

## ALBINISM AND USABILITY OF SOFTWARE FOR COMPUTER-BASED TESTING IN KOGI STATE UNIVERSITY: IS THERE NEED FOR ASSISTIVE TECHNOLOGY?

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*This research paper is an evaluation of usability of software for computer-based testing in Kogi State University by students and candidates with albinism. A qualitative research design was employed for the study because the intent was to elicit information from the respondents. The responses show that the interaction of the user (students with albinism) with computer through specific interfaces during the course of computer-based testing was reasonably satisfactory. However, the software used does not give warning sounds (auditory displays) to indicate that something needs attention during CBT. From the response of 88.7% of the respondents, it is obvious that the software effectively monitors time during CBT examination. Disappointingly, there was no time extension placed on the software/program for student with albinism to complete the test as reported by 91.9% of respondents. All the respondents were of the opinion that assistive technologies should be adopted during CBT examination for people with low vision in KSU. Therefore, this paper recommends that the software designers for CBT in KSU should take into consideration more graphics interfaces, auditory displays, time extension for students with low vision and various assistive technologies that students might use. The University management should make effort at providing assistive technologies to compensate for low vision students. This will help advance quality and equity in education by providing fair and valid assessment for all students and candidates including those with albinism.*

**Key words:** albinism, paper pencil test, computer-based test, software usability, assistive technology, Kogi State University

### 1. Introduction

The predominant mode of student's assessment in Nigeria is the traditional method. In this method, students are assessed using paper and pen on cognitive abilities. This method of assessment has imposed serious limitations to the effectiveness of the method. E-examination can be used to assess cognitive and practical abilities. Cognitive abilities are assessed using e-

testing software; practical abilities are assessed using e-portfolios or simulation software (Abubakar and Adebayo, 2014). It is becoming commonplace to see institutions across the educational strata adopt computer-based tests (CBT) and assessment to admit or screen students for entrance into Nigerian institutions. However, this mode of conducting examination is a new phenomenon in Nigeria.

Not very recently, Kogi State University (KSU) adopted this system of testing (CBT) to replace the traditional paper and pen testing for academic assessment of students especially on general studies examination (GST). The reactions have largely been positive due to recognition of the fact that CBT ensures rapid score reporting. Nevertheless there are some concerns especially on some students that are suffering albinism, a group of genetic conditions that causes a lack of pigment which can effect only the eyes (ocular albinism) or both the eyes and skin (oculocutaneous albinism). The lack of pigment during the development of the eye causes an abnormal development of the retina and affects the formation of the nerve pathways from the eyes to the brain, which causes decreased visual acuity or low vision that cannot be corrected to 20/200(NOAH, 2002). People with albinism may be “legally blind”, however, this is quite different from total blindness (Thewilltosee, n.d ).

Against this backdrop, this study aims at examining the perception of albinism students concerning computer-based testing in Kogi State University. Specifically, it attempts to find out whether the nature of their albinism impair their vision, ascertain the ability of this group of students to use the software designed for CBT in KSU, the problems encountered during CBT and the nature of assistive technologies put in place for them as well as the effect this technology can have on their performance during CBT. This is pertinent because most students with albinism can participate in general education programs and perform well in e-examination with proper intervention.

## **2. Conceptual and Past Studies Review**

As earlier mentioned, albinism is a condition which can affect vision, hair color and skin color. People and animals that have this condition were referred to as “albinos” in the past. This term has been used for many characters in books or movies that are in some way freaky. People who have albinism are rightfully tired of being referred to simply by the name of their eye and

skin condition. In the current fashion of putting the person first when we refer to people who have disabilities, many people prefer to be referred to as someone who has albinism rather than as an albino (Liefert, 2008).

There are several types of albinism. Types one and two affect the eyes and the skin and hair. They are called oculocutaneous albinism. People who have type one have very pale skin and very light hair. Their visual impairments tend to be moderate to severe. People who have type two oculocutaneous albinism have more color in their skin and hair and have less severe visual impairment. The third type of albinism is called ocular albinism, and it affects only the eyes.

