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Covid-19 and Virtual World: The Implications on Nigeria Education

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Abstract

Due to the sudden outbreak of Covid-19 since the first quarter of the year 2020, Nigerian education has not remained the same. Different stakeholders in the education sector have invested their idea in ensuring compliance with the paradigm shift brought about by the new normal. However, the mode of ICT infrastructures and other amenities in almost all the states in Nigeria that can support virtual academic activities is in hibernation. Critically examined in this paper are the roles played by the virtual methods as teaching and learning methodologies in Nigerian schools since Covid-19 outbreak. The paper thoroughly scanned the new normal global trends in virtual education and the important roles played by ICT. Responsive academic website design and adoption, adoption of blended teaching/learning model, and use of social networks among others were identified as best practices to adopt to secure a place for education in Nigeria in the face of the imminent change in teaching methodologies post Covid-19. Furthermore, the study considered perceived challenges both teachers and learners may be confronted with in deploying relevant ICT infrastructures geared towards transitioning from traditional to online provision of services in support of teaching and learning. The paper recommended dynamism in the method of teaching delivery, urgency in the acquisition of new skill sets by academics in Nigeria, while also calling on relevant stakeholders to provide adequate funding for academic institutions to be able to deploy relevant ICT infrastructures needed to adequately support teaching and learning in a virtual environment.

Keywords: *COVID-19, ICT, Nigeria, Stakeholders, Teaching and learning, Virtual education*

1. Introduction

On March 11, 2020, CoronaVIrus Disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO). This is not unconnected to the widespread infection brought about by the virus (Raut *et al.*, 2021) which led to the lockdown of all activities, businesses including indefinite closure of most of the physical schools all over the world (Smalley, 2020). Among the sectors that the lockdown had negative impact on the education sector. This created both

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psychological and emotional stress among the academics and the students (Sahu, 2020; and Cao *et al.*, 2020). In ensuring an uninterrupted discharge of academic duties by the teachers to the students and covering the syllabus as structured in the academic curriculum, online learning stands a good replacement to traditional learning method for timely dissemination of information to students on a regular basis. The sudden transformation from the conventional learning method to the online learning method for uninterruptible academic activities (Soni, 2020) was accomplished through the modernized technologies (McFarlane, 2019). Most of the countries, especially Nigeria were caught unprepared for this epidemic battle due to lack of technical-know-how and the attitude of the government policies towards technologies which would have been a greater tool to control the epidemic.

Ever since the outbreak of Covid-19, Nigerian education has not remained the same. Nigeria is a country on the coast of West Africa, bordered in south by the Bight of Benin and the Bight of Biafra (Bight of Bonny), both part of the Gulf of Guinea, by Niger in north, Benin in west, Cameroon in southeast, and by Chad in northeast by a boundary across Lake Chad. The nation shares maritime borders with Equatorial Guinea, Ghana, and São Tomé and Príncipe. With an area of 923,768 km² the country is more than three times the size of Italy or slightly more than twice the size of the US state California. Nigeria's main rivers are the Niger and the Benue River, its highest point is Chappal Waddi with 2,419 m (7,936 ft), located in Taraba State, near the border with Cameroon. The Federal Republic of Nigeria (its official name) has a population of 177.5 million people (UN est. 2014) making it Africa's most populous country. Capital city is Abuja located in the center of the nation, while Lagos is the primary port and largest city. Spoken languages are English (official), Hausa, Ibo, Yoruba, and others. Nigeria is divided into 36 administrative divisions (states) and one federal capital territory (Abuja).

Different stakeholders in the Nigeria education sector have invested their idea in ensuring compliance with the paradigm shift brought about by the new normal. However, the mode of ICT infrastructures and other amenities in almost all the states in Nigeria that can support virtual academic activities is in hibernation, and this is the only appropriate method for replacing the lost traditional method of teaching and learning processes (McFarlane, 2019; Prokopenko and Berezhna, 2020; and La Torre Castillo, 2021). Similarly, most of the educational institutions in Nigeria especially the private institutions at higher level adopted the paradigm shift by starting online teaching/learning which by and large becomes too difficult for them to sustain. Some of the difficulties are attributed to frustration in accessing and using the variety of online learning platforms by students; this negatively affected the quality of online learning. Moreover, for the professional courses like medicine, it was more difficult to acquire the necessary skills needed to become a qualified medical practitioner. Therefore, comprehensive online learning plans are required in order to proffer solution to these issues (Mintii, *et al.*, 2021). Different researches have been carried out and different technologies developed to overcome the online learning issues. However, this paper critically examines the roles played by the virtual methods as teaching and learning methodologies in Nigerian schools since the Covid-19 outbreak.

