An Investigation of the Efficacy and Interest of Nigerian University Students in Virtual Classroom (VCs)

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Abstract: **This paper adopted a descriptive design to investigate the Efficacy and Interest of Nigerian University Students in Virtual Classroom (VCs). Virtual classrooms are digitally driven classrooms that provide learning support that has potential to enhance students' ability to communicate effectively through latest technology and learn innovative strategies for virtual teamwork by using electronic communication to interact with a group. The study was carried out in one federal and one private university in the North-Central of Nigeria. Three research questions and three hypotheses guided the study. The population comprised of 890 University of Abuja students and 450 Africa University of Science and Technology (AUST), Abuja students giving a total population of 1340 respondents. Purposive sampling techniques based on convenience and accessibility was used to select the two universities. Simple random sampling techniques based on students' consent was used to draw the sample size of 300 from the University of Abuja (Uniabuja) and 250 from Africa University of Science and Technology (AUST), Abuja given a total sample size of 550 respondents. The instrument for data collection tagged "Virtual Classrooms Assessment Questionnaire" (VCAQ) was 33-items questionnaires developed by the researcher was validated by two experts. The instruments were trial tested on twenty (20) males and twenty-five (25) females students in two universities outside the study area; University of Ibadan and Nile University of Nigeria, Abuja. Internal consistency was computed using Cronbach Alpha techniques and yielded a reliability coefficient thus; Section A = 0.75, Section B =0.80 and section C = 0.85 respectively. The reliability coefficient values were considered appropriate for the study. The instrument was administered via social Network Technologies (SNT) and Google Apps in order to adhere to NCDC directives of Covid-19 and data collected. Likert scale of four points was used and the weightings of responses were; strongly Agree (SA) = 4 points, Agree (A) = 3points; Disagree (D) = 2 points and Strongly Disagree (SD) = 1. The options of the responses were added like this, vz; 4+3+2+1=10/4=2.5. The data collected was analyzed using mean ($\bar{x}$) and standard deviation (SD) and independent sample t-test statistics to test the hypotheses at 0.05 level of significance. The results showed among others that the use of virtual classroom (VCs) is not effective in UniAbuja as compared to AUST due to inadequate VC's learning environment and facilities. Based on these submissions, some recommendations were made.**

Keywords: **Efficacy, interest, students, virtual classrooms (VCs), university and Nigeria.**

I. INTRODUCTION

In this 21st century, classroom environment for teaching and learning has changed. Information and communication technology has largely impacted the learning pedagogy at various levels of education across the globe. A teacher is no longer needed physically to teach or verbalize before a group of pupils or students in an organized physically classroom setting. In fact, in the western world, many schools have drastically shifted from face-to-face classroom training to virtual classroom setting. In the online environment, students and teachers are virtually present. Virtual learning environment (VLE) makes students not to be confined to a particular building or restricted to any single location or moment. In this learning environment, various technologies are employed to facilitate the learning process. Such technologies include internet, laptops, tablets, smart phones amongst others. Specifically, virtual learning uses computer software, the internet or both to deliver instruction to students. This minimizes or eliminates the need for teachers and students to share classroom and it has the potential to improve the students' performance, achievement, educational access and schools' cost effectiveness (Michael, 2011)

According to Akpan, Etim & Udom (2016), a virtual classroom is an online environment created using internet, computer, advance videoconferencing devices in which either a teacher or students are not present at the same time in the classroom. Virtual classroom is a teaching resource or tool for delivery of live e-learning. It is often called "synchronous e-learning". The basic difference between the face-to-face classroom environment and virtual training is that the latter is used to deliver content live, over the internet to people who are geographically dispersed. Virtual classroom technologies include web-conferencing, video-conferencing and tele-presence technologies. Virtual classroom has been described by Turoff (2007) as a web-based environment that allows an individual to participate in live training events without traveling to any other place. You can sit in the comfort of your environment and listen to lectures. You can participate in the lab exercises, ask questions and effectively interact with the teacher as if the action is taking place in a conventional face-to-face classroom but is done with the convenience of technological gadgets as desktop, phones and laptop that have

internet connection. The internet on the other hand is a pivotal that necessitates the opportunity and new ways of communicating, interacting and assessing information for both teachers and students.