The lack of pigmentation in the eye causes atypical development of the optic nerve. People who have albinism are also near-sighted, so their vision can be corrected to some degree with eyeglasses. They are also extremely sensitive to light and glare, since they have little pigment in their retinas. This extreme photo sensitivity impairs their acuity in addition to the near-sightedness. Sunshades and hats with brims are helpful, but the vision cannot be corrected to 20/20. Even though many urban schools forbid students to wear hats on campus these days, students who have albinism need a “reasonable accommodation” that allows them to protect their eyes this way on the playground and in other brightly lit situations.

Nystagmus, which is a rapid, involuntary movement of the eyes, is also present in people who have albinism. The primary complaint of children who have nystagmus is that other kids are always asking them what’s wrong with their eyes. The nystagmus itself does not blur their vision or make things look like they are constantly moving. The brain filters out the excess movement and image information coming from the eyes and allows people who have albinism to understand whether things are still or moving. Most people who have nystagmus discover that by holding their heads at a certain tilt and looking from a certain angle they can find a spot where the nystagmus slows or stops. Some people use this spot for looking closely at details, such as when they are reading or looking at pictures. This spot is called the “nul spot.” It is important to allow students who have nystagmus to hold their heads in the position they find best for their vision even if the position is not the ideal posture expected of fully-sighted children (Liefert, 2008).

Strabismus is another involuntary movement of the eyes which may accompany albinism. It may be present in only one eye, and is sometimes referred to as a “wandering” eye. Strabismus prevents people who have it from using both eyes at the same time, resulting in a reduction of depth perception. The brain suppresses the information from one of the eyes to avoid double vision.

Wikipedia defines a computer-based Test (CBT), also known as e-assessment, as computerized testing and computer-administered testing as a method of administering tests in which the responses are electronically recorded, assessed or both. As the name implies, computer-based assessment make use of a computer or an equivalent electronic device (Abifarin and Okunloye, 2011).

According to Thelwell(2000), there are many types of computer-based test in use today in higher education, from formative self-tests to summative final examination. CBT is used in various ways as an integral part of many currently used computer-aided learning(CAL) environment. Presently in Nigeria, CBT is used as a summative examination for post university, polytechnic and college of education matriculation. Some of the Nigerian higher educational institutions have equally adopted it for their semester examinations over the traditional pen-paper test (PPT). Kogi State University is one of such institutions. It has adopted CBT for its general studies examinations (GST) since 2010.

Studies show that the National University of Singapore introduced computer-based testing (CBT) in 2004. Lim, et al (2006) examined medical students’ attitude about CB VS PB testing. Through an online survey 213 (53.5%) final-year MBBS students were tested out of which 91 (79.8%) preferred CBT, 11 (9.6%) preferred paper-and-pencil (PNP) format and 12 (10.5%) were un-sure. Authors further explained that 42 indicated that 42 liked CBT because of good quality of images and independent of assigned seating positions; 22 liked because they could proceed at their own pace; one stated that CBT examinations was fun; 4 enjoyed the convenience of CBT and cited “equality” as the reason they preferred CBT over PNP testing.

Fluck, Pullen & Harper (2009) conducted an e- examination for the students of 4-year Bachelor of Education Program at the University of Tasmania. Students’ (N=270) achievement

was assessed through two equally weighted activities: first was a home assignment in which students explored learning content through the use of ICT and the second activity was a 2 hour test comprised of 14 questions based on all the material in the unit. At the end of the test, a single page survey with five questions was offered to students. Survey indicated that 38% of the survey respondents had previously taken a CB exam, 78% had used the practice CD before e-examination and 71% had found it very or moderately useful. The valid responses (N=230) indicated that 94.5% preferred CBT. The prior exposure to CBT was a highly significant factor for preferring the computer medium.

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

The benefits of computer-based test both for staff and students are well documented. They include rapid formative feedback to the students, reduced marking load for staff and a closer match between assessment and learning environments (Brown, Race and Bull, 1999). However, it should be noted that issues related to student performance should be carefully considered when computer-based test is being used in students' assessment. And as such, a user characteristic needs to be considered especially students with albinism. Those studies reviewed completely ignored that issue. For some years running, Kogi State University has been carrying out CBT on its GST exams and no study has been conducted to evaluate the views and experiences of students with albinism and yet there are a growing number of such students. This study intends to fill that gap.

