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The Impact of Online Learning Service Quality on Student Satisfaction During the COVID-19 Pandemic

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ABSTRACT

Online learning, also known as e-learning, has played a crucial role in enabling remote education, benefiting many institutions during the COVID-19 pandemic. However, student satisfaction is essential for effectively implementing and utilizing online learning platforms, particularly for institutions that have adopted or plan to adopt them. This study examines the quality of online learning services at Bells University of Technology during the COVID-19 lockdown and its impact on student satisfaction. Data were collected and analyzed using descriptive analysis and Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the proposed hypotheses. The findings indicate that the quality of online learning services significantly influences student satisfaction—higher service quality leads to greater student satisfaction.

Keywords: *Online Learning Service Quality, Student Satisfaction, Covid-19, Partial Least Squares Structural Equation Modeling (PLS-SEM).*

Introduction

The outbreak of COVID-19 triggered a series of changes in the teaching-learning method in the global educational system. By limiting worldwide social interactions, the COVID-19 pandemic produced enormous consequences in the worldwide economy, educational sector, and social disturbance. COVID-19 (coronavirus) was declared a pandemic by the WHO on March 12, 2020 [1]; an undeniable enemy that the whole world has to confront [2]. Due to the pandemic, educational institutions all across the world were closed. According to UNESCO [3] data, the peak in school closures happened around the beginning of April 2020, affecting about 1.3 billion pupils (80 percent of the worldwide student population) in 194 countries. Figure 1 shows the graphical representation of several students impacted by school closure across the globe, which includes students enrolled from pre-primary up to tertiary education levels. In the same manner, the Federal Ministry of Education, acting through the Ministry's Permanent Secretary, ordered the closure of secondary, primary, and postsecondary educational institutions nationwide in March 2020 as part of the Nigerian government's efforts to stop the spread of COVID-19. This action had a significant negative social and economic impact on students' academic progress.

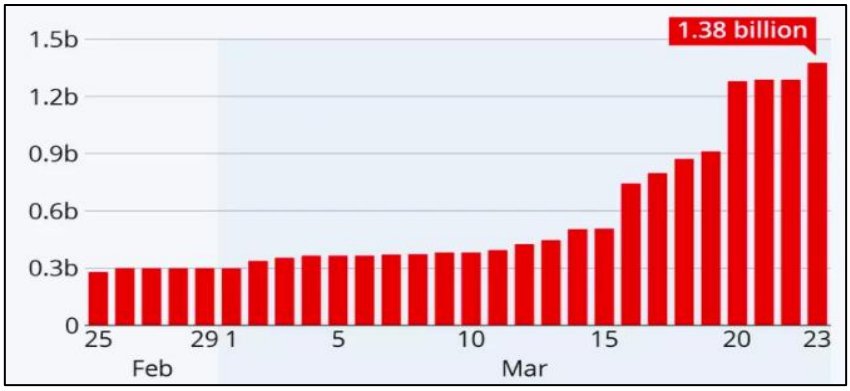

Figure 1. COVID-19 Impact on Global Education.

This leads to educational institution administrators having to devise methods to guarantee that learning continues throughout the lockdown. Before the pandemic, Nigeria used the traditional face-to-face method of instruction delivery. However, the COVID-19 pandemic prompted the shift to e-learning, requiring increased online education to respond to emergencies. This shift in pedagogy involved moving

away from the traditional method and toward a more modern teaching-learning strategy in the educational landscape. Although online education is not a recent concept, it has suddenly increased in popularity due to the advent of the viral coronavirus epidemic and current technological developments [4][5]. This transformation challenges both the instructors/teachers and students [6], [7]. Hence, it is imperative to investigate students' satisfaction with online learning to ensure continuous improvement in using the online teaching platform.

Student Satisfaction and the Quality of Online Learning Services Customer satisfaction

According to [8][9], Customer satisfaction refers to how customers feel after using a company's product or service and comparing their expectations to their experience. Hence, it can be argued that satisfaction occurs when the expected service or product meets or exceeds the perceived service and the mission-oriented purpose of a product. In line with this, companies are expected to treat their customers as assets, enabling them to make a profit continuously [10]; To thrive and stay sustainable in a competitive market.

