ASSESSMENT OF ZOOM APPLICATION FOR PHYSICS LEARNING DURING COVID-19 SCHOOL CLOSURE IN NIGERIA

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Abstract
This study assessed Physics learning on zoom platform during the COVID-19 school closure in Nigeria. Descriptive survey research design was employed for the study. 246 students registered and participated in the study from National Open University of Nigeria (NOUN) over an-eight week period. Three instruments used were Students' Zoom Platform Observation for Attendance (SZPOA), Zoom Application and Physics Engagement (ZAPE), which was validated by experts in online learning and Physics educators, and Physics Achievement Test (PAT), which was validated by experts in Physics and Science Education. The reliability of ZAPE was found to be 0.76 using Cronbach's Alpha while that of PAT was found to be 0.81 using Pearson Product Correlation Coefficient Formula. Results showed low attendance 88 (35.8%) of Physics students and under-representation of female students 22(9%) in Physics education. The study revealed that most students perceived that zoom application support academic engagement except in collaboration and assessment. It also established that the female perception of zoom support for academic engagement is greater than their male counterparts. It was found that students' performance in Physics is low, with no significant difference between male and females. The data suggest the need for massive awareness in Physics e-learning.

Keywords: *Physics Education, Zoom Application, COVID-19 Pandemic, School Closure.*

Introduction

Science is the core of economic, industrial and technological development of any nation (Omiola *et. al.,* 2012; Iwuanyanwu *et. al.,* 2015). For this reason, development cannot take place in the absence of science. Physics is an integral part of science needed for technological transformation in the society. The concepts, principles and practice of Physics contribute to national development, technology and many fields of human endeavour. Physics is the basic science subject that deals with those fundamental questions of matter and interaction of elementary constituents of nature that are susceptible to experimental investigation and theoretically inquiry (Elwan, Serage&Alwan, 2013; Olusegun ,Ohwofosirai & Emagbetare 2015). According to Ukoh (2012), Physics helps students to develop the observation skill, accuracy, analysisability, creative thinking. In a similar manner, Changeiywo, Wambugu & Wachanga (2011) reported that Physics knowledge is important for more advanced transformation, information and technology era. Therefore, Mekonnen (2014) remarked that without Physics knowledge, human will face difficulties in exploring the universe for development and growth. Physics education trains personnel needed for scientific advances and discoveries. As such, the subject has been adjudged as an important element in the education of physicists, Agricultural scientists, engineers and computer scientists, as well as other physical and biomedical scientists (Okeke and Nwadinigwe, 2015).

Despite the importance of Physics, its teaching has been disrupted with the current global pandemic caused by Corona virus also known as COVID-19. The safety concerns and travel restrictions caused by COVID-19 have hampered Physics teaching through loss of school days; interruption of teaching time table; and cancellation of internal assessment. Experimentally, these variables foster cognitive achievement and provide information on students' progress. According to Andersen and Nielsen (2019), the inability of the schools to conduct assessment could delay recognition of learning difficulties with the implication of long-term harmful effects on the child. Also, it was found that differences in hours of instruction in mathematics, language and science caused significant differences in test score outcomes (Lavy, 2015). As a consequence, lost school time could prevent students' access to learners' supports and affect positive learning.

The high rate of fatality and COVID-19 contact transmissibility compelled countries across the globe to adopt measures of stay-at-home and temporary suspension of all academic activities to contain the spread of the virus. Students' idleness and no academic engagement in Physics learning, in core areas

of participating in practical work, assessment, collaboration, communication as well as lack of feedback occasioned by the closure of schools and Universities have become a threat to students' performance and capacity building. According to UNESCO (2020), the crisis is now imparting close to 363 million learners worldwide including 246 Physics students of the National Open University of Nigeria. The objective of NOUN is to provide a wider access to scientific skills and attitudes that aid the technological application of learners using course materials designed with social, cognitive and teaching presence for educational experience, mobile laboratory for practical exercise coupled with learners' support from the facilitators in the study centres. Thus, the approaches adopted by the institution ensured removal of barriers of time and space to educate students to their maximum level.