Writing on the definition of virtual teaching, Wikipedia viewed it as "a system that creates an environment designed to facilitate teachers' management of educational resources for their students, especially a system using computer hardware and software, which involves distance learning. In North America, a virtual learning environment is often referred to as a 'learning management system' (LMS). To technopedia, a virtual classroom is a teaching and learning environment where participants can interact, communicate, view and discuss presentations, and engage with learning resources while working in groups, all in an online setting. The medium is often through a video conferencing application that allows multiple users to be connected at the same time through the internet, which allows users from virtually anywhere to participate. In other words, it is online classroom environment facilitated through specialized video conferencing applications. The participants, of course include one or multiple instructors and students. However, a virtual classroom does not always need an active instructor to supervise students; in this setting, students can proceed at their own pace, with the instructor only around to evaluate the students; sometimes there is no instructor at all. This type of virtual classroom is called unsupervised virtual classroom which is characterized by ready-made learning materials that students can follow without the aid of instructor, essentially a self-paced tutorial course where the assessment can be automated after every activity. This is the most common form of virtual classroom where students just read a PowerPoint presentation or watch a video tutorial. The second type of virtual classroom is the supervised or instructor-led classroom. This conforms more to a traditional classroom definition. There is at least one active instructor present and the lesson is carried out in real time at a specific time and date, with the students being in attendance virtually through a video conferencing application. Here, students and teachers can truly interact and participate in class.

Bringing more light to the concept of virtual teaching (VT), Mangal (2009) and Uzoamaka (2017) opined that virtual classroom is a web-based environment that allows you to participate in live training events without the need to travel. You listen to lectures, ask questions and receive feedback just as you would do in a conventional classroom – except that you do it from the convenience of your desktop or anywhere you have an internet and phone connection. Learning through virtual classroom is more interactive as its nature forces student's attention, saves expense and travel time to a training site. Except that it is limited by the technological capacity of the student; those with slower hardware or internet speeds are at a disadvantage.

In another words, virtual classroom could be seen as an interactive educational computer platform with integrated communication capability. It is a combination of individualized adaptive interaction with communication on demand that provides the unique form of support for the learner (Ifeakor & Anekwe, 2013). It summarizes facts about virtual system as a learning support that has potential to enhance students' ability to communicate effectively through latest technology and learn innovative strategies for virtual teamwork by using electronic communication to interact with a group. The total number of students participating in virtual learning or school has surpassed 6.7million in the U.S (UNESCO, 2010). In South-Africa Universities, Mallareddy (2013) investigated the effectiveness of Virtual classroom teaching in computer science and noted that it was advantageous in removing the barriers of time and space, overcoming the unavailability of teachers, enhances collaboration and communication amongst students and introduces students and teachers to educational technology. During the covid-19 pandemic, especially in the education system, Virtual learning or E-learning has been found to be a significant tool for effectively continuing the teaching-learning process during the lockdown globally (Nadikattu and Vishal,2020). Uzoamaka (2017), in a study conducted on the Traditional Classroom System vs Virtual Classroom System of teaching – learning, discovered that in spite of the reduction in personal interaction between teacher and students, technological issues, cost of accessing the internet, extra-training amongst others constraints that characterized virtual learning system, students were still satisfied with the platform to the extent that most of the students preferred or were interested to have more virtual classroom activities than traditional or face-to-face classroom activities.

The term traditional classroom system represents approaches where a teacher moderates and regulates the flows of information and knowledge face-to-face. Students are expected to continue developing their knowledge of a subject outside of school through homework exercise. The main resource person in the traditional classroom is the teacher who only teaches them face-to-face. Mbakwem (2009) sees it as an arrangement which permits learning space in which the teacher provides face-to-face instruction to students and communication between and among teachers and students is face-to-face. One common characteristic of traditional classroom is that it does not cater for innovation and creativity because its main resource is a teacher. In comparing traditional classroom and virtual classroom, Akpan, Etim and Udom (2016) stated that traditionally, classroom instruction is known to be teacher-centered and requires passive learning by students while virtual classroom is often student-centered and requires active learning. Hence, the later have wide range of advantages over traditional environment such as activeness of the learner, convenience, flexibility, currency of material, increasing retention, lowering education costs, transcending geographical barriers among others.

