TEACHERS' COMPETENCIES AND CONSTRAINTS IN THE IMPLEMENTATION OF E-LEARNING IN PHYSICS IN COVID-19 PANDEMIC ERA

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Abstract:

The study investigated teachers' competencies and constraints in the implementation of e-learning in Physics in the pandemic COVID-19 era. The study adopted the mixed-method research design, specifically descriptive survey and exploratory analysis. The purposive sampling technique was used to select a sample of 66 secondary school Physics teachers in secondary schools in Port Harcourt and Obio-Akpor Local Government Areas of Rivers State. The research instruments were Basic e-Learning Implementation Competencies and Constraints Questionnaire (Be-LICCQ) (r = 0.82) and the Structured Interview Template on e-learning (SITe-L). Data were analyzed using Mean. The study revealed that Physics teachers lack basic competencies in utilizing e-learning facilities in secondary schools. Several constraints were identified by Physics teachers such as inadequate technical support, teachers' resistance to e-learning adoption, epileptic power supply, poor internet connectivity, and administrative barriers among others. The study, therefore, recommends training and retraining of Physics teachers in other to empower them with the skills needed for the implementation of e-learning in Physics, especially in the pandemic era.

Keywords: e-learning, competencies, constraints, physics, physics teaching, COVID-19 pandemic.

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1. Introduction

COVID-19 pandemic was a major public health emergency that attracted international concern. In response to the adverse human catastrophes caused by the transmission of COVID-19, public spaces such as schools, universities and offices that engaged in face-to-face interactions were temporarily closed. Li and Lalani (2020) stated that over 1.2 billion students in 186 countries across the world were affected by the shutdown of schools. Nigeria's educational sector was not exempted from its ugly quagmire as total lockdown of schools from pre-school to tertiary institutions in all parts of the country was immediately enforced. A report by the Emergency Working Group on Education (2020) showed that over 46 million Nigerian students at different levels of education were affected by the closure of the schools. The ugly development made many schools to resort to online delivery of lessons to their students in their different homes. The experience could be summarized as 'the good, the bad and the ugly' for both the teachers and the students who were suddenly forced into the experience without proper or adequate preparation.

E-learning (electronic learning) entails the use of Information and Communication Technologies (ICT) in teaching and learning. Kopp, Gröblinger and Adams (2016) explained that e-learning requires the application of all digital processes optimally in accomplishing educational goals. Eze, Chinedu-Eze and Bello (2018) noted that e-learning education is all-inclusive as blending ICT gadgets and modern telecommunication equipment into the education system is quite essential. Through the e-learning platform, learning materials can be uploaded, an online classroom established synchronously or asynchronously, opportunities to monitor learners' academic engagement, providing an assessment of assignments through an online feedback mechanism, availability of group discussions with students or colleagues among others. Ikeh, Chinyere, Ajah, and Owolaw (2020) asserted that adopting e-learning can be beneficial for both in and out the classroom situations, which implies that it can be blended with the traditional face-to-face instructional approach.

Competence is the general ability and readiness of an individual to act, based on the knowledge and experience acquired through training; focused on the individual's independent participation in the educational and cognitive process and aimed at its successful integration into society (Babaev et al., 2020). Husain (2010) asserted that teachers are expected to develop basics e-learning competencies which involve designing effective learning experiences, preparing the interactive based learning environment and creating a rich learning environment that supports knowledge. Ikeh, Chinyere, Ajah, and Owolaw (2020) posited that e-learning implementation demand skills essential to teachers for effective teaching. Similarly, Malininia (2014) noted that teachers must be equipped with the basic skills of e-learning so as to make the best use of it during teaching and learning. Teaching effectively with technology requires teachers to possess adequate technology skills (Akpabio & Ogiriki, 2017). Empirica (2006) in a survey report noted that teachers do not use e-learning facilities for teaching because most of them claimed that

"lack of skills" is the major barrier. Cuhadar (2018) also found out that the technological competency level of teachers is low.

Literature is replete with research on constraints to the implementation of e-learning in schools. Kisanga and Ireson (2015) discovered constraints to the adoption of e-learning in Tanzanian Universities such as lack of infrastructure, lack of funding to facilitate technology, poor planning, lack of computer knowledge by some teachers, and resistance to change as well as lack of technical and managerial support. Similarly, Ajegbelen (2017) in a study on challenges to e-learning in secondary schools discovered challenges such as high cost of computers and other facilities, inadequate funding, lack of trained personnel, lack of computer knowledge by teachers, and lack of facilities and many workloads on teachers. In the same vein, Okoro (2021) discovered constraints such as inadequate funding, lack of facilities, shortage of facilities, poor internet connections, high cost of facilities, shortage of power supply and negative attitude of lecturers.

