EXAMINING THE MIXED-METHODS ANALYSIS OF STUDENTS' SKILL LEVEL IN THE USE OF COMPUTER-BASED TECHNOLOGY (CBT) IN NIGERIAN UNIVERSITIES

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Abstract

The use of technological tools in traditional education has advanced teaching and learning in the area of education globally. This study explored the gender, student's prior knowledge in the use of Computer-Based Technology (CBT) and classified the CBT skill level of students in selected Nigerian Universities. A descriptive survey research design with the use of mixed-methods was adopted and 3,000 undergraduate students received questionnaires. A total of 2,327 valid questionnaires were returned and used for the data analysis. A sub sample valid returned questionnaire participated in an in-depth focus group interview. The results revealed that females were marginally more interested and willing to use CBTs (50.9%). Additionally, students with greater prior knowledge in the use of CBT were most motivated to engage in blended learning (65.5%). Challenges were identified and included - computer laboratory were not accessible and there was power outages on campus, which prevented access to the internet. Consequently, students had to rely on their personal computers, mobile phones and data purchases, as well as cybercafés. While many students expressed dissatisfaction with this situation, they were at least able to develop their skill level and complete online assignments. Those without access to personal resources were placed at a major disadvantage. It was recommended that University Management should ensure that all

students have access to up-to-date CBT facilities with back-up power supply and a conducive environment where they can develop the skills needed. The use of CBT should be integral to teaching and learning in all Nigerian universities.

Keywords: Computer-based technology, prior knowledge, gender, online learning, CBT skill level

Introduction

The world is now in an age that has moved from the 'Industrial Age' to the 'Information Age' (sometimes called the 'Fourth Industrial Revolution' or 4IR). Advances in computer applications have affected the educational sector profoundly and technology is changing the nature of the social, political and economic life of nations globally (Geylani, 2020; Wulandari, Saufi, Khotimah, Azka, Zaman and Berutu (2020); Thai, De Wever and Valcke, 2017).

Many institutions worldwide have adopted the use of Computer-based Technology (CBT) to enhance teaching and learning, as these technologies have been shown to have a positive influence on students' performance (Nardi and Ranieri, 2019; Sung, Chang and Liu, 2016). Furthermore, different forms of technology are constantly being developed around the world, and are being used to enhance the academic performance of students (Martínez-Jiménez, Pedrosa-Ortega, Licerán-Gutiérrez, Ruiz-Jiménez and García-Martí, 2021; Jena, Bhattacharjee, Gupta, Das and Debnath (2018). As currently used by students in Nigerian tertiary institutions, CBT has been shown to enhance their academic performance and their knowledge of the outside world in general (Ugwoke, Edeh and Ezemma, 2018; Joda, 2013).

Universities in Nigeria are becoming aware of this, and have started incorporating CBT to support face-to-face classroom lectures, as well as academic and administrative day-to-day activities. For example, CBT is used for online courses, assignments, group collaboration and for the evaluation of students, as well as to reduce paper-based examinations and for easy marking and assessment.

Most universities in Nigeria are making this shift via the internet, telecommunications and networks (Tejumaiye, Simon and Obia, 2018; Nnadozie, 2018; Popoola, 2017). Increasingly, students are

expected to be CBT literate and to learn and adopt new technologies to enhance their academic performance (Kayode, 2019; Anshari, Almunawar, Shahrill, Wicaksono and Huda, (2017).

However, it has been argued that Nigerian universities need to increase the use of CBT alongside traditional teaching and learning, especially for undergraduate students, as well as offering students adequate skills training in the use of CBT (Kayode, 2019; Govender and Kayode, 2020). These authors felt that technology adoption in some universities in Nigeria is still in its infancy, but that the educational sector in Nigeria cannot afford to be left out of any developments that may lead to quality education.

Researches have been undertaken in the area of ICT and IT as appliable to education (Manaligod, 2012; Govender, 2006). However, there is scarcity of local research on the prior-knowledge and CBT skill level of undergraduate students in federal universities in Nigeria. This study attempted to identify the CBT skill level of students in federal universities in Nigeria using a mixed-methods analysis.

Research objective

- To ascertain the CBT skill level that students have and believe are necessary to contribute to their academic performance in universities in Nigeria.

Research questions

1. What is the level of CBT skill among students in the selected universities in Nigeria?
2. Does gender and prior knowledge influence CBT skill level among students in Nigerian universities?

Literature Review

Teaching and learning in educational system have seen some progress in the field of knowledge transfer. The 1980s witnessed the development of technology and the introduction of affordable microcomputers in schools to teach programming. Computer-based technologies have since turned into a usual part of life, being used to send emails, write reports, manage finances or just to surf the web. It is said that computers and technology have made the world a global village, restructuring every aspect of human life and activities.