### **3. Area of Study**

Kogi State University, located at Anyigba, is the University of Kogi State, Nigeria. It was established in 1999 and commenced academic activities in April, 2000 in six Faculties. Namely; Faculties of Agriculture, Arts and Humanities, Law, Management Sciences, Natural Sciences and Social Sciences, presently comprising about 30 Departments. The University has commenced the establishment of Faculty of Medicine with the office and laboratory complexes under construction. The Centre for Pre-Degree and Diploma Studies was established to run diploma and pre-degree programmes. The University offer many courses and about 90% of the courses offered in the university are accredited by the Nigeria University Commission (NUC) (Wikipedia, 2014). The University has established a Digital Centre where students sit for general studies examination (GST) through computer-based testing. The Digital Centre serves also as a centre for JAMB CBT examination. In addition, the University conducts its post-UTME examination at the Centre. Furthermore, Direct Entry admission CBT are also held at the Digital Centre. It was at the Digital Centre that the study was conducted.

The Institution started with a student population of about 700, currently, it has student population well over 19,000.



Source: Photo by authors

**Images of some students with albinism in Kogi State University, Anyigba.**

#### **4. Questionnaire Methodology**

Kogi State University Digital Centre where the study was conducted is self-paced and some academic and non-academic staff are deployed to invigilate examinations. The sample for



the study consisted of 62 students with albinism selected from different levels of academic programmes in KSU which required the use of computer (GST 101-Use of English I; GST 102-Philosophy and Logic; GST 104-Philosophy of Science; GST 106- Use of English II; CSC 101-Introduction to Computer; CSC 201-Use of Computer; EDS 202-Entrepreneurship & Skill Development; EDS 302- Entrepreneurship & Skill Dev. II) for the academic session 2014/2015 and those albino candidates who sat for JAMB examination and post UME CBT in 2015. The idea of including JAMB and post UME albino candidates who sat for CBT in KSU is because the population of students with albinism in the tertiary institution is small. The study lasted about 12 months because of the interval between different examinations. A qualitative research design was employed for the study because the intent was to elicit information from the respondents. The instrument for data collection was a 35-item structured questionnaire. The instrument was developed by the researchers based on the objective of the study. The questionnaire consisted of four sections. The first section was on personal data related to respondents' gender and age. The rest 33-items were spread across the other sections of the questionnaire.

Since albinism is a rare group of genetic disorders that cause the skin, hair, or eyes to have little or no color. Albinism is also associated with vision problems. This low vision adversely affects their educational status from birth. Thus a few questions were raised in the second section of the questionnaire as follows:

- i. Are you a student with albinism?
- ii. Does the nature of your albinism impair your vision?

Due to the importance of Human-computer interaction (HCI) in computer base assessment, usability questions were raised and they focused on the interaction of the user with computer through specific interfaces. The essence is to evaluate students with albinism's usability of the software designed for CBT in KSU and the problems encountered by these students. Thus these questions were asked in section three of the questionnaire:

- iii. Are you proficient in the use of computer?
- iv. Does the computer system support Keyboard and mouse navigation during CBT?
- v. Is the information on the screen easy to see and read?
- vi. Do instructions on the software used for the CBT clearly indicate what to do at any stage?
- vii. Are the icons on the software that is used to assist navigation during CBT big and bold enough?

