

RESEARCH ARTICLE

Inequality in accessing learning during pandemic crises in developing countries: Reflections from COVID-19-induced online learning at a Kenyan pharmacy school

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Keywords

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Abstract

Background: Virtual learning platforms gained unprecedented prominence after the coronavirus disease 2019 (COVID-19) outbreak. Assuring the quality of education and student satisfaction are critical, especially in developing countries often plagued with infrastructural limitations, including information technology. **Objectives:** This study was conducted to assess the perceptions of students at a Kenyan Pharmacy School of online learning with regards to affordability and overall effectiveness. **Methods:** A cross-sectional study was conducted using an online survey containing pre-determined questions aligned to achieve the research objectives. **Results:** Students in senior classes (Fifth year) viewed online learning more favourably and had fewer challenges with accessibility than students in the lower classes (First year to third year). **Conclusion:** The study identified areas of strength, such as convenience, time-efficiency, and self-initiative, as well as weaknesses, including inequitable access, internet connectivity challenges, and unsatisfactory lecturer digital competency, with relation to online learning.

Introduction

The unexpected emergence and widespread of the coronavirus disease (COVID-19) curtailed the normal order on multiple fronts, including education. Most countries closed down schools to mitigate the spread of the pandemic (Garber *et al.*, 2019; Lugonzo, 2020; Armbruster *et al.*, 2021). As of March 2020, over 1.7 billion learners were out of school due to COVID-19 (Dhawan, 2020; Karalis & Raikou, 2020), corresponding to about over 90% of the world student population (d'Orville, 2020). As in previous pandemics, the school closures have helped lower mortality that would have occurred as a result of the disease (Tandon, 2020).

In Kenya, learning institutions, including universities, were first closed on 15 March 2020 by a presidential directive to mitigate the spread of the virus. Online learning was then

proposed by the ministry of education to ensure continuity of studies before institutions would be allowed to re-open later for traditional face-to-face learning (Kimathi *et al.*, 2021).

Online learning entails the use of the internet to access learning materials and interact with tutors or instructors. For this purpose, learners have to use smartphones, laptops, tablets, or desktops to access the online learning platforms. Besides technical ability to navigate the online platform, access to good and steady internet is vital to the success of the process. At the Jomo Kenyatta University of Agriculture and Technology in Kenya, online classes started in June 2020 using mainly the Kenya Education Network (KENET) and Zoom platforms.

It is expected that the online classes would produce desired outcomes as with the usual face-to-face learning since the content covered during this period will not be

repeated when schools resume and revert to physical learning. It is thus essential that students can access the online platforms and understand what is being taught satisfactorily. Therefore, this study was conducted to assess student perception of online learning with regards to affordability, accessibility, content coverage, and overall effectiveness, compared to traditional physical learning. The study outcome would be of interest to the university and the Pharmacy and Poisons Board of Kenya, which regulates the training and practise of pharmacy in the country, in understanding the potential challenges and, therefore, the competence of pharmacists trained using the blended approach during the COVID-19-induced online learning.

Methods

Study site

The study was conducted at the Jomo Kenyatta University of Agriculture and Technology School of Pharmacy, Main Campus in Kenya. The University is located about 30 km North-East of the Country's capital city of Nairobi, along the Nairobi-Thika Superhighway.

Study design and sampling method

This descriptive cross-sectional study was conducted from August to October 2020 among bachelor of pharmacy students enrolled for the academic year under review.

Study selection criteria

All bachelor of pharmacy students who were learning online and consented to participate in the study were eligible. Conversely, students who had not enrolled for classes during the study period, those who may have dropped out of the program, and those who did not consent to participate in the study were excluded.

Study variables

The following variables were evaluated during the study: a) level of study, b) time spent on online learning, c) cost of access to the internet, d) type of internet access, e) the number of course units, f) type of online platform used, g) perceptions of the affordability of online learning, h) satisfaction with online learning, i) challenges faced with online learning, and j) recommendations towards improving the online learning experience.

Data collection and statistical analysis

An online survey containing pre-determined questions to enable gathering the relevant information was circulated to the cohorts of the University's School of Pharmacy

students. Descriptive and inferential data analysis were performed to assess the perceptions of students towards online learning, challenges encountered, and recommendations to improve online learning in the future.

Ethical considerations

Approval to conduct the study was granted by the Jomo Kenyatta University of Agriculture and Technology Institutional Ethics and Research Committee (approval number: JKU/2/4/896B). Prior consent was sought from each student before they were allowed to participate in the study. Study participants were assured of confidentiality, and the data collection tool was designed to gather information without revealing the personal identity of participants.

Results

Characteristics of study participants

A total of 147 students participated in the online survey across the various cohorts. The study had more female (83, 56.5%) than male (64, 43.5%) participants, with the highest participation recorded among fifth-year students (54, 36.7%) (Table I).

Most students (132, 88.6%) used smartphones to access online learning, while about one third relied on laptops (48, 32.2%). Considering the physical location, there was an equal distribution of students who were in urban (50, 33.6%), rural areas with electrification (54, 36.2%), and rural areas without electrification (45, 30.2%) (Table I).

