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Title: **eAssessment and Information and Communication Technology Literacy in Open and Distance Learning**
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Mrs Charity Akuadi Okonkwo Ph.D

School of Education, National Open University of Nigeria
14/16 Ahmadu Bello Way, P.M.B. 80067; Victoria Island, Lagos
caeokonkwo@yahoo.co.uk

Abstract

Providing fair assessment with timely feedback for students of the National Open University of Nigeria (NOUN) using the traditional approach – pen on paper examination of learning outcomes is a difficult task due to the large class sizes. This paper explored eAssessment challenges and Information and Communication Technology (ICT) Literacy needed for effective automation of assessment in order to overcome the burden. The population consists of students of NOUN already exposed to eAssessment. Samples were randomly drawn from one study centre in three out of the six geopolitical zones of Nigeria for the study. The study seeks to determine the participants' eAssessment challenges, their ICT literacy and way forward for automation of Assessment processes. The data collected by administration of questionnaire developed by the author via intensive literature search and experience in the field were analysed by using descriptive statistics. The results of the data analyses showed that the participants ICT literacy has implications for automation of Assessment practices. eAssessment challenges were identified and way forward for improving eAssessment were proffered for entrenchment of good practices. Viable recommendations that would lead to standard settings in automation of large scale assessment practices were made to bring about innovations for the 21st century.

Keywords: eAssessment challenges, ICT literacy, automation of assessment, standard settings.

Introduction

The adoption of education for all in Nigeria has resulted in significant increase in school enrolment at all levels of education. Therefore, the carrying capacity of the conventional universities in the country can no longer contend with the number of applicants seeking admission in the conventional systems. Hence, the National Open University of Nigeria (NOUN) was established to provide access to qualitative education for those whose aspiration for higher education is not met by conventional systems and/or those who preferred the open and distance learning mode of instructional delivery due to their peculiar circumstances (Federal Ministry of Education, 2002). Generally, ODL system is challenged to bring quality in assessment given the large number of students. This is because things are purely different in ODL system unlike in the conventional systems where you have a manageable number of students. For instance, in NOUN, the student enrolment for 2007/2008, 2008/2009, 2010/2011, 2011/2012, and 2012/2013 are respectively 16161, 54179, 29674, 24937 and 43349. Consequently, the accumulated number over time becomes a big issue in assessment. Hence, it is very challenging to assess their learning constructively.

There is need to mechanize the assessment process to ensure quality in the quantity. Hence, Dali (2008) suggested that to increase the effectiveness of distance education assessment activities, alternative to traditional measurement tools, different vehicles can be used. The NOUN, saddled with the assessment of large classes, introduced the use of computers in learner assessment in order to effectively manage the assessment of large classes without undermining the quality of learning as innovative strategy for sustainability and quality assurance (Okonkwo, 2013) and as a viable way forward (Okonkwo, 2010a, Okonkwo, 2010b). Studies support that ODL systems must incorporate subject matter on computer literacy which focus not only on knowledge on computer operations but on computer skills (Hussain & Farooq, 2013). That is, in ODL institutions, students should be capable of using basic IT skills which they can gain from the know-how of the basic concepts in computer education course (Oak, 2011) relating to skills in the basic knowledge of computer operation and applications. The use of information technology (IT) is emerging and is being used as a vital tool in open and distance learning (ODL) institutions globally. Hence, NOUN uses IT in students' admission and for assessment purposes. Therefore, IT skill is considered a vital component of eAssessment. Assessing learners through eAssessment must take care of the need to prepare the students to use computer technology skills to get maximum advantage in the assessment process.

