

**INNOVATIVE TEACHING AND LEARNING STRATEGIES FOR  
SCIENCE AND VOCATIONAL SUBJECTS AT SENIOR  
SECONDARY EDUCATION LEVEL IN POST COVID-19 ERA**

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**Abstract**

*The study focused on innovative teaching and learning strategies for science and vocational subjects at the senior secondary education level in Post – COVID-19 era. The history of COVID-19 pandemic was examined and innovative teaching strategies like online teaching and learning, selected you-tube videos, e-mail-based consultations and other social media network-based teaching and learning strategies were extensively discussed. The challenges confronting the effective utilization of these teaching and learning strategies like inadequate funding, irregular power supply, poor network, among others were also examined. It was recommended that institutions should have alternative power supply, allocate more funds and embrace innovations in technology and put in place alternative strategies to combat the challenges posed by the pandemic without compromising students learning while preparing them at the same time for future crises.*

**Keywords:** *Innovative, Teaching, Learning, Strategies, COVID-19*

**Introduction**

The Corona virus diseases 2019 (COVID-19) which was recognized as a pandemic by World Health Organization officially on March 12, 2020 (WHO, 2020) has resulted in the interruption of the educational system from the pre-school to primary, secondary schools to the tertiary institutions.

COVID-19 pandemic has become a serious threat to Nigeria in particular and the world in general. It has impacted the world positively and negatively, it has changed the way we interact with each other, conduct our businesses, trades, travels, education and earn our livelihood. The lockdown of educational institutions in more than one hundred and seven countries of the world according to Akorede (2021) created a lot of problems in the education sector. The precautionary methods to stop the spread of the disease is avoiding MEN i.e. the touching of M- Mouth, E- Eyes, N- Nose and strictly follow WOMAN W-Wash hands, O-Obey social distancing, M- Mask up, E-Exercise and eat well and N-No unnecessary travelling, (Anonymous).

The social distancing and lockdown have made it difficult for students to have face to face interaction with their teachers and fellow students. In view of these developments a lot of innovative teaching strategies that are technology driven have evolved for use in the teaching and learning of science and vocational subjects which are helping to enhance social distancing thereby helping to reduce contact with each other and preventing further spread of the COVID-19 disease. Science subjects are subjects taught in secondary schools that deal strictly with the natural environment. They are out to give students knowledge, attitudes and skills with respect to exploration of nature which is made up of living and non-living things. The subjects include Biology, Chemistry and Physics at the senior secondary school level as well as Basic Science and Technology at the Junior Secondary School level. Vocational subjects on the other hand refer to all subject areas that are career based. They are subject areas that develop practical skills and knowledge related to a broad job area. These subjects at the secondary school level include ICT, Farming and Agriculture, Tailoring, catering, Business Studies, Automobile Electrical and Electronics, Printing and Stenography, among others.

This paper therefore, traced the history of the COVID-19 pandemic, the common symptoms of the disease and mode of transmission. The paper went further to examine the innovative teaching and learning strategies that have become prominent in the teaching and learning of science and vocational subjects in secondary schools in Nigeria in the post COVID-19 era.

### **History of COVID–19 Pandemic**

COVID-19 is an infectious diseases caused by the recently discovered corona virus in Wuhan, China in December 2019.

The novel Corona virus Disease 2019 (COVID-19) is an infectious viral disease caused by the recently discovered corona virus in Wuhan, China in December 2019. Corona virus is one of the major pathogens that primarily targets the human respiratory system. The genomic sequence analysis of COVID-19 showed 88% identity with two bat-derived severe acute respiratory syndrome(SARS)-like corona viruses (Lu, Zhao, Li, Niu, Yang & Wu, 2020), Wan, Shang, Graham, Baric and Li (2020), indicating that mammals are the most likely link between COVID-19 and humans. Several reports have suggested that person-to-person transmission is a likely route for spreading COVID-19 infection. This is supported by cases that occurred within families and among people who did not visit the wet animal market in Wuhan, China (Carlos, Dela, Cruz, Cao, Pasnick & Jamil, 2020), Wu, Hao, Lao, Wong, Leung, Wu, 2020). Person-to-person transmission occurs primarily via direct contact or through droplets spread by coughing or sneezing from an infected individual.

