ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4

Journal of Coastal Life Medicine

The Effects of COVID-19 Pandemic on Biological Students Practical and Efficient Ways of Overcoming These Challenges in Any Future Emergencies using Veritas University as a Case Study.

Received: 18 October 2022, **Revised:** 24 November 2022, **Accepted:** 26 December 2022

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Keywords:
Covid-19, Biological science practical, pandemic, online practical and laboratory

Abstract

Aim: This study aimed at investigating how COVID-19 pandemic has affected the learning of biological students practical using Veritas University Abuja as a case study and better ways of maintaining this challenge in any future emergence of viruses.

Methods:This study was carried out in the department of biological sciences, Veritas University Abuja, Bwari Area council of the Federal Capital Territory, Abuja, Nigeria. Veritas University is made up of five faculties, of which the Faculty of Natural and Applied Science house biological science department. The population of this study consists of all male and female biology students. The target population is 1136 students that offered biology practical during the lock down period. Instruments for the study is questionnaire to be answered by the sampled population, Impact of COVID-19 Lockdown on Learning of Biological Students Practical.

The instrument impact of Covid-19 lockdown on students learning biology practical (ICOLSLBP), and administered to 100 students, in the department of biological science of Veritas University Abuja with the help of 3 research assistance, after which it was collected by the researcher and analyzed by the expert.

Results: From the results obtained from this research which was significant at ($p<0.05$) implied that COVID-19 lockdown had an impact on practical biology lessons. However, the impact was negative. t-test analysis of difference between the effectiveness of conducting online practical lesson and onsite practical lesson. It was significant at ($p<0.05$). It implied that onsite practical lesson was more effective than online practical lesson.

Conclusion: it is observed that Biology practical is not possible online as physical investigations cannot be done virtually without physical contact. However, to maintain this experimental area of study which is vital to scientific discovery, the recommendation of this research work must be taken into consideration in order to stop the further spread of COVID-19, encourage Biology practical and put an end to lockdown even in the case of future emergence of other virus, because when laboratory investigations are encouraged, solutions to problems and sickness will be found.

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Journal of Coastal Life Medicine

1. Introduction

Coronavirus disease (COVID -19) came as a grave devastation and unsettled the world. The entire world was unsettled while adopting best approaches to tackle the pandemic. To stem the tide, the Nigerian Government as well as other Countries of the world imposed strict control measures, ranging from total lock-down, Temperature Checks, Use of face masks, use of hand sanitizer before and after surface contact. The use of hand gloves, social and physical distancing were also introduced in tackling the pandemic. "The coronavirus disease (COVID-19) is caused by Coronavirus2 (SARS-CoV-2) which is an acute respiratory syndrome with a positive-sense single stranded RNA virus species with a zoonotic origin" Sivasankarapilai*et al (2021).* The Federal Capital Territory Abuja Nigeria became the epicenter for the implementation of the Covid-19 Control measures. Apart from the fact that Nigerians were repatriated from other countries , most of these returnees scurried in droves to the Federal Capital Territory and were quarantined in locations approved by the Federal Government of Nigeria.

The Nigerian Educational system suffered a set-back as Schools were shut down in an attempt to control the spread of the virus by Government. Academic activities were halted; while theoretical and practical examinations were interrupted. In particular terms, there was a sharp shift in paradigm in the psychomotor domain of biology students in the Federal Capital Territory. The academic programs were punctuated by absence of physical interaction with their teachers which hindered scientific enquiry. According to report by Center for Disease Control, the corona virus Covid-19 NCDC, (2020), just like any other infectious agent have come to stay and humans must find a way to cope with the disease. Ogunode,2020 observes that "the outbreak of covid-19 pandemic all over the world has disturbed the political, social, economic, religious and financial structures of the world". Economies of the world are at the verge of collapse.(Danmole, 2012) He also observes that the total lockdown has hugely affected the social investment in education, the extra-curricular activities in schools and overall performances of students in Abuja and the country at large.

Prominent in this work in specific terms are the experiences of Biology Students in Veritas University, Abuja where students contended with the herculean task of engaging in biology practical in the laboratories(Hinneh, 2017) in the wake of the Covid-19 pandemic. Practical engagements by students in the biology laboratory such as Culture, yeast fermentation, photosynthesis, dissection of rats, Bacterial growth, separation analysis, observation of plants and animal cell structure and organization, Cells division (mitosis and meiosis) were greatly impeded because of the lockdown(Abraham and Miller, 2008). Biology Students ofVeritas University had recourse to electronic/ audio visual learning to supplant practical scientific enquiries. However, given the peculiarities associated with Biological scientific enquiry which is not such that can be alternated or substituted by a non-methodological/ practical experience, the electronic/ audio visual approach condensed and reduced the skills/expertise which implicate directly on the psychomotor domain of Biology Students. The Coronavirus disease so ravaged the world, bringing in its wake severe attendant implications on a global scale. Scientific researches are ongoing for a curative vaccine, while preventive measures are adopted with supportive care to those who have been infected to stop further spread of the virus to those who are not infected.

