Pharmacy Education (2024) 24(1) 468 - 477
https://doi.org/10.46542/pe.2024.241.468477

RESEARCH ARTICLE

Learning experiences, preference and perception of undergraduate pharmacy students in Nigeria

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Keywords
Covid-19
Learning method
Perception
Pharmacy student
Virtual learning

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Abstract

Background: The Covid-19 pandemic that ravaged the world led to shutting down of schools and higher institutions of learning and the adoption of virtual method of learning. This study assessed the virtual learning experiences, preference, and perception of undergraduate pharmacy students in Nigeria. **Methods:** This is a cross-sectional study conducted on pharmacy students at University of Nigeria, Nsukka using a convenient sampling method with the aid of a four (4) sectioned structured questionnaire. The data was analysed using SPSS version 25. Descriptive analyses were computed. Chi-square was used for inferential analysis. *p*-value was set at $p < 0.05$. **Results:** About 476 (58.5%) were females while 541(66.5%) were between 18-24 years. About 657(80.7%) pay for internet out of their pockets while 649 (79.7%) did not save time during the virtual learning. The majority 709 (87.1%) preferred classroom learning method. About 59.6% of the students had negative perception of virtual learning, 77.80% had low preparedness while 22.20% had high preparedness for virtual learning. **Conclusion:** The pharmacy students experienced lower learning satisfaction and more difficult communication with the instructors and their peers during virtual learning. They had negative perception of virtual learning and extremely low preparedness for virtual learning; they preferred the classroom learning method.

Introduction

The Covid-19 pandemic, which has affected every continent of the world, is caused by severe acute respiratory syndrome Coronavirus 2(SARS-Cov-2). SARS- Cov-2 is a very contagious disease and manifests clinically as a severe pneumonia-induced death, though it could be asymptomatic sometimes (Bashshar, 2017). About 900,000 deaths and more than 28 million cases of coronavirus disease were recorded in September 2020 (Al-Azzam *et al.*, 2020). The effect of the coronavirus disease appears to be more severe in the elderly, though it is a disease that can affect all ages. However, young adults, when infected, may be asymptomatic, which makes them carriers, hotspots or vices and the major vectors of the Covid-19 disease, especially in the university community. Institutions of learning were shut down during the pandemic, and lectures were conducted virtually in compliance with compulsory social and physical distancing as a measure to slow down or curb the spread of the disease (Al-Jaber & Al-Ghamdi, 2020; Olibie *et al.*, 2014).

The invention of hand-held computer-based devices gave rise to mobile-assisted language learning (MALL) (Burston, 2013), which focused on the use of technologies such as pocket electronic dictionaries, personal digital assistants (PDAs) and MP3 players, among others. There has been a rapid growth and advancement of information and communication technology globally. These advancements in technology have been adopted to develop a process where computers, internet tools and other devices can be applied to improve the education and learning system (Rahmani, 2012). Computers or advanced technology offers some great benefits, such as convenience to human production, life and education.

These advanced technologies, such as the internet, e-mail, websites, mobile phones, iPods, etc., offer valuable alternatives to traditional methods of learning and aid in making education easier and more convenient (Mangal & Mangal 2009). Lecturer meetings and conferences have transferred into virtual platforms. Various reports have been gathered from programs on their experiences with virtual readouts and reviewing images through phones or screen-sharing software (Slanetz *et al.*, 2020).

Virtual Learning is a relatively open system that is devoid of time and space. It allows a student to be part of a lecture while confined to a location that is different from where the lecture is being conducted. It also creates room for students and teachers to interact and share with one another and provides access to a wide range of resources (Pelet & Lecarte, 2013). It allows for participation in lectures from your comfort zone and a convenient place and location. Virtual learning offers students the benefit of having access to teaching materials from anywhere at any time, increasing schedule flexibility and asynchronous discussions with peers, etc. (Caton *et al.*, 2021).

Despite its obvious advantages, virtual learning also has some drawbacks. Increased chances of distraction, complicated technology, limited social interaction, and the need for autonomous learning can lead to "*loss of interest*," alienation from the real world, weakened logical abilities, reduced face-to-face interaction, and difficulty staying in contact with instructors (Xu &Jaggars, 2013). It is convenient to assume that students will embrace virtual learning enthusiastically since they are already accustomed to using digital gadgets in their daily routines. However, despite Dudeney & Hockly's (2007) assertion that "*younger learners are growing up with technology, and it is a natural and integrated part of their lives*," there are opinions and reactions that question the benefits of virtual learning.