Unfortunately, the use of virtual classroom is seldom in many Nigerian institutions over the years. However, as global

pandemic (COVID-19) broke out in early 2020 and severely affected the progress of education in various countries' universities and academic institutions across the world, the use of virtual classroom teaching-learning has become inevitable in Nigerian institutions in order to avoid the spread of the disease and maintain education status.

Based on this background, this study investigates the efficacy and interest of Nigerian university students in virtual classroom instruction on one public and one private University.

II. METHODOLOGY

The study adopted a descriptive survey design which sought to investigate the efficacy of Virtual Classroom (VCs) on Nigerian University Students' Interest. The design sought to collect information from respondents without the manipulation of any variable. The study was carried out in two universities; a Federal university and a private university. The two selected universities were; University of Abuja (Uniabuja) and African University of Science and Technology (AUST) Abuja.

The targeted population from University of Abuja (Uniabuja) was 890 while that of Africa University of Science and Technology (AUST) was 450. Therefore, the total population was 1340. The purposive sampling techniques based on convenience and accessibility was used to select the two universities. Simple random sampling techniques based on students' consent was used to draw the sample size of 300 from the University of Abuja (Uniabuja) and 250 from the African University of Science and Technology (AUST), Abuja. The focus students were both undergraduates and postgraduates who have participated in VC's and those currently subscribed into VCs as a result of Covid-19 pandemic. In all, the sample size for this study was **550**. Three research questions and three hypotheses were formulated to direct the study.

The instrument for data collection tagged "Virtual Classrooms Assessment Questionnaire" (VCAQ) was a 33-items questionnaires developed by the researcher. The instrument comprised of five sections – Section 1, was to collect demographic information from the respondents. Section 2 was designed to elicit information on the efficacy of Virtual Classroom (VCs) and further divided into sections A, B & C.

Section A was to elicit information on efficacy of virtual classroom between Uniabuja and AUST; B was to collect information on Students' interest in Virtual Classrooms (VCs) and C was to elicit information on areas of improvement as perceived by the students for enhancement of their VCs learning. The respondents were required to respond to the item statement objectively. Likert scale of four points was used and the weightings of responses were; Strongly Agree (SA) = 4 points, Agree (A) = 3points; Disagree (D) = 2 points and Strongly Disagree (SD) = 1. The options of the responses were added like this, vz; 4+3+2+1=10/4=2.5. This is the acceptable mean while below 2.50 mean not accepted.

The instrument was validated by two academic experts, one in the University of Abuja and the other in Africa University of Science and Technology all in Abuja. The experts after examining the instrument, made some corrections based on the ambiguity of the statement, comprehensiveness, adequacy and relevance to set objectives of the study. Corrections were effected after the inputs from the experts and final copy of the instrument produced for data collection.

The instrument were trial tested on twenty (20) males and twenty-five (25) females in two universities outside the study area; Kogi State University and Nile University of Nigeria, Abuja. The data collected were computed using Cronbach Alpha techniques and yielded a reliability coefficient thus; Section A = 0.75, Section B = 0.80 and section C = 0.85 respectively. The reliability coefficient values were considered appropriate for the study.

The researcher used Google apps to distribute copies of the questionnaires to the students in order to adhere to NCDC directives of Covid-19. The respondents were given two weeks but less than two weeks sufficient questionnaires were submitted accurately thereby ensuring 100% accuracy.

Mean ($\bar{x}$) scores and standard deviation (SD) were used to answer the research questions while the hypotheses were tested at 0.05 alpha levels using independent sample t-test statistics.

III. RESULTS

Results were presented according to the research questions and hypotheses formulated to guide the study in tables 1,2,3,4, 5 and 6.

Research Question 1: What is the efficacy of Virtual Classroom learning (VCL) between UniAbuja students and AUST students?