With COVID-19 lockdown, there is need for transition from course material based and physical contact teaching to the virtual that accommodate stay-at-home mandate. Khaddage and Knezek (2013) reported that technological devices enable education to take place in a much broader context than the confines of school walls. Hence, technology can remove the barrier of social distance to contain the spread of the coronavirus in the society and provide every school gesture that result in students' motivation for learning

Technologies that can be used for virtual education include zoom, Skype, Google Hangout, Adobe Connect or GoToWebinar, and Blue Jeans. These applications provide learning environment where lecturers and students are separated by time and space. The most popular of them all is Zoom, which has been identified to have all kinds of additional features to help participants stay engaged. For instance, the interface design and quality of the video is an advantage over others. The technology makes it incredibly easy to connect via web conference with students from all over the world (Sayemet. al., 2017). According to researchers, zoom is a cloud-based video conferencing technology that uses synchronous mode for educational purposes and unique for providing multiple ways for students to actively engage with course content and interact with peers and lecturers (Bower, 2011; Hudson & Collins, 2012). Gorsky and Caspi (2005) explained that synchronous learning involved the exchange of ideas and information with one or more participants during the same period of time. Thus, the mode of learning is real-time with teacher-student's face-to-face discussion and live teacher instruction. The technology enables recorded session, information sharing or annotate on one another's screens, with the devices for student's feedback and symbols to signify attentions and devices for class control. Additionally, zoom application allows instructors to be creative in their instructions and actively engage in the content with their students; it also permits students to connect through virtual tutorials from any convenient location (Bernazazzani, 2020).

Issue of gender inequality in science, especially Physics is a global challenge because literature revealed that gender studies in science subjects' performance are inconclusive. Oguama, Onuoha & Ugwokwe (2019) showed that gender had no significant influence on students' achievement while Okafor (2016) asserted that boys outperformed girls in science. Ogunneye & Lasisi (2008) noted that the development of any nation requires that all students (male and female) be adequately empowered to be able to contribute their quota meaningfully and appropriately. Therefore, to reap the benefits of Physics, there is need to bridge the gender gap.

Report from previous studies had shown that student's class attendance and engagement are germane to academic outcomes in higher education (Kirby & McElroy, 2003; Fadelelmoula, 2018).Therefore, to better carryout meaningful learning in higher education especially in Physics, class attendance and engagement play greater role in enhancing students' interest and good performance.

It is imperative to use modern technology such as zoom that can enable lecturers and students separated by time and space from non-academic engagement due to COVID-19 school closure. Therefore, the objective of the present study is to assess Physics learning on zoom platform during the COVID-19 lockdown in Nigeria.

Conceptual Framework

The study proposed a conceptual frame work and hypothesized on the effect that Physics students become rusty, backward academically and vulnerable when they are left with no academic

engagement, thereby leading to cognitive decline and failure. In contrast, when students are engaged meaningfully each day, they will be productive and perform to the optimum. The conceptual framework showing the interrelationship between the various constructs of the study is represented in Figure 1.