Although virtual learning has been in practice in many developed countries, it is relatively new in most developing countries like Nigeria. Several studies revealed that students from low-income families and developing countries had difficulty with continuing education during the lockdown (Aucejo *et al.*, 2020; Bevins et al., 2020; Zarei & Mohammadi, 2022). Consequently, the virtual learning method was adopted for the first time in most Nigerian universities. Therefore, lots of institutions and students were not prepared for the transition to virtual learning (Al-Azzam *et al.*, 2020). The lack of readiness for virtual learning by the teachers and students may have resulted in an unfulfilling experience (Garrison & Cleveland-Innes, 2005). Thus, it is essential to assess students' virtual learning experiences, preferences, and perceptions, particularly those of pharmacy students, as they are future healthcare professionals. Information obtained from this study will enable administrators and decision-makers at higher education institutions to determine if the virtual learning method will be integrated with a hands-on laboratory approach on a long-term basis as a means of learning in undergraduate pharmacy education and to know what needs to be modified to achieve a better virtual learning experience.

Methods

Study design

This is a cross-sectional study conducted on pharmacy students at the University of Nigeria, Nsukka, using a convenient sampling method with the aid of a structured questionnaire.

Study setting

This study was conducted in the Faculty of Pharmaceutical Sciences at the University of Nigeria, Nsukka (UNN), one of the oldest federal universities in Nigeria. The faculty comprises six departments and offers a 5-year program leading to a Bachelor of Pharmacy (B. Pharm.) degree. At the time of this study, there were approximately 300 students in each year of the program.

Theoretical and practical courses are offered in every department of pharmaceutical science. The theory aspects of every course are taught in the classroom while the hands-on practical is demonstrated in the laboratory. However, the Department of Clinical Pharmacy and Pharmacy Management has clinical clerkships as a hands-on approach to the clinical and management courses. The students usually receive lectures in their lecture theatres. Pharmacy students are offered science courses only in their first year, and in the second year, some pharmacy departmental courses are introduced, and all the departmental courses are offered to the students from their third year to the fifth year of study.

Prior to the 2020 pandemic, pharmacy students received lectures in their lecture theatres. Every study year has a lecture theatre which has the capacity to accommodate four hundred (400) students. Classes began as students returned following the national lockdown prompted by the pandemic. However, the Department of Clinical Pharmacy and Pharmacy Management delivered its first semester clinical and management theory courses virtually using the Zoom platform. These lectures were held between February

2021 and June 2021. A Zoom link was created by the department, and the link was made available to the students through the class WhatsApp group (every student was added to his/her class WhatsApp group by the class representative). The scheduled lecture timetable was also made available to the students through the WhatsApp platform. The students were to join the lecture at the scheduled time through the Zoom link. Every lecturer at the Department of Clinical Pharmacy and Pharmacy Management acquired training on the use of the Zoom platform to deliver lectures.

Study instrument

This study utilised a questionnaire developed by experts in pharmacy education, clinical pharmacy, and pharmacy management. Face and content validation of the questionnaire were performed by two experts from each field.

The questionnaire used for this study comprised four (4) sections. Section A aimed to gather demographic information from the respondents, details of their virtual learning experiences in the previous semester, and other information such as access to internet, number of times the respondent used their phones or laptops in a day, attendance of online lectures, if they had a free internet connection or if they paid out of their pockets, type of study material used and preferences.

Section B assessed the students' perception of virtual learning. The respondents were to state their degree of agreement or disagreement with the item statements. Responses were anchored on a 4-point Likert scale where Strongly Agree (SA) = 4, Agree (A) =3, Disagree (D) =2, Strongly Disagree (SD) =1. The values were expressed as a percentage. The mean and standard deviations were calculated. The mean scores were used as a cut-off. The mean scores less than the accepted mean were categorised as "*Negative perception*" while mean values higher than the accepted mean were categorised as "*Positive perception*".