- viii. Does the software include pictures and images that are relevant in understanding the CBT questions and instructions?
- ix. Does the screen contain all of the necessary information required to answer a question?
- x. Is the way in which items are presented and arranged on the software appropriate for the CBT examination?
- xi. Are the grammar and vocab used in the software accurate?
- xii. Does the visual display of the system use large white text on a black background, a combination that is often helpful to individuals who are partially sighted?
- xiii. Does the use of color help make the display clear?
- xiv. Are different types of information clearly separated from one another on the screen?
- xv. Are icons, symbols, and graphics used consistent throughout the test?
- xvi. Are different colours used consistently throughout the test?
- xvii. Can the examinee scroll through other items forward or backward?
- xviii. Does it indicate on the screen when an answer has been registered?
- xix. Does the software/program give warning sounds (auditory displays) to indicate that something needs attention during CBT?
- xx. Is there an easy way for the examinee to correct a mistake?
- xxi. Is it clear to the user what should be done to correct error?
- xxii. Is the examinee able to check what they have entered before the answer is submitted?
- xxiii. Is the way the software responds to a user action consistent at all times?
- xxiv. Does the software effectively monitor time during CBT examination?
- xxv. Is the timer reasonably accurate with the number of questions to be answered?
- xxvi. Was there time extension placed on the software/program for student with albinism to complete the test?
- xxvii. Is the scoring system of the software encouraging to the student?
- xxviii. Is the software connected online (internet)?

For the visually impaired learning with computer can be frustrating and intimidating. However, the aim of technology is to improve the lives of human beings. Persons with visual impairments are no different and require the use of assistive technology (AT) to compensate for their vision loss. However, studies have shown that assistive technology devices are essential for students with visual impairments to enhance learning, cognition, and social development (Sze, Murphy, Smith, and Yu, 2004; Wong and 14 Cohen, 2011). Some of the high-tech AT used by persons with visual impairments in today's technologically advanced world consist both hardware and software products including screen readers, screen magnifiers, closed-circuit televisions, electronic magnifiers, scanners and optical character readers, portable and refreshable Braille displays, digital and electronic data, digital readers, Job Access With Speech (JAWS®), talking calculators, etc . Therefore, the following questions were asked in section four of the questionnaire:

xxiv. Do you think assistive technologies are relevant during CBT examinations especially for



students with albinism ( or low vision) in KSU?

xxx. Are there assistive technologies provided for students with albinism during CBT examination in KSU?

xxxi. Any previous training on the use of assistive technology?

xxxii. Can you use assistive technologies effectively?

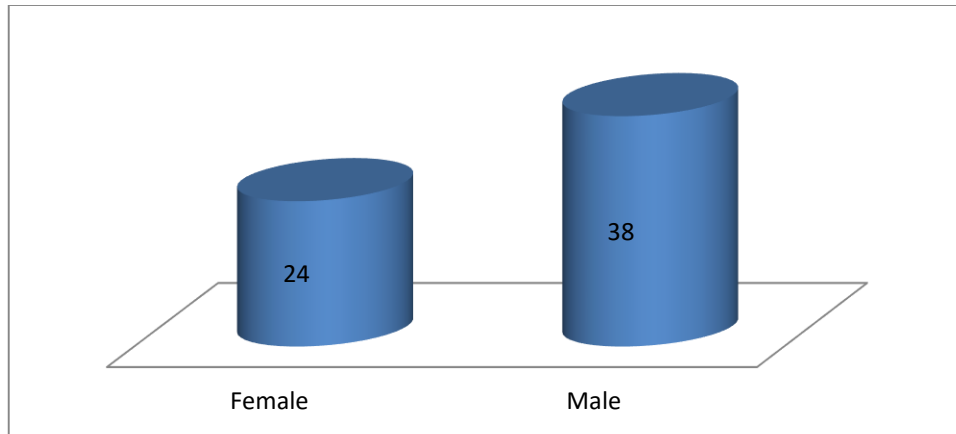
xxxiii. Do you suggest adoption of assistive technologies during CBT examination for people with low vision and albinism in this institution?

The instrument was subjected to face validation by three experts from software design and computer technicians for clarity, relevance and content validity. Three point rating scale was used. The student had to respond to the questionnaire having the options: Yes, To Some Extent and No. The questionnaires were administered to the respondents by the researchers just after the computer-based test with the help of three research assistants. An-on-the-spot collection was made to ensure a high return, and there was 100% return rate. Data obtained were collated and analyzed using tables, simple percentage counts, arithmetic mean and the weighted mean score. The use of weighted mean score involves assigning numerical values to respondent's rating of factors or phenomenon. This method was used for its simplicity and ease of communicating the result of the research by ranking the perceived usability and satisfaction of the different interface of the software used for the CBT in KSU. The evaluation of factors or phenomenon was based on a 3 point likert scales. The weighted mean score for each factor is determined as follows:

$$WMS = \frac{3n_3 + 2n_2 + 1n_1}{n_3 + n_2 + n_1}$$

## 5. Discussion of Result

The cylinder in Figure 1 shows that the number of female among the respondents in the period covered by the research was 24 while male numbered 38 out of a total of 62 respondents that took part in the research. The implication as shown in Table 1 is that female make up 38.7% while the percentage of male is 61.3 in the sampled respondents.



