' counterparts exist. Also, there was a statistically significant association between testwiseness and the ability to succeed in CAT during the pandemic. Additionally, students have been experiencing the digital space in a variety of ways and using different platforms, thus showing diversity in their behaviours and experiences.

Against this backdrop, this study sought to establish the direction of the pull and push of the relationship between testwiseness, digital accessibility and attitudinal disposition amongst undergraduate students towards CAT in government-owned Universities in the North-west, Nigeria.

## **Objectives of the Study**

The broad objective of this study is to investigate whether undergraduate students' testwiseness, access to digital devices are key factors critical to enhancing their attitude towards Computer-Assisted Testing

in some selected Universities in the North-west geo-political zone of Nigeria. To achieve this goal, the specific objectives of this study are to:

- Determine whether significant relationships exist between undergraduate students' testwiseness, digital access and their attitude to Computer-Assisted Testing in the Universities in Northwest Nigeria.
- 2. Examine if a significant sex difference exists in undergraduate students' attitude to Computer-Assisted Testing in Universities in the Northwest Nigeria.

# **Research Hypotheses**

- 1. Testwiseness, digital access will not significantly combined to influence undergraduate students' attitude to Computer-Assisted Testing in Universities in the Northwest Nigeria.
- 2. There is no significant sex difference in undergraduate students' attitude to Computer-Assisted Testing in Universities in the Northwest Nigeria.

## MATERIAL AND METHODS

# Research Design

The study employed a descriptive survey design. A descriptive survey research design collects and uses the data systematically from a give population to describe certain characteristics of that population. Since descriptive survey typically relies on data collected from questionnaires, a sole instrument used for gathering data in this study, which enabled comparisons to be made between and among groups over time, hence its appeal to generalizability and universality of results as well as the degree of confidence which can be placed in the findings of this study (Cohen, et al., 2010).

Also, this study is descriptive in nature in that data gathered from the participants with the use of questionnaire only describe testwiseness as it affects attitudinal disposition of undergraduate students to CAT regardless of their access to digital devices in universities. There was no conscious manipulation of the variables since the interaction among variables have been completed. According to Singh and Upadhya (2008), the descriptive research design typically is used to scan a wide field of issues, populations, programmes in order to measure and describe any generalised features and cannot, therefore, be controlled, engineered or be manipulated by the investigator.

#### **Participants**

The population of the study comprised all undergraduate students in public Universities in Northwest states, Nigeria. There are seven (7) states that make up North-west Nigeria and these states are Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara. Based on data provided by the Ministry of Education in each of the States in North-west Nigeria, there are a total of 17 government-owned universities (8 Federal Government-owned and 9 State Government-owned Universities) in Northwest Nigeria as at the time of this study. Multi-stage sampling technique was used in selecting the Part I undergraduate students in the study. The undergraduate students were selected using the seven states in the North-west as the first stratum. From each of the states, one Federal-Governmentowned and one State Government-owned Universities were selected using simple random technique. From each of the selected Federal and State-owned Universities, stratified random sampling method was employed to select a total of 30 Part I undergraduate students totalling 420 across the North-west states, using sex and level of educational attainment as strata. The undergraduate students were selected from 7 Federal Government-owned and State Government-owned Universities in each of the states making a total of 14 public Universities. 280 male and 140 female undergraduate students were selected from each of the randomly selected one Federal-Government-owned and one State Government-owned Universities making a total of 30 Part I undergraduate students per University. This was done to balance gender difference and to ensure gender equity as they exist in the Universities in the North-west. Thus, a total of 420 consisting of 280 male and 140 Part I undergraduate students were included in the study. Their average age was 18.26 years. Only 330 consisting of 207 male and 123 female Part I undergraduate students returned the instrument administered on them. Thus, the return rate was 79%.

Noteworthy, Part I undergraduate students were selected because they were considered as newest levelled students as they are quite familiar to CAT, which they took as Universities Matriculation Examinations (UME) in different recognised CAT Centres as organised by Joint Admissions and Matriculation Board (JAMB) throughout the country. Thus, their CAT experience is still fresh in their memories and considered accurately useful to the achievement of the objectives of this study.

