



ICT ADOPTION AND EFFECTS ON TEACHING AND LEARNING IN POST COVID-19, NIGERIA

Duru Juliet Chinenye
Abia State University
Uturu, Nigeria

Ebere Uchenna Stanley
Imo State University, Owerri,
Nigeria,

Okezie Maduabughichi Divine
Abia state Polytechnic, Aba, Nigeria

Abstract: With the Covid-19 pandemic and its attendant devastating effects that have hampered every aspect of human existence; it becomes pertinent on the government, stakeholders, and the academia to invigorate possible measures to mitigate the impact of the pandemic as it relates to teaching and learning; considering curtailing measures of the pandemic that restricted human contacts and social gatherings; hence the adoption of ICT by schools for teaching and learning. This is what necessitated this study, to ascertain the effect of ICT adoption in Nigerian schools in the post Covid-19 era. The study explored the purposive sampling technique of data collection. A well-structured questionnaire was distributed to 250 students and 50 lecturers, selected from 5 chosen private universities in South-East Nigeria. The reliability of the instrument was determined using the Cronbach's Alpha coefficient. The study applied the mean, standard deviation, and the Pearson's Correlation for data Analysis. The result revealed that ICT adoption has a significant positive effect on effective teaching and learning through the provision of various ICT tools in the post Covid-19 era in Nigeria; significant positive effect in mitigating the problems of Students-Teacher ratio (mostly in overcrowded classes), and also a significant positive effect in influencing teacher subject-matter mastery and lesson preparedness. In furtherance, the result revealed that ICT adoption in schools has no significant effect on effective classroom management (through internal learning distractors' mitigation), and also no significant effect on education affordability (through cost implication reduction). The study concluded that ICT adoption in schools, on the average, will influence effective teaching and learning in the post Covid-19 Nigeria to a high extent, and recommended among others the need for curriculum review by the Nigerian Government for ICT inclusion, to achieve

effective teaching and learning in schools in the post Covid-19 Nigeria.

Keywords: Education, Effective teaching and learning, ICT Adoption.

I. INTRODUCTION

With the spread of the pandemic; practically all regions carried out lockdowns, closing down activities that require human social affair and cooperation - including schools, shopping centers, sanctuaries, workplaces, air terminals, and rail route stations. From the educational sector, the COVID-19 pandemic made the biggest interruption of training frameworks ever, influencing almost 1.6 billion students in excess of 190 nations and all continents. Terminations of schools and other learning spaces affected 94% of the world's student populace, up to 99 percent in low and lower-middle earning nations. (United Nations, 2020).

To support the human social nature, and for individuals to stay informed concerning the current real factors as they advanced; individuals depended on information and communication technology (ICT), as a panacea to social activities upset by the pandemic. The lockdown brought about the vast majority taking to the web and web based administrations to learn, instruct, convey, collaborate, and proceed with their work liabilities from the solace of their homes. The lockdowns across nations give rise to a gush in the utilization of information and communication technology with enormous changes in usage pattern and usage behaviour. Both students, instructors and employees are acclimating to new "normal" - with teaching and learning going totally online (Rahul et al., 2020).

There is a surge in internet services utilization from 40% to 100 %, contrasted with pre-lockdown levels. Video-conferencing administrations like Zoom have seen a ten times expansion in utilization, and content conveyance administrations like Akamai have seen a 30% increment in



content use. Urban areas like Bangalore have seen a 100 % expansion in web traffic (Branscombe 2020). Information and communication technology (ICT) is perhaps the main thrust advancing financial development in the economy; and have discovered its convenience and effect in the different areas of the economy, the educational sector inclusive. The best of this expediency became pertinent as the pandemic prompted unexpected stoppage of social activities; resulting to the resort to ICT as a bridge-builder to mitigating some of the impacts of the pandemic as it affects teaching and learning.

ICT is a varied utilization of computing, communication, media transmission and satellite innovation (Yusuf, 2000). The information retrieved through digital technologies can advance development, increment usefulness and advance the nature of lives. ICT is promptly helpful in the areas of agriculture, designing, medication, law, engineering, avionics, business, insurance, banking and finances as well as maritime activities. ICT can possibly add to considerable enhancements in the educational system (Moursund, 2005). Globally, Information and Communication Technology (ICT) is viewed as an indispensable vehicle for expediting educational reforms and development; a platform for correspondence, and as a way to accomplish the Sustainable Development Goal Four (SDG 4). Since the enactment of the No Child Left Behind Act (NCLB) and assertion of the SDG 4, numerous nations have picked to accept the long lasting education for all by incorporating ICT in educating and learning at all school levels. ICT can be utilized in education as detailed: Supporting conventional classroom work, helping in the plan and improvement of learning materials; getting to electronic instructive materials like books, journals, virtual library, assuming a critical part in educational administration; Students' data, personnel administration, purchasing and supplies, advertisement, facilitating independent study and individual instruction especially on the open distance-learning programme and assisting the teacher in assessment and testing (Lopez, 2003).