**Figure 1: Distribution of Respondents by Gender**  
Source: Field Survey, 2015.

**Table 1: Frequency Distribution of Gender**

	Frequency	Percent	Valid Percent	Relative Frequency	Cumulative Percent	Inverse Cumulative Percent
female	24	38.7	38.7	0.4	38.7	100
Valid male	38	61.3	61.3	0.6	100.0	61.3
Total	62	100.0	100.0			

Source: Author's computation using SPSS 20. Field survey, 2015.

**Table 2: Statistics of Gender Distribution**

N	Valid	62	Skewness	-.475
	Missing	0	Std. Error of Skewness	.304
	Mean	.6129	Kurtosis	-1.834
	Std. Error of Mean	.06236	Std. Error of Kurtosis	.599
	Std. Deviation	.49106	Minimum	.00
	Variance	.241	Maximum	1.00

Source: Author's computation using SPSS 20. Field survey, 2015.

**Table 3: Age Bracket of Respondents**

Class Interval	Mid-Point (X)	Frequency (F)	FX	Relative Frequency (RF)	Percent	Cumulative Percent	Inverse Cumulative Percent	Pie-Section
18yrs – 23yrs	20.5	42	861.0	0.7	67.7	67.7	100	$42/62 \times 360 = 243.9^\circ$
23yrs – 28yrs	25.5	15	382.5	0.2	24.2	91.9	32.3	$15/62 \times 360 = 87.1^\circ$
28yrs – 33yrs	30.5	5	152.5	0.1	8.1	100.0	8.1	$5/62 \times 360 = 29.0^\circ$
33yrs- 38yrs	35.5	0	0.0	0	0	100.0	0.0	$0/62 \times 360 = 0^\circ$
38yrs – 45yrs	41.5	0	0.0	0	0	100.0	0.0	$0/62 \times 360 = 0^\circ$
<b>Total</b>		<b>62</b>	<b>1,396.0</b>	<b>1.0</b>	<b>100</b>			<b>360°</b>

Source: Field survey, 2015.

$$\text{Arithmetic mean: } \bar{x} = \frac{\sum FX}{\sum F} = 1,396.0/62 = 22.5$$

Table 3 above reveals that respondents whose ages fall between 18 – 23 years were 42 in number (about 67.7%). About 24.2% of the respondents fell within the age range of 23-28 years (numbering 15). Those under 28-33 years totaled 0, i.e., about 8.1%. There was no respondent in the age bracket of 33yrs- 38yrs. Also, no respondent fell in the age group of 38yrs – 45yrs. However, the group arithmetic mean for the age of respondents shows 22yrs, five months.

The response in Table 4 shows 100%, i.e., all the respondents were suffering from albinism an inherited genetic condition that reduces the amount of melanin pigment formed in the skin, hair and/or eyes. However, 17.7% of the respondents said that the albinism they suffer does not impair their vision. About 8.1% of respondents responded that their vision was impaired to some extent while 74.2% said yes that the nature of the albinism they suffer impaired their vision. This suggests that they suffer from oculocutaneous albinism, a type of albinism that not only affect the skin and hair but also the eyes.