Practical researches enhance defined hypothesis with realistic outcomes(Borodavko*et al.*, 2020). This is the bane imposed by COVID-19 on the psychomotor domain of Biology students. Psychomotor has to do with the practical aspect of learning, dealing with hands practical or activity, since what is learn through practical cannot easily be forgotten as against virtual learning imposed by COVID-19 lockdown, which makes the practical aspect of Biology deficient thus restricting it to online lessons done theoretically through zoom, google classroom and other social media platform. However, if COVID-19 research is premised on virtual enquiries it will attend limited results, because a person who views the dissection of rat on YouTube cannot boast of having the practical experience of how to dissect the rat with the one who attends a practical class and dissected the rat with the hands. Collection of data, samples and questionnaires are also dampened by inhibitions associated with virtual scientific enquiries. Hence, the COVID-19 pandemic has taken immediate and direct tolls on the psychomotor domain of biology students(Cossa and Uamusse, 2015)

ISSN: 2309-5288 (Print)
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Journal of Coastal Life Medicine

Therefore, COVID-19 has immediate and consequential impact on researches and practical conducted by biology students within and outside Nigeria.

This study is therefore, aimed at investigating how COVID-19 pandemic has affected the learning of biology students in practical using Veritas University Abuja as a case study and better ways of maintaining the practical aspect of biology amidst COVID-19 pandemic and any future emergence of viruses.

2. Methodology

Area of the Study

This study was carried out in Veritas University Abuja, Bwari Area council of the Federal Capital Territory, Abuja, Nigeria.

Research Design

The survey descriptive design was considered most suitable for the study. It allows the researcher to access the situation under investigation as it exists presently. According to Kerlinger (1986) "survey research design is directed towards determining the nature of a situation as it exists at the time of an investigation". He further described it "as a type of research that allows studies large and small population by selecting and studying samples chosen from the population to discover the relative incidence, distribution, interrelation of sociological and psychological variables". The study examines The Impact of Covid-19 Lockdown on Learning of Biology Practical (A Case Study of Veritas University, Abuja).

Population of the Study

Veritas University Abuja is made up of fivefaculties, of which the Faculty of Natural and Applied Science house biological science department. The population of this study consists of all male and female biology students in the department of biological sciences and those in other departments offering biology practical in the 2019/2020 academic session. The target population is 1136 students that offered biology practical during the lock down Table 3.2; below shows the distribution of the population according to levels.

population of the study

S/N	LEVEL OF STUDENTS	TOTAL NUMBER OF STUDENTS
1	100 level students	1005
2	200 level students	74
3	300 level students	53
4	400 level students	4

Source: Admission unit of Veritas University Abuja (2019/2020)

Sample and Sampling Procedure

A sample is a portion of the entire group called population, selected for observational analysis best and Khan (1986). In other words; it is a sub-set of the population. Whereas population is the group on which a researcher would like the result of a study to be generalized. While sampling procedure is choosing part of a population to use to test hypotheses about the entire population; this is used to choose the number of participants or work samples to use in the assessment process. Purposive sampling techniques was used to select 100 students from the population

Research Instrument

Instruments for the study is questionnaire to be answered by the sampled population, Impact of COVID-19 Lockdown on Learning of Biology Students in Practical Questionnaire (ICLLBSPQ) the treatment instrument was built by the researcher to find out the Impact of Covid-19 Lockdown on the Learning of Biology Practical using Veritas University as a Case Study.

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Journal of Coastal Life Medicine

Validity of Research Instrument

Instruments for the study, Impact of COVID-19 Lockdown on Learning of Biology Students in Practical Questionnaire (ICLLBSPQ) was constructed by the researcher and validated by the supervisor and an expert in Test / measurement and evaluation, and other lectures in science education in Veritas University Abuja, in order to determine the appropriateness of the materials. Based on their suggestions, further improvements were made on the instrument used for the study.

- **Reliability of the Instrument**

The instrument was trial tested on students who were not part of the study. Kudar Richardson Formula 21 (KR 21) was used to determine the reliability of instrument and was found to be reliable of 0.74 which was considered good enough for the research study.