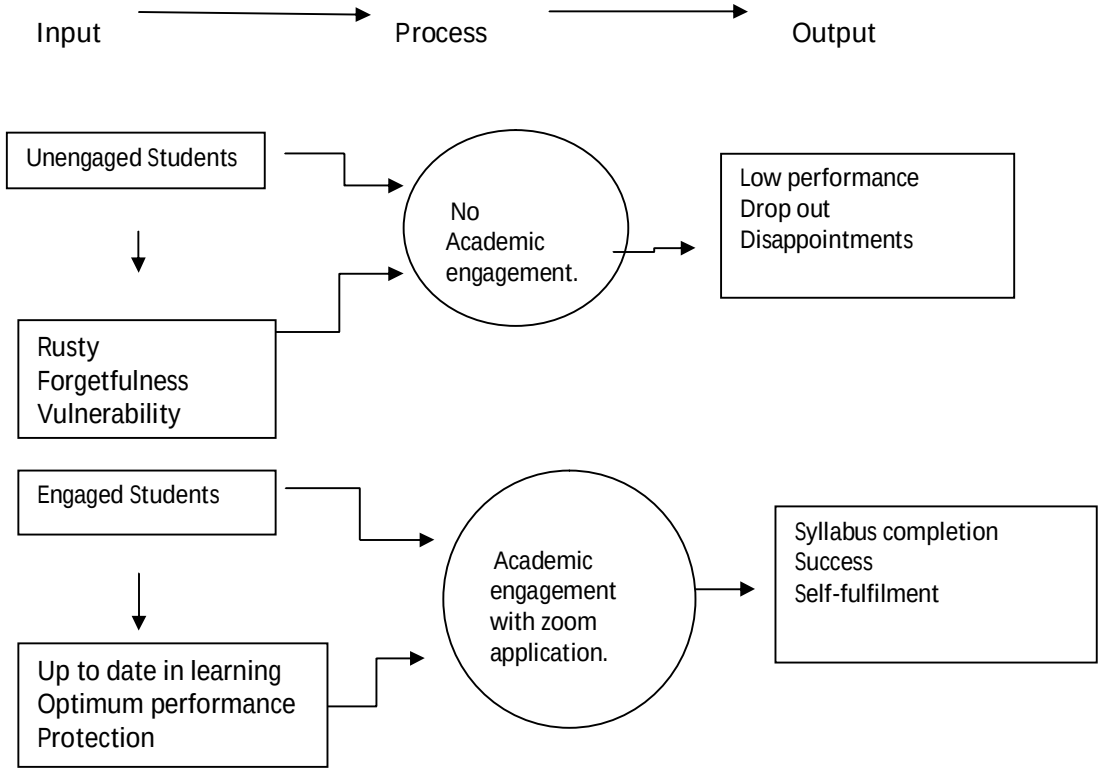


Figure 1: Conceptual framework (Source: Author's conceptualization)

From figure 1, performance in Physics is determined by academic engagement of students' in learning, laboratory activities, attending to assignments, participation in group discussions, and participation in formative and summative assessment. Means of engaging the students as COVID-19 forces school closures in 185 countries is also a key parameter in terms of objectives set for the academic engagements. Therefore, the means must be able to remove the barriers of time and space that separated students and lecturers. This lead to choice of zoom technology where lecturer in virtual environment through management applications, provides course contents and help remote Physics students perform academic engagements that culminate to syllabus completion, success and self-fulfillment.

Technological Acceptance Model

The ground framework to explain zoom application in this study is based on Technology Acceptance Model (TAM) proposed by Davis, Baggozi and Warshaw (1989).The TAM is an information system theory that shows how users would use and accept Zoom application as an educational delivery medium to proffer solution for school closure caused by COVID-19 pandemic.

TAM is one of the most important models for understanding adoption of information technology. It has factors which influence the decision of users when they are presented with a new technology such as: (i) Perceived usefulness (PU), which is the degree a person believes that using a particular system would enhance his or her job performance. (ii) Perceived ease of use (PEOU), which is the degree a person believes that using a particular system would require no effort. (iii) Perceived access (PA), the degree to which a person gain free access to technology usage without hindrance, and (iv)Perceived credibility (PC), expresses the degree to which users appreciate the worth or quality of the technology with dignity and confidence (Davis *et. al.*, 1989).

Aims and Objectives

The aim of this study is to use zoom application to engage students during the lockdown occasioned by COVID-19 pandemic. The objective is to determine the extent of students' attendance and engagement and performance in zoom platform by the Physics students.