As posted by Munoz (2002) research information accessible have shown that ICT in the schools:

- Allows participation and collective work between instructors, researchers, and academic institutions
- Gives admittance to an assortment of information sources, structures and types accordingly reducing the burden of teachers to make notes.
- Makes learning more student-centered, problem centered and request based, creating basic, intelligent, and imaginative reasoning
- Changes the jobs of educators to mentors, facilitators, and tutors
- Offers freedom to learn at all time and from anyplace.
- Reduces overcrowded classrooms
- Increases number of students admission (whenever used for distance education)

- Allows for simple and quick correspondence among students and teachers
- Increased multicultural mindfulness. Technology enhances the teachers' ability to instruct "genuine version of multicultural education", Munoz(2000) concluded.

The National Policy on Education (2014), states the Nigerian philosophy of education; and holds that: Education is an instrument for national development, to this end, the formulation of ideas, their integration for National development, and the interaction of personal and ideas are all aspect of education. Education foster the work and development of the individual, for each individuals seeks and for the general development of the society. Every Nigeria child shall have a right to equal educational opportunity, irrespective of any real or imagined disabilities each according to his or her ability. Education is to be qualitative, comprehensive functional and relevant to the needs of the society. Education can happen in formal or informal environments and any experience that formatively affects the way one thinks, feels, or acts might be considered educational. The methodology of teaching is called pedagogy.

Technology could be the answer to make learning more comprehensive. For instance, digital learning materials can be effectively translated to ones dialects. Universal Design for learning approaches could likewise be embraced to create designs that are open to kids with incapacities, for example, digital books with gesture based communication or sound helped perusing (Baishakhi and Kamal, 2016). Information and Communications Technology (ICT) can impact student learning when teachers are digitally literate and understand how to integrate it into curriculum.

Schools use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information (Blurton, 2000). In some contexts, ICT has also become integral to the teaching-learning interaction, through such approaches as replacing chalkboards with interactive digital whiteboards, using students' own smartphones or other devices for learning during class time, and the "flipped classroom" model where students watch lectures at home on the computer and use classroom time for more interactive exercises.

When teachers are digitally literate and trained to use ICT, these approaches can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace (Goodwin, 2012).

ICT issues planners must consider include: considering the total cost-benefit equation, supplying and maintaining the requisite infrastructure, and ensuring investments are matched with teacher support and other policies aimed at effective ICT use (Enyedy, 2014).



A thought of the impacts, advantages and uses of ICT adoption in education for effective teaching and learning can't completely be valued disregarding the cost implications of utilizing such devices and services, versus the conventional classroom teaching and learning settings. Issues identified with infrastructure and program design can determine achievement, however the best deterrent to extending utilization of ICT in Africa is the associated cost of such technology (Murphy, et al., 2002). Also, Williams (2000) claims that costs are the absolute most significant restricting variable being used of suitable technology for learning. Setting up the right technology to help learning, as opposed to making learning work around technology, will empower schools to accomplish a more significant level of ICT conveyance and backing while at the same time minimizing expenses. Additionally, by moving to the cloud and being 'server-free' schools can save money, increase adaptability and further develop cooperation between teachers, students and office staff. Google's G Suite for Education and Microsoft's Office 365 are both free and have comparative capabilities which are routinely updated. Both can be handily coordinated with existing nearby technology and schools will not have to buy equipment to host server. We have the chance to move away from a model of the school of the last century and reconsider the school of the future. In this school, learning will happen not just in the classrooms. Teachers would know how to utilize technology and instruct in an unexpected way. Children would be open to utilizing technology to learn and address present and future challenges, among others. This is what this study tries to address, having observed teaching and learning in most of our schools/institutions during the covid-19, and how the introduction and application of ICT to teaching and learning proffered solutions to some pertinent issues that are evident in our normal classroom settings during teaching and learning. Available studies on the effects of the adoption of ICT on education – teaching and learning focused mainly on the availability and accessibility of ICT services to schools and institutions and possibly to the end users – teachers and students. They failed to look into critical issues that have affected teaching and learning which the adoption of ICT by schools and institutions during the Covid-19 pandemic has created a window to, as it proffered a solution to some of these challenges that have impeded teaching and learning in our schools. It is these gaps that this study tries to fill, among others.