Procedure for Data Collection

The instrument impact of Covid-19 lockdown on students learning biology practical (ICOLSLBP), and administered to 100 students, in the department of Biological science of Veritas University Abuja with the help of 3 research assistance, after which it was collected by the researcher and analyzed by the expert.

- **Procedure for Data Analysis**

The data collected were analyzed using mean and standard deviation to answer the research question while t-test was used to test the Hypothesis at 0.05 level of significance.

To ease interpretation, strongly agree and agree responses by participants were considered as agree whilst strongly disagree and disagree were considered as disagree. The descriptive function of the ICLOSLBP was used to organize the data into frequency counts, percentages and mean scores. A mean score above 2.50 was considered good practice whilst mean score below 2.50 was considered bad practice. A mean score of 3 was considered as neutral.

3. Result:

Descriptive Analysis of Research Questions

The three questions earlier raised in the study were answered descriptively.

Research Question 1: What is the impact of COVID-19 lockdown on students' learning like Google Classroom of biology practical?

Table 1: Mean analysis showing impact of COVID-19 lockdown on learning of biology students in practical

S/N	Item	Students' Level of Agreement				Mean	Decision
		SA	A	D	SD		
1	It encourages interactivity and flexibility on platforms, Zoom, WhatsApp and Telegram	18	21	39	22	2.39	Disagreed
2	It encourages self-study	41	32	22	5	3.09	Agreed

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

3	There is always distraction or inability to concentrate	36	40	16	8	3.04	Agreed
4	Limited evaluation of learning outcomes	35	38	20	7	3.01	Agreed
5	Low engagement or participation of students during teaching-learning process	25	43	22	10	2.83	Agreed
6	Exclusion of students in rural areas	26	39	18	17	2.74	Agreed
7	Some students are not familiar with some of the platforms' interfaces	27	41	24	8	2.87	Agreed
8	Inability of students to understand practical lessons through online platforms	24	38	26	12	2.74	Agreed
9	Parents' collaboration in the supervision of students	25	35	21	19	2.66	Agreed
10	Inadequate digital skills	31	42	18	9	2.95	Agreed

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

	on the part of lecturers and students						
	Sectional Mean					**2.83**	**Agreed**

Scale Mean 2.50

From Table 1, it could be observed that the mean values of 3.09, 3.04, 3.01, 2.83, 2.74, 2.87, 2.74, 2.66 and 2.95 respectively were in agreement with items 2, 3, 4, 5, 6, 7, 8, 9 and 10 while the mean value of 2.35 was in disagreement with item 1. The sectional mean of 2.83 indicated that some of the respondents agreed that self-study, students' inability to concentrate at home, limited evaluation of learning outcomes, low engagement or participation of students during teaching-learning process, exclusion of students in rural areas, students' not familiar with platforms' interferes with students' inability to understand practical lessons through online platforms, parents' collaboration in the supervision of students and inadequate digital skills on the part of lecturers and students are the impact of COVID-19 lockdown on learning of biology students in practical while the remaining respondents disagreed with interactivity and flexibility on platforms like Google Classroom, Zoom, WhatsApp and Telegram as impact of COVID-19 on students' learning.

Research Question 2: How effective was online classes in biology practical during COVID-19 lockdown?

Table 2: Mean analysis showing effectiveness of online classes in biology practical during COVID-19 lockdown

S/N	Item	Students' Level of Agreement				Mean	Decision
		VE	EF	FE	NE		
11	Speedy delivery of lesson	18	19	41	22	2.33	Disagreed
12	Accurate delivery of lesson	16	21	39	24	2.29	Disagreed
13	It can contain a large volume of practical lesson plans, assignments and tests	36	42	18	4	3.10	Agreed
14	It gives immediate feedback	19	27	18	36	2.29	Disagreed
15	It aids storage of practical lessons	22	39	25	14	2.69	Agreed
16	It aids easy retrieval of practical lessons	25	34	26	15	2.69	Agreed
	Sectional Mean					**3.08**	**Agreed**

Scale Mean 2.50

From Table 2, it could be seen that the mean values of 3.10, 2.69 and 2.69 respectively were in agreement with items 13, 14 and 15 while the mean values of 2.33, 2.29 and 2.29 respectively were in disagreement with items 11, 12 and 14. The sectional mean of 3.08 revealed that some of the respondents agreed that online practical classes can contain a large volume of lesson plans, assignments and tests, store practical lessons and make retrieval of practical lessons easy while the remaining respondents disagreed with speedy delivery of lessons, accurate delivery of lessons and giving immediate feedback as effectiveness of online practical classes.