The following research questions were raised to guide the investigation:

1. What is the extent of Physics students' attendance for academic engagement in zoom platform?
2. What is the performance of the students with 100% attendance and academic engagement on zoom platform during COVID-19 lockdown?
3. To what extent does zoom application support academic engagement as perceived by Physics students?
4. To what extent does gender influence zoom application support for academic engagement as perceived by Physics students?

Hypothesis

Ho_1: There is no significant difference between male and female students' Physics performance in zoom platform During COVID-19 lock down.

Research Methodology

Descriptive survey mount on quantitative research was employed for the study. This study was conducted during COVID-19 lockdown school closure of National Open University of Nigeria (NOUN) that began on 28th March, 2020. The study text is SED223 (Physics for integrated science). The target population is all Physics education students in NOUN. A total of 246 students in 200 Level comprising of 140 males and 106 females were expected to participate in the study for a period of eight weeks. However, only 88 of the students comprising of males (n = 66) and females (n = 22) were in attendance. These students spread over the six geo-political zones of Nigeria, namely north East, North West, North Central, South East, South South, and South West.

The University management, through Directorate of Learning Management Content (DLMC) of NOUN had earlier organized training workshop for lecturers on the use of zoom application to drive course contents in the areas of Mechanics and Heat the way it is designed and calibrated, most especially the mathematically inclined subjects. Three instruments were used for the study. The first is Zoom Platform Observation for Attendance (ZPOA), used during students' academic engaged time. At every teaching event on zoom platform, lecturer engaged the students in an observable way and screen shot the participant list. Through this method, data on attendance were collected.

The second of the instrument was lecturer's developed questionnaire tagged Zoom Application and Physics Engagement (ZAPE) which elicits information on zoom application support for academic engagement as perceived by Physics students. The questionnaire items had responses and weights as Not at all (1), Rarely extent (2), To a certain extent (3), To a great extent (4). The data were analysed using mean and standard deviation to answer the research questions. A mean of 2.5 and above were regarded as high extent while any mean less than 2.5 while any mean less than 2.5 were regarded as low extent. Therefore, the participants' range mean scores were assumed and interpreted to be:

1 - Not at all
2 - Rarely extent
3 - To a certain extent
4 - To a great extent

The questionnaire was validated by experts in online learning and Physics educators. The reliability of the instruments was determined using Cronbach's alpha and value was found to be 0.76. The last of the instrument was adopted from NOUN Physics past questions titled Physics Achievement Test (PAT) with a reliability coefficient of 0.81 using Pearson Product Correlation Coefficient and was validated by experts in Physics and Science Education. The PAT contains five theory test items in the area of Mechanics and Heat as calibrated in the course outline. Data collected from the study were analysed based on research questions generated. Research questions1, 2 and 3 were answered using descriptive statistics for bar and line graph. The only hypothesis was analysed using t-test statistical

analysis. The vignette of the classroom arrangement showing the position of the lecturer and the students that were spread in different geo-political zone in the study is represented in Figure 2:

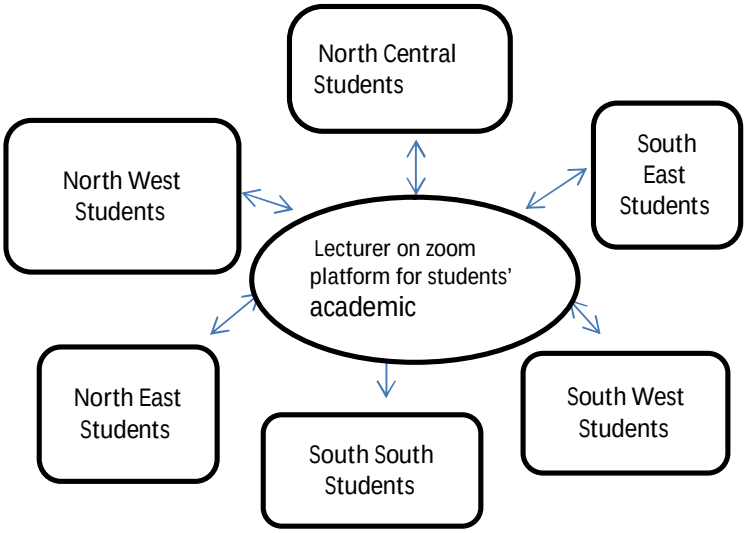


Figure 2: Vignette of the classroom arrangement

Figure 2 shows lecture's students arrangement in virtual Physics class. The lecturer through zoom platform engage students in content, promote student-lecturer and student-student interaction and interactive assessment. While students with their technological skills, actively participate in online activities from their different location.