Assessment is an integral part of the learning system. Assessment occupies a vital position in the process of teaching-learning, certification and acquiring knowledge and skills. There are three types of assessment qualities which are essential for effective assessment. They are validity, reliability and fairness (Makamene, 2011). For assessment to be valid, care should be taken to verify whether the purpose of assessment has been achieved or not. Reliability entails the extent to which assessment is free from errors of measurement. An error free assessment system is treated as a reliable system. Fairness in assessment is concerned with the objectivity of assessment and making assessment free of subjective judgment (UNESCO, 2006). But, assessment in the open and distance learning (ODL) system is a complex process. It is a huge challenge to assess and manage quality given the ODL wide spread system of education. Sustaining quality in the ODL ever expanding class size can only be possible if the system is in order. It is only a valid system of assessment which can ensure fulfillment of the course objectives that needs to be practiced. Hence, the use of IT as basic assessment tool in large scale assessment that has the potentials to establish a student friendly and innovative practice of assessment in ODL system is needed. To accomplish the reliability of the total system of assessment, the process has to be managed with lesser error. Also to develop confidence in the distance learners, the assessment system should be transparent as fair as possible so that students never feel frustrated towards the assessment process. Hence, the ODL system needs the use of information technology (IT) based assessment tool that has the potential to accommodate large class sizes and to establish student friendly and innovative practice of assessment.

Usually, assessment data management systems are web-based and are made available by an institution's intranet, with a system of priority based accessibility in order to ensure data security (Dhir, 2005). An assessment system must take into account issues of interface, accessibility, security, usability, the information to be collected, hardware and software technology, and information storage and processing (Love and Cooper, 2004). Hence, this study focused on eAssessment and Information Technology (IT) literacy among students of National Open University of Nigeria. This is done to determine their IT literacy, IT and eAssessment challenges. Based on the outcomes of the investigation, way forward for improving eAssessment would be proffered.

Research Questions

This study is guided by these research questions.

1. What are the extents of IT literacy among NOUN students?
2. What are the IT challenges students face in eAssessment?
3. What are the test item challenges in eAssessment?
4. What are the possible ways of improving on eAssessment?

Conceptual framework

Recent development in the field of education suggested that Information Technology (IT) literacy is transforming how we learn and the nature of how work is conducted as well as the meaning of social relationships. Thus, IT forms the basis for lifelong learning. So, Information Literacy (IL) is seen as “the ability to recognize when information is needed and having ability to locate, evaluate, and use effectively the information” (LearnHigher, 2006). Whereas, Andretta (2005) opined that information literacy skills include accessing information efficiently, evaluating information critically, and using information accurately and creatively and that these literacies form the basis for lifelong learning. On the other hand, the Big6, an approach to teaching information and technology skills defines IL as the ability to define information problems and identify information needed; understand information seeking strategies; locate sources and find information within sources; use information; synthesize information; and evaluate or judge information and/or processes. While the American Library Association (ALA) Presidential Committee on Information Literacy, Final Report (1989) states that “To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use efficiently the needed information”. On the other hand, Technology literacy (TL) according to SETDA (2003) is the ability to responsibly use appropriate technology to communicate, solve problems, and access, manage, integrate, evaluate, and create information to improve learning in all subjects in the 21st century. The long term goal of technology literacy is for students to use the tools of their society with skill; in an ethical, accurate, and insightful manner to meet the demands of the 21st century workplace. Whereas, Jenkins, Purushotma, Cliton, Weigel, & Robinson (2006) surmised that literacy skills for the 21st century are skills that enable participants in the new communities emerging within a networked society to participate within the society. While the report, Maximizing the Impact: The pivotal role of technology in a 21st century educational system (2007) states that technology is an enabling force behind globalization, knowledge, work and entrepreneurship.

Therefore, open and distance learners operating in a knowledge networked society where technology has transformed communication, require far more sophisticated literacy skills than those that are required in the conventional learning environments. It should be noted however, in support of the argument of Nimon (2003) that simply using technology in the classroom does not assure that the students are acquiring new literacies. Also, mastering software applications does not ensure that essential skill and strategies for making informed decisions and literate choices automatically follow. Therefore, it is vital according to Nimon (2013: 32) that the technical facility to manipulate electronic communications is seen for what it is, the ability to lay the groundwork for a task of making meaning from information, but it is not equivalent to the completion of the task itself. Lankshear and Knobel (2003) opined that far too little research has been conducted in this area of research – information on the impact of technology on curriculum, pedagogy and literacy. Therefore, there is a need for better understanding of the technological world of students. Hence, this study is concerned with eAssessment and information and communication technology literacy in open and distance learning.