The paper thoroughly scanned the new normal global trends in virtual education and the important roles played by ICT. Responsive academic website design and adoption, adoption of blended teaching/learning model, and use of social networks among others were identified as best practices to adopt to secure a place for education in Nigeria in the face of the imminent change in teaching methodologies post Covid-19. Furthermore, the study considered perceived challenges both teachers and learners may be confronted with in deploying relevant ICT infrastructures geared towards transitioning from traditional to online provision of services in support of teaching and learning.

The paper recommended dynamism in the method of teaching delivery, urgency in the acquisition of new skill sets by academics in Nigeria, while also calling on relevant stakeholders to provide adequate funding for academic institutions to be able to deploy relevant ICT infrastructures needed to adequately support teaching and learning in a virtual environment.

2. Literature Review

Covid-19 outbreak started in Wuhan province of China sometime in December 2019. The ubiquitous nature of the virus makes it different from any ever-known virus and this greatly changed the way and manner in which people interact and carry out their daily activities. Most institutions of learning, organizations, sectors and business owners shifted to technology-based methods in order to mitigate the disruption of their daily activities by the epidemic outbreak. Although little or nothing could be done to control the negative impact of the outbreak on some organizations and institutions like the medical institutions where students' practical exposure to clinical specialties was limited and e-referral of patients was almost impossible (Ahmed *et al.*, 2020), responsive academic website design and adoption, adoption of blended

teaching/learning model, and use of social networks among others could be adopted as best practices to secure a place for education in Nigeria in the face of the imminent change in teaching methodologies post Covid-19 (Iwai, 2020).

2.1. Teaching/Learning Shifting Toward Virtual Reality/Online System During And After Covid-19 Pandemic

Several studies have evaluated the importance and role played by virtual technology in ensuring that people are kept connected via online platform to discharge their normal duties (Cook *et al.*, 2008). Moreover, in order to evaluate the worth of applying the virtual technology to remote education for online learning process, daily assessments have been undertaken (Voloshinov *et al.*, 2020). Elzainy *et al.* (2020) achieves 59% satisfaction towards online academic activities in their survey on online learning experience. Their findings reassure the success that would be recorded as more physical classrooms are beginning to shift towards virtual reality.

2.1.1. Virtual Reality/Online System Components

In (Bello *et al.*, 2018), computerized learning systems were referred to as electronic educational technology, e-learning, Learning Platform (LP) or Learning Management System (LMS). The major difference is that Virtual Learning Environment (VLE) and LMS are applications, whereas, the learning platform shares characteristics with an Operating System (OS) where different educational web-based applications can be run on the platform. The term VLE and LP are generically used to describe a range of integrated web-based applications that provide teachers, learners, parents and others involved in education with information, tools and resources to support and enhance educational delivery and management. These terms are broadly synonymous with Managed Learning Environment (MLE). The application that form part of these online services can include web pages, email, message boards and discussion forum, text and video conferencing, shared diaries, online social areas, as well as assessment, management and tracking tools (Olubummo *et al.*, 2019; and Posey *et al.*, 2012).

The term Learning Platform (LP) refers to a range of tools and services often described using terms such as educational extranet, VLE, LMS, ILMS and Learning Content Management System (LCMS) providing learning and content management. The term learning platform also includes the Personal Learning Environment (PLE) or Personal Online Learning Space (POLS), including tools and systems that allow the development and management of electronic portfolios. Related concepts of LMS include Content Management System (CMS), which properly refers to the organization of the educational or other content, not the overall environment; LCMS, which is more often used for corporate training systems than for systems in education institutions; and MLE, which normally refers to the overall infrastructure in an institution of which VLE is a component.