Online Learning Service Quality

According to [11], [12] were the first to identify ten aspects of service quality, namely tangibility, responsiveness, reliability, competence, access, courtesy, communication, credibility, security, and comprehension, which was later compressed by the authors in 1988 to five which are tangibility, empathy, responsiveness, reliability, and assurance. The likes of [13], [14], and [15] have used the five aspects of service quality to measure service quality based on customer perception in different sectors of the economy. To quantify online service quality, [16] created four dimensions: efficiency, fulfillment, system availability, and privacy, as well as three dimensions, namely response, compensation, and recovery, to measure online recovery service quality. In the case of online learning, According to [17], [18] [19]The following factors significantly determine students' online learning satisfaction: technology, learners, instructors, and course materials. In agreement, [20] measured the service quality of online learning by using the following dimensions: system, instructor, and course material, as well as administrative services.

Online Learning Service Quality and Student Satisfaction

Various researchers have worked on the investigation of the effect of online learning service quality and student satisfaction, some of which include [7], [11], [20]–[25] all concluded that online learning service quality, which comprises the quality of the system, information, and service, has a beneficial impact and can improve e-learning student satisfaction. Also, [26] explored the impact of quality of service and quality of program delivered on student satisfaction at some universities, and it was concluded that each indicator of student satisfaction is positive. During the COVID-19 pandemic, students' attitudes to online learning were investigated by [27] It was concluded that e-learning is an excellent teaching strategy that helps increase knowledge. Still, it was pointed out that e-learning needs more than content delivery; learners should be able to engage with the resources and get feedback. It was also noted that integrating online learning into the curriculum necessitates a well-planned strategy and a more active approach. In consistence with the previous research mentioned above, this study investigates students' satisfaction with online learning among undergraduate students of Bells University of Technology, Ota, Ogun State, Nigeria. It gives information on the steps that must be taken to improve the situation. The transformation from traditional face-to-face teaching to online learning presents various challenges to students and instructors/lecturers, hence the need for this study. The following hypothesis was proposed: Null Hypothesis (H0): quality of online learning does not affect student satisfaction. Alternative Hypothesis (H1): The quality of online learning affects students' satisfaction

Research Method

A cross-sectional survey was carried out amongst the target population, comprised of undergraduate students from different levels, departments, and colleges who took part in the online learning and examination during the COVID-19 pandemic lockdown in Nigeria. 400 Level students, 393 undergoing 6 months of Students Industrial Work Experience (SIWES) training, did not participate in this survey. The study area population comprises undergraduate students, which was 2,167 as of the 2019/2020 session; hence, the total number of students eligible for this study is 1774 after subtracting the number of those on SIWES from the study population. The sample size was determined using the Taro Yamane formula, which is as expressed in equation 1,

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

Where n= signifies the sample size
N= signifies the population under study, which is 1774 undergraduate students.
e= signifies the margin of error (0.10)

From equation (i) n = 94.66, Approximately 95 students are the expected total number of respondents for this study. However, a total of 100 students responded. A standardized self-administered questionnaire was developed from the literature. The questionnaire was administered online with the aid of Google Forms. The questionnaire comprises two sections, with Section A tagged as the demography section. At the same time, Section B comprises three dimensions: Learner's dimension, Instructor and Course Material, and Online Learning Platform. The learner's dimension (with 7 items) measured the students' characteristics. Instructor and Course Material characteristics (with 12 items) measured teachers' characteristics, frequency of interaction, feedback, coordination, content delivery, and course materials. Online Learning Platform (with 7 items) measured the platform's effectiveness during the content delivery. Each item of the domains was rated on a 5-point Likert scale (Strongly Disagree-1, Disagree-2, Neutral-3, Agree-4, and Strongly Agree-5). Cronbach's alpha and composite reliability tests were used to ensure the study instrument's validity and reliability.

The data was analyzed using descriptive analysis and structural equation model with Excel and Partial Least Squares Structural Equation Modeling (PLS-SEM). Table 1 shows the items in each dimension.