**Table 4: Severity of Albinism, Proficiency in Computer and Usability of Software of CBT.**

Information on the Nature/Severity of Albinism							
	Yes	To some extent	No	Total Response			
Are you a student with albinism?	62 (100%)	0 (0%)	0(0%)	62(100%)			
Does the nature of your albinism impair your vision?	46 (74.2%)	5 (8.1%)	11(17.7%)	62(100%)			
Proficiency in Computer/ Usability of Software for Computer-Based Testing by Students with Albinism in KSU							
	Yes (3) 0(0%)	To some Extent (2) 59(95.2%)	No (1) 3(4.8%)	Total Response 62(100%)	Weighted Score 121	Mean Score 2.0	Rank 7
Are you proficient in the use of computer?							
Does the computer system support Keyboard and mouse navigation during CBT?	54(87.1%)	0(%)	8(12.9%)	62(100%)	170	2.7	3
Is the information on the screen easy to see and read?	5(8.1%)	50(80.6%)	7(11.3%)	62(100%)	122	2.0	7
Do instructions on the software used for the CBT clearly indicate what to do at any stage?	56(90.3%)	0(0%)	6(9.7%)	62(100%)	174	3.0	1
Are the icons on the software that is used to assist navigation during CBT big and bold enough?	51(82.3%)	3(4.8%)	8(12.9%)	62(100%)	161	2.6	4
Does the software include pictures and images that are relevant in understanding the CBT questions and instructions?	53(85.5%)	0(0%)	9(14.5%)	62(100%)	168	2.7	3
Does the screen contain all of the necessary information required to answer a question?	47(75.8%)	3(4.8%)	12(19.4%)	62(100%)	159	2.6	4
Is the way in which items are presented and arranged on the software appropriate for the CBT examination?	55(88.7%)	0(0%)	7(11.3%)	62(100%)	172	2.7	3
Are the grammar and vocab used in the software accurate?	54(87.1%)	0(0%)	8(12.9%)	62(100%)	170	2.7	3
Does the visual display of the system use large white text on a black background, a combination that is often helpful to individuals who are partially sighted?	56(90.3%)	0(0%)	6(9.7%)	62(100%)	174	2.8	2
Does the use of color help make the display clear?	50(80.6%)	0(0%)	12(19.4%)	62(100%)	162	2.6	4
Are different types of information clearly separated from one another on the screen?	51(82.3%)	0(0%)	11(17.7%)	62(100%)	164	2.7	3
Are icons, symbols, and graphics used consistent throughout the test?	48(77.4%)	0(0%)	14(22.6%)	62(100%)	158	2.5	5
Are different colours used consistently throughout the test?	42(67.7%)	0(0%)	20(32.3%)	62(100%)	146	2.4	6
Can the examinee scroll through other items forward or backward?	56(90.3%)	0(0%)	6(9.7%)	62(100%)	174	2.8	2
Does it indicate on the screen when an answer has been registered?	55(88.7%)	0(0%)	7(11.3%)	62(100%)	172	2.8	2
Does the software/program give warning sounds	0(0%)	0(0%)	62(100%)	62(100%)	62	1.0	11

(auditory displays) to indicate that something needs attention during CBT?							
Is there an easy way for the examinee to correct a mistake?	49(79.0%)	7(11.3%)	6(9.7%)	62(100%)	167	2.7	3
Is it clear to the user what should be done to correct error?	50(80.6%)	5(8.1%)	7(11.3%)	62(100%)	167	2.7	3
Is the examinee able to check what they have entered before the answer is submitted?	57(91.9%)	0(0%)	5(8.1%)	62(100%)	176	2.8	2
Is the way the software responds to a user action consistent at all times?	54(87.1%)	0(0%)	8(12.9%)	62(100%)	170	2.7	3
Does the software effectively monitor time during CBT examination?	55(88.7%)	0(0%)	7(11.3%)	62(100%)	172	2.8	2
Is the timer reasonably accurate with the number of questions to be answered?	52(83.9%)	3(4.8%)	7(11.3%)	62(100%)	169	2.7	3
Was there time extension placed on the software/program for student with albinism to complete the test?	5(8.1%)	0(0%)	57(91.9%)	62(100%)	62	1.0	11
Is the scoring system of the software encouraging to the student?	14(22.6%)	4(6.4%)	44(71.0%)	62(100%)	94	1.5	10
Is the software connected online (internet)?	25(40.3%)	0(0%)	37(59.7%)	62(100%)	112	1.8	9
<b>Total</b>	1,094	89	384	1567			
<b>Proportions</b>	0.70	0.05	0.25				
<b>Weights</b>	3	2	1				

Source: Field survey, 2015.