Design and Method

The study adopted a descriptive survey design. The population consists of all National Open University of Nigeria students who have been previously exposed to eAssessment in the university. Three geopolitical zones were randomly selected from six geopolitical zones of Nigeria. One study centre was further randomly drawn from each of the three political zones for the study. Facilitation was not compulsory for students. Therefore, students do not usually go to the study centres except during registration of courses and/or during examination exercises. The sample consists of twenty four (24) students from Umudike Study Centre representing South East geopolitical zone; fifty (50) students from Lagos study centre representing South West geopolitical zone; and thirty (30) students from Makurdi study centre representing North Central geopolitical zone. This gave a total of one hundred and four (104) participants gotten through proportionate random sampling of students registering in the current semester. Hence, the sample size was based on the number of students in attendance during the period of data collection which was done in January 2014 course registration period.

The instrument for data collection consists of researcher's developed items of the Likert scale type. The generation of the items was based on intensive literature search; and on responses and complaints given by students earlier on their challenges on eAssessment (Okonkwo, 2010c). It was on four clusters. The first cluster performance of various ICT tasks was obtained from intensive literature search on tasks relating to effective use of the computer. Two clusters namely ICT challenges in eAssessment and test items challenges were obtained from students complaints obtained during monitoring exercise of the first eAssessment exercise. While the last cluster on way forward in eAssessment was deduced from experiences from the field and interaction with other colleagues, staff of NOUN, on eAssessment. The instrument was validated by presenting it to colleagues who had also earlier monitored eAssessment in NOUN. Their critical comments were incorporated in the final version of the questionnaire. Whereas, the reliability was calculated using Statistical Package for Social Sciences (SPSS 16). The Cronbach Alpha's reliability coefficient values for the various sections of the questionnaire are: 0.958 for performance of ICT tasks; 0.859 for ICT challenges in eAssessment; 0.861 for test items challenges and 0.827 for way forward in eAssessment. These values indicate that the instrument used in the data collection for the study is reliable and valid.

The data obtained by administering the instrument were analysed with the use of SPSS 16. This consists of descriptive analyses involving the computation of frequencies, percentages, mean, standard deviation and variance. These analyses were carried out to investigate the research questions. The boundaries of each response in the 4-point Likert scales (do very well by myself (3), can do with help from someone (2), know what this means but cannot do it (1), don't know what this means (0)) for research question 1; with boundaries of each response in the 4-point Likert scales from 0 to 3 were calculated by dividing the serial width 3 by number of responses 4 and found to be 0.75 (obtained by following Topkaya (2010) pattern of analysis. This value was used in interpreting the mean values. Thus, depending on the calculation, the accepted boundaries for each response are presented below:

$$0 = 0 + 0.75 = 0.75$$

$$1 = 0.75 + 0.75 = 1.50$$

$$1.50 + 2.25 = 3.75/2 = \mathbf{1.875 \text{ i.e. the middle value}}$$

$$2 = 1.50 + 0.75 = 2.25$$

$$3 = 2.25 + 0.75 = 3.00$$

Therefore, a mean (\bar{X}) score of 1.875 and above on the scale for research question 1 was taken as the meaningful indicator of literacy in the performance of ICT tasks whereas scores of 2.25 and above were taken as high ones. While any score below 1.50 was taken as indicator of low ICT literacy. However, the variance (V), and standard deviation (SD) were presented to show how the individuals raw scores from which the mean was computed were dispersed (Okonkwo & Ikpe, 2011).

Also, for research questions 2 to 4, the boundaries of each response in the 5-point Likert scales (strongly agree (4), agree (3), disagree (2), strongly disagree (1), and undecided (0)) from 0 – 4 were calculated by dividing the serial width 4 by the number of responses 5 and found to be 0.8 (Topkaya, 2010). This value (0.8) was used in interpreting the mean values. Thus, depending on the calculation, the acceptable boundaries for each response are presented below:

$$0 = 0 + 0.8 = 0.8$$

$$1 = 0.8 + 0.8 = 1.6$$

$$2 = 1.6 + 0.8 = \mathbf{2.4 \text{ i. e. mid point}}$$

$$3 = 2.4 + 0.8 = 3.2$$

$$4 = 3.2 + 0.8 = 4.0$$

A mean (\bar{X}) score of 2.4 and above on the scale was taken as the indicator of moderate presence of the issue being considered. While a score of 3.2 and above is a high one. Any score below 2.4 was taken as an indicator of low presence of the issue raised with respect to research questions 2 to 4 which deal on IT challenges students face in eAssessment; test items challenges; and possible ways forward for improving eAssessment.