Section C determined the extent of pharmacy students' preparedness for virtual learning. The respondents were to state the degree of their preparedness using the 4-point Likert scale where Very high extent (VHE) =4, High extent (HE) =3, Low extent (LE) =2, Very low extent (VLE) =1. The values were expressed as a percentage. The mean and standard deviations were calculated. The mean scores were used as a cut-off point to categorise those who had high extent of preparedness and those who had low extent of preparedness. The respondents who had mean scores less than the accepted mean had a "Low extent of preparedness" for virtual learning, while those who had mean values higher than the accepted mean had a "*High extent of preparedness*" for virtual learning.

Section D obtained information on the areas that need to be improved for effective virtual learning. The respondents were to state their degree of agreement or disagreement with the item statement. Responses were anchored on a four (4) point Likert scale where Strongly Agree (SA) = 4, Agree (A) =3, Disagree (D) =2, Strongly Disagree (SD) =1. The mean and standard deviations were calculated.

Fifty (50) questionnaires were given out to students in their first year of study and were found to be useable since the information needed was obtained using the questionnaire. However, first-year students were not included in the study. The reliability of the questionnaire was determined using Cronbach Alpha.

Sample size

The students' population was obtained from the students' class lists for each study year. The sample size was calculated to be 974 with the aid of a sample size calculator @www.raosftsoft.com//samplesize at a 95% confidence interval and 5% margin of error. The *p*-value was set at ≤0.05. However, a total of 1000 questionnaires were given out for attrition to create room for the ones that will not be properly filled.

Inclusion and exclusion criteria

All the students who were offered clinical courses, agreed to participate in the study. Students who were not offered clinical courses (first-year and second-year students) were excluded from the study.

Data collection

The questionnaires were administered to students in their third, fourth, and fifth years (those enrolled in clinical courses) during practical classes, after regular classes, and during clinical rotations, respectively, after obtaining their consent to participate in the study.

They were given a few minutes to respond to the questionnaire, and the questionnaires were collected from them on the same day, ensuring a 100% retrieval rate. All information obtained from the respondents was kept confidential. The data was collected between August 2021 and October 2021.

Data analysis

The data obtained were processed using IBM SPSS Statistics for Windows Version 21.0 (IBM Corp, Version 21.0, Armonk, NY, USA) for data cleaning and analysis. Descriptive statistics such as frequencies, percentages

and means were computed. Inferential statistics was performed using Chi-square to determine the association between the categorised variables and the demographic characteristics of the students. The level of statistical significance was set at 0.05.

Ethical consideration

Ethical approval was obtained from the faculty research and ethics committee for the faculty of pharmaceutical sciences. The Ethics approval reference number is FPSRE/UNN/21/0011.

Results

The Cronbach's alpha value of 0.608 was obtained for the reliability of the study instrument. Out of 1000 questionnaires that were given out, only 814 were returned and found usable giving a response rate of 81%.

Of the 814 respondents, 476 (58.5%) were females while the rest were males. About 541 (66.5%) respondents were within the age range of 18-24 while 272 were between the ages of 25-29. About 366 (45.0%) of the respondents were in their third year of study while 287 (35.3%) were in their fifth year of study. About 736 (90.4%) had access to the internet, while 657 (80.7%) reported paying for internet supplies out of their pockets (See Table I).

Table II showed the respondents' virtual learning experiences and their preferences. About 751 (92.3%) stated that their class attendance increased during virtual learning, 649 (79.7%) did not save time during the virtual learning, the concentration of about 749 (92.0%) decreased during virtual lectures while 47 (5.8%) had the same level of concentration as they would have during the usual classroom learning. However, 105 (12.9%) of the students preferred the virtual learning method, while 709 (87.1%) preferred the usual classroom learning method.

The majority, 606 (74.9%) of the students, learned effectively through virtual learning, while 638 (78.4%) did not have adequate interactions with the lecturer. About 403 (9.6%) were usually cut off from an internet connection during the lecture, while 378 (48.2%) had their vision blurred at some point during the lecture.

The students' mean perception of virtual learning was 22.031. About 40.40% of the students had a positive perception of virtual learning, while 59.60% had a negative perception of virtual learning. Details are shown in Table III.