A hypothesis was tested from respondent's opinion in Table 4 above. The 3 point likert scale is analyzed with the assumption that the scale is linear. Weights (1, 2 and 3) are assigned to the various element of the scale according to the order of influence or agreement with the questions. The simple weighted average are calculated for each of the elements and total average are calculated for each of the elements and total average subject to a normal distribution test with a normal curve centre about mean( $\mu$ ) of 2 and variance( $\sigma^2$ ) of 3.  $\mu = \sum x/n = (1+2+3)/3 = 2$ ;  $\sigma^2 = \sum (x-\mu)^2/n = \sum (x-2)^2/n = 2$ . Weighted mean factor =  $\sum_{i=1}^n \omega_i X_i / \sum_{i=1}^n \omega_i$ , where  $\omega_i = (\omega_1 + \omega_2, \dots, \omega_n)$ ;  $\sum_{i=1}^n \omega_i$  are non-negative. The weighted mean factor (wf) is 2.5 and it is compared with the average ( $\mu=2$ ). If the weighted mean factor is less than the average ( $\mu=2$ ). We accepted the null hypothesis that the interaction of the user (students with albinism) with computer through specific interfaces during the course of computer-based testing was not satisfactory. If otherwise, we accept the alternative hypothesis. Since the weighted factor is slightly higher than the average  $\mu$ , it then implies that the interaction of the user (students with albinism) with computer through specific interfaces during the course of computer-based testing was reasonably satisfactory.

As revealed in Table 4, 95.2% of respondents were to some extent proficient in the use of computer. However, access to computers and internet capabilities is still a stumbling block for some of them. 87.1% of the respondents were of the opinion that the computer system use for CBT in KSU support keyboard and mouse navigation during CBT. To some extent, the information on the screen is easy to see and read as expressed by 80.6% of the respondents. 90.3% of respondents were of the opinion that the instructions on the software clearly indicate what to do at any stage of the CBT. The icons on the software are big and bold enough as depicted by 82.3% of the respondents. Though 14.5% of the respondents were of the opinion that the software does not include pictures and images that are relevant in understanding the CBT questions and instructions, nonetheless, 85.5% of respondents were of a contrary view. 4.8% of respondents reported that to some extent the screen contained all of the necessary information required to answer a question. About 19.4% said no to that while well over 70% said yes to it.

The way in which items are presented and arranged on the software are appropriate for the CBT examination as expressed by 88.7% of respondents 87.1% of the respondents think that the grammar and vocab used in the software are accurate and that the visual display of the system use large white text on a black background, a combination that is often helpful to individuals who are partially sighted (view of 90.3% respondents). According to 80.6% of respondents, the use of color help make the display clear and also different types of information

are clearly separated from one another on the screen (as expressed by 82.3% of respondents). 22.6% of respondents are not of the opinion that the icons, symbols, and graphics were used consistent throughout the test but a whelming majority (77.4%) think so . It is also believed that different colours were used consistently throughout the test (as observed by 67.7% of respondents). A huge majority of the respondents (90.3%) were of the opinion that the examinee can scroll through other items forward or backward on the software and that it does indicate on the screen when an answer has been registered as viewed by 88.7% of the respondents. However, about 11.3% of respondents viewed differently.

A closer examination of Table reveals that the software does not give warning sounds (auditory displays) to indicate that something needs attention during CBT. This was the observation of all the respondents (62 respondents) (this response was ranked 11<sup>th</sup> position using the mean score. This means that this issue was not given consideration during the design and development of the software used for the CBT) but 79.0% of respondents think that there is an easy way for the examinee to correct a mistake and it is clear to the user what should be done to correct error (80.6% of respondents opinions). 91.9% of respondents believed that the examinee is able to check what they have entered before the answer is submitted and also, the response of 87.1% of the respondents suggest that the way the software responds to a user action is consistent at all times. From the response of 88.7% of the respondents, it is obvious that the software effectively monitors time during CBT examination and the timer is reasonably accurate with the number of questions to be answered as thought by 83.9% of respondents.