Research Question 1: What is the extent of Physics students' attendance for academic engagement in zoom platform?

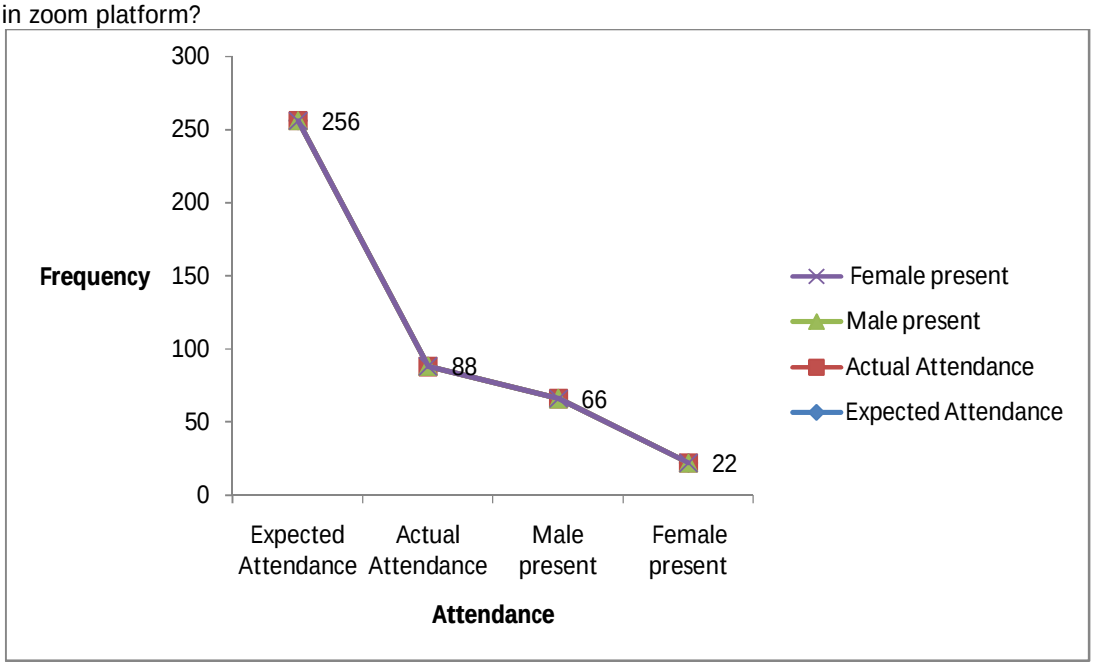


Figure 3: Physics students' attendance for academic engagement in zoom platform.

Figure 3 show low attendance during the zoom meeting. Out of 246 students that registered for the course, only 88 comprising of 66 male and 22 female students were in attendance. This implies that the number of students that made themselves available for academic engagement through zoom platform during COVID-19 school closure is very low.

Research Question 2: What is the performance of students taught on zoom platform during COVID-19 lockdown?