Table 1: Mean (X) Standard deviation (SD) of UniAbuja and AUST students on efficacy of Virtual Classroom Learning (VCL).

S/N	Items on the efficacy of VCs between UniAbuja and AUST	UniAbuja $\bar{x}$	UniAbuja SD	AUST $\bar{x}$	AUST SD
1	I am computer literate	2.20	0.60	3.50	0.92
2	I have personal computer, laptop, tablet, smart phone, etc	2.30	0.90	3.40	0.66
3	I am Skilled in the operations of internet enable devices	2.30	0.78	3.02	1.05
4	I have Social Network technologies operation skills	2.50	0.67	3.10	0.94
5	I have ICTs and E-learning operations skills	2.40	0.80	3.50	0.50
6	I am competent in VCs operation skills	2.20	0.75	3.60	0.49

7	My lecturers can instruct through VCs	2.80	0.40	3.20	0.75
8	Internet connectivity is available in all classes	2.30	1.10	3.10	0.83
9	Computer laboratories are well equipped	2.50	0.67	3.70	0.52
10	Free accessibility to internet	2.60	0.80	3.50	0.46
11	Free audio-video support	2.60	0.66	3.09	0.35
12	Steady power supply guaranteed	2.10	0.70	3.60	0.46
13	Availability of videoconferencing hall	2.50	0.81	3.61	0.46
	Grand Mean	2.41	0.74	3.38	0.65

The result of the data presented as shown in table – 1 above, revealed that students in University of Abuja (Uniabuja) had a mean score of 2.20 (SD = 0.60) for item 1, while students for Africa University of Science and Technology (AUST) had a mean of 3.50 (SD = 0.92). For other items from 2-12, the mean values obtained for UniAbuja students were; 2.30, 2.50, 2.40, 2.20, 2.80, 2.30, 2.50, 2.60, 2.60, 2.10 and 2.50 respectively. While their corresponding standard deviation (SD) were; 0.60, 0.90, 0.78, 0.67, 0.80, 0.75, 0.40, 1.10, 0.67, 0.80, 0.66, 0.70 and 0.81. For Africa University of Science and Technology (AUST), Abuja, the mean values obtained were; 3.50, 3.40, 3.02, 3.10, 3.50, 3.60, 3.20, 3.10, 3.70, 3.50, 3.09, 3.60 and 3.61 respectively. While their corresponding standard deviation (SD) were; 0.92, 0.66, 1.05, 0.94, 0.50, 0.49, 0.75, 0.83, 0.52, 0.46, 0.35, 0.46 and 0.46 respectively.

This is an indication that the use of VCs has more efficacies in AUST than UniAbuja. University of Abuja had grand mean of 2.41 (SD = 0.74), while AUST had grand mean of 3.38(SD = 0.65). This value shows a very significance difference between the two universities in terms of efficacy of VCs and students interest.

Research Question 2: what are the things that motivate students' interest to Virtual Classroom system?

Table 2: Mean (x) and Standard deviation (SD) on students' interest to VCs

S/N	Items on students' interest in VCs	UniAbuja x̄	SD	AUST x̄	SD
14	I preferred VCs to face-to-face system because of digital creativity involved	2.20	0.98	3.50	0.67
15	VCs is cost effective	2.90	0.53	3.70	0.64
16	I preferred to continue study in VCs because of flexibility	2.40	0.80	3.50	0.92
17	I feel emotionally attached to VCs	2.70	0.78	3.30	0.90
18	I have hope of the future in VCs than traditional system	2.60	0.66	3.40	0.80
19	I feel disconnected in learning without VCs	3.00	0.77	3.10	0.83
20	I preferred face-to-face learning environment to VCs	2.50	1.02	3.30	0.90
21	VCs create flexibility and conform for learning	2.30	0.90	3.60	0.49
22	VCs help me to interact with people globally.	2.70	1.01	3.70	0.46
23	Immediate feedback is assured with VCs than face-to-face system	3.00	0.78	3.60	0.49
	Grand Mean	2.02	0.63	3.67	0.55