Table I: Sociodemographic characteristics of respondents (n= 814)

Variable	Number responding (N)	Percentage (%)
Age		
18-24	541	66.5
25- 29	272	33.4
30-35	1	0.1
Gender		
Male	338	41.5
Female	476	58.5
Year of study		
3rd	366	45.0
4th	161	19.8
5th	287	35.3
Access to internet		
Yes	736	90.4
No	78	9.6
Gadget available for use		
Yes	749	92.0
No	65	8.0
Gadget used		
Desktop	4	5
Laptop	123	15.1
Phone	687	84.4
Frequency of use of gadgets		
Once a day	15	1.8
Twice a day	134	16.5
Several times a day	647	79.5
Once a week	18	2.2
Out-of-pocket payment		
Yes	657	80.7
No	157	19.3
Online lectures		
Yes	813	99.9
No	1	1
Stable internet		
Yes	433	53.2
No	381	46.8
Power supply		
Yes	434	53.3
No	380	46.7
Lecture materials		
Written audio content	2	0.2
Power-point slides	693	85.1
Reading from reference books	2	0.2
Summarised hand-outs	117	14.4

Table II: Respondents experiences and preferences for virtual learning (n=814)

Variable	Frequency	Percentage
Class attendance		
Increased	19	2.3
Decreased	751	92.3
Same	44	5.4
Time saving		
Yes	165	20.3
No	649	79.7
Level of concentration		
Increased	18	2.2
Decreased	749	92.0
Same	47	5.8
Stress level		
Increased	13	1.6
Decreased	760	93.4
Same	41	5.0
Continuance of virtual learning		
Yes	451	55.4
No	363	44.6
Preference		
Virtual	105	12.9
Classroom	709	87.1

Table III: Pharmacy students perception of virtual learning

Variable	Frequency (%)				Total
	Strongly disagree	Disagree	Agree	Strongly agree	
I learn effectively through virtual learning	58 (7.2)	606 (74.9)	z111(13.7)	34 (4.2)	806
Virtual learning is convenient for me in terms of time and location	59 (7.2)	632 (77.6)	111(13.6)	12 (1.5)	814
I learn collaboratively with others from diverse environment	55 (6.8)	618 (75.9)	119 (14.6)	2 (2.7)	814
I have adequate interactions with my lecturers	53 (6.5)	638 (78.4)	111 (13.6)	12 (1.5)	814
I get distracted when i am having lectures online	172 (21.1)	200 (24.6)	436 (53.6)	6 (7)	814
I have acquired great proficiency in the use of technology	48 (5.9)	639 (78.5)	113 (13.9)	14 (1.7)	814
Virtual learning does not offer me the opportunity of hands-on experiment	176 (21.6)	184 (22.6)	453 (55.7)	1 (1)	814
Virtual learning usually makes me pay high cost for my studies	176 (21.7)	253 (31.2)	383 (47.2)	0	812
I usually do not receive most of my lectures or get cut-off sometimes during lecture due to internet connection	177 (21.8)	233 (28.7)	403 (49.6)	813 (100)	814
I usually get blurred visions and headache when i spend so much time on my computers	179 (22.0)	257 (31.6)	376 (46.2)	2 (2)	814
Mean of total perception = 22.031					
Positive Perception =40.40%					
Negative Perception = 59.60%					

The mean preparedness of the students for virtual learning was 8.237. Majority, 77.80% had low preparedness while 22.20% had high preparedness for virtual learning. Of the 77.80% that had low preparedness for virtual learning, about 648(79.6%) was due to the cost, 597(73.3%) do not have access to internet facilities and gadgets required for virtual while 622(72.2%) were not confident that virtual learning will improve their performance (Table IV).

Table IV: Extent of preparedness of the students for virtual learning

Variable	Frequency (%)				Total
	Very low extent	Low extent	High extent	Very high extent	
I am prepared to continue with virtual learning because the cost is low	57(7.0)	648 (79.6)	89 (10.9)	20 (2.5)	814
I am greatly confident that virtual learning will improve my learning performance	63 (7.8)	622 (72.7)	108 (13.3)	18 (2.2)	811
I have enough accessibility to internet facilities and gadgets needed for virtual learning	94 (11.5)	597 (73.3)	114 (14.0)	9 (1.1)	814
I want every of my lectures to be conducted virtually	89 (10.9)	632 (77.7)	85 (10.5)	7 (0.9)	814
Mean preparedness = 8.237					
High preparedness =22.20%					
Low preparedness =77.80%					

Table V showed the areas that need improvement for an effective virtual learning experience to be achieved. About 235 (29.0%) of the students agreed, 196 (24.2%) strongly agreed that more functional computers/ laptops and tablets should be provided for students to use for virtual learning, while 335 (41.2%) agreed and 330 (40.5%) strongly agreed that internet connectivity should be provided for all classes and students. The majority, 371 (45.6%), disagreed that students should be trained and retrained for more competency.

