ESL Students' Perception of Computer and Paper-based Assessment Mode in Open and Distance Learning in Nigeria

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Abstract

This study, using the discourse analyses technique, investigates how English as Second Language (ESL) university undergraduates in Nigeria perceive and respond to the test mode effects of computer-based and paper-based tests in Open and Distance Learning institutions. The National Open University of Nigeria (NOUN) is used as a case study. The factors considered in this investigation are computer familiarity/literacy of test takers, content familiarity as well as gender competitiveness. 200 randomly selected 100 level (first year) undergraduate students undergoing the GST 101 – Use of English course were randomly assigned to either a computer-based or identical paper-based test. A post-test design with only one factor – test mode (computer-based and paper-based) was used in this study. Dependent variables included students' scores on a 100-item (50 multiple choice and 50 fill-in-the blanks) test as well as students' self-report on the open and distance learning survey. The two groups took the same set of fifty multiple choice and fifty open-ended (fill-in-the blank) questions and were given a maximum of one hour to complete the test. To measure the respondents' characteristics, a modified version of the Distance Learning Profile, which consists of 12 statements that fall into these categories; Frequency of Computer use, Independence, Competitiveness, Perceived Course Quality, and Active Engagement was used. The study also used thematic/content analysis to analyse the data which subsequently showed that the computer-based test group performed better than the paper-based test group. Although content familiarity and computer literacy were related to this performance difference, gender competitiveness was not. The respondents who took the computer tests had higher and better scores than those who took the paper-based equivalent of the tests. Our submission, therefore, is that the mode of test administration can have significant impact on students' performance, especially as this study has shown that majority of undergraduate students in NOUN tend to appreciate and perform better in computer-based assessment than paper-based test. This is clearly one of the impacts of the present digital age where many of these students have become familiar with various digital technologies that currently exist in different institutions in the country. Other ODL institutions in Nigeria are therefore advised to adopt the NOUN example for positive academic test output.

Keywords: Computer-based test, Paper-based test, Open and Distance Learning (ODL), National Open University of Nigeria (NOUN), Computer familiarity, Content familiarity.

Introduction

Innumerable examinations and assessments are administered every year in various institutions of learning around the world, and these tests are meant to accurately and scientifically measure the knowledge and competence of an individual. Consequently, behind every test that measures a student's knowledge, a rigorous test development process is employed by the institution. The tests are basically an assurance that those who have been certified have met important intellectual standards. Suffice it to say that there is really no shortcut to creating tests that are valid, reliable and fair. That, indeed, is the process of test development. The foregoing is buttressed by Shah (2002), who opines that it is generally believed that examinations often test and determine the extent to which educational objectives have been achieved as well as the extent to which educational institutions have served the needs of community and society.

Background to the study

Institutions of higher learning worldwide employ various examination methods to test students' knowledge. These include paper-based and computer-based examinations, assignments, presentations and many more techniques. Sim, Holifield and Brown (2004) identified more than fifty various techniques used within higher education for assessment purposes; the most commonly used are examinations. Interestingly, the rapid advancement of Information and Communication Technology (ICT) in teaching and learning has shifted the paradigm (Kuzu & Uysel, 2009) from paper-based to computer-based system of examinations which are now identified as Computer Assisted Testing, Computer Based Testing (CBT), Computer Aided Assessment (CAA), Computer Based Assessment (CBA), Online-Assessment, E- Assessment and Web-Based assessment (Bull, 1999). Computer-based examinations are the form of assessment in which the computer is an integral part of question papers' delivery, response storage, marking of response or reporting of results from a test or exercise (Whittington, Bull &Danson, 2000). Conole and Warburton (2005) defined computer-based assessment (CBA) as 'the use of computers for assessing students' learning.

The NOUN Open and Distance Learning Experience

The National Open University of Nigeria (NOUN) uses the dual delivery mode (both paper-based and computer-based tests) which allows for the continual monitoring of comparability of exam performance in its Open and Distance Learning (ODL) environment.

NOUN has become Nigeria's foremost ODL institution of higher learning where learning at a distance is practiced as the combination of on-line learning (e-learning) and other distance education delivery methods. The university has systematically introduced, utilised and applied modern Information and Communication Technology as well as Management Information System (MIS) to enhance open and distance education in the country.