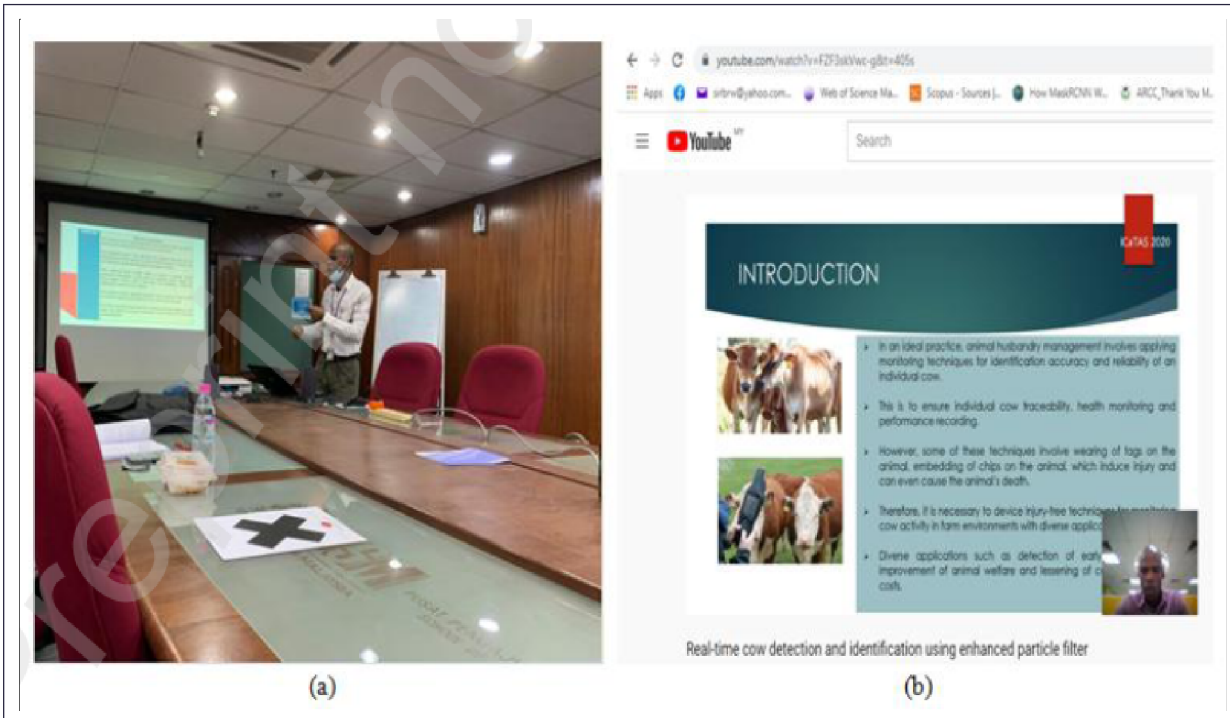

Figure 1: Teaching and Learning Using (a) Virtual Reality Technology; and (b) Online System (Bello *et al.*, 2021)

2.1.2. Blended Learning Via Virtual Reality/Online System

In educational technology, blended learning can be compared to VLE; a web-based platform for the digital aspects of courses of study, usually within educational institutions as shown in Figure 1.

According to Husain (2012), VLE platforms commonly allows (1) content management for creation, storage, access to and use of learning resources; (2) curriculum mapping and planning for lesson planning, assessment and personalization of the learning experience; (3) learner engagement and administration for managing access to learner information and resources and tracking of progress and achievement; and (4) real-time communication for live video conferencing or audio conferencing. According to Bersin (2004), training that is technology-based emerged as a substitute to instructor-led training in the 1960s on mainframes and mini-computers. Scale is one of the major advantages that blended learning offers, while on the contrary, one instructor can only teach so many people in the traditional method. PLATO, acronym for Programmed Logic for Automatic Teaching Operations is a system developed by the University of Illinois and Control Data with the history of innovations and coursework offering from elementary to the college level (Rising, 2003).

Due to a number of interface limitations, mainframe-based training gave way to satellite-based live video in the 1970s. The live video was to the advantage of the people who were not computer literate. But to make the live video functional, it involved huge capital; this became the major challenge confronting alternative technology. According to Coach Resources (2012), in the early 1990s, CD-ROM became the choice of everyone as a better replacement to the earlier methods of providing technology-based learning as bandwidth through 56k modems were not able to support very high quality sound and video. Tracking coursework that is completed was not that easy for CD-ROM, and this became a serious limitation on its part, so learning management system emerged as a replacement to CD-ROM in order to facilitate coursework progress tracking. The aviation industry applied the use of learning management system heavily to track (1) performances on courses; (2) how much time spent; and (3) where someone left off. CD-ROM was used by Boeing Aviation Company to provide training for personnel as approved by AICC, acronym for Aviation Industry Computer-Based Training Committee that was formed in 1988. Modern blended learning is delivered online; (Coach Resources, 2012) opined that CD-ROM could feasibly still be used if a learning management system meets an institution's standards.