Table V: Areas of improvement for virtual learning as perceived by the students

Variable	Frequency (%)				Total
	Strongly disagree	Disagree	Agree	Strongly agree	
More function computers/laptops/tablets should be provided for students use		380 (46.9)	235 (29.0)	196 (24.2)	811
Internet connectivity should be provided for all students		149 (18.3)	335 (41.2)	330 (40.5)	814
There should be provision of steady power supply		140 (17.2)	326 (40.0)	348 (32.8)	814
Students are to be trained and retrained for more competency in virtual learning operations	2 (2)	371(45.6)	253 (31.1)	187 (23.0)	813

Findings showed that there is no association between the student's variables and the impact of virtual learning. The age of the students had no association with the impact of virtual learning (p=0.175). Also, the impact of virtual learning had no association with the year of study of the students (Table VI).

Table VI: Association between perception of virtual learning and the respondents' demographics

Variables	Negative perception (n)	Positive perception (n)	X^2	*p*-value
Age				
10- 24	230 (69.9%)	311(64.1%)		
25- 29	99 (30.1%)	173 (35.7%)	0.39	0.175
30- 34	0(0,0%)	1 (0.2%)		
Gender				
Male	131 (39.8%)	207 (42.7%)	0.662	0.416
Female	198 (60.2%)	278 (57.3%)		
Year of study				
300	151 (45.9%)	215 (44.3%)		
400	66 (20.1%)	95 (19.6%)	0.361	0.835
500	112 (34.0%)	175 (36.1%)		
Do you have access to internet				
No	37 (11.2%)	41 (8.5%)	1.764	0.184
Yes	292 (88.8%)	444 (91.5%)		
Which gadget do you use to access Internet				
Desktop	0 (0.0%)	4 (0.8%)		
Laptop	43 (13.1%)	80 (16.5%)	4.655	0.098
Phones	286 (86.9%)	401 (82.7%)		
How often do you use your gadgets				
Once a day	7 (2.1%)	8 (1.6%)		
Twice a day	53 (16.1%)	81 (16.7%)	0.408	0.939
Several times a day	261 (79.3%)	386 (79.6%)		
Once a week	8 (2.4%)	10 (2.1%)		
Do you pay for internet out of pocket				
No	58 (17.6%)	99 (20.4%0	0.975	0.323
Yes	271 (82.4%)	386 (76.6%)		

Discussion

This study revealed that the students had lower learning satisfaction and more difficulty communicating with the instructors and with their peers during virtual learning. The students also encountered the challenge of time management and difficulty in staying focused for long hours online, and their attendance at lectures decreased. Several studies corroborate these findings (Pham & Ho, 2020; Saravanan *et al.*, 2020; Barrot *et al.*, 2021; Noori, 2021). Virtual learning offers a sense of unreality, and it largely depends on the student's commitment to the courses (Gaudioso, 2003). Peer-to-peer communication and interaction in a group discussion are not often feasible in the virtual learning method. Lack of face-to-face interactions with other peers and instructors can be a disadvantage for the students and teachers (Aniekwe, 2017). Research in academic settings has shown that online learning has been associated with students feeling disconnected from their learning environment (Baxter & Haycock, 2014). This could contribute to lower levels of motivation for learners.

In this study, the students had a negative perception of virtual learning. This implied that the students perceived that they did not learn effectively due to ineffective communication with peers and instructors from diverse environments. Moreover, one-third of the students experienced increased stress, possibly due to unstable internet connections and the extra financial burden of paying for internet connectivity out of their own pockets. This stress could influence their academic performance and perception of virtual learning. Virtual learning did not offer them the opportunity to have hands-on experiments, and they sometimes get cut off from lectures due to poor network connection and/or unstable power supply. There are also incidences of blurred vision and fatigue that sets in from looking at the computer screen for too long. Similar studies by Anekwe (2017) and Yilmaz (2015) confirmed that one of the most persistent problems with virtual learning is the lack of hands-on experiments. Additionally, virtual learning places increased demands on students' and

teachers' time and financial resources and is frequently disrupted by unstable internet connections and power supply issues. Becker (2000) stated that internet-based courses cannot replicate the hands-on experience that students gain through in-class laboratories.

