

Validity of Nigeria's Unified Tertiary Matriculation Examination, Physics Computer- Based Tests: Threats and Opportunities

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Abstract: *The Joint Admission and Matriculation Board (JAMB) in Nigeria has adopted Computer-Based Testing (CBT) for her Unified Tertiary Matriculation Examinations (UTME) for prospective tertiary education students. The study sought to find out the threats and opportunities encounter during this examination by students taking Physics. The study adopted a descriptive survey design. The population of the study consists of fifteen thousand six hundred and eighty- eight (15688) Senior Secondary two and three (SS 2 & SS 3) students who took and who will take Physics in JAMB UTME in Umuahia Education Zone of Abia State Nigeria. The sample is made up of two hundred and fifty (170males, 80females) SS2 & SS3 students got by a combination of purposive and cluster sampling techniques. Four (4) research questions and two (2) null hypotheses guided the study. The instruments for data collection are researchers' developed structural questionnaire of the four point Likert type. The instrument was validated by physics experts and its reliability obtained as 0.86 using Cronbach Alpha. The research questions were answered with mean and standard deviation while the hypotheses were tested with t test. Recommendations were made based on the findings of the study.*

Keywords: *JAMB and UTME, Physics, Computer-Based Testing, Threats and Opportunities.*

I. Introduction

Examination and testing in physics is an important part of the teaching/learning process of physics education which allows the physics teacher to evaluate physics students during and at the end of physics courses. Physics tests determine the extent to which the educational objectives set by the teacher have been achieved. Tests in physics can also help the teacher to evaluate students and assess them to find out whether they are learning what is expected of them. In most schools, the examination and testing method used to assess students' academic progress is paper-pencil based tests. Fortunately the rapid advancement of Information and Communication Technologies (ICTs) in teaching/learning has shifted the paradigm from paper-pencil based to computer-based test system of examination (Uysal&Kuzu, 2009).

Validity of tests means the degree to which a test actually measures what it intended measuring. The major purpose of computer-based test is to assess the examinee's knowledge and competence in what is being tested. For the examinee to be effectively tested with the computer, he/she should be able to identify the correct answer to the problem and also be able to communicate the answer through the computer. Basically in administering tests using the computer, previous experience of the examinee, examinee's attitude towards computers and familiarities with computer can either facilitate or hinder the examinee's performance on the tests. This means that the validity of the tests may be threatened if the examinee's performance is associated with the level of knowledge, attitudes towards the computer and experience with the computer.

There had been a great concern about the conduct, authenticity and reliability of examinations in Nigeria especially during the process of selecting prospective candidates into Nigerian universities. This is why the Joint Admission and Matriculation Board (JAMB) introduced the computer-based testing (CBT) for candidates seeking admissions into Nigerian tertiary institutions during the 2015 Unified Tertiary Examination. The objectives of using this computer-based testing include the elimination all forms of examination malpractices and promotion of the use of electronic testing in Nigeria. The transformation from the paper and pencil test to computer based test according to JAMB would help to reduce examination malpractice, use of mercenaries to write the UTME by candidates, as well as late arrival of examination materials during examinations and will introduce more confidence in the system. Consequently, 2015 was set as the deadline for the adoption of the technology for all candidates writing the UTME with a view to nipping in the bud the alarming rate of examination malpractice which had defied all forms of anti-fraud policies and measures.

The use of CBT for entrance examinations in education cannot be overemphasized. Computer-based tests (CBT) are the form of assessment in which the computer is an integral part of question papers' delivery, response storage, making of response or reporting of results from a test or exercise (Whittington, Bull &Danson, 2000). Computer-based testing can effectively promote more effective learning especially in the area of testing a range of knowledge, skills and understanding (Gonen & Kocakaya, 2005). According to Bodmann and Robinson (2004), computer-based tests offer several advantages over the tradition paper-pencil tests. Merrell &

Tymms (2007) stressed the importance of using computers as assessment and instructional tools since they stimulate real world problems which are structured and complex in nature. Explaining further, Honey and Hilton (2011) affirmed that computer-based assessment has the ability to foster different kinds of skills such as scientific processing in the students and also the ability to design and execute scientific investigations. Among other advantages, computer testing is more efficient than paper-based tests because it also offers year-round testing, flexibility in scheduling and faster score reporting.

Computer-based testing (CBT) has been found to have a lot of benefits with respect to the administration of test. Such benefits include improved security, access to interactive items formats and immediate scoring. The computer offers an opportunity for flexible scheduling where the examinees can take tests individually at virtually any time. Examinees are given feedback on the correctness of the response to each question as they are taking the test.