Computer-based and Paper-based Tests in NOUN

NOUN introduced computer-based tests/examinations a few years ago to complement the paper-based tests/examinations. It is believed that the introduction of computer-based tests by the university authority was predicated on the following factors;

- Students Population: The National Open University of Nigeria has seventy-six study centres located across the country. Computer-based testing via the internet facility of the university, therefore, allows a more diverse students' population to be located nationwide.

- Standardisation of test environment: this refers to the fact that the tests (computer-marked Assessments and e-examination) are usually presented in the same way and in the same format for a specified time. Thus, errors in administration, which may lead to bias, are highly minimized.
- On-line scoring: This has always resulted in faster feedback and greater accuracy (that is – reduction in human error). The administration in NOUN has continued to acknowledge the fact that delivery and scoring of the various tests online has led to economic cost savings.
- Although there was an initial concern about the students' computer proficiency and typing skills, this was soon laid to rest as it became evident that many more students who were conversant with their hand-held mobile phones, iPads/tablets, etc., felt comfortable using the computer medium to do their tests and e-examinations.

Review of Related Literature

Karadeniz (2009) studied the impact of paper based, web based and mobile based assessment on students' achievement. A group of 38 students were experimented for 3 weeks. Significant differences were found between the scores achieved by the students in the second week, but not in the first week. It was observed by the author that students had positive attitude towards web based and mobile based assessment due to ease of use as well as comprehensive and instant feedback.

Bodmann and Robinson (2004) undertook an experimental investigation to compare speed and performance differences among computer-based (CBTs) and paper-based tests (PPTs). In the experiment, fifty-five undergraduate students enrolled in the subject of educational psychology and participated in the studies with other students who were already familiar with computer-based test. Both computer-based and paper-based tests contained 30 MCQ items with 35 minutes of time limit. Approximately half of the class (28 students) took the first test on the computer and the rest preferred first test on paper. Procedures shifted for the second tests, with the first group receiving PPTs and the second group CBTs – with a gap of two weeks. It was concluded that undergraduates completed the CBT faster than PBT with no difference in scores.

Advantages and Disadvantages of Computer and Paper-based Tests

Some people are uncomfortable with the prospect of taking a test on a computer. Yet computers provide a great advantage in scoring efficiency, especially, when the test is composed in a multiple-choice format. Besides, computer tests may be structured according to the level of difficulty. A software program may be progressively structured so as to dispense first with the easiest questions before proceeding to more challenging ones. Computer testing and scoring is particularly apt when the objective is to rank test takers as a percentile segment of a peer group population. The paradigm is useful also in study courses aimed at successful performance on required admission tests.

However, computer tests are sometimes found lacking in the area of navigation, the means by which the test taker moves through the test questions. It involves either keyboarding skills or the manipulation of electronic mouse devices, both of which operate at various levels of efficiency. It may be difficult for a person taking a test on a computer to move back and forth between questions and issues. On a paper examination, the test taker can peruse the entire section, or quickly return to a difficult question.

So long as one is proficient in keyboarding, computer-based testing is a more convenient way to compose written responses. The computer also provides a great advantage in editing, since it is much easier to correct grammar, sentence structure, and spelling, as well as to move whole blocks of text. On paper, mistakes require erasures and smudging; these do not make a favorable impression on test scorers. The cursive, manual writing of essays or compositions can be a tedious and even painful process. Though some people say the slowness of the manual process allows for greater depth of thought, manual handwriting is irregular in appearance and may confound the reader. Using a word processor to write an essay can be a much faster process.

The difference between computer-based and paper-based testing is, therefore, a matter of personal preference, personality, and familiarity with the format.

Test administration mode in NOUN
In the survey and analysis of the NOUN experience, it was found that the students who took the computer-based GST 101 (Use of English) test performed better than those who took the paper-based test equivalent. The two groups took the same set of fifty multiple choice and fifty open-ended (fill-in the blank) questions and were given a maximum of one hour to complete the test. Tables 1 and 2 below display the differences in the scores of both groups, though the content and cognitive activities of the two categories of tests were identical. It is important to emphasise that the method of qualitative analysis used is the thematic/content analysis technique. This became useful for this study because the themes observed in the study were produced by the results of the research.

Methodology
Design and Sample
This study used a post-test design with only one factor – test mode (computer-based and paper-based). Dependent variables included students' scores on a 100-item (50 multiple choice and 50 fill-in the blanks) test as well as students' self-report on the open and distance learning survey.
200 undergraduate students (studying different programmes in the university) who registered for the GST 101 – Use of English course were selected as the sample for this investigation. 100 students were randomly selected and separated into either the computer-based test group or the paper-based test group.