According to Coach Resources (2012), some examples of channels through which online blending learning can be delivered include webcasting (synchronous and asynchronous) and online video (live and recorded). Solutions such as Khan Academy have been used in classrooms to serve as platforms for blended learning (Coach Resources, 2012) . Virtual learning environment is a term that is synonymous to management learning environment; whereas, management learning environment is synonymous to learning management system. Although, individual learning technology mentioned so far look discrete but, in actual fact, they are homogenously related (Bello *et al.*, 2018) . A VLE is normally not designed for a specific course or subject, but is capable of supporting multiple courses over the full range of the academic program, giving a consistent interface within the institution and to some degree with other institutions using the system. The VLE supports an exchange of information between a user and the learning institute he or she is currently enrolled in through digital mediums like e-mail, chat rooms, web 2.0 sites or a forum, thereby helping convey information to any part of the world with just a single click (Garrison and Kanuka, 2004). According to Bello *et al.* (2018), one of the processes to enhance the learning experience was the virtual resource room, which is student centered, works in a self-paced format, and which encourage students to take responsibility for their own learning. In virtual mode, the materials are available in the form of computer aided learning program, lecture notes, special self-assessment module.

2.1.3. Cyber Tutor

Another mechanism for student-to-student interaction in a form of simple discussion forum is by using a novel link cyber tutor. This allows the students with an e-mail account to connect with course content and the staff with their doubts and related questions. The students are able to contact the staff without a face-to-face visit which saves the on-campus time. The staff remains anonymous which allows for the several staff to act as a cyber tutor during the course. The students do not remain anonymous although their e-mail addresses are cryptic enough to mask their identity. Students can discuss about the exams, lab reports, posters, lectures and technical help with downloading materials. The evaluation of the use of virtual resource room is done by surveys, focus groups and online feedback forms. However, with the number of LMS-based online learning activities, there is a significant failure rate of LMS in some developing countries (Zaharias and Pappas, 2016; and Al-Samarraie *et al.*, 2018). In order to surmount the failure rate, provision must be made for widespread utilization of both virtual reality and online teaching/learning platforms (Kaini and Motie, 2021; Volles, 2016; and Yoon *et al.*, 2017).

Furthermore, some researchers like Shahid *et al.* (2021) and Cheng *et al.* (2021) have presented the views of the university students on online education in the course of the Covid-19 pandemic. Their results have shown that students

especially, medical students were satisfied with the online teaching and e-learning platforms provided as substitute to the conventional face-to-face platform although with 36.2% having interest in online theoretical sessions and 24.8% having interest in conventional face-to-face sessions in anatomy education. For most life science subjects like medicine that involves both physical and clinical practices, a student offering those courses needs technology that can fill any gap that may exist between the two practices for practical knowledge (Volodymyrovych *et al.*, 2021), this gap is what virtual reality has been developed to fill.

Live streaming, according to Goh and Sandars (2020) has been an effective medium of conveying academic activities to the students who have been restricted on the face-to-face method, and it can enhance the technical skills of the educators and improve interactions among the participating individuals through the audio/video accessories (McCoy *et al.*, 2015; and Ching and Hsu, 2015). As ICT is a requirement for achieving a successful collaborative online teaching/learning (McCoy *et al.*, 2015; and Kolbaek, 2018), there is a need for expertise in that domain.

3. Materials and Methods

The empirical data of 380 students used for this study was acquired from few selected universities in Nigeria through Google surveys (forms) using cross-sectional survey method. The conducted research via the Google form was performed and analyzed by quantitative approach with the links shared to the student using Telegram app.

3.1. Instrument Development and Data Collection

A five-point Likert scale-based structured questionnaire was used for the evaluation of the virtual reality and online teaching/learning system. The questionnaire was divided into 15 questions with five options, namely: (1) Agree (A); (2) Strongly Agree (SA); (3) Disagree (D); (4) Strongly Disagree (SD); and (5) Neither Agree Nor Disagree (NAND). The 15 questions of the questionnaire were structured accordingly to contain the most relevant questions like demographic profiles.

Table 1: Demographic Profiles of Respondents (N = 380)

Respondents	Frequency	Percentage
Gender		
Male	116	30.53
Female	264	69.47
Age Group (Years)		
Less than 20	28	7.37
21-30	292	76.84
31-40	41	10.79
More than 41	19	5
Experience Using the Virtual Reality and Online Teaching/Learning System (Years)		
<1	40	10.53
>1≤2	201	52.89
>2≥3	139	36.58

For data sampling, convenience data sampling technique was employed. The statistics recorded for participating students in the survey based on academic level were 76 postgraduate students (20%) and 304 undergraduate students (80%) with total number of 380 students (100%). The survey was conducted in December 2020. The perception of the user's acceptance as adopted from (McGill *et al.*, 2003; and Rai *et al.*, 2002) for the questionnaire items containing the collected data from the participants were used in measuring the acceptability of the virtual reality technology as a replacement of the face-to-face teaching/learning system. Table 1 shows the demographic profiles of respondents.