Interpretation and Discussion of Results

Table 1
Demographic information about the Participants and their Frequency, Percentage, Mean score Values, Standard Deviation and Variance in relation to this study.

S/No	Category	Level	Frequency	Percentage
1.	Gender	Male	61	58.7
		Female	43	41.3
		Total	104	100.0
2	Age	0 – 20 years	14	13.5
		21 – 30 years	63	60.6
		31 – 40 years	20	19.2
		41 – 50 years	4	3.8
		51 – 60 years	3	2.9
		Total	104	100.0
3.	Year in Programme	100 level	38	36.5
		200 level	39	37.5
		300 level	11	10.6
		400 level	13	12.5
		500 level	3	2.9
		Total	104	100.0
4.	Work Experience	No Experience	44	42.3
		1 – 5 years	33	31.7
		6 – 10 years	16	15.4
		11 – 15 years	2	1.9
		16 – 20 years	3	2.9
		21+ years	6	5.8
5.	Study Centre	Total	104	100.0
		Umudike Study Centre – South East Zone	24	23.1
		Lagos Study Centre – South West Zone	50	48.1
		Makurdi Study Centre – North Central Zone	30	28.8
		Total	104	100.0

Table 1 showed that the participants consist of 61 (58.7%) males and 43 (41.3%) females; the age range distributions were: 0 – 20 years 14 (13.5%), 21 – 30 years 63 (60.6%), 31 – 40 years

20 (19.2%), 41 – 50 years 4 (3.8%) and 51 – 60 years 3 (2.9%); distributions according to their levels of study (year in programme) were: 100 level 38 (36.5%), 200 level 39 (37.5%), 300 level 11 (10.6%), 400 level 13 (12.5%) and 500 level 3 (2.9%); whereas, the distribution of the participants with respect to work experience were: No experience 44 (42.3%), 1- 5 years 33 (31.7%), 6 – 10 years 16 (15.4%), 11 – 15 years 2 (1.9%), 16 – 20 years 3 (2.9%) and 21⁺ years 6 (5.8%) while for study centres the distributions were: Umudike Study Centre 24 (23.1%), Lagos Study centre 50 (48.1%), and Makurdi Study Centre 30 (28.8%).

Research Question 1

The extents of IT literacy among NOUN students

Table 2

Distribution of Answers Given to the IT literacy among NOUN Students

S/No	Category	Number	Mean	Standard Deviation	Variance
1.	ICT Routine Tasks	104	2.6605	.43971	.193
2.	ICT Skill Tasks	104	2.2652	.63102	.398
3.	Internet Tasks	104	2.6961	.54660	.299
4.	Higher Level Tasks	104	1.8188	.69940	.489
	General ICT Tasks	104	2.3595	.45191	.204

Table 2 revealed that the mean values for ICT routine tasks ranged is 2.2652; ICT skill tasks is 2.2652; ICT internet task is 2.6961 and higher level tasks 1.8188 whereas the mean for general ICT tasks is 2.3595. All the cases also showed high values (above mean of 2.25) with exception of higher level tasks. These results showed that the participants can perform the routine tasks meaningfully; they are very literate in the performance of ICT skill tasks; and can also explore the Internet meaningfully, since they can perform these tasks highly. Their performance in ICT higher level tasks showed that they were still having challenges with the higher level tasks. But their general level of performance of ICT tasks can successfully take them through the requirements of eAssessment. Thus, NOUN incorporation of computer literacy in her ODL practice noted by Hussain & Farooq (2013) and Oak (2011) among other researchers is very rewarding. This result is very encouraging and could be because NOUN had earlier included a course in computer science as a general study course for all students of the university at 100 level of their study. This practice should be adopted by institutions wishing to introduce eAssessment especially those that have large class sizes to contend with.