Advances in computers and computer applications have had positive impacts on the educational sector as well as changing the nature of teaching and learning, including training delivery and performance assessment (Syed, Ahmad, Alaraifi and Rafi, 2021; Ogunlade and Oladimeji, 2014; Grant, Malloy and Murphy, 2009). There has been a paradigm shift from the conventional classroom to learning that includes Web 2.0 internet learning, e-learning and online learning (Irele and Kayode, 2020; Ozden, 2011).

The use of CBT to enhance traditional teaching and learning is often referred to as 'blended learning'. Blended learning combines online digital tools with traditional classroom methods as a way of using computers connected to the internet to support face-to-face delivery in the classroom. Blended learning offers the option of allowing lecturers and students to interact using e-learning on an online platform (Al Awamleh, 2020; Gunawan, Kalensun and Fajar, 2018; Gopalan, 2016).

Presently, students need an education that embraces and improves their technical skills and lecturers should be involved as students need to use CBT to discover essential information and academic materials (Govender and Kayode, 2020; Ugwuadu and Joda, 2013). A high CBT level of usage within traditional education is essential to all universities (Nizzolino and Canals, 2021; Kubiatko and ickova, 2010; Govender and Chitanana, 2016; Oni and Uko, 2016).

Despite the introduction of CBT technologies in Nigeria, frequency of use of these technologies in the education sector in various universities have been hampered by regular power failures, low internet bandwidth facilities on campuses, and insufficient available resources to address these problems. The need to improve this situation should be a priority due to the high prevalence of computers and applications of technology in academia and everyday activities globally (Govender and Kayode, 2020; Kayode, 2019).

Methodology

This study adopted a mixed-methods approach. Frequency, percentage, means and standard deviation descriptive analysis was used for the quantitative data. Qualitative analysis was used to support the findings from the analysis of the quantitative data. Qualitative methods included questionnaires and focus group interviews – responses from

the participants were coded and themed to provide insight into participant views. The identities of the participants were kept anonymous, and participation was voluntary. Participants were informed about the objectives of the study and assured that they could withdraw at any time. The informed and consent letter was signed by the participants. The researcher was issued ethical clearance from the Research Ethics Committee of the University of KwaZulu-Natal, South Africa.

This study used a mixed-methods design in order to combine and compare both quantitative and qualitative data. This approach was deemed appropriate for answering the research questions. When conducting mixed-methods research, quantitative and qualitative data are collected at different phases of the research process and then examined collectively (Bryman, 2017; Christensen & Johnson, 2010; Molina-Azorín et al., 2015)

Figure 1 below, adapted from Creswell (2014), gives an overview of how the quantitative and qualitative results were combined and interpreted.