4. Results

From the 380 participants comprising 76 postgraduate students and 304 undergraduate students across the entire selected region, majority of the students consented to participate in this study were medical students in their clinical years with only 1/3 of them filling the feedback questionnaire. Due to discouraging turnout from other participating disciplines, this study concentrated more on medical students. We believe the reason behind this is not far from the fact that medical students were the most affected group among all the academic disciplines during the Covid-19 pandemic.

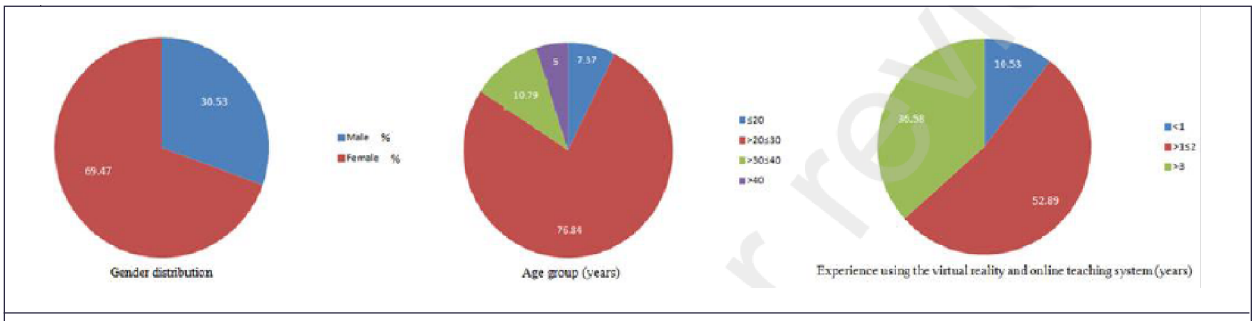

Figure 2: Demographic Profiles of Respondents

4.1. Analysis of Demographic Profiles of Respondents

Figure 2 shows the pie chart analysis of the demographic profiles of the 'gender' factor where the female participants recorded response rate of 69.47% which was higher than the 30.53% recorded for the male participants. Likewise, higher percentage was recorded for the age group of respondents between 21-30 years. Also, regarding the "experience using the virtual reality and online teaching/learning system," participating students with 1 to 2 years experience had highest frequency and percentage.

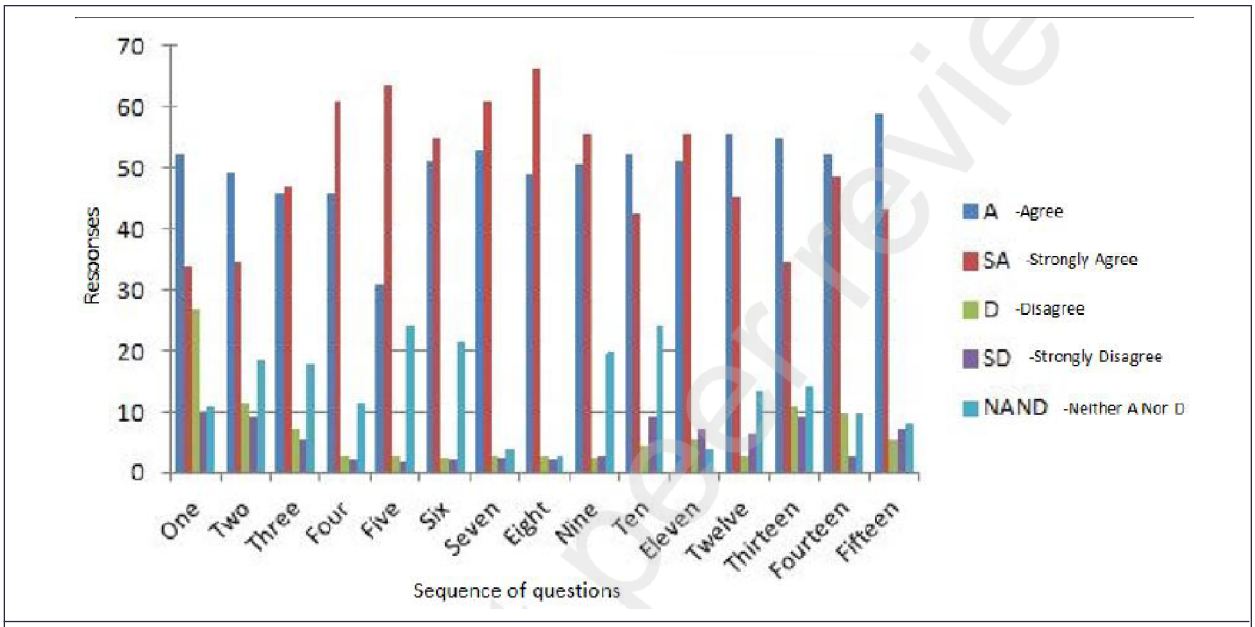

Figure 3: Chart Showing Responses (%) From the Questionnaire on Virtual Reality and Online Teaching/ Learning System During the Covid-19 Pandemic