This study reveals that most (87%) of the students preferred classroom learning. This statement agrees with the findings of Al-Azzam et al. (2020) on a sample of dental students, which revealed that a lower percentage of students preferred virtual learning. Previous studies comparing online and traditional classroom learning methods reported that student's attitudes and acceptance toward e-learning have been shown to be more positive and favourable when the virtual learning modules were in combination with classroom learning (Gallien & Oomen-Early, 2008; Khalil *et al.*, 2020;). Studies suggested that learning could be made more effective if there is an integration of virtual learning with face-to-face classroom learning in a manner that allows lectures to be taught in the classroom to enhance the visualisation while offering the ability to use online communication tools and online environment to share materials to support access to digital resources (Cong, 2020; Tanis, 2020). Other factors, such as personality types, may influence student preference. Personality regulates how individuals perceive, make judgements, and react in certain situations. Students' acceptance of virtual learning is commonly associated with their self-regulation skills. Self-regulatory behaviour includes the ability to set goals, effective time management, problem-solving capacity, and awareness of time to seek advice from instructors (Botiacario, 2003; Hjeltnes & Hansson, 2005; Appana, 2008; Zhou *et al.*, 2020). In addition to the constraint of self-efficacy, factors such as virtual learning motivation and high task value also strengthen the preference for virtual learning (Botiacario, 2003; Appana, 2008). Motivation is the precursor to learning and is a heavy influencer of individual learning (Mayer, 2005).

This study revealed that the student's perception of virtual learning was not associated with their demographic variables. A similar study reported a weak correlation between the student perceptions of learning with the actual gain of knowledge (Chen *et al.*, 2020). Student perception may not reflect student understanding of course learning outcomes.

In this study, about 78% of the students had very low preparedness for virtual learning, and 80% were unwilling to continue with virtual lectures. This could be due to unstable internet connections, the high cost of internet connectivity required for virtual learning or an unstable power supply. This study revealed that more computers and laptops, improved internet connectivity, free access to internet networks, and a steady power supply were the areas needing improvement for effective virtual learning. These findings agreed with the observation made by Garrison and Cleveland-Innes (2005), who opined that online learning interaction needed to be structured, planned, and improved. Ifeakor and Anekwe (2013) also confirmed that availability and access to internet connectivity were some of the strategies for the improvement of virtual learning. Available and stable internet connectivity and stable power supply are some of the major factors that affect effective virtual learning experience (Anekwe, 2017).

To ensure a more sustainable and effective virtual learning experience and environment, it is recommended that Nigerian federal universities provide the necessary gadgets and technological tools such as laptops and desktops, application software, and an effective time schedule for students. Also, stable and free internet connectivity should be made available for students and lecturers to create a stable and dependable virtual learning environment. Provision should be made for technical virtual learning centres to help the students who may need to acquire more technical skills required for virtual learning to be more effective. There is a need for the establishment of virtual learning centres to meet the technical needs of the students and lecturers in all the federal universities in Nigeria.

Limitations

The generalisability of the study was limited by using data from only one faculty of a single university. Also, the study did not assess the impact of virtual learning on the students' GPA, as the results of their most recent examinations were not yet available at the time of the study.