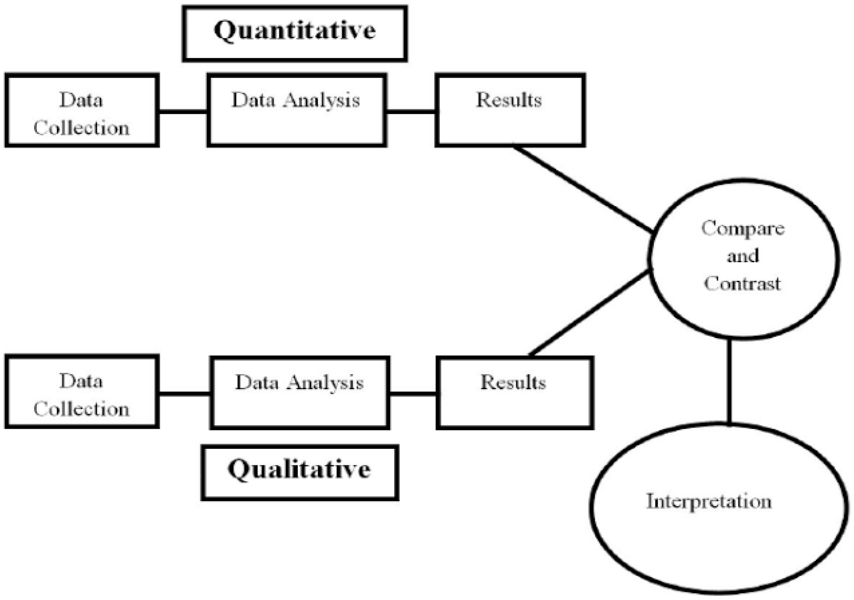

Figure1: The mixed-methods design of the study

Sample and sampling procedure

The population sampled comprised 60,024 undergraduate students from the identified universities in South West Nigeria. Undergraduate students in year 1–4 (100 level to 400 level) were the respondents for this study. The sample was purposively selected and included 500 students from each of the six campuses (University of Ibadan, Ibadan, Oyo State; Obafemi Awolowo University, Ile Ife, Osun State; University of Lagos, Lagos; Federal University of Agriculture, Abeokuta, Ogun State; Federal University of Technology, Akure, Ondo State; Federal University, Oye, Ekiti State) totalling three thousand (3,000) students for all the universities. (615 questionnaires were not returned and 58 were spoiled and could not be used). Only 2,327 valid questionnaires from all the six universities in South West Nigeria were returned and used for the analysis..

Quantitative analysis

The Statistical Package for Social Sciences (SPSS) was used for the coding and analysis of the questionnaires, and results were reported in terms of descriptive statistical analysis. Because of the scale of quantitative data, qualitative data was used to support the quantitative results

Qualitative analysis

Thirty (30) participants from each university (from those who returned valid questionnaires) were used for the focus group interview (qualitative data) to support the quantitative analysis. Okeke and Van Wyk (2015) states that a focus group interview is appropriate for collecting data from a group of people with the same characteristics. The researcher formulated some related items from the research question to be used for the focus groups interviews. The focus-group interview schedule is provided in Appendix B.

Results and Discussion

Analysis of Demographic Data

Table 1: Respondents according to Gender for all Universities in the study

Gender	Frequency	Percentage (%)
Female	1185	50.9
Male	1142	49.1
Total	**2327**	**100.0**

Table 1 shows the distribution of respondents by gender. The findings revealed that male students were slightly more (2%) than females in the sample. This suggested that there was not much difference in the use of CBT for learning between the sexes. There was an increased participation of the use of CBT with face-to-face learning by females. This result contradicts other findings on the disparity between sexes in the usage of CBT. For example, Wentling, (2009) have shown that the use of computers and the internet are traditionally associated with men, and that men are more prone to use the computer than women. In addition, other scholars (Appianing and Van Eck 2019; Laosethakul and Leingpibul, 2010) found that females view the use of CBT boring and male use mostly the ICT than female, which may have affected female in their tendency to use computers. The present study reveals that females were interested and willing to use CBT with their traditional education.

Table 2: Respondents according to students' prior qualification for all universities in the study and supporting qualitative data

Prior qualification	Frequency	Percentage (%)
O'Level	1,524	65.5
A'Level	393	16.9
OND	271	11.6
NCE	139	6.0
Total	**2327**	**100**

Table 2 shows the distribution of respondents by entry level of education. About 66% of the participants were admitted into the institutions through their O Level or Unified Tertiary Matriculation

Examination (UTME). Seventeen (17%) gained admission through A'Level, i.e., Direct Entry, which means that they began their university education from 200 level, unlike those who came in through O'Level and started from 100 level. About 12% of the respondents entered the university with the Ordinary National Diploma Certificate, which is also in the Direct Entry category (but had been in a polytechnic before proceeding to the university). Only 6% was admitted with an NCE. The majority of the students entered through UTME or A'Level. Other forms of entry aside from the UTME were less than 40%.

This study revealed that participants were also of the view that their prior knowledge before gaining admission into the university motivated them to use CBT tools with their traditional learning. This was evident from their responses as follows:

> *"Even before I gained admission, I need ICT knowledge and I've been trying to develop myself in them personally with my laptop and despite the fact that the school is not providing anywhere wither for ICT I'm trying to get along with my study through the online materials. (FG1:P1)"*
>
> *"My prior knowledge lay the foundation of my CBT skill so when I gained admission all I needed to do was some personal expiration which help to improve my skill to an extent at least now I can type my assignment, I can make presentation. (FG1:P10)"*
>
> *"Yes! I have prior knowledge before I enter into the university. Right from my secondary school, we've, they've been teaching us how to use computer. So, coming to university I see they don't even have computer here, there's no way to access it because me I already know how to use it, like Microsoft Word, excel, PowerPoint and some other things. (FG2:P10)"*
>
> *"I have prior knowledge of CBT before coming into the university but I … learnt it on my own because I had encouraged myself to learn such like Corel draw, Microsoft office etc. I had the zeal to, and I wanted to know more about the use of computer so I learn a little before coming. (FG3:P3)"*
>
> *"I have prior knowledge too before gaining admission because I still sit at home a while so I did some professional courses which is online course and everything then web design and everything. So, I have prior knowledge before gaining admission. (FG1:P9)"*

Results of the statistical analysis and supporting qualitative data

Table 3 shows the different skill levels in CBT items/applications, where HS represents 'Highly Skilled', MS represents 'Moderately Skilled', WS represents 'Weakly Skilled', and NS represents 'No Skill'.