4.2. Analysis of Responses from Respondents

Figure 3 shows the responses (in percentage) from the questionnaire on virtual reality and online teaching/learning system during the Covid-19 pandemic. The results demonstrated acceptability of virtual reality and online teaching/ learning system. Results analyses of the five-point Likert scale-based structured questionnaire used for the evaluation of the 15 questions raised on virtual reality and online teaching/learning system as shown in Figure 3 are presented in the subsections below.

4.2.1. Analysis of Responses to Questions One to Three

Whether virtual reality and online teaching/learning system were built with user-friendly interface was the first question on the survey list in which 52.21% students ticked A and 33.78% ticked SA with the question. However, 26.77% students ticked D, 9.87% ticked SD, and 10.87% ticked NAND with the same question. The second question demanded response to whether virtual reality and online teaching/learning system really worth substituting for the deposed face-to-face teaching and learning methods due to Covid-19 pandemic. 49.57% students ticked A, and 34.66% ticked SA with the question. On the other hand, 11.63% students ticked D, 8.99% ticked SD, and 18.64% ticked NAND with the same question. The third question was interested in knowing if the whole time was dedicated to the educational activities only in the course of virtual reality and online teaching/learning. 46% students ticked A, 46.94% ticked SA, 7.24% ticked D, 5.49% ticked SD, and 17.77% ticked NAND with the question.

4.2.2. Analysis of Responses to Questions Four to Six

Whether both practical and theoretical knowledge were achieved and normal interaction between students and teachers in real-time was maintained via the use of virtual reality and online teaching/learning system for the overall learning objectives were the questions raised in 4, 5 and 6. A and SA recorded impressive response with 45.96% students ticked A, 60.98% ticked SA, 2.85% ticked D, 1.98% ticked SD, and 11.63% ticked NAND in response to question 4. In response to question 5, 30.92% students ticked A, 63.61% ticked SA, 2.85% ticked D, 1.89% ticked SD, and 24.14% ticked NAND. In response to question 6 on learning objectives, 51.33% students ticked A, 54.84% ticked SA, 2.58% ticked D, 1.98% ticked SD, and 21.5% ticked NAND.

4.2.3. Analysis of Responses to Questions Seven to Nine

Questions on whether virtual reality technology and online teaching/learning system aid sustainability of pre-vocational training and development of individual zeal for learning and vice-versa are the important question asked in questions 7-9. In response to question 7, 52.89% students ticked A, 60.98% ticked SA, 2.85% ticked D, 2.58% ticked SD, and 3.73% ticked NAND. 49.57% students ticked A, 66.24% ticked SA, 2.85% ticked D, 1.98% ticked SD, and 2.85% ticked NAND in response to question 8. In response to question 9 on whether development of individual zeal for learning aids virtual reality and online teaching/learning, 50.45% students ticked A, 55.71% ticked SA, 2.58% ticked D, 2.89% ticked SD, and 20.63% ticked NAND.

4.2.4. Analysis of Responses to Questions Ten to Eleven

Likewise, questions 10 and 11 dwelled on whether virtual reality and online teaching/learning system encourage critical thinking and computer literacy and can be used as true test for assessing the knowledge of students. 52.21% students ticked A, 42.56% ticked SA, 4.61% ticked D, 8.99% ticked SD, and 24.14% ticked NAND in response to question 10. Question 11 received reasonable response with 51.33% students ticked A, 55.71% ticked SA, 5.49% ticked D, 7.24% ticked SD, and 3.73% ticked NAND.

4.2.5. Analysis of Responses to Questions Twelve and Thirteen

Questions 12 and 13 tried to know whether there was fairness in workload management and self-study/education during virtual reality and online teaching/learning compared to face-to-face method. 55.71% students ticked A, 45.19% ticked SA, 2.85% ticked D, 6.36% ticked SD, and 13.38% ticked NAND in response to question 12. In response to question 13 on whether virtual reality and online teaching/learning system contribute to self-study/education due to movement control/social distance order that was in place during Covid-19 pandemic, 54.84% students ticked A, 34.66% ticked SA, 10.75% ticked D, 8.99% ticked SD, and 14.26% ticked NAND with the question.