Table 1. Scales Items

Instructor and Course Material	
ICM1	Course materials are easy to access
ICM 2	The content of the topic covered on the Online learning platform is satisfactory
ICM 3	Course materials are engaging and motivate to think
ICM 4	Course materials are detailed and understandable
ICM 5	Instruction about student participation is clearly stated
ICM 6	Instructor steadily gives lectures
ICM 7	The instructor prepares and organizes teaching material well
ICM 8	Instructor makes students feel a sense of belonging
ICM 9	Instructor teaching ability with various Online learning platforms, communication, and teaching aids satisfactory
ICM10	Satisfied with instructor's accessibility & professional behavior during class and invigilation
ICM11	Satisfied with instructor's supportive-ness and responsiveness towards questions asked
ICM12	The instructor reviews the topic covered in the previous session
Learner's Dimension	
LD1	I'm confident in using an Online learning platform
LD2	Online learning orients my study plan & enhances student's motivation, creativity &problem-solving skills
LD3	Online learning platforms enhance the self-studying ability of students
LD4	Online learning platforms are effective in bridging the gap of missed academic period during lockdown
LD5	The advantages of the Online class outweighed the disadvantages during the school lock down
LD6	Interaction with instructor & other students during the courses taken online satisfactory
LD7	Online learning is comfortable and enjoyable
Online Learning Service Quality	
OLSQ1	Online learning platforms is easy to use
OLSQ2	The quality of the graphic aids of the online lecture platform is satisfactory
OLSQ3	Instructor Response time is quicker online
OLSQ4	Effective utilization of the online learning platform depends on the strength of the internet connection between the end and front users.

Results And Discussion

The descriptive statistics for demography variables

The questionnaire was open to respondents (i.e. all eligible students by sharing the questionnaire link through the respective class rep.) for 3 months. Out of 95 students, which is the expected total number of respondents for this study, 100 students responded and completed the survey with a response rate of 5.64% of the total number of students eligible for this study, making the study a pilot study. From Table 2, most of the students that responded are male, students in 300L, and students in class grades 3.50-4.49, respectively. Most of the students had internet facilities, with data packages provided by different telecommunication services being the highest compared to those that participated in the online classes with the aid of Wi-fi throughout the period the courses and examinations were conducted.

Table 2. Students' Characteristics (n=100)

Characteristics		Percentage
Sex	Male	58
	Female	42
Academic Year	100 Level	Nil
	200 Level	13
	300 Level	77
	500 Level	10
Class of Grade	1.49 – below	Nil
	1.50 - 2.39	3
	2.40 – 3.49	30
	3.50 – 4.49	56
	4.50 – 5.00	11
Internet Accessibility at Home	Yes	99
	No	1
Participation in class through	Wi-Fi	19
	Data Package	81
Department	Management Technology	30
	Mechanical & Biomedical Engineering	31
	Computer Science and Information Technology	11
	Electrical Electronics& Computer Engineering.	18
	Microbiology and Biochemistry	5
	Food Technology & Nutrition & Dietetics, Culinary Science & Hospitality, and Biotechnology	6
	Accounting	4
	Business Administration	7
	Urban and Regional Planning	1
	Building Technology	6
	Surveying and Geoinformatics	1

Result Validity and Reliability

The reliability of the research variables was tested with Cronbach's Alpha (α) and Composite Reliability (CR). In the validity context, according to [28] on each research item tested, if the loading factor is above 0.5, then the answer is accurate, while in the context of reliability, the response to the group of research items will be consistent and acceptable if the Cronbach Alpha is equal to or greater than 0.7 [29]. By [30] AVE values greater or closer to 0.500 corroborate the convergent validity, as do values of Alpha and CRs closer to or higher than the suggested figure of 0.700. All of the scales' testing reliabilities, including composite reliabilities ranging from (0.893-0.946) and Cronbach alpha (0.84-0.937), were above this criterion, in line with [31] findings, suggesting that this scale is trustworthy. The reliability and validity, along with the factor of loading results, are shown in Table 3 and 4, respectively. In Table 3, Cronbach's Alpha and Composite Reliability ratings exceeded the required values, of 0.7. This indicates that all of the variables have a high internal consistency reliability, implying that the many items that made up the Cronbach's Alpha and Composite scores of the survey measured are in general agreement. The correlation between the items measures the agreement. Furthermore, the Average Variance Extract (AVE) was more significant than 0.500. This affirms convergent validity

Table 3. Research Item Reliability and Validity

	α	CR	AVE
ICM	0.937	0.946	0.596
LD	0.882	0.908	0.588
OLSQ	0.840	0.893	0.676

Cross-loading was used to test discriminant validity. All of the factor loadings were found to be bigger than their cross-loadings, indicating discriminant validity as shown in Table 4.