Conclusion

The undergraduate pharmacy students experienced lower learning satisfaction and more difficult communication with the instructors and their peers during virtual learning. They had negative perception of virtual learning and low preparedness for virtual learning; they preferred the classroom learning method.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

Acknowledgement

We want to acknowledge and appreciate all the students who willing participated in the study

References

Al-Azzam, N., Elsalem, L., & Gombedza, F. (2020). A cross-sectional study to determine factors affecting dental and medical students' preference for virtual learning during the COVID-19 outbreak. *Heliyon*, **6**(12), E05704. https://doi.org/10.1016/j.heliyon.2020.e05704

Al-Jaber, M. A., & Al-Ghamdi, S. G. (2020). Effect of virtual learning on delivering the education as part of the sustainable development goals in Qatar. *Energy Reports*, **6**(8), 371–375. https://doi.org/10.1016/j.egyr.2020.11.174

Anekwe, J. (2017). Impacts of virtual classroom learning on students' of Nigerian federal and state universities. *European Journal of Research and Reflection in Educational Sciences*, **5**(3), 21–36. https://www.idpublications.org/wp-content/uploads/2017/03/Full-Paper-IMPACTS-OF-VIRTUAL-CLASSROOM-LEARNING-ON-STUDENTS%E2%80%99-OF-NIGERIAN.pdf

Appana, S. (2008). A review of benefits and limitations of online learning in the context of the student, the instructor, and the tenured faculty. *International Journal on E-Learning*, **7**(1), 5–22. https://www.learnteclib.org/primary/p/22909/

Aucejo, E. M., French, J., Araya, M. P. U., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: Evidence from a survey. *Journal of Public Economics*, **191**, 1–25. https://doi.org/10.1016/j.jpubeco.2020.104271

Barrot, J. S., Llenares, I. I., & del Rosario, L. S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Education and Information Technologies*, **26**, 7321–7338. https://doi.org/10.1007/s10639-021-10589-x

Bashshar, C. (2017). *Virtual learning environments' impact on adult learners' motivation in the workplace*. Walden Dissertations and Doctoral Studies. 3384. https://scholarworks.waldenu.edu/dissertations/3384

Baxter, J. A., & Haycock, J. (2014). Roles and student identities in online large course forums: Implications for practice. *International Review of Research in Open and Distance Learning*, **15**(1), 20–40. https://doi.org/10.19173/irrodl.v15i1.1593

Becker, H. J. (2000). Findings from the teaching, learning, and computing survey. *Education Policy Analysis Archives*, **8**(51). https://doi.org/10.14507/epaa.v8n51.2000

Bevins, F., Bryant, J., Krishnan, C., & Law, J. (2020). *Coronavirus: How should US higher education plan for an uncertain future?* McKinsey and Company. https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/Coronavirus%20How%20should%20US%20higher%20education%20plan%20for%20an%20uncertain%20future/Coronavirus-How-should-US-higher-education-plan-for-an-uncertain-future-final.pdf

Burston, J. (2013). Mobile-assisted language learning: a selected annotated bibliography of implementation studies 1994-2012. *Language Learning and Technology*, **17**(3), 157–225. http://dx.doi.org/10125/44344

Caton, J., Chung, S., Adeniji, N., Hom, J., Brar, K., Gallant, A., Bryant, M., Hain, A., Basavia, P., & Hosamani, P. (2021). Student engagement in the online classroom: comparing preclinical medical student question-asking behaviours in a videoconference versus in-person learning environment. *FASEB BioAdvances*, **3**(2), 110–117. https://doi.org/10.1096/fba.2020-00089

Chen, E., Kaczmarek, K., & Ohyama, H. (2020). Student perceptions of distance learning strategies during COVID-19. *Journal of Dental Education*, **85**(S1), 1190-1191. https://doi.org/10.1002/jdd.12339

Cong, L. M. (2020). Successful factors for adoption of synchronous tools in online teaching at scale. In T. McLaughlin, A. Chester, B. Kennedy & S. Young (eds.), *Tertiary education in a time of change: Disruptions, challenges and strategies* (pp. 39–60). Springer. https://doi.org/10.1007/978-981-15-5883-2_4

Dudeney, G., & Hockly, N. (2007). How to teach English with technology. Pearson Education Limited.

Gallien, T., & Oomen-Early, J. (2008). Personalized versus collective instructor feedback in the online courseroom: Does type of feedback affect student satisfaction, academic performance, and perceived connectedness with the instructor? *International Journal of E-Learning*, **7**(3), 463–476. https://www.learntechlib.org/primary/p/23582/

Garrison, D., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Education*, **19**(3), 133–148. https://doi.org/10.1207/s15389286ajde1903_2

Gaudioso, E., & Boticario, J. G. (2003). *Towards web-based adaptive learning communities*. In Proceedings of Artificial Intelligence in Education (pp. 237-244). Sydney, Australia: IOS Press.