Despite the numerous advantages of the CBT potential problems also exist. The use of the response entry device, whether keyboard, touch screen or mouse can introduce errors. Examinees due to anxiety can press the wrong key in response to questions which can result in an error thereby compromising the validity of the examinee's result. The time lag between an individual's answer and the resulting response from the computer can also create some problems. According to Mills (2000), long time lags between responses can result in negative user attitudes, anxiety and poor performance. Examinees could supply correct answers that are not recognized by the computer which may result to lower reliability and poorer discrimination indices.

In Nigeria, many candidates who sat for the 2015 Unified Tertiary Matriculation Examination (UTME) were faced with the challenge of abrupt shutting of computer systems and thumbprints that did not match what was filled, thus forcing them back home dejectedly without writing their tests. The issue of candidates not able to access the JAMB website and the due accreditation of candidates not done until few days to the exams cannot be in the interest of the candidates. Some of JAMB staff took money from the candidates and contributed in the chaotic situation that endangered the lives of many of the candidates who came to sit for the exam. According to Punch (20th March 2015), it is a nightmare for thousands of candidates taking this year's Unified Tertiary Matriculation Examination across the country, using the newly-introduced Computer-Based Test format. Reports of a dearth of computers, failure of internet servers, power failure, slow booting of computers, loss of time in the process, and offering candidates' subjects they never registered for are widespread. Worse still, JAMB exposed the candidates to extreme danger and unnecessary stress by fixing some of the tests at 6.00am. In Lagos, Nigeria where the difficulties were expected to be minimal, the shortages of CBT centers were well pronounced to the point that JAMB had to register some candidates in neighboring states of Ogun, Osun and Kwara. Many others from Lagos travelled to the border town of Badagry, a journey of about four hours in order to sit for the exam. Candidates that were to sit for the exam on March 12 at Command Secondary School, Ipaja, Lagos, learnt of the change of venue to the WAEC Agidingbi office, Ikeja, only when they had reported at the former.

Based on the above, this study tends to investigate the threats and opportunities of students who took the 2015 JAMB CBT physics examination and those who will take the exam next year respectively. Specification the study is to find out the threats encountered by SSS3 physics students who took the 2015 UTME CBT and the opportunities of SSS2 physics students who are to sit for the 2016 UTME CBT.

Research Questions

The following research questions guided the study

1. What are the threats encountered by SSS3 physics students who sat for the 2015 UTME CBT?
2. What are the opportunities of SSS2 physics students who are to sit for the 2016 UTME CBT?
3. What are the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT?
4. What are the opportunities of male and female SSS2 physics students who are to sit for the 2016 UTME CBT?

Hypotheses

The following hypotheses guided the study

1. There is no significant difference in the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT
2. There is no significant difference in the opportunities of male and female SSS2 physics students who are to sit for the 2016 UTME CBT

II. Method

This study employed the descriptive survey design to investigate the threats and opportunities of physics students who took the JAMB CBT physics examination and those who will take the exam next year. The population of the study is fifteen thousand six hundred and eighty- eight (15688) Senior Secondary two and three (SS 2 & SS 3) students who took and who will take Physics in JAMB UTME in Umuahia Education Zone of Abia State Nigeria. The sample is made up of two hundred and fifty (170males, 80females) SS2 & SS3 students got by a combination of purposive and cluster sampling techniques. Four (4) research questions and two (2) null hypotheses guided the study. The instruments for data collection are researchers' developed structural questionnaire of the four point Likert type. The instrument was validated by physics experts and its reliability obtained as 0.86 using Cronbach Alpha. The research questions were answered with mean and standard deviation while the hypotheses were tested with t test.

III. Result

The findings got are represented in the tables below

Research Question 1: What are the threats encountered by SSS3 physics students who sat for the 2015 UTME CBT?

Table 1: Threats encountered by SSS3 physics students who sat for the 2015 UTME CBT?

S/N	ITEM	SA	A	D	SD	X	Remarks
1	Having access to JAMB website was very difficult	101	98	40	11	3.16	Agree
2	Anxiety due to low knowledge of computer operation	97	95	50	8	3.12	Agree
3	Most of the computers were faulty	142	80	14	14	3.40	Agree
4	Abrupt shutting down of computers	160	80	10	-	3.60	Agree
5	Thumbprints not matching what was originally filled	98	103	46	3	3.18	Agree
6	Accreditations for the exams were done only a few days before the exam.	109	95	46	-	3.97	Agree
7	Shortage of computers	98	105	40	7	3.18	Agree
8	Lack of expertise knowledge by JAMB officials	104	89	50	7	3.13	Agree
9	Failure of internet servers	105	92	40	13	3.16	Agree
10	Lack of internet connectivity	89	150	11	-	3.31	Agree
11	Power failure	150	100	-	-	3.36	Agree
12	Slow booting of computers	109	90	49	2	3.22	Agree
13	Lack of computer literacy	120	90	40	-	3.32	Agree
14	Late coming by the students scheduled for 6 am exam due to	159	70	11	10	3.51	Agree
	i. Security challenges	140	110	-	-	3.56	Agree
	ii. Logistic problems e.g. catching of cabs to the exam venue						