Table 4. Item cross-loading (Discriminant Validity)

	ICM	LD	OLSQ
ICM1	0.666	0.493	0.559
ICM2	0.675	0.545	0.583
ICM3	0.793	0.540	0.556
ICM4	0.820	0.596	0.653
ICM5	0.767	0.534	0.568
ICM6	0.819	0.561	0.650
ICM7	0.776	0.524	0.536
ICM8	0.810	0.574	0.668
ICM9	0.876	0.696	0.685
ICM10	0.828	0.511	0.625
1CM11	0.774	0.464	0.633
ICM12	0.618	0.388	0.444
LD1	0.586	0.848	0.587
LD2	0.583	0.853	0.610
LD3	0.469	0.742	0.469
LD4	0.479	0.738	0.452
LD5	0.361	0.630	0.512
LD6	0.715	0.776	0.609
LD7	0.481	0.757	0.499
OLSQ1	0.640	0.668	0.800
OLSQ2	0.674	0.537	0.881
OLSQ3	0.688	0.647	0.841
OLSQ4	0.537	0.418	0.761

The Heterotrait-Monotrait (HTMT) ratio of correlation and the Fornell and Larcker criterion were also utilized to evaluate the discriminant validity. The Fornell and Larcker criteria are used to examine the correlation of the latent constructs with the square root of the average variance extracted (AVE). As seen in Table 5, each latent construct explains the variance of its indicator more well than the variance of other latent constructs since the square root of each construct's AVE has a more significant value than the correlations with other latent constructs. To further measure discriminant validity,[32] I recommend utilizing the HTMT score if it is less than 0.90. Discriminant validity between two reflective ideas has been demonstrated, according to the HTMT criterion. This is reflected in Table 5, where the obtained data on HTMT is shown.

Table 5. Discriminant Validity Using Fornell-Larcker and Heterotrait-Monotrait Method

Fornell-Larcker Method			
	ICM	LD	OLSQ
ICM	0.772		
LD	0.700	0.767	
OLSQ	0.778	0.703	0.822
Heterotrait-Monotrait Method			
	ICM	LD	OLSQ
ICM			
LD	0.751		
OLSQ	0.868	0.797	

To test the hypothesis that postulated a positive and significant relationship between learners, instructors, and course materials on online learning service quality, hence affecting student satisfaction,

the smart PLS result, as shown in Figure 2 was analyzed. The analysis determines the variances of Online Learning Service Quality (OLSQ) as explained by Learner, Instructor, and Course material dimensions. The result indicates that the coefficient of determination, R^2, is 0.655. This explains the percentage of variation of OLSQ that is predictable from the learner, instructor, and course material dimensions, which is 65.55%. This implies that a 65.55% change in OLSQ can be attributed to ICM and LD.

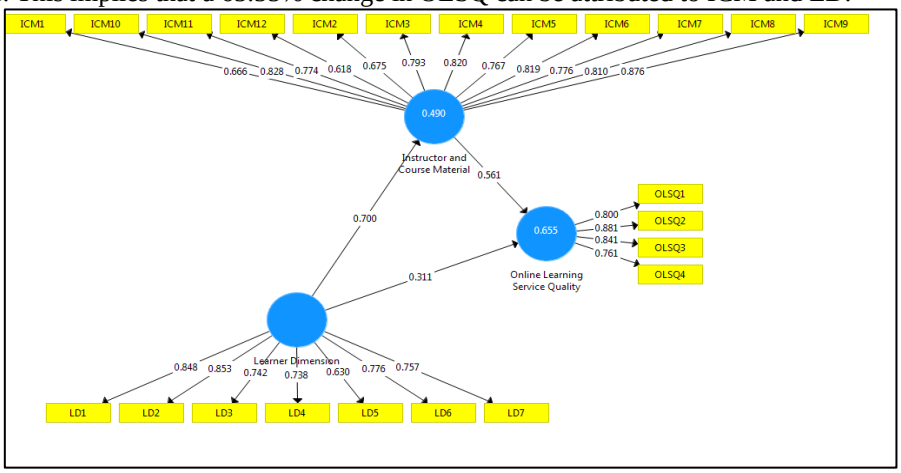

Figure 2. Relationship between Learner Dimension, Instructor, Course Material, and Online Learning Service Quality established by PLS-SEM analysis

The P value from Table 6 shows that the hypotheses tested are accepted since they are all less than 0.05. To further justify this, the P values from the model path (fig.) are all greater than 1.96; hence, the model paths are significant.