Table 3: Descriptive analysis of CBT skill level of undergraduate students in the six sampled universities in Nigeria

S/no.	Items	HS	MS	WS	NS	Mean	S.D
1	General computer use	618 (26.6%)	1422 (61.1%)	225 (9.7%)	62 (2.7%)	3.12	0.675
2	Email	703 (30.2%)	1351 (58.1%)	236 (10.1%)	37 (1.6%)	3.17	0.662
3	Word processing (i.e., MS Word, Word Perfect)	621 (26.7%)	1391 (59.8%)	253 (10.9%)	62 (2.7%)	3.10	0.687
4	Spreadsheets (i.e., Excel, SPSS, STATA)	591 (25.4%)	1274 (54.7%)	335 (14.4%)	127 (5.5%)	3.00	0.786
5	Presentation software (i.e., PowerPoint)	389 (16.7%)	918 (39.4)	666 (28.6%)	354 (15.2%)	2.58	0.94
6	Desktop publishing (i.e., MS Publisher)	295 (12.7%)	673 (28.9%)	794 (34.1%)	565 (24.3%)	2.30	0.974
7	Graphics software (i.e., CorelDraw, Adobe Photoshop)	298 (12.8%)	641 (27.5%)	810 (34.8%)	578 (24.8%)	2.28	0.978
8	Website development	321 (13.8%)	483 (20.8%)	650 (27.9%)	873 (37.5%)	2.11	1.06
9	Internet to retrieve information	695 (29.9%)	1356 (58.3%)	239 (10.3%)	37 (1.6%)	3.16	0.662
10	Storage of data on a CD	363 (15.6%)	1262 (54.2%)	659 (28.3%)	43 (1.8%)	2.84	0.697
11	Smart board	244 (10.5%)	573 (24.6%)	734 (31.5%)	776 (33.3%)	2.12	0.992
12	Web CT course development (or similar program)	230 (9.9%)	565 (24.3%)	729 (31.3%)	803 (34.5%)	2.10	0.987
13	Synchronous chat (i.e., MSN, Yahoo)	607 (26.1%)	1421 (61.1%)	236 (10.1%)	63 (2.7%)	3.11	0.678
14	Online course development	359 (15.4%)	749 (32.2%)	697 (29.9%)	523 (22.5%)	2.41	1.00
15	Multimedia	339	749	696	523	2.40	0.986

S/no.	Items	HS	MS	WS	NS	Mean	S.D
	presentations	(15.4%)	(32.2%)	(29.9%)	(22.5%)		
16	Using course-related software programs	335 (14.4%)	765 (32.9%)	694 (29.8%)	533 (22.9%)	2.39	0.992
17	Using databases	369 (15.9%)	721 (31.0%)	698 (30%)	539 (23.2%)	2.40	1.01

The mean scores for the variables ranged from 2.10 to 3.17. Since the Likert scale of 'not skilled', 'weakly skilled', 'moderately skilled' and 'highly skilled' was used in the data collection instrument, calculated means of scale greater than 2 and 3 were considered moderate and highly skilled, respectively.

The findings revealed the following ranking for the variables: Email ($\underline{x}$ = 317, SD = 0.662), internet retrieval ($\underline{x}$ = 3.16, SD = 0.662), general computer use ($\underline{x}$= 3.12, SD = 0.675), synchronous and asynchronous chat ($\underline{x}$ = 3.11, SD = 0.678), word processing ($\underline{x}$ = 3.10, SD = 0.687), and spreadsheet use ($\underline{x}$ 3.00, SD = 0.786) were moderate and highly skilled, storage data ($\underline{x}$ = 2.84, SD = 0.697), presentation software ($\underline{x}$ = 2.58, SD = 0.94), online courses ($\underline{x}$ = 2.41, SD = 1.00), multimedia presentations ($\underline{x}$ = 2.40, SD = 0.986), using database ($\underline{x}$ = 2.40, SD = 1.01), using course-related software ($\underline{x}$ = 2.39, SD = 0.992), desktop publishing ($\underline{x}$ = 2.30, SD = 0.974), graphics software ($\underline{x}$ = 2.28, SD = 0.978), Smart board ($\underline{x}$ = 2.12, SD = 0.992), website development ($\underline{x}$ = 2.11, SD = 1.06), and Web CT course ($\underline{x}$ = 2.10, SD = 0.987), were weakly skilled.