The course and procedure
The GST 101 Use of English and Communication skills course is a first semester course usually undertaken by new students in the university. It is a compulsory English as Second Language (ESL) course for every new student, irrespective of their programme of study in the university. It is a two-credit unit course and is specifically structured to teach the students the techniques of listening and reading. In every language skill development programme, these two skills are very important. Much more so, because ODL students registered in NOUN will necessarily need to listen to tutorial facilitators as well as regularly read their course materials.

Early in the course, to establish an overview, course vocabulary and requisite fundamental knowledge about listening and reading as well as the techniques of listening and reading are covered in textbook reading and tutorials. Thereafter, students' fundamental knowledge is tested.

On test day, the students were made to complete a self-report distance learning profile and then completed the test either on computer or on paper.

Test, Post-test and self-report instruments
The computer test consisted of 100 questions. 50 of these were multiple-choice questions each with four alternatives, while the remaining 50 questions were open-ended – where the students were required to fill in an appropriate answer in a given blank space. On the paper-based versions, eight questions were written on each page. The students read each question and then wrote an appropriate letter (A, B, C, or D) of the answer choice on a separate answer sheet that was provided. The computer-based test was structured differently. This was carried out with the technical assistance of five computer programmers from the Cham City computer institute, Lagos. The students received five questions per screen. They then clicked on the letter of the correct answer choice before proceeding to the next question. Subsequently, they typed the correct answers of each question on the blank spaces provided for the open-ended questions. Students could review and change previously answered questions. The item order was not the same on the paper-based and computer-based versions; on the computer version, the test questions were randomized.

To measure examinee characteristics, a modified version of the Distance Learning Profile was used. The Distance Learning Profile was first proposed by Clariana and Moller (2000) and it contained 24 statements that have been shown to strongly relate to distance learning course performance. These statements fall into five categories (factors) including Active Engagement, Independence, Competitiveness, Perceived Course Quality, and Frequency of Computer use.

Our modified Distance Learning Profile consists of 12 statements which also fall into these categories; Frequency of Computer use (items 1, 2, 3, and 10), Independence (items 4, 8, and 9), Competitiveness (item 7), Perceived Course Quality (items 11 and 12), Active Engagement (items 5 and 6).

Relationship between test mode results and students' characteristics
In the foregoing discussion, it was stated that the students' characteristics we considered in this study included content familiarity, computer familiarity, and gender competitiveness. After a careful study of the examinees' scores when juxtaposed with their Distance Learning Profile information, it was observed that gender was not associated with computer versus paper test mode effect. However, computer familiarity (frequency of computer use), content familiarity (perceived course quality and active engagement in learning), and competitiveness were associated with the significant differences observed for the test mode with high attaining students obviously outscoring low-attaining students.

As mentioned earlier, the National Open University of Nigeria (NOUN) is the country's foremost institution of higher learning that offers qualitative distance learning programmes. Subsequently, the items in tables 3 and 4 above can also be regarded as Distance learning profile predictors of the various test takers in each group. To determine whether any of the items in the tables directly predict course achievement, simple correlations of each item with post-test scores were conducted. Specifically, students who reported that the course and its assignments / activities were interesting (items 5, 6 & 11), and those who often prepared well for the course which they see as a high quality

course (items 8 and 12) actually performed best in each of the test group (computer-based and paper-based groups).

The items designed to measure computer familiarity (items 1, 2, 3 and 10) showed that most of the students who performed very well in the test were very familiar with the use of computers. Interestingly, students from both groups who reported that they work harder than others performed best both on computer-based and paper-based tests.

Table 1
Computer-based test result

Scores & Grades	70-100(A)	60-69(B)	50-59(c)	45-49(D)	40-44(E)	0-39(F)	Total
No of examinees	30	25	20	15	10	Nil	100

Table 2
Paper-based test result

Scores & Grades	70-100(A)	60-69(B)	50-59(c)	45-49(D)	40-44(E)	0-39(F)	Total
No of examinees	15	20	35	16	12	2	100

The above data clearly suggests that the mode of administration may have significant effect on students' performance on multiple choice and open-ended question items.