Physics is a science subject whose knowledge application through technology is crucial for providing the infrastructure that all countries need. Undoubtedly, the importance of physics for the sustainable development of all countries is unambiguous. The aim of learning Physics in secondary schools in Nigeria is to ensure that learners acquire basic concepts and principles of Physics, provide scientific skills and attitudes expected in the promotion of technological applications and importantly enhance creativity self-reliance and sustainability (FRN, 2014). Regan (2008) as cited in Udoh (2010) noted that the engagement of e-learning platforms for the teaching of Physics stimulates students' interest and promotes the understanding of difficult concepts inherent in the subject. An effective Physics teacher is one who must be a master of his/her subject, grounded in the methods of teaching and as well relate concepts learnt to the everyday life experience of the learners through the integration of modern technologies via the e-learning platform. The onus is therefore on the Physics teachers who are now faced with the challenges of the best possible ways for implementing e-learning to ensure learners' understanding of Physics in secondary schools. Physics is a subject that requires higher-order thinking skills, and as such has been recording consistently poor performance of students over the years. WAEC Chief Examiner's reports in the past years such as 2016 to 2019 have consistently revealed students' weaknesses in the understanding of concepts in Physics. The pandemic has also compounded the situation as the teaching of Physics has been taken to online platforms. Many schools resorted to the online transmission of lessons during the pandemic. How competent were the teachers for this task? What were the constraints to the implementation of e-learning in Physics during the pandemic? This study, therefore, investigated teachers' competencies and constraints in the implementation of e-learning in Physics in the COVID-19 pandemic era.

2. Aim and Objectives of the Study

The aim of the study was to investigate teachers' competencies and constraints in the implementation of e-learning in Physics in the pandemic COVID-19 era. Specifically, the objectives of the study were to:

1) ascertain the level of basic competencies possessed by secondary school Physics teachers in the use of e-learning facilities.
2) investigate the constraints to the implementation of e-learning for Physics teaching in secondary schools in Rivers State.

2.1 Research Questions

1) What is the level of basic competencies possessed by secondary school Physics teachers towards their application of e-learning facilities?
2) What are the constraints to the implementation of e-learning for Physics teaching in secondary schools in Rivers State?

3. Materials and Methods

The study investigated teachers' competencies and constraints in the implementation of e-learning in Physics during the pandemic COVID-19 era. The study adopted the mixed-method research design, specifically descriptive survey and exploratory analysis which provided both qualitative and quantitative data. Mixed method research design according to Fischler (2021) is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative research and methods in a single study to understand a research problem with "more in-depth exploration" or clarification. The population of the study consisted of all Physics teachers in secondary schools in Port Harcourt and Obio-Akpor Local Government Areas of Rivers State. A purposive sampling method was used to obtain 66 secondary school Physics teachers engaged in the study. These teachers were chosen based on the fact that they have qualifications in education. The research instruments were Basic e-Learning Implementation Competences and Constraints Questionnaire (Be-LICCQ) and Structured Interview Template on e-learning (SITe-L).

Basic e-Learning Implementation Competences and Constraints Questionnaire (Be-LICCQ) is divided into three sub-categories. Sub-category A was designed to elicit demographic information from the respondents. Sub-category B was designed to elicit information from the respondent on basic competencies required of secondary school Physics teachers for the purpose of implementing e-learning activities in the teaching of Physics in COVID-19 era. Sub-category C contains statements that focus on constraints to the implementation of e-learning in Physics.

Structured Interview Template on e-learning (SITe-L) consisted of questions that were asked by the researcher which required free oral expressions of the respondents and are required to complement their initial response on Be-LICCQ. The interview session for each respondent lasted for 30mins and a recorder was used to record their expressions

during the interview with the permission of the respondent. The recorded responses were further transcribed for coding as well as the thematic content analysis was employed to ascertain existing similar patterns across the data set. The instruments were validated by two experts in Educational Technology and the other two in Science Education. Using test-retest technique, copies of the instrument Be-LICCQ were administered to 20 secondary school Physics teachers and a reliability coefficient of 0.82 was obtained when the responses were subjected to Pearson Product Moment Correlation. Data was analyzed using Mean.

On Be-LICCQ, level of basic competences possessed by Physics teachers are rated Very Low (VL), Low (L), High (H) and Very High (VH) for competences with approximate mean values of 1, 2, 3, and 4 respectively. On the constraints to the implementation of e-learning, a criterion mean value of 2.50 was used as the basis for decision making. A calculated mean value less than 2.50 is considered to be rejected while a calculated mean that is equal to 2.50 and above is considered to be accepted as a constraint.

4. Results and Discussions

Research Question 1: What is the level of basic competencies possessed by secondary school Physics teachers towards their application of e-learning facilities?