Research Question 2

The IT challenges students face in eAssessment

Table 3

Distribution of Answers Given to IT Challenges in eAssessment

Items	Number	Mean	Standard Deviation	Variance
Interrupted power supply to the computers	104	2.5769	1.28993	1.664
Use of laptop as proxy servers	104	2.1827	1.39878	1.957
Use of outdated computers with CRT screens instead of LCD screens	104	2.0288	1.35429	1.834
Server not robust enough for redundancy	104	1.9327	1.46986	2.160
Server not robust enough to handle the traffic requests	104	2.1346	1.46849	2.156
Use of proxy server leading to system failure	104	2.0673	1.48301	2.199

Use of proxy server leading to loss of data	104	2.0481	1.45735	2.124
Frequent timing-out of candidates leading to different bits of scores	104	2.3173	1.41603	2.005
Timing –out of candidates leading to inconsistency in actual time on tasks	104	2.3077	1.40095	1.963
Lack of computer access	104	2.4712	1.23033	1.524
Excessive workload	104	2.1058	1.24572	1.552
Lack of Internet access	104	2.2596	1.14056	1.301
Lack of technical support	104	2.4423	1.26050	1.589
Lack of necessary ICT skills	104	2.4423	1.30590	1.705

Table 3 showed that the mean values for the IT challenges in eAssessment in NOUN ranged from 1.9327 to 2.5769. Four items including “interrupted power supply to the computers” had a meaningful presence in the IT challenges expressed by NOUN students at the initial eAssessment process in the university (Okonkwo, 2010b, 2010c). This result revealed that on the average, the participants’ were not having inhibition to the use of IT. This is expected because even those who cannot own their personal computers can easily have access to computer at the cyber café at a minimal cost. Therefore, any institution that wants to introduce eAssessment can comfortably do that knowing that students would also make effort to have access to computers without much inhibition. When the NOUN was saddled with the assessment of large classes, She introduced the use of computers in learner assessment in order to effectively manage the assessment of classes (Okonkwo, 2010a) without undermining the quality of learning as innovative strategy for sustainability and quality assurance (Okonkwo, 2013). Therefore, this result is very encouraging. It showed that NOUN has come of age in the conduct of eAssessment. That the university has successfully managed the teething problems of eAssessment. Interrupted power supply is a national issue that needs to be addressed nationally. However, the NOUN is complementing power issue with the use of standby electric generating set at huge cost to the university and the nation at large. Hence, the nation should seriously look into the issue of power supply in Nigeria.

Research Questions 3

The test item challenges in eAssessment

Table 4

Distribution of Answers Given to Test Items Challenges in eAssessment

Items	Number	Mean	Standard Deviation	Variance
Items poorly written – not in question format	104	1.9038	1.50416	2.263
Multiple choice items having stem but no distractors	104	1.8750	1.54346	2.382
Multiple choice items not having correct key	104	1.8558	1.47087	2.163
Multiple choice items having distractors but no stems	104	1.6731	1.50367	2.261
Items having no answer boxes for fill-in the blanks	104	1.8750	1.32700	1.761
Items not properly edited in scripted format	104	1.7981	1.33205	1.774
Giving too much time for answering questions	104	1.8173	1.26002	1.588
Timing of candidates manually instead of automatically	104	2.2212	1.42758	2.038
Rescheduling of examination time-table by carrying courses forward	104	2.6442	1.31399	1.727
Use of manual identification instead of biometric identification	104	2.2115	1.45931	2.130

Table 4 confirmed that the NOUN had truly overcome the teething problems of assessment of large class sizes with the use of technology as suggested by earlier researchers (Okonkwo, 2010a). This is obvious from the results. The mean scores ranged from 1.6731 to 2.6442. Both academic and non-academic of the university are constantly trained on ICT literacy in addition to continual training of training of the academic staff on test items writing in relation to the IT software used in the eAssessment. In fact, only one item (rescheduling of examination time-table by carrying courses forward) which had a mean score of 2.6442 was meaningful. This is understandable in view of the fact that the number of students writing the examination is usually very large. But, time will eventually come when the university would benefit from the gradual huge investment in IT hardware and software. At that time the problem of scheduling of examination time-table would be better managed.