Consequently, this result contradicts Clark's (1994) postulation that paper-based versus computer-mediated instructional components should produce exactly equivalent results if the content and cognitive activities of the two are identical. However, our findings correlate with Bunderson, Inouye and Olsen's (1989) findings which observed that though the paper-based and computer-based questions are matching and the intellectual activities needed to reply the test items are the same, important dissimilarities in the test scores are often perceived.

Examining individual characteristics of leaners provides one interesting avenue for determining the critical factors involved in the test administration mode effect. From a detailed interaction with the students who took both tests, it was observed that the students who scored high marks in the computer-based test were more familiar with computers, more familiar with the content of the test and had a competitive inclination. Consequently, many science-oriented year one students with a good knowledge of the Use of English course were among the top scorers in the computer and even paper-based test. This proposition was arrived at after analyzing the data collected from the test takers. The data used are as follow;

Table 3
Observation of students' individual characteristics and test performance

Computer-based test group.

s/no	Item	Yes	No
1.	I use computers every day.	72	28
2.	I don't really like computers.	10	90
3.	I often use the internet.	90	10
4.	I work harder than others to stand out from the crowd.	68	32
5.	The GST 101 (Use of English) course is actually boring.	06	94
6.	The GST 101 course assignments are interesting and challenging.	90	10
7.	I am usually competitive.	74	26
8.	I usually prepare for examinations well in advance.	60	40
9.	I learn best without supervision.	56	44
10.	I often access my e-mail.	80	20
11.	Many of the GST 101 course activities are uninteresting.	10	90
12.	Generally speaking, I consider this to be a high quality course.	84	16

Table 4
Paper-based test group.

s/no	Item	Yes	No
1.	I use computers every day.	56	44
2.	I don't really like computers.	34	66
3.	I often use the internet.	26	74
4.	I work harder than others to stand out from the crowd.	56	44
5.	The GST 101 (Use of English) course is actually boring.	40	60
6.	The GST 101 course assignments are interesting and challenging.	50	50
7.	I am usually competitive.	56	44
8.	I usually prepare for examinations well in advance.	50	50
9.	I learn best without supervision.	50	50
10.	I often access my e-mail.	56	44
11.	Many of the GST 101 course activities are uninteresting.	28	72
12.	Generally speaking, I consider this to be a high quality course.	52	48.

Discussion

It is mandatory in any investigation of the test mode effect that the exact equivalent relationship between the paper and computer forms is closely examined. The paper-based and computer-based test versions in this study were similarly worded and the students in both groups were allowed to review and change their responses. Interestingly, the computer-based test delivery mode in this investigation had a higher impact on the scores of students relative to the paper-based test. It was also observed that the Distance Learning Profile items administered to the students before the tests were taken showed different correlations with paper-based versus computer-based test performance.

An important issue that was not investigated in detail in this study is 'item order' in tests. Beaton and Zwick (1990) postulated that item order can affect performance in any test; this relates to "ordered" versus randomized test item sequencing. Their argument was that when the instructional lesson content and test items are in the same order, the "ordered" test will likely obtain greater

scores than a randomized version of the test. This argument is clearly flawed by this investigation where the paper-based test items which were presented in an ordered format had lower scores than the randomized computer-based test. In other words, the computer-based test group performed better and had higher scores than the paper-based examinees.

Conclusion

It should be stated that establishing a model that fully accounts for test performance differences in computer versus paper-based testing in Open and Distance Learning institutions in Nigeria may need further research, especially because of the rapid growth of computer-based testing worldwide. Based on the review and results presented in this study, it is clear that computer familiarity is the critical factor in the test mode effect in the National Open University of Nigeria. It is very important to state here that undergraduate students in their third and final years, as well as post graduate students are required to take the paper-based examination before graduating from NOUN. This policy was recommended by the National Universities Commission (the body that regulates standards in Nigerian universities). Perhaps, their belief is predicated on the poor communication (spoken and written) skills displayed by many university graduates in Nigeria, consequently raising fundamental questions about whether computer-based testing can actually reveal the students "actual knowledge" in a given area of study in the university.

The findings of this study indicate that it is critical to realize that computer-based and paper-based tests, even with identical items will not necessarily produce equivalent measures of student learning in an Open and Distance Learning environment. Subsequently, ODL institutions and their administrators in Nigeria specifically and Africa generally, need to expend quality time and financial resources to investigate test mode effects of computer-based and paper-based tests.

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