4.2.6. Analysis of Responses to Questions Fourteen and Fifteen

Finally, questions 14 and 15 demanded response to the flexibility provided by virtual reality and online teaching/learning system and whether teachers have the expertise in using them. 52.21% students ticked A, 48.7% ticked SA, 9.87% ticked D, 2.85% ticked SD, and 9.87% ticked NAND in response to question 14. Response to the last question 15 had 59.22% students ticked A, 43.34% ticked SA, 5.49% ticked D, 7.24% ticked SD, and 8.12% ticked NAND.

5. Discussion

The government of Nigeria in order to control the Covid-19 pandemic took some measures which included restrictions on travels and social gathering. This inevitably disrupted students' academic life and undoubtedly has a major impact on the academic growth of students [38] and resulted in unnecessary extension of academic calendar, although, with privileged schools using distant/remote learning methods (Kwok *etal.*, 2020).

Meanwhile, studies have demonstrated why most schools like medical colleges went on compulsory holiday during the Covid-19 pandemic and the psychic trauma on the students, which can be attributed to stress and worry, among others (Mei *etal.*, 2011). The primary goal of this study was to critically examine the roles played by the virtual methods as teaching and learning methodologies in Nigerian schools most especially in medical colleges since the Covid-19 outbreak. The paper thoroughly scanned the new normal global trends in virtual education and the important roles played by ICT. The study evaluates the significance of modern technology of virtual reality and online teaching/ learning in delivery professional courses that involve specialized training as it was recognized in some reports like Horizon 2020 teaching and learning report. This study revealed many added advantages in using online teaching platform by the teachers, whereby more ICT knowledge was gained for the overall benefit of their students.

This survey used a five-point Likert scale-based structured questionnaire for the evaluation of the virtual reality and online teaching/learning system. From the 380 participants comprising 76 postgraduate students and 304 undergraduate students across the entire selected region, majority of the students consented to participate in this study were medical students in their clinical years with only 1/3 of them filling the feedback questionnaire. A pie chart analysis of the demographic profiles of all the respondents shows the 'gender' factor where the female participants recorded response rate of 69.47% which was higher than the 30.53% recorded for the male participants. Likewise, higher percentage was recorded for the age group of respondents between 21-30 years. Also, regarding the "experience using the virtual reality and online teaching/learning system," participating students with 1 to 2 years experience had highest frequency and percentage. Comparatively, the findings in this study are similar to what was reported in Al-Balas *et al.* (2020)

Analysis of responses from respondents was divided into six with analysis of response to question one of the first three questions dwelling on knowing whether virtual reality and online teaching/learning system were built with user-friendly interface. Results of the first question showed that 52.21% students agreed with the question and 33.78% strongly agreed with the question. Notwithstanding, 26.77% of the students disagreed, 9.87% strongly disagreed, and 10.87% neither agreed nor disagreed with the same question. The second question demanded response to whether virtual reality and online teaching/learning system really worth substituting for the deposed face-to-face teaching and learning methods due to Covid-19 pandemic. 49.57% of the students agreed with the question, and 34.66% strongly agreed. On the other hand, 11.63% of the students disagreed, 8.99% strongly disagreed, and 18.64% neither agreed nor disagreed with the same question. The third question was interested in knowing if the whole time was dedicated to the educational activities only in the course of virtual reality and online teaching/learning. 46% of the students agreed with the question, 46.94% strongly agreed, 7.24% disagreed, 5.49% strongly disagreed, and 17.77% neither agreed nor disagreed with the question. Comparatively, the findings in this study are similar to what was reported in Dhawan (2020).

Whether both practical and theoretical knowledge were achieved and normal interaction between students and teachers in real-time was maintained via the use of virtual reality and online teaching/learning system for the overall learning objectives were the questions raised in 4, 5 and 6. Agreed and strongly agreed recorded impressive response with 45.96% of the students agreed with the question, 60.98% strongly agreed, 2.85% disagreed, 1.98% strongly disagreed, and 11.63% neither agreed nor disagreed in response to question 4. In response to question 5, 30.92% of the students agreed, 63.61% strongly agreed, 2.85% disagreed, 1.89% strongly disagreed, and 24.14% neither agreed nor disagreed. In response to question 6 on learning objectives, 51.33% of the students agreed with the question, 54.84% strongly agreed, 2.58% disagreed, 1.98% strongly disagreed, and 21.5% neither agreed nor disagreed. Comparatively, the findings in this study are similar to what was reported in Eldokhny and Drwish (2021).

