

Barriers to Effective Online Learning among Pharmacy Students in Zambia: Opportunities for Pedagogical Approach of Blended Learning

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Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic necessitated a rapid global shift to online learning. In Zambia, however, there is limited information on the specific challenges university students face in this new learning environment. This study aimed to investigate the barriers to effective online learning among pharmacy students at the University of Zambia. **Materials and Methods:** A cross-sectional study was conducted from October 2022 to April 2023 among 613 pharmacy students at the University of Zambia. Data were collected using a structured questionnaire and analyzed with IBM SPSS version 25.0. Thematic analysis used to analyze the challenges experienced by pharmacy students during online learning. **Results:** Among the 613 participants, 52.4% were female and 33.8% were between the ages of 18 and 23 years. The majority of students (56.5%) reported experiencing internet connectivity challenges during online learning. Additional reported barriers included inadequate data bundles coupled with poor network quality (9.0%), high costs of data bundles (8.8%), and disrupted interactions and feedback due to network issues (3.1%). Other challenges included limitations on the number of students that online platforms could accommodate (2.8%), difficulties maintaining concentration due to network issues (2.0%), issues with gadgets and data bundles (1.8%), combined problems of poor network and limited online class capacity (1.6%), power outages affecting connectivity (1.5%), low student participation (1.3%), and various technical challenges (1.3%). **Conclusion:** The transition to online learning has imposed significant challenges on pharmacy students, particularly related to internet connectivity, data bundle issues, interactive feedback, and technical problems. These findings highlight the urgent need for universities to adopt blended learning curricula that integrate both online and face-to-face instruction, as well as targeted interventions to address the technical and infrastructural barriers hindering effective online education in Zambia.

Keywords

Blended Learning, E-Learning, Online Learning, Pharmacy, University Students, Zambia

1. Introduction

The coronavirus disease 2019 (COVID-19) brought challenges to the education sector globally (Etando et al., 2021; Burgess and Sievertsen, 2020). Due to the ease of transmission and spread of this viral infection, lockdowns were instituted as mitigation measures (Guzzetta et al., 2020; Farooq, Khan and Khan, 2020; Haider et al., 2020). The pandemic also led to the closure of universities, colleges, and schools worldwide with various impacts on the learners (Harmey and Moss, 2021; Sahu, 2020). However, there was a need to continue offering education services to the students and this led to many universities implementing online learning (Yeo et al., 2021; Zheng, Bender and Lyon, 2021; Aristovnik et al., 2023; Lemay, Bazelais and Doleck, 2021).

Online learning, commonly known as e-learning, refers to the delivery of educational content and services through digital devices such as computers, smartphones, and tablets (Mooney and Bligh, 1997). This approach has become increasingly prevalent in medical education, offering flexible and accessible learning opportunities for students (Mooney and Bligh, 1997). A variety of platforms have been utilized to facilitate e-learning, including Moodle, Zoom, and Google Meet, each offering unique features to enhance the online learning experience (Mwila et al., 2021b; Gamage, Ayres and Behrend, 2022; Carmi, 2024; Bailey, Almusharraf and Almusharraf, 2022). The closure of schools led to the implementation of e-learning in many schools to maintain the academic progress of learners (Amir et al., 2020; Al-Balas et al., 2020; Lemay, Bazelais and Doleck, 2021).

Consequently, e-learning has some challenges especially for students residing in developing countries and low-and-middle-income countries (LMICs) (Mwila et al., 2021b; Lufungulo et al., 2021; Li et al., 2021). Learners have had different experiences during online learning across the globe (Tashtoush, Wardat and Elsayed, 2023). Most students from LMICs experienced challenges due to a lack of appropriate gadgets used for online learning (Barrot, Llenares and del Rosario, 2021), poor internet connectivity (Moustakas and Robrade, 2022; Mahyoob, 2020), power cuts (Yende, 2024), living in rural or remote areas (Belay, 2020), learning environment control (Barrot, Llenares and del Rosario, 2021), having online examinations (Mahyoob, 2020), and quality of facilities used for online learning (Kurniawan and Andani, 2022). Moreover, some students found it difficult to learn certain subjects using online platforms (Mwila et al., 2021a; Aboagye, Yawson and Appiah, 2020).

The closure of schools was reported in many countries and affected student's academic progress (Mudenda et al., 2021; Sahu, 2020; Mudenda et al., 2020; Sul-

tana, Bari and Munir, 2022). Alongside this, many students experienced mental health challenges as they could not handle the physical school closures and initiation of online learning (Barrot, Llenares and del Rosario, 2021; Kurniawan and Andani, 2022; Khan et al., 2020; Mazrekaj and De Witte, 2024). Despite the introduction of e-learning, the closure of schools had a great negative impact especially on students from resource-limited settings (Mwila et al., 2021b; Lutfor et al., 2023).