Table 6. Path Coefficients (Mean, Standard Deviation, t-test value) and hypothesis test result

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (SD)**	**t-test statistic**	**P. Value**
ICM > OLSQ	0.562	0.564	0.103	5.475	0.000
LD > ICM	0.700	0.706	0.048	14.525	0.000
LD > OLSQ	0.308	0.310	0.105	2.924	0.004

Table 6 exhibits the path coefficients and hypothesis testing data, whereas Fig. 3 depicts the structural path in bootstrapping. A t-test with a significance level of 5% was used to determine whether the path coefficients of the model were significant. The null hypothesis was rejected, indicating that the hypothesized path link between the variables was statistically significant. As a result, the proposed alternative hypothesis received support (i.e. the quality of online learning affects students' satisfaction)

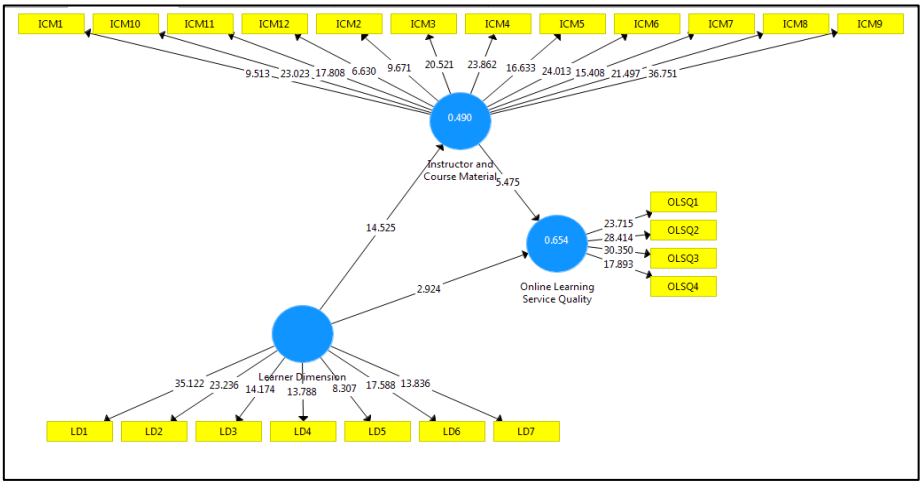

Figure 3. Structural Path Significance in Bootstrapping

It is also worth noting that Students who receive feedback are more driven and excited to forge better bonds with one another. Thus, in an environment such as online learning, instructors should provide students with consistent, timely, and regular feedback to improve their performance[33] [34].

In light of this, the expected quality feedback from the instructor by students for this study was analyzed descriptively, as shown in Fig. 4. The variables considered include ICM10, ICM11, and OLSQ3 that have to do with getting responses or other information based on class interaction from instructor. As seen in fig 4, it can be deduced that the majority of the students agreed that the feedback gotten from the instructors was satisfactory. With the next highest being neutral and disagree, an indication that there is still a need for improvement. In agreement with [35], prompt instructor feedback will increase student engagement and satisfaction with the course. Given this, educators should prepare students for the virtual world by emphasizing learning, teamwork, and a lively, creative setting. This will enable students not to be bored, thus enhancing their willingness to learn. They should also constantly be available to assist students.

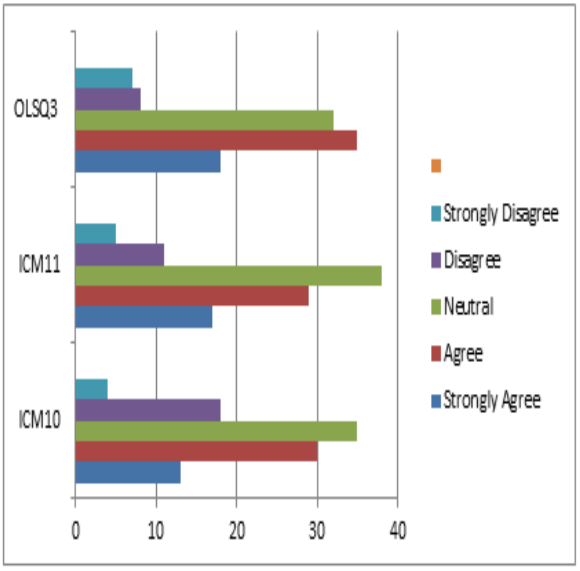

Figure 4. Instructor Feedback Assessment

However, significant challenges have confronted the adoption of online learning in Nigeria. This study will shed light on some of these and provide potential solutions.