# Research Instrument

A self-developed instrument tagged: "Undergraduate's Testwiseness Digital Accessibility and Attitude Inventory (UTDAAI)", was used to elicit information about the influence of testwiseness on undergraduate students' attitude to CAT in spite of their digital accessibility. The instrument contained 30-item divided into three sections, and rated on a five-point Likert-scale graduated from "Most of the time" to "None of the time" agreement about the statement.

The questionnaire was of two parts: part one elicited students' bio-data such as name of the institution, sex, degree in view, CAT experience, location of the institution, type of institution, to mention only a few. The second part comprised of 30-item with each item designed to collectively measure each of the variables testwiseness, digital accessibility and their influence on the undergraduate students' general attitude to CAT on campuses of the randomly selected Universities used in the study.

## Validity and Reliability of the Instrument

The face and construct validity of the instrument were established through subjecting items to expert judgments of five experts. Two of these experts were Tests and Measurement, while the remaining three were Educational Psychology, Sociology of Education and Guidance and Counseling experts respectively. Afolabi (2012) maintained that face validity of instrument is based upon a superficial examination of the nature of the instrument. Hence, the experts appraised the items on the basis of ambiguity, relevance and sentence structure respectively. The experts' judgments revealed that the instrument had adequate face and construct validity. Thereafter, a pilot study was conducted to establish the reliability the instrument. This involves the double administration of the instruments on 30 undergraduate students from a State-owned University within a two-week interval. The 30 undergraduate students randomly selected were not the same with the 5,880 students used for the study as sample. A Pearson Product Moment Correlation (PPMC) co-efficient formula was used for data analysis. The result shows a test-retest reliability co-efficient of 0.87 (n = 30; p<0.05) and internal consistency reliability estimate of 0.93 (n = 30; p<0.05). The test-retest reliability was preferred because of the desire to determine the internal consistency of the instrument for data collection. Thus, the instrument was accepted as highly reliable, consistent and valid over time.

## Procedure for Data Collection

The research instrument was personally administered to the respondents by the researcher with the aid of the Research Assistants recruited for the purpose of this study. A total of 420 instruments were administered on the selected sample. Out of these, only 330 questionnaires were returned correctly filled consisting of 207 male and 123 female Part I undergraduate students. Thus, a return rate of 79% was achieved. Thereafter, a key was developed to code every information received from the questionnaire. Hence, the copies of the instrument were scored variable-by-variable as guided by the research hypotheses. For part one of the questionnaire, items 1-8 enabled the classification of the participants into male and female undergraduates; high, moderate and low attitudinal disposition to CAT. Part two, section A, B, and C of the questionnaire consisted of 30-item which were broken down to variables in the study. Each of the items was scored in an increasing (ascending) order of magnitude for those items that were positively worded; while those items that were negatively worded were scored in a decreasing (descending) order of magnitude. The combination of these scores formed the basis on which the data were analysed.

#### Data Analysis

Using updated SPSS version 21.0., the data collected were subjected to analysis computing first, the mean  $(\bar{x})$  scores and standard deviations (SD). Afterwards, independent t-test statistical method was used to test hypotheses two, Stepwise Multiple Regression statistical method was used to test hypothesis one respectively. Hence, all hypotheses postulated were tested at 0.05 level of significance.

#### RESULTS

The computed scores of the undergraduate students' attitude to Computer-Assisted Testing was subjected to mean and standard deviation. Further, the scores were used to categorize students' attitude into positive and negative attitudes with scores that range from minimum through 1-mean (10-15) as negative while scores from mean through highest (16-21) as positive attitude. The results of the analyses are presented in Table 1.

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N	Mean	Std. Deviation	Minimum	Maximum	
330	15.72	3.18	10	21	
Attitude t	to CAT	Frequency	%		
Posit	ive	203	61.5		
Negative		127	38.5		

**Table 1:** Mean and Standard Deviation of Undergraduate Students' Attitude to Computer-Assisted

 Testing

From Table 1, the results showed that the majority of the participants (203 out of total 330) representing 61.5% of the undergraduate students exhibited positive attitudinal disposition trait towards CAT, while 127 participants representing 38.5% of undergraduate students manifested negative attitudinal disposition trait towards CAT. Hence, this implies that a preponderant majority of undergraduate students showed a positive attitude to CAT in Universities in the North-west Nigeria.