Result in table 1 clearly showed that all the items presented to the students have mean scores between 3.12 and 3.97. This means that all the students agreed that the listed items are the threats encountered by SSS3 physics students who sat for the 2015 UTME CBT.

Research Question 2: What are the opportunities of SSS2 physics students who are to sit for the 2016 UTME CBT?

Table II: Opportunities of SSS2 physics students who are to sit for the 2016 UTME CBT?

S/N	ITEM	SA	A	D	SD	X	Remarks
1	Training for increase in the level of computer literacy	120	110	10	10	3.36	Agree
2	Constant power supply by providing personal generators	150	100	-	-	3.36	Agree
3	Repairing and putting the computers in order before the exam	120	130	-	-	3.48	Agree
4	Training of JAMB officials for high expertise computer knowledge	110	120	20	-	3.36	Agree
5	Accreditations for the exams to be done long before the exam.	152	70	26	2	2.77	Agree
6	Provision of standby computers	130	90	20	10	3.36	Agree
7	Ensuring High level of internet connectivity by providing multiple servers	155	95	-	-	3.62	Agree
8	Good operational condition of internet servers	140	110	-	-	3.56	Agree
9	Provision of standby computers operators and technicians	130	90	20	10	3.36	Agree
10	Students are able to access their result immediately	135	115	-	-	3.54	Agree
11	Rescheduling of 6am examinations to 8am	200	50	-	-	3.80	Agree
12	Moving closer to the examination venue maybe a day before the exam	90	120	30	10	3.16	Agree

Result in table 2 clearly showed that all the items presented to the students have mean scores between 2.77 and 3.80. This means that all the students agreed that the listed items are the opportunities of SSS2 physics students who are to sit for the 2016 UTME CBT.

Research Question 3: What are the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT?

Table III: Threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT?

S/N	ITEM	SA		A		D		SD		X	
		M	F	M	F	M	F	M	F	M	F
1	Having access to JAMB website was very difficult	90	11	66	32	9	31	5	6	3.42	2.60
2	Anxiety due to low knowledge of computer operation	80	17	60	35	25	25	5	3	3.27	2.83
3	Most of the computers were faulty	89	53	60	20	10	4	11	3	3.31	3.54
4	Abrupt shutting down of computers	120	40	45	35	5	5	-	5	3.68	3.50
5	Thumbprints not matching what was originally filled	70	28	70	33	28	18	2	1	3.22	3.10
6	Accreditations for the exams were done only a few days before the exam.	90	19	75	20	5	41	-	-	3.50	2.73
7	Shortage of computers	80	18	60	45	27	13	3	4	3.20	2.97
8	Lack of expertise knowledge by JAMB officials	85	17	50	39	30	20	5	2	3.27	2.78
9	Failure of internet servers	90	15	62	30	18	22	-	13	3.42	2.59
10	Lack of internet connectivity	60	29	105	45	5	6	-	-	3.32	3.29
11	Power failure	100	50	70	30	-	-	-	-	3.59	3.63
12	Slow booting of computers	99	10	60	30	11	38	-	2	3.51	2.60
13	Lack of computer literacy	100	20	50	40	20	20	-	-	3.47	3.00
14	Late coming by the students scheduled for 6 am exam due to	140	19	20	50	7	4	3	7	3.75	3.01
	i. Security challenges	110	30	60	50	-	-	-	-	3.65	3.38
	ii. Logistic problems eg catching of cabs to the exam venue										

Result in table 3 clearly showed that all the items presented to the students both males and females have mean scores between 2.59 and 3.68. This means that all the students both males and females agreed that the listed items the threats of SSS3 physics students who sat for the 2015 UTME CBT.

Research Question 4: What are the opportunities of male and female SSS2 physics students who are to sit for the 2016 UTME CBT?

Table IV: Opportunities of male and female SSS2 physics students who are to sit for the 2016 UTME CBT?