The data in table 2 above showed clearly that University of Abuja had a mean of 2.20 (SD = 0.98) for item 14, while AUST had a mean of 3.50 (SD = 0.67), indicating that AUST students with the mean of 3.50 shows more interest in VCs than UniAbuja with the mean score of 2.20. For other items 15-23, the mean values obtained of University of Abuja students were; 2.90, 2.40, 2.70, 2.60, 3.00, 2.50, 2.30, 2.70, and 3.00 respectively. While their corresponding standard deviation were; 0.53, 0.80, 0.78, 0.66, 0.77, 1.02, 0.90, 1.01 and 0.78,

For AUST, the mean value obtained were; 3.50, 3.70, 3.50, 3.30, 3.40, 3.10, 3.30, 3.60, 3.70 and 3.60 accurately. While their corresponding standard deviation were; 0.67, 0.67, 0.92, 0.90, 0.80, 0.83, 0.90, 0.49, 0.46 and 0.49 respectively. This is an indication that students in Africa University of Science and Technology had more interest in VCs than University of Abuja students. However, the grand mean of 3.67 (SD = 0.55) for AUST showed greater interest in VCs than the grand mean of 2.20 (SD = 0.63) of University of Abuja (UniAbuja). The possible reason might be because Africa University of Science and Technology has VCs facilities available to students more than University of Abuja.

Research Question 3: What are the areas of improvement as perceived by the students of UniAbuja and AUST for enhancement of their learning in virtual classrooms?

Table 3: Mean (x) and Standard deviation (SD) of UniAbuja and AUST students on the area of VCs Improvement

S/N	Items on areas of improvement as perceived by students	UniAbuja x̄ SD		AUST x̄	SD
24	More computers/laptops/tablets should be provided for students use	2.80	0.98	3.50	0.69
25	Internet connectivity in all the classes	3.00	1.00	3.30	0.90
26	Quality computer laboratories	3.10	1.04	3.40	0.81
27	Free access to the internet	2.90	0.94	3.30	0.64
28	Teachers are to be trained and retrained for more competency in VCs operations	3.30	0.78	3.30	0.64
29	Removing payments from some courses for students	2.90	1.14	3.80	0.60
30	Steady power supply	3.70	0.64	3.90	0.30
31	Social Network technologies (e.g yahoo/google messanger, Twitter, YouTube, Google Plus, MySpace,	3.80	0.60	3.70	0.64

	Facebook, WhatsApp, Gmail etc.				
32	Training of all students and teachers on skills in the operations of internet enable devices	3.50	0.92	3.70	0.64
33	Unstable Internet Services networks	3.40	0.80	3.70	0.64
	Grand Mean	3.02	0.62	3.50	0.45

The result of the data presented in table 3, revealed that all the respondents in both University of Abuja and AUST agreed that all the listed items were areas of improvement. This shown by the fact that most of the listed items scored above the weighting mean of 2.50 and above. This is an indication that to achieve efficacy and effectiveness in Virtual Classroom learning (VCs) across all universities both private and public, more computers, laptops etc should be provided, internet connectivity on campus, quality computer laboratories provided, free internet access should be provided, teachers are to be trained and re-trained for more competency in VCs operations, training of all students and teachers on skills for operations of internet enabled devices, and above all, there has to be steady power supply among others. This fact is also confirmed by the grand mean of 3.02 (SD = 0.62) and 3.50,(SD = 0.45) of both UniAbuja and AUST.

Table 4: t –test statistics of the Mean Ratings of UniAbuja and AUST on the Efficacy of VCs on Students Learning**.**

University's Variation	N	x̄	SD	Fcal	DF	Sig.	Decision
UniAbuja	301	90.09	5.75				
				26.00	548	0.00	$H0_1$ (Rejected)
AUST, Abuja	249	114.09	3.95				

The analysis of table 4 above indicates a significant difference on the efficacy of VCs on students' learning between UniAbuja and AUST. The t-test statistics showed the mean difference and standard deviation as, 90.09 (SD =5.75) and 114.09(SD = 3.95) with the degree of freedom (DF =548) and significant at 0.00 alpha level. The null hypothesis ($H0_1$) is therefore rejected, meaning that the use of VCs is more effective in AUST than UniAbuja. So, the alternative hypothesis (H_1) accepted that there exist significant difference on the issue of efficacy of VCs between AUST and UniAbuja. The possible reason might be because Africa University of Science and Technology has VCs facilities more than University of Abuja.