Evidence has indicated that after lockdowns were lifted, universities, colleges, and schools continued providing online learning together with physical classes (Finlay, Tinnion and Simpson, 2022; Batista-Toledo and Gavilan, 2022; Atwa et al., 2022). This form of incorporating online and classroom (face-to-face) learning is referred to as blended learning (Dziuban et al., 2018; Hrastinski, 2019; Atwa et al., 2022). It offers more benefits compared to traditional classroom learning alone as education continues even during the closure of schools as it integrates traditional-based classes and online learning (Singh, Steele and Singh, 2021; Rasmitadila et al., 2020). Blended learning can effectively enhance participants' acquisition of knowledge, learning satisfaction, and self-evaluation in evidence-based medicine (Liu et al., 2024).

In Zambia, online learning was instigated across all universities after the report of the first case of COVID-19 on March 18, 2020 (Simulundu et al., 2021; Kasanga et al., 2020). Additionally, university, colleges and schools introduced online learning to ensure that students were not disadvantaged academically (Lufungulo et al., 2021; Mwila et al., 2021b). Various platforms such as Moodle, Zoom, and Google Meet were widely used across universities, colleges, and schools (Mwila et al., 2021b). Despite the easing of lockdown restrictions, educational institutions across Zambia have continued to offer online learning alongside traditional in-person classes. However, there remains a dearth of information on the challenges that Zambian students face in both online and classroom settings during and after the COVID-19 pandemic. Against this backdrop, this study was undertaken to investigate the barriers to effective online learning among pharmacy students in Zambia.

2. Materials and Methods

2.1. Study Design, Site, and Population

This cross-sectional study was conducted among pharmacy students at the University of Zambia from October 2022 to April 2023. The University of Zambia offers training to pharmacy students who are future pharmacists (Mudenda et al., 2024). Additionally, other programs offered in health included Medicine, Physiotherapy, Biomedical Sciences, Radiology, and Nursing Sciences (Mudenda et al., 2023a). To be eligible, a student was to provide consent and be registered with the University of Zambia in the program of pharmacy.

2.2. Sample Size Estimation and Sampling Criteria

In this study, Taro Yamane's formula was used to calculate the minimum sample

size that was representative of the registered pharmacy students at the University of Zambia (Charan and Biswas, 2013). To estimate the sample size, a total of 937 registered pharmacy students at the University of Zambia was used with a margin of error of 5%. A 10% non-response rate was considered and led to a sample size of 309. Additionally, using a design effect of 1.5, a sample size of 464 was obtained. All participants were sampled using computer-generated random sampling numbers.

2.3. Data Collection Tool

Data collection was done using an adapted questionnaire (Amir et al., 2020). The questionnaire was reviewed for content and face validation by experts in public health. Further, a pilot study was conducted among 20 pharmacy students at the Levy Mwanawasa Medical University in Lusaka, Zambia. The questionnaire had two sections including Section A which had socio-demographic characteristics of participants and Section B which had questions about challenges influencing the online learning of pharmacy students at the University of Zambia.

2.4. Data Analysis

The data collected were entered into Microsoft Excel version 2013 (Microsoft, Redmond, WA, USA) for processing and later exported to IBM Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM, Chicago, IL, USA) for descriptive analysis. Descriptive statistics were performed on the socio-demographics, and challenges experienced by pharmacy students during online learning. Thematic analysis used to analyze the challenges experienced by pharmacy students during online learning.

2.5. Ethical Approval

This study was approved by the University of Zambia Health Sciences Research Ethics Committee (UNZAHSREC) with an approval number of 202211231184. Participation in the study was voluntary after students were informed of the purpose of the study. This study only included students who provided informed and written consent to be part of the study.

3. Results

3.1. Sociodemographic Information of Study Participants

This study enrolled a total of 613 undergraduate pharmacy students (Table 1). Most students (52.4%) were females and 50.6% were aged between 18 and 23 years. Additionally, most students (33.8%) were in their third year of study (Table 1).

3.2. Challenges Experienced by Pharmacy Students during Online Learning

Most students reported experiencing internet network challenges during online learning (Table 2). The table summarizes the various challenges faced by 613

Table 1. Sociodemographic characteristics of participants.