Disappointingly, there was no time extension placed on the software/program for student with albinism to complete the test as reported by 91.9% of respondents. The response to this issue was ranked low on the 11<sup>th</sup> position using the mean score. This implies that this issue was not address in the course designing and development of the software used for the CBT and it is of concern to students and candidates with albinism and low vision. The report on Table 4 also indicates that the scoring system of the software was encouraging to 22.6% of respondents, for 6.4% of respondent to some extent but not encouraging to over 70% of respondents. This is probably because of a few days delaying in releasing result compared to previous design which allowed for instant access to test score and examination score. In another report, 40.3% of respondents were of the opinion that the software was connected online (internet) while 59.7% of the respondents do not think so. This is probably because they are not aware that KSU conducts CBT such that every computer system has access to the questions from a large database connected to an internet server. The problem of electricity is resolved by a stand-by sound proof plant which complements the public power supply.

**Table 5: Use of Assistive Technologies during CBT**

	<b>Yes</b>	<b>To some Extent</b>	<b>No</b>	<b>Total Response</b>
Do you think assistive technologies are relevant during CBT examinations especially for students with albinism ( or low vision) in KSU?	60(96.8%)	0(0%)	2(3.2%)	62(100%)
Are there assistive technologies provided for students with albinism during CBT examination in KSU?	1(1.6%)	0(0%)	61(98.4%)	62(100%)
Any previous training on the use of assistive technology?	11(17.7%)	0(0%)	51(82.3%)	62(100%)

Can you use assistive technologies effectively?	10(16.1%)	0(0%)	52(83.9%)	62(100%)
Do you suggest adoption of assistive technologies during CBT examination for people with low vision and albinism in this institution?	62(100%)	0(0%)	0(0%)	62(100%)

Source: Field survey, 2015.

Assistive technology devices have become essential tools for students with visual impairments to compensate for their low vision or vision loss. As depicted in Table 5, about 96.8% of respondents do think that assistive technologies are relevant during CBT examinations especially for students with albinism ( or low vision) in KSU. Surprisingly, there are no assistive technologies provided for students with albinism during CBT examination in KSU. This is as reported by 98.4% of respondents. This result concurs with Alper and Raharinirina (2006) that individuals with disabilities/visual impairment are not fully benefiting from the use of assistive technologies at school and community settings. In a related reported, 82.3% of respondents never had previous training on the use of assistive technology and over 80% respondents cannot use assistive technologies effectively. This is probably because of accessibility barriers. Nonetheless, 100% of the respondents do suggest adoption of assistive technologies during CBT examination for people with low vision and albinism in KSU.

## 6. Conclusion and Recommendation

Computer-based testing (CBT) has emerged as one of the recent “innovative” approaches to assessments most pursued by many institutions of higher learning including Kogi State University. In order to make it more accessible for students with visual impairment, there is need to design the software used for CBT such that it can support some assistive technologies which would compensate for the low vision or vision loss which adversely affect their educational status from birth. This will help advance quality and equity in education by providing fair and valid assessment for all students and candidates including those with albinism.

This study therefore recommended that the management of Kogi State University should establish resource rooms/centres where students with visual impairment will have computers with adequate assistive ICT facilities. In that regard, the University should train special educators on the use of computer assistive devices so that they can train students with albinism. That way they can be proficient in the use of computer and assistive devices.

The software designers for CBT in KSU should take into consideration more graphics interfaces, auditory displays, time extension for students with albinism, various assistive technologies that students might use.

The University management should make effort at providing assistive technologies to compensate for low vision students. Even if it means seeking for funds from Education Trust



Funds (ETF). This will help advance quality and equity in education by providing fair and valid assessment for all students.

### Limitation of the study

The following limitations were noted: Some of the candidate with albinism especially those who sat for JAMB examination were not able to be reached because they left right after the examination. That made the size of the sample small. The study is restricted to Kogi State University as such the findings cannot be generalized to other institutions that may have adopted the use of assistive technology in CBT.

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