S/N	ITEM	SA		A		D		SD		X	
		M	F	M	F	M	F	M	F	M	F
1	Training for increase in the level of computer literacy	100	20	60	50	5	5	5	5	3.50	3.06
2	Constant power supply by providing personal generators	140	10	130	70	-	-	-	-	3.82	3.13
3	Repairing and putting the computers in order before the exam	90	30	80	50	-	-	-	-	3.53	3.38
4	Training of JAMB officials for high expertise computer knowledge	100	10	60	60	10	10	-	2	3.53	3.03
5	Accreditations for the exams to be done long before the exam.	132	20	30	40	8	18	-	2	3.73	2.98
6	Provision of standby computers	100	30	50	40	10	10	10	-	3.41	3.25
7	Ensuring High level of internet connectivity by providing multiple servers	135	20	35	60	-	-	-	-	3.79	3.25
8	Good operational condition of internet servers	100	40	70	40	-	-	-	-	3.59	3.50
9	Provision of standby computers operators and technicians	100	30	60	30	10	10	-	10	3.53	3.00
10	Students are able to access their result immediately	115	20	55	60	-	-	-	-	3.68	3.25
11	Rescheduling of 6am examinations to 8am	140	60	30	20	-	-	-	-	3.82	3.75
12	Moving closer to the examination venue maybe a day before the exam	90	-	80	40	-	30	-	10	3.53	2.38

Result in table 4 clearly showed that all the items presented to the students both males and females have mean scores between 2.38 and 3.82. This means that all the students both males and females agreed that the listed items the opportunities of SSS2 physics students who will sit for the 2016 UTME CBT.

Hypothesis 1: There is no significant difference in the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT

Table V: T- test values of threats encountered by male and female physics students who sat for the 2015 UTME CBT

SEX	N	MEAN	DF	t-cal	t-table	REMARKS
Male	170	3.44	248	2.09	1.96	*SG
Female	80	3.04				

*SG = Significant P > 0.05

With mean points of 3.44 and 3.04 for male and female physics students respectively under df = 248 at 0.05 level of significance, the t calculated value is 2.09 while the critical t value is 1.96. This implies that the calculated t value is greater than the critical t value meaning that the null hypothesis is rejected. This therefore means that there is a significant difference in the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT.

Table VI: T- test values of opportunities of male and female physics students who will sit for the 2016 UTME CBT

SEX	N	MEAN	DF	t-cal	t-table	REMARKS
Male	170	3.61	248	2.32	1.96	*SG
Female	80	3.21				

*SG = Significant P > 0.05

With mean points of 3.61 and 3.21 for male and female physics students respectively under df = 248 at 0.05 level of significance, the t calculated value is 2.32 while the critical t value is 1.96. This implies that the calculated t value is greater than the critical t value meaning that the null hypothesis is rejected. This therefore means that there is a significant difference in the opportunities for male and female SSS2 physics students who will sit for the 2016 UTME CBT.

IV. Discussion

Tables 1 and 3 showed that all the items have mean values greater than 2.5 which means that all the physics students both males and females agreed that difficulty in accessing JAMB website, anxiety due to low knowledge of computer operation, faulty computers, abrupt shutting down of computers, thumbprints not matching what was originally filled, accreditations for the exams done only a few days before the exam, Shortage of computers, Lack of expertise knowledge by JAMB officials, failure of internet servers, lack of internet connectivity, power failures, slow booting of computers, lack of computer literacy, Late coming by the students scheduled for 6 am exam due to Security challenges and logistic problems eg catching of cabs to the exam venue were all threats to the physics students who sat for the 2015 UTME CBT. This result is in agreement with Huff & Sireci (2000) who opined that speediness, test anxiety, variability in test information functions and computer illiteracy posed threats to computer-based tests. Supporting this, Thurlow, Lazarus & Thompson (2002) are of the opinion that there is a lot of concerns in the area of equity, where questions are asked about whether the required use of computers for important tests puts some students at a disadvantage because of lack of access, use, or familiarity. Such concerns they continued include unfamiliarity with answering standardized test questions on a computer screen, using buttons to search for specific items, and indecision about whether to use traditional tools (e.g., hand held calculator) vs. computer-based tools. Computer-based testing places more demands on certain skills such as typing, using multiple screens to recall a passage, mouse navigation, and the use of key combinations (Ommerborn & Schuemer, 2001). Tables 2 and 4 showed that all the items have mean values greater than 2.5 which means that all the physics students both males and females agreed that training for increase in the level of computer literacy, constant power supply by providing personal generators, repairing and putting the computers in order before the exam, training of JAMB officials for high expertise computer knowledge, accreditations for the exams to be done long before the exam, provision of standby computers, ensuring high level of internet connectivity by providing multiple servers, good operational condition of internet servers, provision of standby computers operators and technicians, students

being able to access their result immediately, rescheduling of 6am examinations to 8am and moving closer to the examination venue maybe a day before the exam are opportunities of SSS2 physics students who will sit for the 2016 physics UTME CBT. This is in agreement with Thompson, Johnstone, &Thurlow (2002) who are of the view that increase in the level of computer literacy, good and functional computers, ensuring high level of internet connectivity, efficient administration, improved writing performance, immediate results, efficient item development, increased authenticity, and the potential to shift focus from assessment to instruction are all prospective opportunities for computer-based tests.