Hjeltnes,T. A., & Hansson, B.(2005). *Cost effectiveness and cost efficiency in E-Learning*. QUIS. https://www.courseero.com/file/46770687/Strengths-and-limitations-of-e-learning-editeddocx/

Ifeakor, A. C., & Anekwe, J. U. (2013). Information and communication technology and school-based assessment: Challenges for sustainable development. AFRREV STECH: An *International Journal of Science and Technology*, **2**(1), Article

1. https://www.ajol.info/index.php/stech/article/view/108239

International Conference on Artificial Intelligence in Education. (2003). *AIED 2003: Supplementary Proceedings* [of the 11th International Conference on Artificial Intelligence in Education Sidney, Australia]. University of Sydney.

Khalil, R., Mansour, A. E., Fadda, W. A., Almisnid, K., Aldamegh, M., Al-Nafeesah, A., Alkhalifah A., & Al-Wutayd O. (2020). The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. BMC Medical Education, **20**, 285. https://doi.org/10.1186/s12909-020-02208-z

Mangal, S. K., & Mangal, U. (2009). *Essentials of educational technology*. PHI Learning Private Limited.

Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R. E. Mayer (Eds.), *The Cambridge handbook of multimedia learning* (1st ed., pp. 31–48). Cambridge University Press.

Noori, O. A. (2021). The impact of COVID-19 pandemic on students' learning in higher education in Afghanistan. *Heliyon*, **7**(10), e08113. https://doi.org/10.1016/j.heliyon.2021.e08113

Olibie, E., Ezoem, M., & Ekene, U. (2014). Awareness of virtual learning among students of two Nigerian Universities Curriculum Implications. *International Journal of Education Learning and Development*, **2**(1), 34-48. https://eajournals.org/ijeld/vol-2-issue-1-march-2014/awareness-virtual-learning-among-students-two-nigerian-universities-curriculum-implications/

Pelet, J. E., & Lecarte, B. (2013). Virtual worlds as the next asset of virtual learning environments for students in business. *International Journal of Virtual and Personal Learning Environments*, **3**(2), 59–76. https://doi.org/10.4018/jvple.2012040104

Pham, H. H., & Ho, T. T. T. (2020). Toward a 'new normal' with e-learning in Vietnamese higher education during the post COVID-19 pandemic*. Higher Education Research and Development*, **39**(7), 1327–1331. https://doi.org/10.1080/07294360.2020.1823945

Rahmani, J. (2012). Learning styles and academic achievement: A case study of Iranian high school girl's students procedia - Social and behavioral sciences, **51**, 1030–1034. https://doi.org/10.1016/j.sbspro.2012.08.282

Saravanan, C., Mahmoud, I., Elshami, W., & Taha, M. H. (2020). Knowledge, anxiety, fear, and psychological distress about COVID-19 among University students in the United Arab Emirates. *Frontiers in Psychiatry*, **11**, 582189. https://doi.org/10.3389/fpsyt.2020.582189

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, **28**. https://doi.org/10.25304/rlt.v28.2319

Xu, D & Jaggars, S. S. (2013). The impact of online learning on students' course outcomes: Evidence from a large community and technical college system. *Economics in Education Revolution 2013*, **37**, 46–57. https://doi.org/10.1016/j.econedurev.2013.08.001

Yilmaz, O. (2015). The effects of "Live Virtual Classroom" on students' achievement and students opinions about "Live Virtual Classroom" at distant education. *The Turkish Journal of Educational Technology*, **14**(1), 108–115. https://files.eric.ed.gov/fulltext/EJ1057348.pdf

Zarei, S., & Mohammadi, S. (2022). Challenges of higher education related to e-learning in developing countries during COVID-19 spread: A review of the perspectives of students, instructors, policymakers, and ICT experts. *Environmental Science and Pollution Research*, **29**, 85562–85568. https://doi.org/10.1007/s11356-021-14647-2

Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., Xiang J., Wang Y., Song B., Xiaoying G., Guan L., Wei Y., Li H., Xudong W., Xu J., Tu S., Zhang Yi., Chen H., Cao B. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet*, **395**(10229), 1054–1062. https://doi.org/10.1016/S0140-6736(20)30566-3