The Common symptoms of COVID-19 according to WHO (2020) are: fever, tiredness and new continuous dry cough. Some patients may have aches, pains, nasal congestion, running nose or diarrhea. Others include loss of appetite/taste/smell, sputum production, muscle aches, vomiting, among others.

The symptoms begin mildly and can gradually lead to serious ailment like difficulty in breathing. Older people and those with underlying medical conditions like high blood pressure, heart problems, diabetes are at higher risk of contacting the virus and developing complications.

Studies to date, show that the disease spread through contact with respiratory droplets expelled by an infected person. WHO (2020) recommends washing of hands regularly under running water for 20 seconds with soap and water or alcohol based hand sanitizers, maintaining 1 meter (3 feet) distance between oneself and anyone who is coughing and sneezing. Avoid touching eyes, nose and mouth, follow good respiratory hygiene like covering of mouth and nose with your bent elbow or use of tissue paper when coughing or sneezing and staying at home when unwell.

COVID-19 pandemic has become a serious threat to Nigeria in particular and the world in general. It has impacted the world negatively, it has changed the way we interact with each other, conduct our businesses, trades, travels, education and earn our livelihood.

Nigeria had 131 confirmed cases in twelve States on 30<sup>th</sup> March, 2020 and two fatalities then. As 13<sup>th</sup> April, 2020 Nigeria has 323 confirmed cases in twenty States with ten deaths. Majority of the confirmed cases in Lagos and the FCT are individuals with recent international travel history or those that came in contact with returnees from international trips.

The cessation of movement, physical distancing measures and prohibition of mass gathering remain the most efficient and effective way of reducing the transmission of the virus. It is in view of these developments, that the Federal Government announced the lockdown of Lagos, Ogun and the FCT for an initial period of two weeks and on the 13<sup>th</sup> April, 2020 extended the period of lockdown for a period of another two weeks effective from 11:59 PM on Monday 13<sup>th</sup> April 2020.

The lockdown has brought untold hardships on Nigerians especially those who earn daily wages such as traders, daily workers, artisans and manual workers since their sustenance depends on their ability to go out, mingle with others and seek daily jobs. It has become a matter of life and death, churches, schools, mosques were closed down. Majority of states in Nigeria and the major cities of the world were in complete lockdown.

The lockdown was relaxed in phases and schools resumed in September, 2020 in Benue State, however there were predictions that a second phase of the pandemic was likely to occur. Spain had declared state of emergency on account of the Covid-19 pandemic which may extend to March, 2021. United Kingdom announced one month lockdown, France announced two weeks, Germany four weeks and Italy to follow shortly. All these countries confirmed second wave which was deadlier. So we must get rid of the mentality that the virus does not exist and take utmost care and maintain all precautions to forestall further spread.

### **Innovative Teaching and Learning Strategies for Science and Vocational Subjects at the Senior Secondary School Level**

The advent of COVID-19 pandemic has led to the evolution of some innovative teaching and learning strategies that are technology driven. This is in view of the fact that institutions had to be locked down and students had to stay at home to avoid physical contact. Some of them are discussed as follows:

### **1. Advancement and Deployment of Modern Technologies for Teaching and Learning**

The COVID-19 pandemic and the subsequent closure of schools brought a lot of innovations in the Education sector. A lot of modern technologies are now deployed in the teaching and learning Process. Today many teachers and their students use social media like WhatsApp, Facebook etc. to teach their students and give assessments. These were social media in existence before the COVID 19 pandemic but not many teachers and students were interested in their usage particularly as it relates to teaching and learning.

### **2. Distance Learning**

Distance learning is one of the prominent modes of teaching and learning that became widely used during the school closures occasioned by the COVID-19 pandemic. A lot of institutions deployed online lectures, online notes for their students since the face-to-face contact was no longer possible. Teachers organized their examinations and assessments on-line and these modes of teaching and learning have become prominent and have come to stay.

### **3. E-mail Based Consultations**

This entails the course facilitator offering learners with a tutorial that is complimentary with the course contents via their e-mail addresses. The course facilitator sent questions to the learners via their e-mail addresses and the learners were expected to answer these questions at their pace in their various locations and scan the solutions to the course facilitator for corrections, The course facilitator sent a concise summary of their corrections to the learners through their e- mail addresses.