**Research Hypotheses One:** This states that testwiseness, digital accessibility will not significantly combine to influence undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-West Nigeria. To answer this research hypothesis, a multiple correlation analysis was initially computed followed by Stepwise Multiple Regression. The multiple correlation analysis was used to determine the nature of relationships that exist between Testwiseness, digital accessibility and undergraduate students' attitude to Computer-Assisted Testing. The result is presented in Table 2.

Variables	Testwiseness	Digital accessibility	Attitude to Computer-
			Assisted Testing
Testwiseness	1	0.245*	-0.030
Digital accessibility	0.245*	1	-0.082
Attitude to Computer-Assisted	-0.030	-0.082	1
Testing			
* Significant, p <0.05			

**Table 2:** Bivariate Correlation Analysis Showing Relationships between Testwiseness, Digital

 Accessibility and Undergraduate Students' Attitude to Computer-Assisted Testing

Table 2 revealed the results of the Multiple Correlation analysis, which showed that there was no significant relationship between testwiseness and undergraduate students' attitude to CAT (r = -0.030; p>0.05) as well as digital accessibility and attitude to CAT (r = -0.082; p>0.05). However, a positive significant relationship existed between testwiseness and digital accessibility (r = 0.245; p<0.05).

Further, analysis using Stepwise Multiple Regression with testwiseness and digital accessibility as predictor variables was conducted. This helps to show whether testwiseness or digital accessibility is a more potent predictor of students' attitude to CAT. The results of the analysis are presented in Table 3.

	~		Coefficients <sup>a</sup>	·	~~~~	
R=0.030 $R^{2}=0.001$		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
F-value=0.288		В	Std. Error	Beta		
1	(Constant)	16.548	1.477		11.201	.000
	Testwiseness	036	.065	031	552	.581(ns)
R=0.083						
$R^2 = 0.007$ ,						
F-value=1.134						
2	(Constant)	17.866	1.777		10.053	.000
	Testwiseness	014	.067	012	209	.835(ns)
	Digital accessibility	101	.076	076	-1.330	.184(ns)
a. <b>Dependent</b>	Variable: Attitu	de to Con	nputer-Assiste	d Testing		
ns = not signif	ficant; p> 0.05					

**Table 3:** Stepwise Regression Analysis Showing Combined Influence of Testwiseness, Digital Accessibility on Undergraduate Students' Attitude to Computer-Assisted Testing

Table 3 indicated the results of the Stepwise Multiple Regression analysis, which showed that testwiseness ( $\beta = -0.036$ ; p-value 0.581>0.05) alone as well as testwiseness ( $\beta = -0.014$ ; p-value 0.835>0.05) and digital accessibility ( $\beta = -0.101$ ; p-value 0.184>0.05) are not statistically significantly combined predictors of undergraduate students' attitude to CAT in Universities in the North-west Nigeria. Also, the value of R<sup>2</sup> (0.007) for the two variables implies that testwiseness and digital accessibility as variables do not have any statistically significant contributory influence on undergraduate students' attitude to CAT in Universities. As such, the null hypothesis was confirmed, which stated that testwiseness, digital accessibility will not significantly combined to influence undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria.

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**Research Hypothesis Two:** This states that there is no significant sex difference in undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria. To test this research hypothesis, the computed raw score of the undergraduate students' attitude to CAT was subjected to test of difference using independent t-test with sex of respondents used as grouping variable. The results of the analysis are presented in Table 4.

**Table 4:** Sample t-test Showing Sex difference in undergraduate students' attitude to Computer-Assisted Testing

	SEX	Ν	Mean	Std. Deviation	df	t	p-value
Attitude	MALE	207	15.76	3.185	328	0.253(ns)	0.800
to CAT	FEMALE	123	15.67	3.185			

#### ns = not significant; p> 0.05

Table 4 showed the results of the t-test, which revealed that there was no significant sex difference (t = 0.253; p > 0.05) in the undergraduate students' attitude to CAT. Hence, the null hypothesis was confirmed, which states that there is no significant sex difference in the undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria.