Tables 5 showed the mean points of 3.44 and 3.04 for male and female physics students respectively under $df = 248$ at 0.05 level of significance, the t calculated value is 2.09 while the critical t value is 1.96. The null hypothesis is therefore rejected meaning that there is a significant difference in the threats encountered by male and female SSS3 physics students who sat for the 2015 UTME CBT.

Table 6 also showed mean points of 3.61 and 3.21 for male and female physics students respectively under $df = 248$ at 0.05 level of significance, the t calculated value is 2.32 while the critical t value is 1.96. Since the calculated t value is greater than the critical t value, the null hypothesis is rejected. This therefore means that there is a significant difference in the opportunities for male and female SSS2 physics students who will sit for the 2016 UTME CBT. The implication is that gender therefore played a role in the study.

V. Conclusion

Computer- based testing has some potential opportunities which include: efficient administration, preferred by students, improved writing performance, built-in accommodations, immediate results, efficient item development, increased authenticity, and the potential to shift focus from assessment to instruction. There are also a lot of challenges which affect the validity of the tests. For CBT to be valid, these challenges must be overcome in order for computer-based testing to be effective for large-scale state assessments.

VI. Recommendations

Based on the findings, the following recommendations were made.

1. Efforts should be made by the Government to supply functional computers in secondary schools and ensure that both teachers and students are adequately trained to be computer literate.
2. The Government should also ensure constant power supply.
3. Faulty computers should be repaired before the exam.
4. JAMB officials should be trained for high expertise computer knowledge.
5. Service providers should ensure high level of internet connectivity by providing multiple servers.
6. Examinations should not be scheduled as early as 6a.m.

References

- [1]. Uysal, O. & Kuzu, A. (2009). A Thesis Proposal. Quality Standard of Online Higher Education in Turkey. Internationalization and the Role of University Networks. Proceedings of the 2009 EMUNI Conference of Higher Education and Research, Potoroz, Slovenia, 25- 26September. Retrieved December 25, 2010 from http://www.emuni.si/Files//Denis/Conference/EMUNI_HE-R/Proceedings/Papers/48.pdf
- [2]. Whittington, D., Bull, J., &Danson, M. (2000). Web-Based Assessment: Two UK Initiatives. The Sixth Australian World We Conference. Rihga Colonia Club Resort, Cairns, 12-17 June 2000, Australia. Retrieved October 12, 2010 from <http://www.ausweb.scu.edu.au/aw2k/papers/index.html>
- [3]. Gonen, S. & Kocakaya, S. (2005). Comparison of Attitudes towards Physics and Computer Attitudes in High School First Graders According to two Different Instructional Methods. Pamukkale Universities Egitim Fakultesi Dergisi, 17.
- [4]. Bodmann, S. M. & Robinson, D. H. (2004). Speed and Performance Differences among Computer- Based and Paper- Pencil Tests. Journal of Educational Computing Research, 31 (1), 51- 60.
- [5]. Merrell, C. & Tymms, P. (2007). Identifying Reading Problems with Computer- Adaptive Assessments. Journal of Computer Assisted Learning, 23 (1), 27-35.
- [6]. Honey, M. A. & Hilton, M. (2011). Learning science through computer games and simulations. Washington, DC. The National Academic Press.
- [7]. Mills, C. (2000). Unlocking the promise of CBT. Keynote address presented at a conference of the Association of Test Publishers, Carmel Valley, CA.
- [8]. Hurf, K. L. & Sireci, S. G. (2000). Validity Issues in Computer-Based Testing. Technical Report of American Institute of Certified Public Accountants.
- [9]. Thurlow, M.L., Lazarus, S., & Thompson, S.J. (2002). 2001 state policies on assessment participation and accommodations. Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.
- [10]. Ommerborn, R., &Schuemer, R. (2001). Using computers in distance study: Results of a survey amongst disabled distance students. FernUniversität-Gesamthochschule in Hagen. Retrieved March, 2002, from the World Wide Web: <http://www.femuni-hagen.de/ZIFF>
- [11]. Thompson, S.J., Johnstone, C.J., &Thurlow, M.L. (2002). Universal design applied to large-scale assessments (Synthesis Report 44). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.