MOTIVATION FOR THE STUDY

Observations during the Covid-19 lockdown of schools/institutions leading to various government rolling out radio and television school programs to cover the curriculum; and the adoption of various ICT tools by schools and institutions for teaching and learning, and how this adoption within this period addressed some pertinent issues evident in our schools like student – teacher ratios

(mostly in overcrowded classes), effective classroom management (as impending factors to effective classroom management by way of mitigating internal learning distractors) among others, have motivated this study to see how the adoption and sustainability of ICT in our schools will impact teaching and learning in the post Covid-19 era in Nigeria.

OBJECTIVES OF THE STUDY

The main objective of this study is to analyze the effect of the adoption of ICT for teaching and learning on the Nigerian educational sector in the post Covid-19 era. Other specific objectives include:

1. To determine the extent to which ICT adoption, through the provision of various ICT tools will affect effective teaching and learning in the post Covid-19 era in Nigeria.
2. To ascertain the extent to which ICT adoption will mitigate the problem of students' to teachers' ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria.
3. To find out how ICT adoption will affect effective classroom management (through internal learning distractors' mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria.
4. To determine how ICT adoption will influence teacher subject-matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria.
5. To ascertain the effect of ICT adoption on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria.

RESEARCH QUESTIONS

The following questions were raised and they served as a guide to this study.

1. To what extent will ICT adoption, through the provision of various ICT tools affect effective teaching and learning in the post Covid-19 era in Nigeria?
2. To what extent will ICT adoption mitigate the problem of students - teacher ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria?
3. To what extent will ICT adoption affect effective classroom management (through internal learning distractors' mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria?
4. To what extent will ICT adoption influence teacher subject-matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria?
5. What effect has ICT adoption on education affordability through cost implication reduction for



effective teaching and learning in the post Covid-19 era in Nigeria?

Hypotheses

The following are the research hypotheses for the study, and they are formulated in the null form.

Ho₁: ICT adoption has no significant effect on effective teaching and learning, through the provision of various ICT tools, in the post Covid-19 era in Nigeria.

Ho₂: ICT adoption has no significant effect in mitigating the problem of students - teacher ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria.

Ho₃: ICT adoption has no significant effect on effective classroom management (through internal learning distractors' mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria.

Ho₄: ICT adoption has no significant effect in influencing teacher subject-matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria.

Ho₅: ICT adoption has no significant effect on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria.

II. LITERATURE REVIEW

Empirical literatures on the subject matter include the study of Opira (2010), who investigated the effect of ICT on students' learning by taking the case of Gulu University. The study sought to establish the relationship between ICT and students' learning, particularly looking at the availability, accessibility and user-ability of the ICT resources in the Institute. The study established that the availability of ICT resources in the University was still very much wanting and very inadequate for the students to use. The researcher concluded that availability, accessibility and user-ability of ICT resources significantly affect students learning in Gulu University, and recommends that there is need for the University to invest more in computers and related technologies. Basir, Alandejani and Almadani (2018) studied ICT adoption impact and students' academic performance: Evidence from Saudi Universities. This study investigated and explored the adoption of information communication technology by the universities and the impact it makes on the university students' academic performance. The study also examined the moderators' effect of gender, GPA, and student majors on the relationship between ICT and academic achievement. Structure equation modelling was chosen to determine the validity of the research model. The Analysis of Moment Structures (AMOS), specially used for structural equation modelling and path analysis, was used as the research tool. The findings reveal that there exists a relationship between ICT adoption and academic performance in a conservative environment. An additional finding also stated that ICT adoption resulted in the improvement of the performance of

female students more than the male. However, students' IT major was found to be making no impact on students' academic achievement. Also, Yusuf et al (2013) studied the gap and challenges facing the use of ICT that facilitates knowledge acquisition within and beyond the classroom. The study is a descriptive survey that assessed five universities for the most urgent solution. The population of the study was 120 respondents and this is made up of university lecturers and the students. Findings revealed that there is a gap between the university teachers and students and ICT usage in classrooms and many university lecturers and students have to go to commercial cyber cafés in town before they have access to a computer that is internet connected, teachers are faced with some challenges and barriers of availability of facilities which prevent them to employ ICT in the classroom, the solutions proffered include funding, provision of facilities and technical expertise in Nigeria.