This showed that students' skills in CBT were higher for some tools than others. This depended on the software that they had available on their personal laptops, which they mostly depended on due to challenges on campus, such as school computers being unavailable and regular power failures. It was observed that the reason for some students having no typing skills or experience in the use of a computer was that they could not afford a personal computer, coupled with computers not being available or power outages on the campus.

The study also revealed that most students had knowledge of the use of CBT that related to and enhanced their studies. Most participants reported a skill level of either high or moderate in the use of these CBTs. The following was the evidenced from focus group discussions:

> *"I feel my CBT skill level is very high. I have access to my PC, so I explore at any time I wish to and that is help me a lot in discovering more. (FG2:P6)"*

> *"Use of messages chatting CBT tools actually help students to collaborate and connect with themselves in educational ways. This has forced students to always visit their computer for their learning. We have groups, let's use WhatsApp for example. We have departmental group, where we share information, where people will do group discussion on their pages. Social media whatever it is, we have group and pages and many things that people use to get information. So, it depends on what you want to do. It is personal with the students. Some people have systems and they don't watch movie on it. They don't play game. I personally don't play game on my system. So, it depends on individual. (FG2:P4)"*

But for other students who did not have access to personal computers, their skill levels were low. This is reported in the following responses:

> *"My CBT level is very low because my parents live in the village and my secondary school too is in the village. So, I did not have access at all, it was in this university that I started to use phones in which my colleagues have been teaching me some applications. (FG1:P9)"*

> *"Of course, my level in the usage of CBT affects my CGPA, because at times, when we are being given assignment to do there are some of us that you know they are not skilled very well and then they end to come out with an assignment that is not what the lecturer mark but I believe myself have been getting good grade because of my moderate skills in the use of CBT. (FG1:P2)"*

> *"For me, I will say that, in this school, my overall CBT level is very lowly skilled. Why did I say this, why I'm saying this that most of our courses especially the practical that we normally*

> *do, all those basic skills just because we are not expose to all to see computer equipment before we enter school. (FG2:P7)"*
>
> *"Going by what my fellow colleagues have said, mine is low. (FG3:P8)"*
>
> *"Some of the students don't have the facility. It is like some students don't have laptops, some don't have browsing phone, so they don't have access to the internet. (FG2:P5)"*

In the responses from the participants, the researcher observed that students found the use of Android phones and their personal laptops helpful, and they felt it increased their skills and their learning on campus. This is evident from the following quotes:

> *I would say that the students, my other colleagues, were very eager to lean with CBT tools because a lot of us has gotten our own personal laptops to help ourselves and a lot of us even if the school is not providing internet access, a lot of us have our modem, and data to browse and not even waiting for the school this time around. So, we are eager to learn with this technology. (FG2:P3)*
>
> *The CBT resources is not really fully but we students have gadgets that we use iPhone, our laptop systems. So, I think that solves it in the campus. (FG1:P3)*
>
> *Yes Ma! … my CBT skill level is moderate but developed on my personal laptop and self-training regular practice, this has been contributing to my academic performance. (FG2:P7)*

Conclusion

The level of skill in usage of CBT varied depending on student resources and initiative. Over 98% of students complained that they relied on their personal laptop, mobile phone, a cybercafé and their own data for internet connections whenever they needed to do their assignments or read outside the classroom.

This article also used qualitative data. These responses supported the quantitative analysis. In the responses, students revealed that they felt disempowered with regard to CBT usage. They felt that improved access and skill would improve their academic performance.

These results especially the qualitative responses of students explained their views regarding the challenges that undergraduate students in Nigerian universities face due to the unstable electricity and low internet bandwidth facilities on their campuses.

Recommendations

This research work has revealed some of the factors that positively or negatively affected the use of CBT and the CBT skill level of students on campus in selected Nigerian universities. Both quantitative and qualitative data shown that students are ready and eager to engage with CBT tools to enhance their learning. Based on the findings of this study and of the literature and researcher's experience in this area, the following recommendations were made:

1. Blended learning, which combines traditional and e-learning activities, allows students to augment their classroom-based learning at their own speed and from anywhere. This should be ingrained in all Nigerian universities' teaching and learning.

2. There is a need to expand capacity training for all lecturers in the universities in Nigeria so that they can learn new technology platform skills. This will enhance their teaching materials.

3. Subsidies from the government for CBT devices and facilities would also aid in the promotion of CBT and blended learning. All stakeholders, including university administration, lecturers student representative bodies, as well as potential ICT financing partners, should be included in government policy in this regard.

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