Variable	Characteristic	Frequency	Percent
Gender	Female	321	52.4
	Male	292	47.6
Age (years)	18 - 23	310	50.6
	24 - 29	196	32.0
	30 - 35	61	10.0
	36 - 41	34	5.5
	42 and above	12	2.0
Year of Study	Second	114	18.6
	Third	207	33.8
	Fourth	131	21.4
	Fifth	161	26.3
Employment status	Employed	167	27.2
	Unemployed	446	72.8
Marital status	Married	79	12.9
	Unmarried	534	87.1

Table 2. Challenges experienced by pharmacy students during online learning.

Characteristic	Frequency	Percent
Network challenges	346	56.4
Bundles and network challenges	55	9.0
Data cost is expensive	54	8.8
Interactions are negatively affected and network challenges	34	5.5
Background noise, disturbances and network	17	2.8
A limited number of students are accommodated by online platforms	17	2.8
Lack of concentration and network challenges	12	2.0
Gadgets, bundles, and network	11	1.8
Poor network and limited number accommodated in class	10	1.6
Power cuts and network	9	1.5
Low participation from students	8	1.3
Poor concentration	8	1.3
Technical challenges and network	8	1.3
Others	24	4.0
Total	613	100

Note: Others include: concerns of cheating during assessments, lack of motivation, motivation, network, concentration, and bundles, not being allowed in class for some platforms for those who had not paid school fees, not audible lecturers and network problems, online platforms sometimes shut down, rushed lectures, study materials not given in time, time is not enough, type of platform used and network problems, and unreliable and inconveniencing.

pharmacy students during online learning. The most prevalent issue, reported by 56.4% of students, is network challenges, which underscores the critical importance of stable internet connectivity. In addition to this, 9.0% of students experienced difficulties related to inadequate data bundles combined with network issues, while 8.8% cited the high cost of data as a barrier. Other notable challenges include disruptions in interactions due to network problems (5.5%), background noise and disturbances (2.8%), and limitations on the number of students that online platforms can accommodate (2.8%). Smaller percentages of students reported challenges related to maintaining concentration, accessing proper gadgets, power cuts, low participation, and various technical issues, each ranging from approximately 1.3% to 2.0%. Overall, the data clearly indicate that connectivity issues, both in terms of network quality and data affordability are the dominant obstacles to effective online learning among pharmacy students in Zambia.

4. Discussion

This study examined the barriers to effective online learning among pharmacy students in Zambia. The findings reveal that students face a range of challenges that significantly hinder their learning experience. Unstable internet connectivity emerged as the most critical issue, frequently disrupting access to course materials and live lectures. Additionally, the high cost of data bundles further restricts students' ability to engage consistently with online platforms. Beyond connectivity issues, many students reported lacking the necessary gadgets, such as reliable computers or smartphones, which are essential for navigating digital learning environments. Frequent power cuts also contribute to interruptions in the learning process, making it difficult for students to maintain a consistent study schedule. Furthermore, students noted that the online format negatively impacts concentration and reduces opportunities for meaningful interactions with both peers and lecturers. These factors collectively undermine the overall quality of online education, highlighting the need for strategic interventions. Addressing these challenges will require a multifaceted approach, including infrastructural improvements, subsidized data plans, and enhanced access to digital devices. By tackling these issues, universities can create a more conducive learning environment that supports both academic success and student engagement.

Online learning among students faced numerous challenges that significantly impacted the quality of education. In this study, most students reported that their online learning was hugely affected by poor internet networks. Evidence has revealed that internet connectivity is very critical during online learning (Sofi-Karim, Bali and Rached, 2023; Asio et al., 2021). However, poor internet connectivity may cause students to drop out during a lesson or fail to hear what the lecturer is teaching. The problem of network connection has been reported in other studies as a factor that influenced learning outcomes among students (Das, 2023; Mudenda et al., 2023b; Cullinan et al., 2021; Moonasamy and Naidoo, 2022).

Many students struggled with unstable internet connections and expensive data

bundles, which caused frequent interruptions during online classes. This instability made it difficult for students to follow lectures in real time, often leading to missed information and a disjointed learning experience, similar to other reports (Aroonsrimarakot et al., 2023). The situation was further complicated by the high cost and limited availability of data bundles, which placed an additional financial burden on students. High data costs were also reported in South Africa (Moonasamy and Naidoo, 2022). The challenges with internet connectivity and data bundles were also reported in Ghana among college students (Ofori Atakorah et al., 2023). In many cases, students had to ration their data usage, which sometimes meant they were unable to attend entire classes or access essential resources. Unstable internet connections have also been reported to affect online learning in other countries (Mohan et al., 2020; Barrot, Llenares and del Rosario, 2021). Additionally, power cuts presented another major hurdle, particularly in areas with unreliable electricity. These power outages often occur during crucial learning sessions, forcing students to miss out on important lessons and fall behind in their studies. The lack of a stable power supply not only disrupted live sessions but also made it difficult for students to charge their devices, further hindering their ability to participate in online learning, similar to findings from other studies (Ahmed et al., 2023; Yende, 2024; Mwila et al., 2021b).