III. DATA AND METHODOLOGY

This study was conducted in South-East Nigeria, namely Abia, Imo, Anambra, Enugu and Ebonyi States. Five private tertiary institutions were purposefully selected for the study in the proportion of one institution from each state. Private universities were found to have resorted to e-learning during the Covid-19 lockdown. To achieve the objectives of the study, a well-structured questionnaire was used to elicit information from the respondents selected through purposive sampling technique. The questionnaire was divided into two sections. Section 1 sought for information on bio-data of the respondents such as age, sex, level of education, gender and marital status. The second section contained questions relating to respondents perception on the role of ICT in enhancing their academic performance and the challenges confronting them in the use of Information and Communication Technology (ICT). Each of the explanatory variables was developed in a cluster of five questions each. Two hundred and fifty (250) students and fifty (50) lecturers were selected as sample for the study. The researchers employed the use of Research Assistants, who are lecturers in the selected schools, to administer the questionnaires and to offer necessary guidance to the respondents in areas of difficulty during the process of questionnaire administration.

The responses were scored on the five (5) points Likert Scale/weighting (Strongly agreed=5, Agreed=4, Neutral =3, Disagreed =2, Strongly disagreed=1). A simple percentage and T-test statistical tools were used to elicit answers for the research questions and test the hypotheses at 0.05 level of significance. The test-retest-reliability coefficient of 0.86 was established through the use of the statistical tool of Cronbach's Alpha coefficient. Whereas the mean and standard deviation was used to answer the research questions; the paired sample test was used to test the hypothesis, in a bid to measure the extent of university



adoption of ICT and the impact that this adoption had on each of the explanatory variables in the post Covid-19 era in Nigeria. The Statistical Package for Social Sciences (SPSS) version 22 was used for the data analysis.

The research questions were answered using the following boundary limits for interpreting values of issues in order to answer the research questions.

SCALE MEASURING	MAX POINT	MID-POINT	MINIPOINT	INTERPRETATION OF VALUE
Strongly Agreed(SA)	5.00	5.00	4.50	Very High Extent
Agreed (A)	4.00	4.49	3.50	High Extent
Neutral (N)	3.00	3.49	2.50	Moderate Extent
Disagreed (D)	2.00	2.49	1.50	Low Extent
Strongly Disagreed (SD)	1.00	1.49	0.50	Very Low Extent

$$\text{Mean} = X = \frac{\sum fx}{N} \quad (\text{For Research Questions})$$

$$\text{Five point response scale} = \frac{5 + 4 + 3 + 2 + 1}{5} = \frac{15}{5} = 3:0$$

Considering the five items structured questionnaire used for this study, the boundary limits for interpreting value of items in order to answer the research questions becomes:

SCALE MEASURING	MAX POINT	MID-POINT	MINI POINT	INTERPRETATION OF VALUE
Strongly Agreed (SA)	25.00	25.00	22.50	Very High Extent
Agreed (A)	20.00	22.45	17.50	High Extent
Neutral (N)	15.00	17.45	12.50	Moderate Extent
Disagreed (D)	10.00	12.45	7.50	Low Extent
Strongly Disagreed (SD)	5.00	7.45	2.50	Very Low Extent

Decision Rule: On the basis of the five points Likert Scale which was used for the data analysis, any item that has a mean value of 15.00 and above is accepted whereas any item with value less than 15.00 is rejected.

VARIABLES DESCRIPTION

- TLT-Variou s ICT Teaching and Learning Tools
- STR-Students-Teacher Ratio Problems (mostly in overcrowded classes)
- ECM-Effective Classroom Management
- TSM-Teacher Subject Matter Mastery

EDA-Education Affordability/Cost Implication Reduction
 ICTADP Adoption of ICT for teaching and learning

3.1 Questionnaire Reliability using Cronbach's Alpha Coefficient

The Cronbach's Alpha Coefficient (a) which is one of the most frequently used measures of internal consistency of instruments, was used to assess the reliability of the data. The majority of authors consider that Cronbach's Alpha should not drop below 0.7 and that an alpha value of 0.7 or more signifies reliable measures (Bryman and Bell, 2011).