Limitation of Online Learning in Nigeria

The unsatisfactory condition of the country's electricity supply is one of the main obstacles to online learning. In 2016 electricity distribution and generation were appallingly low, with a constant escalation and decrease in megawatt generation. A stable electricity supply is essential to every country's development, which benefits every industry.

Also, the horrifying status of the educational system's infrastructural deficiencies is another unignorable challenge. This has attracted the attention of most stakeholders who have learned their solidarity in support of the Academic Staff Union of Universities (ASSU) in their quest for the government to revitalize the deteriorating infrastructures in public tertiary institutions. When an institution does manage to construct an ICT center or unit, it is usually vacant or inadequately furnished. [36] and [37] agreed that inadequate human resource development and educational infrastructure had a detrimental impact on higher education institutions' ability to use the Internet for learning effectively. Furthermore, Nigeria, as a consuming nation, must rely on importing gear connected to ICT to provide online learning. Due to strong inflation and fluctuating foreign exchange rates, the cost of importing these equipment keeps increasing. As a result, the typical Nigerian student cannot afford online learning tools and software. Another significant barrier to online learning is the absence of adequate ICT skills. Those that do exist are overworked because of the increased demand for their services, and the government provides little to no training for people interested in technology and cannot afford the cost of the training in private establishments. This, according to [38] affects the country's adoption and development of online learning.

Effectiveness of Online Learning Compared to Traditional Method

Several advantages contribute to the effectiveness of online learning over traditional methods, some of which are discussed. Flexibility: One of its key advantages is the freedom to establish one's

schedule, which comes with online learning. Without regard to geography, schedule, or curricular constraints, students can select courses based on their interests and objectives. In agreement with this, Makarova (2021) observed that flexibility ranked second as one of the advantages of online learning compared to traditional learning in the researcher's survey. This method ensures efficient time management by highlighting pertinent content.

Affordability: Regarding affordability, online learning offers a big benefit. Online courses fully eliminate all expenses associated with the buildings and furnishings, including desks, seats, paper handouts, and other materials that are genuinely required in classrooms.

Geographical Autonomy: Everyone can equally access data, knowledge, and high-quality education via online learning. Learning is not constrained to a specific location as in the traditional method.

Self-Paced Learning: This is another benefit that flexibility offers via online learning. This teaching approach caters to each learner's unique demands. Students can tailor their educational experiences to meet their requirements. This gives students the advantage of creating more time for extracurricular pursuits.

Interactive Learning: With the help of online group projects and meetings, students may work together more effectively with their peers and increase interaction with their instructor.

Less pressure: Traditional methods foster a competitive atmosphere among students, and their levels of management of pressure differ. According to [39], there has been an increase in the number of students who seek counsel due to health-related issues, such as anxiety and depression, etc., birthed out of the learning environment and process. Through virtual education, learners may engage with educators and fellow students in a setting conducive to learning rather than competition.

Conclusion

The institution believes that students are valuable consumers of their services. Hence, student satisfaction is important for successfully utilizing the institution's online learning platform and its effectual output. This study aims to see how the quality of online learning services affects student satisfaction during the COVID-19 epidemic in 2020. From the result, it can be concluded that OLSQ positively affects student satisfaction. For the institution to continuously render quality service through e-learning at posts Covid-19 there's a need for continuous improvement to make the online platform user-friendly for both the end-user (instructors) and the front-user (students), ensure sufficient bandwidth, and organize training for instructors on effective ways of engaging students online through sharing of course material and teaching. This study is limited in the number of students taken as the study population and is a determinant of student satisfaction, which future research can improve on. Future research directions might explore the long-term impacts of online learning on academic performance and the integration of hybrid learning models post-pandemic. Likewise, the effects of online learning on different learning outcomes can be explored.

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