#### DISCUSSION

The purpose of this study was to investigate whether undergraduate students' testwiseness, access to digital devices are key factors critical to enhancing their attitude towards Computer-Assisted Testing in some selected Universities in the Northwest geo-political zone of Nigeria. Hence, the finding showed that testwiseness, digital accessibility did not significantly combined to influence undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria. However, a there was a positive significant relationship between testwiseness and digital accessibility. Also, there was no significant sex difference in the undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria.

These findings are in consonant with the confirmation of Tavakolia & Samian (2014) and Ibrahim (2020) who alluded that testwiseness is independent of the subject matter for which the items are supposed to measure. Perhaps, this could be due to the fact that as test takers' responses to former items is a determinant of subsequent items to be answered subsequently, it could be therefore deducible that test takers may not possess the knowledge to answer correctly most of the items in

CAT, but they could depend on their testwiseness and substitute testwiseness for knowledge of the subject matter culminating in a higher performance. While test content has been found not to be a largely determining factor in the use of testwiseness strategies, test method is known to be largely influential factor.

A likely reason for this finding which shows that testwiseness combined with digital accessibility is not a potent predictor of undergraduate students' attitudinal disposition to CAT could be due to the fact that TW is widely recognized as a source of additional variance in test scores and as a possible depressor of test validity. In other words, the fact that TW encompasses both the method of measurement (tests testing situation), and characteristics of examinees (states-traits), indicates that TW is indeed a factorially complex construct, which contains principles of TW which are independent of the test-constructor or test purpose. This reason as presented here is applicable in most testing situations, regardless of previous exposure (or a lack of it) to either the test-maker, or other tests with a similar purpose. Similarly, this reason does not includes rules of thumb to avoid minor mistakes, so that the examinee is not penalized for his or her carelessness. Thus, if examinees wish to maximize their test scores, use of an appropriate TW strategy is a viable means of doing so. This explains why there was a positive significant relationship between testwiseness and digital accessibility as one of the findings in this study.

Another finding in this study indicated that there was no significant sex difference in the undergraduate students' attitude to Computer-Assisted Testing in Universities in the North-west Nigeria. This implies that regardless of gender, both sexes have the same set of attitudinal posture towards CAT. This finding is not surprising as it was consistent with the discovery of Boo and Vispoel (2012) and Mojarrad et al., (2013) studies, which revealed that most of the students prefer to take the test on computer (CAT). Also, this finding confirms Ibrahim and Iliyasu (2021) investigation, which concluded that students have been experiencing the digital space in a variety of ways and using different platforms, thus showing diversity in their behaviours and experiences to CAT.

# CONCLUSION AND RECOMMENDATIONS

Based on the findings in this study, it can be concluded that TW and digital accessibility combined are not statistically significantly potent predictors of undergraduate students' attitudinal disposition to CAT in Universities in the North-west Nigeria. But, there existed a positive significant relationship between TW and digital accessibility. Whereas, gender is not a potent factor in undergraduate students' attitudinal disposition to CAT in Universities in the North-west Nigeria. The following recommendations are made based on the findings of this study:

- 1. It is the contention of the present researchers, that a testing programme as CAT be included in the Junior and Senior Secondary Schools' curriculums in the country.
- 2. Although TW may be successfully taught at an earlier age, it is probably more appropriately taught at the University level. Here the student is more apt to retain the concepts, due to exposure to more testing situations where proper employment of the TW cues will reinforce their being learned.
- 3. In addition, inclusion of TW training at this point in one's academic experience, will provide the student with requisite skills needed for success on the many tests soon to be encountered in the University years. TW training at an earlier age may be introduced on a smaller level (e.g., programmed texts only), in order to prevent deficiencies in test taking abilities from developing.
- 4. Whatever CAT type may be adopted in the University, the important point is that TW training provides necessary test taking skills, therefore helping to negate the handicap of low test-wise individuals.

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