Research Question 3: What are the factors that militated against the effectiveness of online practical biology classes during COVID-19 lockdown?

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

Table 3: Mean analysis showing factors that militated against the effectiveness of online practical biology classes during COVID-19 lockdown**.**

S/N	Item	Students' Level of Agreement				Mean	Decision
		SA	A	D	SD		
17	High cost of data	33	38	18	11	2.93	Agreed
18	Inadequate expertise on the part of lecturers and students	28	32	26	14	2.74	Agreed
19	Inadequate online learning facilities	25	34	21	20	2.64	Agreed
20	Poor network services	26	37	19	18	2.71	Agreed
21	Unstable power supply	29	31	24	16	2.73	Agreed
22	Hardware failure	28	33	21	18	2.71	Agreed
23	Software viruses	30	27	26	17	2.70	Agreed
	Sectional Mean					**2.74**	**Agreed**

Scale Mean 2.50

From Table 3, it could be observed that the mean values of 2.93, 2.74, 2.64, 2.71, 2.73, 2.71 and 2.70 respectively were in agreement with items 17, 18, 19, 20, 21, 22 and 23. The sectional mean of 2.74 indicated the respondents agreed that high cost of data, inadequate expertise on the part of lecturers and students, inadequate online learning facilities, poor network services, unstable power supply, hardware failure, software viruses and lack of acquisition of practical skills were factors that militated against the effectiveness of online practical biology classes during COVID-19 lockdown.

4.2 Hypotheses Testing

The two research hypotheses earlier formulated in the study were tested at 0.05 level of significance.

Ho1: COVID-19 lockdown has no significant impact on practical biology lessons

Table 4: t-test analysis showing impact of COVID-19 lockdown on practical biology lessons

Variables	N	Mean	Std. deviation	Df	$t\text{-}_{cal}$	$t\text{-}_{tab}$	Sig ($P\text{-}_{cal}$)	Remarks
COVID-19	100	8.21	1.533	198	2.268	1.653	0.024	Reject Ho_1
Practical biology lessons	100	7.71	1.585					

Significant at df=198; $P \leq 0.05$, $t\text{-}_{calculated} > t\text{-}_{tabulated}$

Table 4 showed t-test analysis of impact of COVID-19 lockdown on practical biology lessons. The $t\text{-}_{cal}$value of 2.268 was found to be greater than the $t\text{-}_{tab}$ value of 1.653 given 198 degrees of freedom at 0.05

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

level of significance. The t_{cal}value was significant since it was greater than t_{tab} value, the null hypothesis was rejected. Also, $P_{cal}$was less than the $P_{set.}$ It implied that COVID-19 lockdown had an impact on practical biology lessons. However, the impact was negative.

Ho2: There is no significant difference between the effectiveness of conducting online practical lesson and onsite practical lesson

Table 5: t-test analysis showing difference between the effectiveness of conducting online practical lesson and onsite practical lesson

Variables	N	Mean	Std. deviation	Df	t_{cal}	t_{tab}	Sig (P_{cal})	Remarks
Online practical lesson	100	8.19	1.529	198	2.180	1.653	0.030	Reject Ho_2
Onsite practical lesson	100	7.71	1.585					

Significant at df=198; $P \leq 0.05$, $t_{calculated} > t_{tabulated}$

Table 5 showed t-test analysis of difference between the effectiveness of conducting online practical lesson and onsite practical lesson. The t_{cal}value of 2.180 was found to be greater than the t_{tab} value of 1.653 given 198 degrees of freedom at 0.05 level of significance. The t_{cal}value was significant since it was greater than t_{tab} value, the null hypothesis was rejected. Also, $P_{cal}$was less than the $P_{set.}$ It implied that onsite practical lesson was more effective than online practical lesson.

4. Discussion

Research Question one: This study has shown that COVID-19 had a negative impact on learning of biology students in practical. From the results obtained from the analysis of research question one which seeks to find out the impact of COVID-19 lockdown on learning of biology students in practical. The analysis revealed that COVID-19 affects the learning of biology practical adversely this is in agreement with the findings of Aiyedun&Ogunode who opined that "the COVID-19 pandemic has affected academic programs thereby leading to major disruptions in academic activities". This result is in line with Ogunode (2020) who discovered that "100% of the respondents agreed that the COVID-19 pandemic has led to the suspension of the academic calendar of higher institutions in FCT, Abuja; a larger percentage of the respondents believes that the COVID-19 pandemic has led to the suspension of the research program of higher institutions in FCT; and majorities agreed that COVID-19 pandemic has led to the suspension of community service of higher institutions in FCT, Abuja".