Research Question 4

The possible ways of improving on eAssessment

Table 5

Distribution of Answers Given to Possible Ways of Improving on eAssessment

Items	Number	Mean	Standard Deviation	Variance
Introducing computer literacy course as compulsory GST course for students	104	3.0962	1.24260	1.544
Adequate provision of uninterrupted power supply	104	3.2404	1.25021	1.563
Adequate provision of computer systems with LCD screens	104	2.8942	1.42732	2.037
Proper writing of items in scripted format	104	2.8365	1.32277	1.750
Proper editing of items in scripted format	104	2.8654	1.21526	1.477
Strict use of biometric ID authentication of candidates	104	2.5769	1.54977	2.402
Equipping and owing eAssessment centres for NOUN eAssessment	104	3.0385	1.34325	1.804
Providing adequate seating facilities for eAssessment	104	3.1346	1.20724	1.457
Provision and use of robust server dedicated to eAssessment at eAssessment centres	104	2.9135	1.44216	2.080
Continuous professional development of staff on item writing and scripting	104	2.9904	1.32559	1.757

Table 5 confirmed that all the suggestions put forward for improving on eAssessment were endorsed by the participants highly. The mean values ranged from 2.5769 to 3.2404. Hence, the use of technology in assessment for standard setting in large scale assessment has to consider these suggestions in order to enthrone best practices in the eAssessment practices.

Conclusion

The study explored eAssessment challenges and ICT literacy needed for effective deployment of technology in Open and distance Learning. The results of the study already discussed in the relevant sections showed that ICT literacy is very important for effective deployment of technology in eAssessment. That the NOUN had successfully overcome the IT challenges encountered at the first instance of enthronement of eAssessment in the university attest to that declaration. The result could be attributed to ICT literacy which was enhanced in the university by her inclusion of ICT literacy course as compulsory general study course. The test items challenges were also overcome by continually training the staff on ICT usage and test items writing in relation to the computer software used in the university for her eAssessment purposes. Hence, the university was able to scale through the assessment of large class sizes with the use of technology.

It is therefore recommended that other institutions should imbibe eAssessment as assessment innovation for the 21st century. However, in order to ensure good practice, at the end of the assessment, there is need to discuss the challenges and prospects with all the stakeholders such as programme leaders, course coordinators, IT personnel and the university management so that the feedback would be ploughed back to the system. Based on the feedback, further necessary improvements in the assessment systems should be made. By doing so, a valid and reliable assessment system can be developed and implemented in ODL and the confidence of students will be sustained. Thereby satisfying the most important function of any university, open or conventional, to work for the students and to satisfy their expectations of suitable system of assessment from better teaching-learning environments. These are necessary because a sound assessment system is capable of motivating students to achieve their learning objectives effectively; and continuing professional development of staff ought not to be overlooked. Also, ways of improving eAssessment listed in Table 5 ought to be practiced in addition to these other listed good practices.

- A team of supervisors needs to be appointed to observe, supervise and vet the questions before uploading in the e-Assessment platform.
- eAssessment questions should be carefully prepared and timely uploaded to enable the IT managers observe any structured defect in the items for correction before the due date.
- Accordingly, assessment and IT experts for each school need to be appointed to moderate and supervise the entries to ensure compliance with platform and assessment regularities. Where irregularities are observed, such should be communicated to the concerned evaluator for necessary action to be taken.
- Suitable question banks of each course and programme for eAssessment should be developed to reduce examination tension of evaluators. This would enable them pay more attention to the quality of the items generated for assessment purposes.
- Academic counselors and tutors should be trained in eAssessment regularly to ensure prompt and efficient tackling of challenges of assessment.
- Also, learners are to be trained on the eAssessment platform in addition to taking them through the IT course as General Study (GST) to enhance the IT usage.

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