Table 1: Reliability Statistics

Cronbach's Alpha ^a	Cronbach's Alpha Based on Standardized Items ^a	N of Items
.896	.855	6

Source: SPSS Output 2022.

The value of Cronbach's Alpha derived from the analysis is 0.896. Therefore, the instrument developed for evaluating the effect of the adoption of ICT in schools for teaching and

learning on the Nigerian educational sector in the post Covid-19 era, was considered to be reliable.



3.2 Research Questions

Research Question One: To what extent will ICT adoption, through the provision of various ICT tools affect effective teaching and learning in the post Covid-19 era in Nigeria?

Table 2(A&B) Present Respondents’ mean rating on the extent ICT adoption through the provision of various ICT tools affect effective teaching and learning in the post Covid-19 era in Nigeria. N=300.

Table 2A: Case Processing Summary of TLT and ICTADP

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
TLT * RESPCATG	300	100.0%	0	0.0%	300	100.0%

Table 2B: Mean Test Report of TLT and ICTADP

TLT

RESPCATG	Mean	N	Std. Deviation
LECTURERS	22.82	50	1.892
STUDENTS	22.99	250	1.719
Total	22.96	300	1.747

Source: SPSS Output 2022

Decision: The result of the study as presented in the case processing summary Table 2Aabove revealed that all the respondents were included in the study (N=300).From the mean test report Table 2B, the lecturers’ mean value = 22.82, whereas the students’ mean valve= 22.99.The overall mean valve is 22.96, with a standard deviation of 1.747.The overall mean value falls within the boundary limit of very high extent. The result therefore indicated that ICT adoption will affect teaching and learning through the provision of various ICT tools, in the post Covid-19 era in Nigeria to a very high extent.

Research Question Two: To what extent will ICT adoption mitigate the problem of students - teacher ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria?

Table 3(A&B) Present Respondents’ mean rating on the extent ICT adoption in schools will mitigate the problem of student-teacher ratio (mostly in overcrowded classes) in the post covid-19 era in Nigeria. N=300.

Table 3A: Case Processing Summary of STR and ICTADP

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
STR * RESPCATG	300	100.0%	0	0.0%	300	100.0%

Table 3B: Mean Test Report of STR and ICTADP

STR

RESPCATG	Mean	N	Std. Deviation
LECTURERS	22.28	50	1.874
STUDENTS	22.60	250	1.797
Total	22.54	300	1.811

Source: SPSS Output, 2022

Decision: The result of the study as presented in the case processing summary Table 3Aabove revealed that all the respondents were included in the study (N=300).From the mean test report Table 3B, the lecturers’ mean value =

22.82, whereas the students’ mean value=22.60.The overall mean value is 22.54, with a standard deviation of 1.811.The overall mean value falls with the boundary limit of very high extent. The result therefore indicated that ICT adoption



in schools will mitigate the problem of students-teacher ratio (mostly in overcrowded classes) in the post covid-19 era in Nigeria to a very high extent.

Research Question Three: To what extent will ICT adoption affect effective classroom management (through internal learning distractors' mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria?

Table 4(A&B) Present Respondents' mean rating on the extent ICT adoption in schools will influence effective classroom management (through internal learning distractors mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria. N=300.

Table 4A: Case Processing Summary of ECM and ICTADP

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
ECM * RESPCATG	300	100.0%	0	0.0%	300	100.0%

Table 4B: Mean Test Report of ECM and ICTADP

ECM

RESPCATG	Mean	N	Std. Deviation
LECTURERS	22.76	50	1.733
STUDENTS	22.47	250	1.878
Total	22.52	300	1.855

Source: SPSS Output, 2022.

Decision: From the case processing summary Table 4Aabove, the result revealed that all the respondents were included in the study (N=300).From the mean test report Table 4B, the lecturers' mean value = 22.76, whereas the students' mean value=22.47, the overall mean value is 22.52, with a standard deviation of 1.855.The overall mean value falls with the boundary limit of very high extent. The result therefore indicated that ICT adoption in schools will influence effective classroom management (through internal learning distractors mitigation) for effective teaching in the post Covid-19 in Nigeria to a very high extent.

Research Question Four: To what extent will ICT adoption influence teacher subject-matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria?

Table 5(A&B) Present Respondents' mean rating on the extent ICT adoption in schools will influence Teacher subject matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era Nigeria. N=300.