Table 1: Mean values of the level of
basic competencies possessed by Physics teachers

S/no	Basic e-learning competencies	Mean	Decision
1	Word processing skill	2.27	L
2	Spread sheet skill	2.01	L
3	Database skill	1.95	L
4	Electronic presentation skill	2.11	L
5	Web navigation skill	1.84	L
6	Website design skill	1.20	VL
7	Email management skill	2.29	L
8	Digital camera skill	2.58	L
9	Power point skill	2.10	L
10	Computer network knowledge	1.84	L
11	File management & windows explorer skills	1.92	L
12	Downloading software from the web	1.87	L
13	Installation of computer software	1.02	VL
14	Videoconferencing skill	2.14	L
15	Computer-related storage devices	2.04	L
16	Scanner knowledge	2.22	L
17	Deep Web knowledge	1.97	L
18	Computer security knowledge	1.99	L
19	Educational copyright knowledge	1.05	VL
Aggregate mean		**1.92**	**L**

The analysis on Table 1 indicates the response on the level of basic competencies possessed by Physics teachers in their applications of e-learning facilities in secondary schools. The findings of the study based on the aggregate mean value of 1.92 show that the level of basic competencies possessed by Physics teachers towards their applications of e-learning facilities is low.

Research question 2: What are the constraints to the implementation of e-learning for Physics teaching in secondary schools in Rivers State?

Table 2: Mean of responses to constraints
to the implementation of e-learning for Physics teaching

S/no	Constraints to e-learning implementation	Mean	Decision
1	Financial constraints	2.73	Accepted
2	Lack of e-learning infrastructure	2.81	Accepted
3	Inadequate technical support	2.54	Accepted
4	Teachers' resistance to e-learning adoption	2.66	Accepted
5	Lack of training for e-learning implementation	2.87	Accepted
6	Epileptic power supply	2.75	Accepted
7	Cost of internet data services	2.52	Accepted
8	Poor internet connectivity	2.55	Accepted
9	Lack of e-learning knowledge	2.61	Accepted
10	Administrative barriers	2.73	Accepted
Aggregate mean		**2.68**	**Accepted**

Table 2 shows the constraints to the implementation of e-learning for Physics teaching in secondary schools. An aggregate mean value of 2.68, indicates that the teachers accepted all the identified items are constraints to the implementation of e-learning for the teaching of Physics in secondary schools.

5. Summary of Findings

The findings of the study showed that the level of basic competencies possessed by Physics teachers towards their applications of e-learning is low. Corroborating the findings of this study is the finding of Empirica (2006) that teachers do not use e-learning facilities for teaching because of a lack of skills. It also agrees with Cuhadar (2018) who found out that the technological competency level of teachers is low. Excerpts from the participants indicated below complimented the findings of the study:

> "…apart from my phone that I can use to browse the internet for information, I don't think I can use the computer effective. Most times I require the assistance of a colleague to be able to do some typing…"

> "…the challenge I have is to synchronize video and words when making an educational resource for my students."

"…developing e-learning platform for the teaching of these present students in sciences especially Physics will be quite intriguing, but we teachers are deficient the basic skills that could facilitate this learning environment."

The study further revealed that the Physics teachers accepted all the identified items as constraints to the implementation of e-learning for the teaching of Physics in secondary schools. The constraints include inadequate technical support, teachers' resistance to e-learning adoption, poor internet connectivity, epileptic power supply, and administrative barriers among others. Excerpts from an interview session collaborate with the findings as noted below:

"…the challenges for implementing e-learning is quite overwhelming because it is financially dependent. Even where some schools would provide these facilities, some of us (teachers) might not be able to flow with the present technological trend."

"I feel that the government should deliberately engage teachers in the training for the use of e-learning facilities so that teachers can be equipped with skills for use the platform for teaching."

"I have tried using the zoom app to teach my students during the Covid-19 pandemic but it actually cost me a lot in terms of finance… school managements that are technologically conscious would have supported but to no avail."

"…countries that implement e-learning platform for teaching have surpass the issues of power failure. Before there can be discussion the use of e-learning for teaching, electric power should be constant."

These findings are in consonance with those of Kisanga and Ireson (2015) who discovered constraints to the adoption of e-learning such as lack of infrastructure, lack of funding to facilitate technology, lack of computer knowledge by some teachers, resistance to change as well as lack of technical and managerial support. These findings also agree with those of Ajegbelen (2017) who discovered challenges such as the high cost of computers and other facilities, inadequate funding, lack of trained personnel, lack of computer knowledge by teachers and lack of facilities. These findings also agree with those of Okoro (2021) who discovered constraints such as inadequate funding, lack of facilities, shortage of facilities, poor internet connections, shortage of power supply, high cost of facilities and negative attitude of lecturers.

6. Recommendations

In light of the findings of the study, the following recommendations were made:

1) Training and retraining programmes should be organized for Physics teachers to be acquainted with the skills of using e-learning facilities for the teaching of Physics in the COVID-19 era.
2) The support of Government (at all levels), school administrators and other stakeholders in the field of education are exigently required to address the constraints impeding the implementation of e-learning in the teaching of Physics.

7. Conclusion

A fact that cannot be denied is that e-learning has come to stay in education. Physics teachers, therefore, need to key into the transformation that e-learning affords. They need to seek training in the competencies needed for this transformation in order to benefit the students who are at the receiving end of the teaching and learning process.

Conflict of Interest Statement
The authors declare that there is no conflict of interest.

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