Whether virtual reality technology and online teaching/learning aid sustainability of pre-vocational training and development of individual zeal for learning and vice-versa are the important question asked in questions 7-9. In response to question 7, 52.89% of the students agreed with the question, 60.98% strongly agreed, 2.85% disagreed, 2.58% strongly disagreed, and 3.73% neither agreed nor disagreed. 49.57% of the students agreed with the question, 66.24% strongly agreed, 2.85% disagreed, 1.98% strongly disagreed, and 2.85% neither agreed nor disagreed in response to question 8. In response to question 9 on whether development of individual zeal for learning aids virtual reality and online teaching/learning, 50.45% of the students agreed with the question, 55.71% strongly agreed, 2.58% disagreed, 2.89% strongly disagreed, and 20.63% neither agreed nor disagree with the question. Comparatively, the findings in this study are similar to what was reported in Fatani (2020).

Likewise, questions 10 and 11 dwelled on whether virtual reality and online teaching/learning encourage critical thinking and computer literacy and can be used as true test for assessing the knowledge of students. 52.21% of the students agreed with the question, 42.56% strongly agreed, 4.61% disagreed, 8.99% strongly disagreed, and 24.14% neither agreed nor disagreed in response to question 10. Question 11 received reasonable responses with 51.33% of the students agreed with the question, 55.71% strongly agreed, 5.49% disagreed, 7.24% strongly disagreed, and 3.73%

neither agreed nor disagreed with the question. Comparatively, the findings in this study are similar to what was reported in Fatani (2020)..

Questions 12 and 13 tried to know whether there was fairness in workload management and self-study/education during virtual reality and online teaching/learning compared to face-to-face method. Reasonable feedbacks were received from the students with 55.71% of them agreed with the question, 45.19% strongly agreed, 2.85% disagreed, 6.36% strongly disagreed, and 13.38% neither agreed nor disagreed in response to question 12. In response to question 13 on whether virtual reality and online teaching/learning contribute to self-study/education due to movement control/social distance order that was in place during Covid-19 pandemic, 54.84% of the students agreed, 34.66% strongly agreed, 10.75% disagreed, 8.99% strongly disagreed, and 14.26% neither agreed nor disagreed with the question. Comparatively, the findings in this study are similar to what was reported in Fatani (2020)..

Finally, whether there is provision for flexibility by virtual reality and online teaching/learning system and whether teachers have the expertise in using them were the questions raised in 14 and 15. While 52.21% of the students agreed with the question, 48.7% strongly agreed, 9.87% disagreed, 2.85% strongly disagreed, and 9.87% neither agreed nor disagreed in response to question 14. Response to the last question 15 had 59.22% of the students agreed with the question, 43.34% strongly agreed, 5.49% disagreed, 7.24% strongly disagreed, and 8.12% neither agreed nor disagreed with the question. Comparatively, the findings in this study are similar to what was reported in Firmansyah *etal.* (202).

6. Conclusion and Recommendations

This paper has presented virtual reality technology and online teaching/learning system as alternative to face-to-face lessons for both teachers and students in Nigerian schools during Covid-19 and post Covid-19 pandemic. A five-point Likert scale-based structured questionnaire was used for the evaluation of the virtual reality and online teaching/learning system with selection of few schools majorly the medical colleges. By using the virtual reality and online teaching/learning system, there was a great compensation for the period the physical teaching and learning were interrupted by the Covid-19 pandemic resulting into uninterrupted educational activities and practical skills development. Virtual reality technology and online teaching/learning system are imperative for continuous academic and stabilized system of education in Nigeria. In conclusion, the highly contagious Covid-19's Delta variant is hitting many sectors in the world with higher death tolls and cases. The pandemic will continue to pose downside risks to the global outlook although there are nascent signs of growth.

Based on the conclusion reached in this study, the paper recommended dynamism in the method of teaching delivery, urgency in the acquisition of new skill sets by academics in Nigeria, while also calling on relevant stakeholders to provide adequate funding for academic institutions to be able to deploy relevant ICT infrastructures needed to adequately support teaching and learning in a virtual reality environment. Nigeria as a nation should develop virtual reality education, internet and mobile learning pedagogies. Training of teachers on how to use digital teaching methods and provision of education access to the less privileged Nigerian students in situations where face-to-face lessons are affected by the Covid-19 pandemic is also recommended.

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