In the present study, the online learning environment also suffered from a lack of real-time clarifications and feedback from instructors. This challenge has been reported in other studies (Saleem et al., 2022; Aroonsrimarakot et al., 2023). In traditional classrooms, students can immediately ask questions and receive explanations, which is essential for deepening their understanding of the material. However, in the online format, delays in communication or a lack of response from instructors left many students with unresolved doubts, leading to gaps in their knowledge. This was exacerbated by poor interactions between students and teachers, as well as among peers. The virtual setting often lacked the personal engagement and dynamic exchanges that are typical in physical classrooms, reducing the effectiveness of collaborative learning. Therefore, these challenges need to be addressed (Barrot, Llenares and del Rosario, 2021).

This study found that background disturbances were another significant issue, as students often had to attend classes from home, where distractions such as household noise and other activities were prevalent. These disturbances made it difficult for students to concentrate fully during lessons, negatively affecting their ability to absorb and retain information. Additionally, the limited number of participants that could be accommodated on platforms like Zoom and Google Meet meant that not all students could join live sessions, leading to feelings of exclusion and frustration. The background disturbances experienced during online learning have been reported previously (Barrot, Llenares and del Rosario, 2021).

The present study found that low participation was a common problem in online classes, with many students feeling disconnected from the learning process. The lack of physical presence and peer interaction diminished students' engage-

ment, leading to passive participation. This lack of motivation was compounded by rushed lectures, where instructors, attempting to cover the syllabus within the constraints of the online format, moved through material too quickly for students to fully grasp the concepts. These challenges have also been reported in previous studies (Amir et al., 2020; Mudenda et al., 2023b). Therefore, university authorities need to find ways of motivating students to be satisfied with online learning.

In the present study, technical challenges, such as software glitches, platform crashes, and difficulties in accessing or submitting assignments, further complicate the online learning process. These issues not only frustrated students but also led to delays in their academic progress. Technical challenges have been reported to lower the satisfaction of students with online learning (Çakmakkaya et al., 2024; Al-Balas et al., 2020; Gachanja, Mwangi and Gicheru, 2021). Lack of digital culture has been proven to be a big challenge, especially in developing countries (Ndibalema, 2022). Additionally, the online assessment environment created opportunities for cheating, as the lack of supervision made it easier for students to engage in dishonest practices. This finding is reported to undermine the integrity of the assessment process and devalue the efforts of students who studied diligently (Sevnarayan and Maphoto, 2024; Henderson et al., 2023; Jalilzadeh, Rashtchi and Mirzapour, 2024).

The current study reported that the learning environment in the online format often led to poor concentration among students. The combination of technical issues, lack of engagement, and various distractions made it difficult for students to focus during classes. This reduced their ability to learn effectively, leading to a decline in academic performance. These challenges collectively created a less conducive learning environment, highlighting the need for improvements in the delivery and support of online education. The learning environment may affect the delivery of online learning and may lead to poor learning outcomes (Barrot, Llenares and del Rosario, 2021; Aroonsrimarakot et al., 2023).

The present study found that the lack of access to appropriate gadgets significantly impacted the effectiveness of online learning among students. In the context of remote education, having a reliable device such as a laptop, tablet, or smartphone is essential for attending virtual classes, completing assignments, and accessing educational resources. However, many students, particularly those from economically disadvantaged backgrounds, struggled to participate in online learning due to the absence of these necessary tools. For students without gadgets, attending live online classes was an impossible task. The findings of this study are similar to previous findings (Segbenya et al., 2022). This digital divide created a significant barrier to education, as these students were unable to join virtual classrooms, interact with their peers and instructors, or engage with the course material in real time. As a result, they missed out on valuable learning opportunities and fell behind their classmates who had the necessary technology at their disposal. Even for students who did have access to some form of technology, the quality and suitability of their gadgets often posed challenges. For example, using

an outdated smartphone with a small screen or limited processing power made it difficult to view course content, participate in video calls, or use educational software effectively. These limitations not only hindered the learning experience but also added to the frustration and stress of trying to keep up with academic demands. The use of digital technologies in education could have come with various challenges including how the technology is used (Timotheou et al., 2023).