### **4. YouTube Videos**

This is another On-line innovative teaching and learning strategy that a lot of course lecturers had to employ in view of the lockdown enforced to reduce face- to- face contact thereby reducing the spread of the corona virus disease. Many course facilitators invested time in producing on-line videos for upload, others devoted their time to the utilization of software like: Zoom and Blackboard Collaborate (Huber and Helm, 2020).

### **5. Google Classroom**

Google classroom according to Akorede (2021) is a web-based platform that requires no payment and it encompasses all Google Suit services for teaching and learning process, such as Google Docs, Gmail, Google Forum, Google Slides and Google calendar. Google classroom is a great tool in helping

teachers to create specific classes for different subjects. According to larmuseau, Desmet and Depaepe (2019) the tool helps course facilitators to allocate tasks, dialogue and maintain some level of interaction with their students. To them, course facilitators through this facility can view the status of assignments, offer directives, give prompt feedback and allot scores inside the classroom.

### **6. Online Mock Quizzes**

These are on line questions covering the contents of a course given to students to practise in preparation for examinations. These quizzes according to Akerode (2021) are usually organized as structured essay –type questions on MY E Learning course platforms and learners were requested to answers the questions by inserting solutions in the spaces provided by the examiner.

### **7. Gaming Experience/Artificial Intelligence**

Gaming experience using artificial intelligence according to Akorede (2021) gives a lot of new and exciting experience to students, children, young people students are more attracted to these games and they enhance some of the competences in students such as readiness to undertake risks, decision making in crucial situations, critical thinking, persistence, entrepreneurial attitudes, among others

## **Challenges Confronting the Utilization of the Innovative Teaching and Learning Strategies**

Several challenges confront the effective utilization of the technology driven innovative teaching and learning strategies. Some of the challenges are discussed as follows:

### **1. Irregular Power Supply**

One of the greatest challenges faced by course lectures and facilitators in their efforts in utilizing these technology-driven innovative teaching strategies is irregular power supply. A lot of these teaching and learning strategies require adequate supply of power which is inadequately available in our institutions of learning.

### **2. Network Problems**

The problem of network is also one of the serious challenges confronting the effective utilization of these innovative teaching and learning strategies. Many of these strategies are on line and are dependent on the availability of network which is also not adequately available.

### **3. Inadequate Funding**

A lot of the innovating teaching and learning strategies are technology driven and are also heavily dependent on digital instruments, equipment and gadgets that are capital intensive. Most schools are inadequately funded and therefore find it difficult to procure these facilities for on line teaching and learning. This a serious challenge confronting the smooth transition to on line teaching and learning.

### **4. Time Management**

The innovative teaching and learning strategies present some challenges that are not experienced in the face-to-face teaching and learning technique. The formal face-to-face technique prevents the facilitator wasting precious time in producing videos for holding on- line classroom sessions.

### **5. Inadequate Skills to Manage On line Teaching and Learning**

Many teachers and students find it difficult to manage both the on line teaching and learning. This is because both teachers and students are used to the conventional face to face teaching and learning. This to a large extent is hindering the adoption of these technologies because many teachers and students lack the requisite skills.

### **Conclusion**

The COVID-19 Pandemic has impacted positively and negatively on the educational system. In view of the lockdown that stopped face- to- face teaching and learning strategies to prevent the spread of the disease, innovative teaching and learning strategies that are technology driven evolved and have come to stay. All stakeholders in the education sector must put measures in place to ensure that secondary schools adopt these innovative teaching and learning strategies for science and vocational subjects so as to mitigate the negative impacts and consolidate on the gains.

### **Recommendations**

The following recommendations are hereby put forward:

1. Secondary schools should put in place an effective Information and Communication Technology (ICT) to support on-line teaching and learning for teachers and students.

2. Government should also ensure regular supply of power and also provide alternative sources in order to enable the ICT equipment to function steadily.
3. Teachers should be made to undergo trainings in the use of modern technologies for teaching and learning.
4. Institutions should continue to create awareness among their students with regards to the COVID-19 pandemic and its negative impacts.
5. Teachers should continue to encourage students to keep to the precautionary guidelines and protocols established.

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