Table 5A: Case Processing Summary of TSM and ICTADP

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
TSM * RESPCATG	300	100.0%	0	0.0%	300	100.0%

Table 5B: Mean Test Report of TSM and ICTADP

TSM

RESPCATG	Mean	N	Std. Deviation
LECTURERS	22.30	50	1.832
STUDENTS	22.12	250	1.623
Total	22.15	300	1.658



Source: SPSS Output, 2022.

Decision: From the case processing summary Table 5A above, the result of the study revealed that all the respondents were included in the study (N=300). From the mean test report Table 5B, the lecturers' mean value = 22.30, while the students mean value=22.12. The overall mean value is 22.15, with a standard deviation of 1.658. The overall mean value falls within the boundary limit of high extent. The result therefore indicated that ICT adoption in schools will influence Teacher subject matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria to a high extent.

Research Question Five: What effect has ICT adoption on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria?

Table 6(A&B) Present Respondents' mean rating on the extent ICT adoption in schools will affect educational affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria. N=300.

Table 6A: Case Processing Summary of EDA and ICTADP

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
EDA * RESPCATG	300	100.0%	0	0.0%	300	100.0%

Table 6B: Mean Test Report of EDA and ICTADP

EDA

RESPCATG	Mean	N	Std. Deviation
LECTURERS	21.88	50	1.520
STUDENTS	22.27	250	1.678
Total	22.20	300	1.657

Source: SPSS Output, 2022.

Decision: The result of the study, as presented in the case processing summary table above revealed that all the respondents were included in the study (N=300). From the mean test report table, the lecturers' mean value = 21.88, while the students' mean value=22.27. The overall mean value is 22.20, with a standard deviation of 1.657. The overall mean value falls within the boundary limit of high extent. The result therefore indicated that ICT adoption in schools will affect educational affordability through cost

implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria, to a high extent.

3.3 Hypotheses Testing Using Pearson Correlation Analysis

Hypothesis One

Ho₁: ICT adoption has no significant effect on effective teaching and learning, through the provision of various ICT tools, in the post Covid-19 era in Nigeria.

Table 7: Result of Bivariate Correlation Analysis of TLT and ICTADP Correlations

		ICTADP	TLT
ICTADP	Pearson Correlation	1	.073**
	Sig. (2-tailed)		.002
	N	300	300
TLT	Pearson Correlation	.073**	1
	Sig. (2-tailed)	.002	
	N	300	300

** . Correlation is significant at the 0.01 level (2-tailed).

Decision: The result of the bivariate correlation analysis above (Table 7) using the Pearson's Correlation test

indicated that there is a positive relationship between ICT Adoption in schools and effective teaching and learning in a



post Covid-19 Nigeria through the provision of various ICT tools. Again, since the P-value (0.002) is less than the Critical values of 0.01 & 0.05 respectively, there is sufficient evidence to conclude that the Correlation is significant at the 0.01 & 0.05 levels. We therefore reject the null hypothesis and accept the alternative; and infer that ICT adoption has a significant positive effect on effective

teaching and learning, through the provision of various ICT tools in the post Covid-19 Nigeria.

Hypothesis Two

Ho₂: ICT adoption has no significant effect in mitigating the problems of students - teacher ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria.

Table 8: Result of Bivariate Correlation Analysis of STR and ICTADP Correlations

		ICTADP	STR
ICTADP	Pearson Correlation	1	.143*
	Sig. (2-tailed)		.013
	N	300	300
STR	Pearson Correlation	.143*	1
	Sig. (2-tailed)	.013	
	N	300	300

*. Correlation is significant at the 0.05 level (2-tailed).

Decision: The result of the bivariate correlation analysis above (Table 8) using the Pearson’s Correlation test indicated that there is a positive relationship between ICT Adoption in schools and effective teaching and learning in a post Covid-19 Nigeria, through the mitigation of the problems of students-teacher ratio (mostly in overcrowded classes). Again, since the P-value (0.013) is less than the Critical value (0.05), there is sufficient evidence to conclude that the Correlation is significant at the 0.05 level. We therefore reject the null hypothesis and accept the

alternative; and infer that ICT adoption has a significant positive effect in mitigating the problems of students - teacher ratio (mostly in overcrowded classes) for effective teaching and learning in the post Covid-19 era in Nigeria.

Hypothesis Three

Ho₃: ICT adoption has no significant effect on effective classroom management (through internal learning distractors’ mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria.