Table 5: t-test statistics of the Mean Rating of UniAbuja on the efficacy and Interest of students in VCs with respect to Gender

UniAbuja Variation	N	x̄	SD	F_{cal}	DF	Sig.	Decision
Male	150	90.00	5.57				HO_2 Rejected
				0.002	297	0.05	
Female	149	89.99	5.59				

The independent sample t-test statistics above showed that the mean difference of UniAbuja male students is 90.00(SD = 5.57) and the female students is 89.99(SD = 5.59) at 297 degree of freedom and significant at 0.05 alpha level. This means that UniAbuja male students have more interest in the use of VCs than their female counterpart. Hence, the alternative hypothesis (H_2) accepted. The possible reason might be because male students have more time and better access to social network technologies and ICTs than female students.

Table 6: t-test statistics of the Mean Rating of AUST on the interest of students in VCs with respect to Gender

AUST Variation	N	x̄	SD	F_{cal}	DF	Sig.	Decision
Male	125	114.00	3.92				
				0.031	247	0.86	H_3 Accepted
Female	124	114.18	3.99				

The independent sample t-test statistics of table 6 above revealed that no serious significant difference exists between male and female AUST students interest in Virtual Classroom (VCs). The t-test statistics showed the mean variation as thus; Male 114.00(SD = 3.92) and female 114.18(SD = 3.99), Fcal =0.031, at 247 degree of freedom (DF) and significant at 0.86 alpha level. Thus, the alternative hypothesis that said there is no significant difference between male and female AUST students interest in VCs is true and accepted. The possible reason might be because of availability and accessibility of VCs facilities in Africa University of Science and Technology (AUST), Abuja.

IV. CONCLUSION

The study concludes that the efficacy and interest of students in Virtual Classroom Learning anchored on the capacity of the University to make available as a matter of priority adequate and dependable virtual learning environment, application software and the necessary technological tools for VCs. It was evidenced from the analysis that in UniAbuja, there was poor VCs operations skills for some lecturers and students, low internet availability on campus, inadequate computer laboratories, lack of free accessibility to internet, audio-video support, videoconferencing hall, power failure among others. But in AUST, the infrastructure (internet availability, well equipped computer laboratories, free internet access, audio-video support, videoconferencing hall and steady power supply) are in place; thereby making the use of VCs effective among the students. In the area of students' interest in VCs, very few students in University of Abuja showed emotional attachment and preferred to continue study in VCs rather than face-to-face learning system. The reason might be because of lack of digital facilities needed for effective operation of VCs . But in AUST, almost all students preferred VCs to face-to-face learning system because there is adequate and reliable virtual classroom learning environment, application software, necessary technological tools and digital facilities needed for

effective operation of VCs and support for overall improvement.

Conclusively, area of improvement as perceived by students and lecturers are; more computer/laptops for lecturers and students, internet connectivity all over the campus, quality computer laboratories, free access to the internet, reliable internet services, more training for students and lecturers for competency in VCs operation and steady power supply.

V. RECOMMENDATIONS

The following recommendations are given for overall improvement (efficacy) and interest of students in Virtual Classroom learning across Nigerian Universities.

1. Government should provide all application software, technological tools and infrastructure needed for effective operation of VCs in all Universities especially Federal or public universities.
2. The Nigerian government should establish in the entire universities virtual classroom learning environment support centers to help meeting the technological needs of the student. This will in no doubt encourage them to be participating more in VC learning.
3. Lecturers and students should be trained and re-trained from time to time to catch-up with the dynamism in VCs operation skills.
4. The universities should have campus-wide internet connectivity and grant free access to their usage by both the lecturers and the students. This will offer a good opportunity in interconnecting all the students and lecturers for virtual classrooms' learning.

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