In this study, students without adequate gadgets were unable to fully participate in interactive online activities, such as group projects, discussions, and collaborative learning exercises. This lack of participation not only affected their academic performance but also deprived them of the social interaction and peer support that are essential components of the learning experience. The absence of gadgets also limited students' ability to develop digital literacy skills, which are increasingly important in today's technology-driven world. Students who lacked regular access to devices missed out on opportunities to become proficient in using digital tools and platforms, which could have long-term implications for their future education and career prospects.

Based on the findings of this study, to enhance online education, educational authorities should focus on training instructors/teachers/lecturers to better support their students. Universities should implement learning management systems (LMS) to ensure timely course material delivery and secure online discussion forums. Collaboration among parents, students, and university management is essential for improving education quality. Faculty with limited skills should receive training to enhance their online teaching capabilities. Additionally, even students with limited technological skills need to be supported. Students should also be guided on how they can control their learning environment and time management. Pre-developed course modules can help both teachers and students prepare for online classes. Finally, any concerns from instructors or learners about online education's technological or content features must be promptly addressed and resolved.

This study has some limitations. First, as the study was conducted solely among pharmacy students at the University of Zambia, the results may not be generalizable to pharmacy students in other institutions or to students from different disciplines. This single-site focus may limit the applicability of the findings to broader student populations within Zambia or similar contexts. Second, the cross-sectional design of this study limits the ability to establish causal relationships between the identified challenges and online learning outcomes. The snapshot nature of the data collection means that temporal changes and evolving challenges over time are not captured. Third, data were collected using an adapted questionnaire, which relies on self-reported information. This method is subject to biases such as recall bias and social desirability bias, potentially affecting the accuracy and reliability of the responses regarding the challenges experienced. However, this study provides vital findings into the challenges faced by pharmacy students during online learning.

5. Conclusion

This study revealed that pharmacy students in Zambia faced significant challenges during the transition to online learning. Key issues included inconsistent internet connectivity, inadequate data bundles, limited opportunities for interactive feedback, reduced class participation, and a range of technical difficulties. These obstacles not only disrupted their immediate learning experience but also threatened to undermine long-term academic outcomes. In light of these findings, there is a compelling need for higher education institutions to develop and implement blended learning curricula. Such curricula would integrate traditional face-to-face teaching with online methods, harnessing the flexibility of digital platforms while mitigating the issues associated with remote learning. By addressing the specific challenges identified by the students, educators can create a more supportive and effective learning environment that promotes better engagement and improved academic performance.

6. Recommendations

The University of Zambia and other universities can implement a range of solutions to address the challenges identified by pharmacy students during the transition to online learning. Here are several targeted strategies:

1) Enhance Connectivity and Infrastructure

- **Partner with Telecommunication Providers:** Negotiate with local telecommunications companies to offer subsidized or free data bundles exclusively for educational purposes, ensuring that students can access online platforms without prohibitive costs.
- **Invest in Robust Online Platforms:** Upgrade and expand the capacity of online learning management systems to handle larger numbers of simultaneous users, thereby reducing issues related to network congestion and limited class sizes.

2) Adopt a Blended Learning Model

- **Integrate Face-to-Face Components:** Develop curricula that combine online learning with traditional classroom sessions. This hybrid approach can mitigate the limitations of purely online instruction by providing direct interaction and support.
- **Utilize Asynchronous Materials:** Record lectures and provide downloadable content so that students facing connectivity issues or power outages can access learning materials at their convenience.

3) Strengthen Technical Support and Training

- **Dedicated IT Support:** Establish a helpdesk or support center specifically for resolving technical issues related to online learning, ensuring prompt assistance when problems arise.
- **Faculty and Student Training:** Organize regular training sessions to familiarize both educators and students with digital tools and best practices for online

learning, which can enhance engagement and reduce technical difficulties.

4) Improve the Online Learning Environment

- **Interactive Tools:** Incorporate interactive features such as discussion forums, breakout rooms, and real-time feedback mechanisms to foster better communication and engagement during online sessions.
- **User-Friendly Platforms:** Ensure that the online systems are intuitive and accessible, reducing the learning curve for new users and minimizing frustration caused by technical complexity.

5) Increase Access to Digital Devices

- **Loan or Subsidy Programs:** Provide initiatives for students who lack appropriate gadgets by offering loan programs or financial assistance for purchasing necessary devices, ensuring that all students have equal access to digital learning tools.

6) Implement Feedback and Continuous Improvement Mechanisms

- **Regular Surveys and Feedback Loops:** Establish channels for ongoing feedback from students regarding their online learning experiences. This can help identify emerging challenges and inform timely improvements.
- **Monitor and Adapt:** Use feedback data to continuously refine online teaching methods and technical infrastructure, adapting strategies as needed to meet evolving student needs.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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