Table 9: Result of Bivariate Correlation Analysis of ECM and ICTADP Correlations

		ICTADP	ECM
ICTADP	Pearson Correlation	1	.094
	Sig. (2-tailed)		.102
	N	300	300
ECM	Pearson Correlation	.094	1
	Sig. (2-tailed)	.102	
	N	300	300

Decision: The result of the bivariate correlation analysis above (Table 9) using the Pearson’s Correlation test indicated that there is a positive relationship between ICT Adoption in schools and effective classroom management for effective teaching and learning in a post Covid-19 Nigeria. Again, since the P-value (0.102) is greater than the Critical value (0.05), there is sufficient evidence to conclude that the Correlation is insignificant at the 0.05 level. We therefore accept the null hypothesis and reject the

alternative; and infer that ICT adoption has no significant effect on effective classroom management (through internal learning distractors’ mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria.

Hypothesis Four

Ho₄: ICT adoption has no significant effect in influencing teacher subject-matter mastering and lesson



preparedness for effective teaching and learning in the post

Covid-19 era in Nigeria.

Table 10: Result of Bivariate Correlation Analysis of TSM and ICTADP Correlations

		ICTADP	TSM
ICTADP	Pearson Correlation	1	.239**
	Sig. (2-tailed)		.000
	N	300	300
TSM	Pearson Correlation	.239**	1
	Sig. (2-tailed)	.000	
	N	300	300

** . Correlation is significant at the 0.01 level (2-tailed).

Decision: The result of the bivariate correlation analysis above (Table 10) using the Pearson’s Correlation test indicated that there is a positive relationship between ICT Adoption in schools and teacher subject matter mastery and lesson preparedness for effective teaching and learning in a post Covid-19 Nigeria. Again, since the P-value (0.000) is less than the Critical values of 0.01 & 0.05 respectively, there is sufficient evidence to conclude that the Correlation is significant at the 0.01 & 0.05 levels. We therefore reject the null hypothesis and accept the alternative; and infer that

ICT adoption has a significant positive effect in influencing teacher subject-matter mastering and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria.

Hypothesis Five

Ho₅: ICT adoption has no significant effect on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria.

Table 11: Result of Bivariate Correlation Analysis of EDA and ICTADP Correlations

		ICTADP	EDA
ICTADP	Pearson Correlation	1	-.107
	Sig. (2-tailed)		.065
	N	300	300
EDA	Pearson Correlation	-.107	1
	Sig. (2-tailed)	.065	
	N	300	300

Decision: The result of the bivariate correlation analysis above (Table 11) using the Pearson’s Correlation test indicated that there is a negative relationship between ICT Adoption in schools and education affordability through cost implication reduction for effective teaching and learning in a post Covid-19 Nigeria. Again, since the P-value (0.065) is greater than the Critical value (0.05), there is sufficient evidence to conclude that the Correlation is insignificant at the 0.05 level. We therefore accept the null hypothesis and reject the alternative; and infer that ICT adoption has no significant effect on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria.

will influence effective teaching and learning in the post Covid-19 era in Nigeria to a high extent. Among the incorporated explanatory variables, the result on the test for individual hypothesis revealed that ICT adoption has a significant positive effect on effective teaching and learning through the provision of various ICT tools in the post Covid-19 era in Nigeria; significant positive effect in mitigating the problems of Students-Teacher ratio (mostly in overcrowded classes) for effective teaching and learning in post Covid-19 era in Nigeria; and also a significant positive effect in influencing teacher subject matter mastery and lesson preparedness for effective teaching and learning in the post Covid-19 era in Nigeria. In furtherance, the result revealed that ICT adoption in schools has no significant effect on effective classroom management (through internal learning distractors’ mitigation) for effective teaching and learning in the post Covid-19 era in Nigeria, and also no

IV. CONCLUSION

On the basis of the research questions raised for the study, we conclude that ICT adoption in schools, on the average,



significant effect on education affordability through cost implication reduction for effective teaching and learning in the post Covid-19 era in Nigeria.

V. RECOMMENDATIONS

On the strength of the findings of the study, the researchers made the following recommendations:

- ❖ There should be curriculum review by the Nigerian Government for ICT inclusion, to achieve effective teaching and learning in schools in post Covid-19 Nigeria.
- ❖ There is urgent need for in-house/on-the-job training for teachers on the use and application of ICT tools, equipment and application programs for effective teaching and learning.
- ❖ The Government should ensure that ICT learning tools and equipment are tailored to be learning and learners' centered, with effective feedback and monitoring mechanisms to checkmate the problems of learning distractors and deviants.
- ❖ Government intervention in removal or reduction of duties chargeable on imported ICT education tools/equipment is necessary.
- ❖ There should be power supply consistency and adequate infrastructural availability in schools to aid teaching and learning with ICT.
- ❖ There should be availability of well-trained analysts and computer engineers in readiness to address issues of system failures/breakdown, and ICT equipment fault development.
- ❖ Parental guidance should be entrenched to ensure that there is no abuse of usage by students.