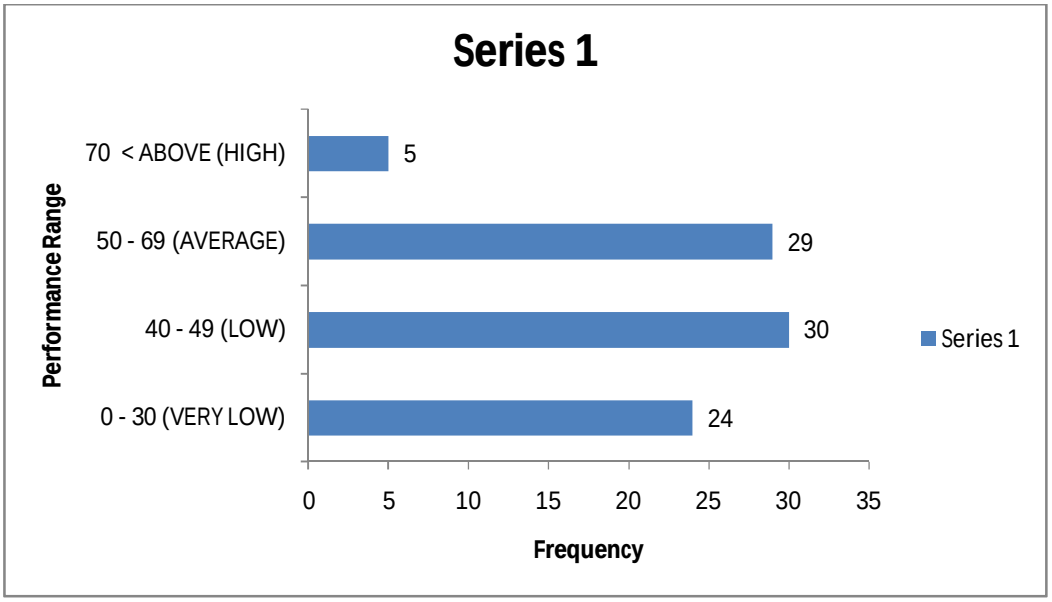


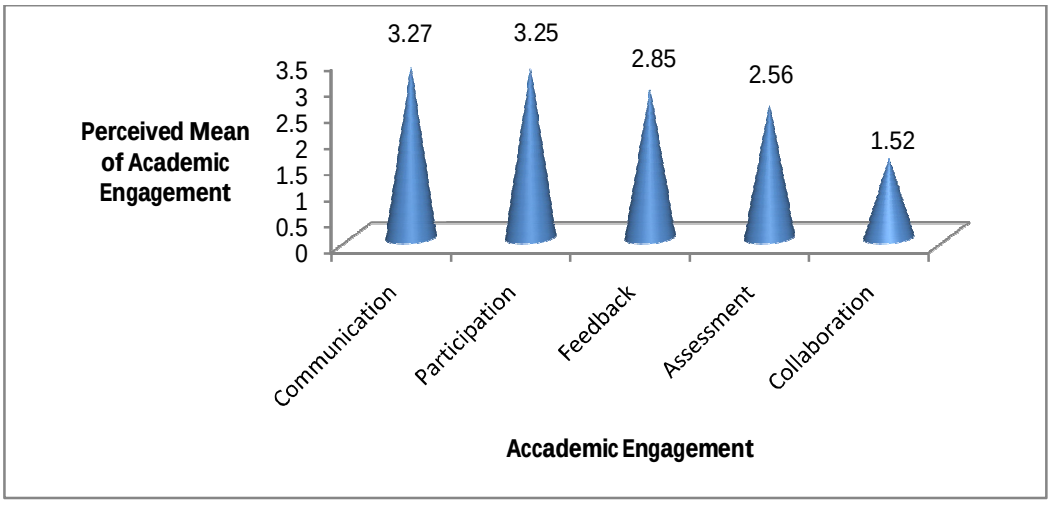
Figure 4: Bar graph showing the performance of Physics taught on zoom platform

Figure 4 show that students' performance is generally low. Out of eighty eight (88) students in attendance, fifty four (54) scored below average. Twenty nine of the students fall within average while only five students scored above average.

Research Question 3: To what extent does zoom application support academic engagement as perceived by Physics students?