Research Question two: The research question two which states that How effective was online classes in biology practical during COVID-19 lockdown?

The result showed that the respondent agreed that biology practicals can actually be effectively conducted online, since demonstration of the practical can be seen by the students and they also agreed that online practical can accommodate a larger participant without location being a barrier this is opposition to the findings of OsamudiamenEbohon, AnayochukwuChukwunonsoObienu, Francis Irabor, Frank IwebukeAmadin and Ehimwenma Sheena Omoregie (2021) watch before the actual virtual lecture. A fair number of students claim they did not gain all knowledge and skills expected in some courses taught virtually. One possible reason for this claim may be due to distractions as well as limited student–student and student–teacher interactions. While students agree that the number of assignments was too many and instructions were unclear, some no instructions were given except for the numerous reading materials sent in the google classroom and

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ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

teachers favored more assignments and oral examinations. Result from our study showed that these perceived large number of assignments and unclear instructions negatively influenced student's satisfaction significantly ($p < 0.05$).

Research Question three: The third research question which seeks to investigate the factors that militated against the effectiveness of online practical biology classes during COVID-19 lockdown shows that the majority of the respondent agreed that several factors militates against the smooth running of online practical classes such factors includes high cost of data, inadequate online facilities, power failure, poor network services, lack of practical experience and acquisition of practical skill etc. The research work revealed that this factors are basically responsible for inefficiency in the conduction of Biology practical and thus Biology practical is not feasible online.

The hypotheses which says COVID-19 pandemic has no significant impact on practical biology lessons was therefore rejected, showing that COVID-19 lockdown greatly affected the conduction of Biology Practical lessons, this is in agreement with the result of Ruth and Eilish, (2020) who discovered that "the COVID-19 crisis school closures had an overall negative impact on teaching, learning and assessment in science at both primary and second-level in Ireland. Teachers reported a 'somewhat negative' impact on their capacity to support student learning in science generally, differentiate learning to cater for students' needs or abilities, gather evidence of learning and make judgements on student learning, and provide feedback on progress towards learning goals".

Research question two which states that, there is no significant difference between the effectiveness of conducting online practical lesson and onsite practical lesson was also rejected indicating that onsite practical lessons is more effective than online practical classes, this is also in agreement with the findings of Aiyedun and Ogunode (2020) who discovered that "the majority of the respondents agreed that the COVID-19 pandemic has affected their institution and the students agreed that their institution is partially open, but there are major disruptions in academic activities". The respondents agreed that Classroom Lectures have been canceled or postponed due to COVID-19 and respondents agreed that COVID-19 will affect enrollment numbers for the new academic year. Which indicated that exams were not expected to be carried out as planned that semester due to COVID-19 as it affected research and practical work at the institution. This was also evident in Veritas University as the 100 level students had to postpone their practical Biology second semester examination and write in 200level first semester as the Dissection of Rat which was meant for second semester 100 level students could not be done virtually as it required practical skills carried out in a scientific laboratory. And more so students' projects were in danger of not being successfully completed as a result of COVID-19. This result is in line with Ogunode (2020) who discovered that "100% of the respondents agreed that the COVID-19 pandemic has led to the suspension of the academic calendar of higher institutions in FCT, Abuja; a larger percentage of the respondents believes that the COVID-19 pandemic has led to the suspension of the research program of higher institutions in FCT; and majorities agreed that COVID-19 pandemic has led to the suspension of community service of higher institutions in FCT, Abuja".

5. Conclusion:

The result of these findings on impacts of COVID 19 lockdown on students' learning of Biology practical addresses the after effect that COVID-19 confinement had on the students learning Biology practical. Coronavirus disease brought with it major constraint that inhibit physical contacts, social gathering and interaction of persons in places of worship, places of learning, and other associations that bring people together. As a result of this, Biology students were prevented from participating in the practical aspect of their studies which stresses hands-on activities. The studies on 'Biology Teachers' views on practical work in secondary schools of south Western Nigeria' emphasized on practical work in Biology as any learning experience which involves students' participation in activities such as observing, measuring, experimenting, recording, carrying out fieldwork, laboratory study of specimens, viewing experiment sample on microscope and lots more. From the above views, it is observed that Biology practical is not possible online as physical investigations cannot be done virtually without physical contact. However, to maintain this experimental area of study which is vital to scientific discovery, the recommendation of this research work

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

must be taken into consideration in order to stop the further spread of COVID-19, encourage Biology practical and put an end to lockdown even in the case of future emergence of other virus, because when laboratory investigations are encouraged, solutions to problems and sickness will be found.

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