VI. REFERENCES

- [1]. Baishakhi B., and Kamal D. (2016). Role of ICT in 21st Century's Teacher Education. *International Journal of Education and Information Studies*. ISSN 2277-3169 Volume 6, Number 1, pp. 1-6 Research India Publications <<http://www.ripublication.com>>
- [2]. Basir W., Alandejani A., and Almadami M. (2018). ICT Adoption Impact on Students' Academic Performance: Evidence from Saudi Universities. *Hindawi Education Research International*. Volume 2018, Article ID 1240197.
- [3]. Blurton C. (2000). New Directions of ICT – Use in Education. United National Education Science and Culture Organization (UNESCO)
- [4]. Branscombe M. (2020). The New Stack; The network impact of the global COVID-19 pandemic.<<https://thenewstack.io/the-network-impact-of-the-global-covid-19-pandemic/>> Retrieved June 6, 2020, from. [Google Scholar]
- [5]. Bryman A., and Bell E. (2011). *Business Research Methods* (3rd Ed.) Oxford University Press Publication.
- [6]. Enyedy, N. (2014). *Personalized Instruction: New Interest, Old rhetoric, Limited Result and the Need for a New Direction for Computer-Mediated Learning*. Boulder, CO: National Education Policy Centre.
- [7]. Federal Republic of Nigeria - FRN (2014), *National Policy on Education*: Lagos: NERDC.
- [8]. Goodwin K. (2012). *Use of Tablet Technology in the Classroom*. Strathfield, New South Wales: NSW Curriculum and Learning Innovation Centre.
- [9]. Lopez V. (2003). An exploration of the use of information technology in college classroom, *College Quarterly*, B(1) <<http://www.Collegequarterly.Ca/2003-vol06-num01-fall/lopes.htm>>. Retrieved November 1st 2014. Research Article | Open Access
- [10]. Moursund D. (2005). *Introduction to Information and Communication Technology in Education*, University of Oregon, Eugene, <http://uoregon.edu/~7emoursund/Books/ICt/ICTBook.pdf>. Retrieved November 1, 2014.
- [11]. Munoz J. (2002). Disintegrating: Multiculturalism with technology. *Multicultural Education*, 10(2): 19. Available from<<http://search.proquest.com/docview/216343832?accountid=35812>>.
- [12]. Murphy P., Anzalone S., Bosch A. and Moulton J. (2002). *Enhancing Learning Opportunities in Africa*. Distance Education and Information and Communication Technologies for Learning. Human Development Sector, Africa Region, The World Bank.
- [13]. Opira G. (2010). *Effects of Information and Communication Technology on Students' Learning: A Case of GuluUniversity*. Being A Dissertation Submitted In Partial Fulfillment Of The Requirements For The Award Of The Degree Of Master Of Education, Information And Communication Technology Of Makerere University.
- [14]. Rahul D., Neena P., and Abhipsa, P. (2020). Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice, *An On-line Journal Elsevier Public Health Emergency Collection*. Published Online 2020 Jun 9.
- [15]. UNDP (2020). *The Covid-19 Pandemic in Nigeria; Brief 3*, April 21 2020. Potential impacts of lockdown policies on poverty and well-being – United Nations Development Programme, Brief 3.
- [16]. Williams R. (2000). *Diffusion of Appropriate Educational Technology in Open and Distance*



- Learning in Developing Commonwealth Countries:
Final Project Report. Internet Learning Trust, UK.
- [17]. Yusuf O. (2000). Integrating Information and Communication Technologies (ICT) in Nigeria tertiary education, The African Symposium, An on-line Journal of African Educational Research Network.
- [18]. Yusuf M., Adeoye A., Festus O., and Loto B. (2013). Appraising the role of information communication technology (ICT) as a change agent for higher education in Nigeria. *International Journal of Educational Administration and Policy Studies*, Vol. 5(8), pp. 177-183, December 2013 <<http://www.academicjournals.org/IJEAPS>>