Table 1: Extent of zoom application support for academic engagement

Academic Engagement	Mean	Std. Devn	Std Error	Rank
Communication	3.27	.582	.062	1
Participation	3.25	.572	.061	2
Feedback	2.85	.558	.059	3
Assessment	2.56	.623	.066	4
Collaboration	1.52	.502	.054	5



From Table 1 and Figure 5, items set for 88 Physics students reflected perceived mean academic engagement as communication (X = 3.27), participation (X = 3.25), Feedback (X = 2.85), Assessment (X = 2.07), and Collaboration (X = 1.52). It could be inferred that most students perceived that the zoom application support Active participation, feedback and communication. While majority of the student perceived that it did not support collaboration and assessment.

Research Question 4: To what extent does gender influence zoom application support for academic engagement as perceived by Physics students?

Table 2: **Mean rating of male and female extent of zoom application support for academic engagement.**

S/N	Academic Engagement	Gender	N	Mean	Std. Deviation	Std. Error Mean	Remark
1	Communication	Male	66	3.24	.583	.072	
		Female	22	3.36	.581	.124	High
2	Participation	Male	66	3.27	.570	.070	High
		Female	22	3.18	.588	.125	
3	Feedback	Male	66	2.82	.552	.068	
		Female	22	2.95	.575	.123	High
4	Assessment	Male	66	2.52	.614	.076	
		Female	22	2.68	.646	.138	High
5	Collaboration	Male	66	1.36	.485	.060	
		Female	22	2.00	.000	.000	Low

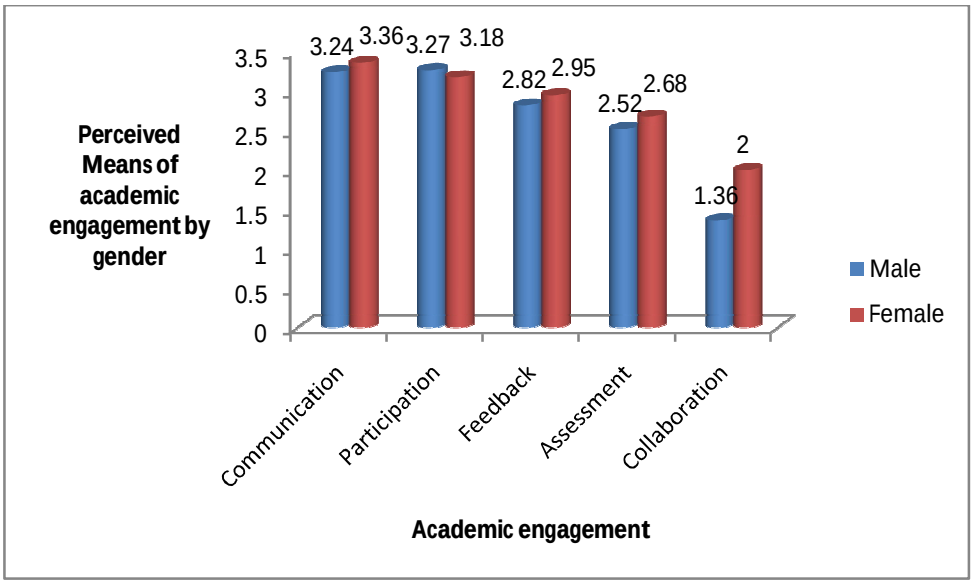


Figure 6: Bar Graph showing the perceived means of academic achievement

Table 2, Figure 6 shows the mean rating of male and female Physics students' perceived extent of zoom application support for academic engagement. From table 2 and figure 6, both the male and female students have higher mean values perceived in four indices, while their perceived mean value was low in collaboration

Testing of Hypothesis

Ho_1: There is no significant difference between male and female students' Physics performance in zoom platform During COVID-19 lock down.

Table 4: t-test of male and female Physics students' performance by gender in zoom platform

Variable	N	Mean score	Standard Deviation	Standard error	DF	t-cal	P
Male	66	21.203	11.98	1.74	86	-1.420	.160*
Female	22	25.18	12.82	2.23			

*Significant at P<0.05 level

Table 4 shows that male Physics students in NOUN had a mean score of 21.203 in Physics performance test while female students had mean of 25.18. The t-calculated is -1.420 (degree of freedom is 78) with p-value of 0.160. The hypothesis is accepted at 0.05 level of significance. (p-value> 0.05). It is therefore concluded that there is no significant difference between male and female performance in zoom platform During COVID-19 lock down.

Discussion of Findings

The low attendance indicates a bad pointer to the performance of the students in view of the assertion of Credé *et. al,.*(2010) who reported a positive correlation between students attendance and good performance. The low attendance recorded by some students in the North East zone of Nigeria could be ascribed to insecurity caused by insurgence and terrorism in the area. In other zones, lack of interest, power, or internet facilities to connect with the meeting could be responsible for their absenteeism.

Gender attendance revealed low attendance of female students. This finding is in agreement with Ogunleye (2001) who reported that girls are underachieving and under-represented in Physics. In the same vein, Gonzuk and Chagok (2001) reported that girls are easily discouraged towards taking Physics due to the negative impression that Physics is a difficult subject. The under representation of female students in zoom meeting for Physics instruction might be due to increase in domestic engagements, the sole responsibility of females in African culture. This could prevent females from performing to optimum in contributing technological development of Nigeria.

The result from figure 4 shows that the general performance of students is low. This observation is in line with Adler, Raju, Beveridge, Wang, Zhu and Zimmermann (2008), believe that adjustment is critical for academic success. Poor adjustment correlates with poor academic performance and poor success later. Reason might stem from emergency migration of students to zoom platform for academic engagement that was caused by COVID-19 school closure.

Further findings show that most students perceived that the zoom application support participation, feedback and communication in learning. This corroborates the assertion of Nan Wang (2009) that web-based distance education achieves better educational performance with communication that ensures two-way interaction between lecturer and students. This report also substantiates the finding of James *et. al.,* (2010) who submitted that feedback is an essential element of improving the learning process of the students.

Furthermore, some of the students perceived that zoom application did not support collaboration and assessment. The findings on Assessment disagree with Booth & Berwyn (2003) who reported that online assessment creates consistent and standardized enhance assessment process for progress monitor and allows quick feedback to learners. Also, not in consonance with James *et. al.,*(2002) who asserted that assessment is central to the overall quality of teaching and learning in higher education. Findings on collaboration are in contrast with the study of Swan (2006), who asserted that collaborative activity is important to shape online learning. In this study, lack of awareness of great importance of zoom application to Physics learning could be responsible for students' perception on collaboration and assessment. Female students have higher mean value in their perception of zoom support for academic engagement than their male counterparts. This result is not in agreement with Falade (2013) who reported that females experienced a less equitable environment in technology for learning purpose due to the fact that the medium require some technical skills.

Conclusion

This paper assessed Physics learning on zoom platform during the COVID-19 school closure in Nigeria. The findings indicate low attendance of Physics students and under-representation of female students in Physics education. The study revealed that most students perceived that zoom application support academic engagement except in collaboration and assessment. The result also established that the male perception of zoom support for academic engagement is greater than their female counterparts. Students' performance is low in Physics with no significant difference between male and females.

Recommendations

In the light of the challenges highlighted above, the following recommendations are made:

1. Massive awareness and sensitization activities that promotes e-learning among the citizen should be promoted in Nigeria. This will greatly make students reap the benefits of participating in online programmes.
2. Stake holder should motivate female students through incentives for e-learning participation, in other to eliminate gender disparities and promote equal access.
3. Disease control programmes that eliminate infectious diseases especially the novel COVID-19 should be introduced into Nigerian school curriculum.
4. Government should source for an alternative power generation, like solar energy for sufficient power, while student source modem to allow for smooth online learning.
5. Government should make power available at all times for uninterrupted online learning.

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