There were noticeable class-based differences in the physical location of students: higher proportions of students in the senior class resided in urban areas compared to students in lower classes. The third-year class had the highest proportion of students who operated from a rural address without electrification (Figure 1).

Regarding sources of energy for online learning, electricity (111, 74.5%) was the principal source, with solar energy accounting for about a fifth (32, 21.5%) of the energy supply among study participants (Table I).

The overall median cost of accessing internet services for online learning per student was KES 2000 IQR [1000, 3000] (Figure 2). First-year students generally spent much less (KES 1000 IQR [600, 2000]) compared to students in other classes (Table I).

Cellular data (98, 65.3%) was the most dominant source of internet for the students, with only 23 (15.3%) and 29 (19.4%) reporting reliance on either Wi-Fi only or both cellular and Wi-Fi, respectively (Table I).

Table I: Characteristics of study participants

Variable	Frequency	Percentage
Gender		
Female	83	56.5
Male	64	43.5
Cohort		
First year	29	19.7
Second year	25	17.0
Third year	39	26.5
Fifth year	54	36.7
Devices used		
Smartphone	132	88.6
Laptop	48	32.2
Tablets	2	1.3
Online learning location		
Urban	50	33.6
Rural with electricity	54	36.2
Rural without electricity	45	30.2
Source of energy		
Electricity	111	74.5
Solar	32	21.5
Generator	5	3.4
Other	1	0.7
Internet sources		
Cellular	98	65.3
WIFI	23	15.3
Both	29	19.4
Cellular data service provider		
Safaricom	104	76.5
Airtel	20	14.7
Telkom	11	8.1
Other	1	0.7
*Monthly cost of online learning (KES)		
First year (n= 25)	1000	[600, 2000]
Second year (n=23)	2000	[1000, 3000]
Third year (n=38)	2500	[1500, 3000]
Fifth year (n=47)	2500	[1000, 3000]
Overall (n= 133)	2000	[1000, 3000]

*Values are median and interquartile range

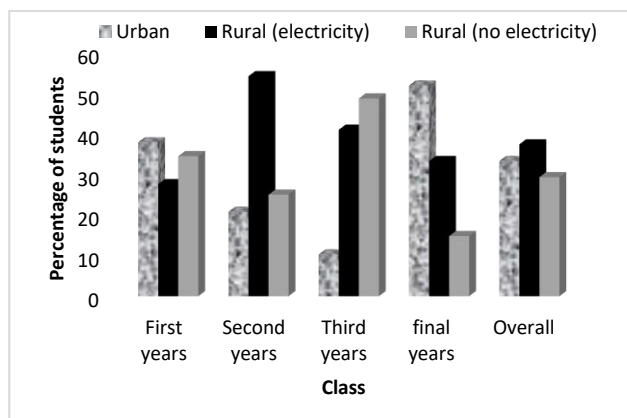


Figure 1: Class-based distribution of students by physical location (urban, rural with electricity, and rural without electricity) during online learning

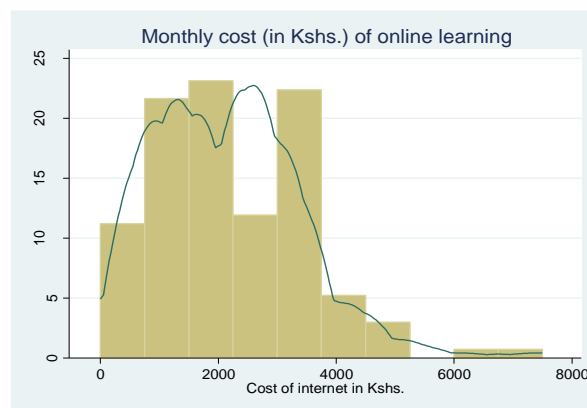


Figure 2: The overall frequency distribution histogram of the students' monthly expenditure on the internet

Lecture attendance and assessment of perceptions

Overall, slightly more than half of the students (82, 54.7%) stated that they attended over 75% of the online lecture sessions at the time when the lectures were taking place. About 1 of 12 (14, 8%) students managed to attend only up to 24% of the lecture sessions in real-time. Except for third-year students, the higher proportion of students per class attended at least 75% of the sessions in real-time (Figure 3a). Lecture recordings complemented online learning, with 58.7% of the students reporting to have relied on recordings alone for up to 24% of all their online classes. Less than 10 (9.3%) of the students depended solely on lecture recordings for over 75% of all the online classes (Figure 3b).

Access, satisfaction, and challenges with online classes

Only about a quarter (36, 24.3%) of the students thought that online classes were affordable (Table II). Analysis of class-based comparison showed that lower classes (Years 1 to 3) had the highest proportions of students who felt that online learning was unaffordable. Although senior classes had higher proportions of students who found online learning affordable, this proportion was, nonetheless, less than 50% (Appendix A, supporting information). Nearly half of the students (71, 48.3%) asserted that they were not satisfied with the content covered during the online learning classes (Table II).

Loss of network connectivity was a common problem across the classes, with lower classes being particularly affected. Overall, nearly 60% of the students stated that they often lost their internet connection during online learning (Table II). The third-year class had the highest proportion (77, 89.8%) of students with frequent loss of internet connection (Appendix B, supporting information). Regarding internet connectivity, students in lower classes experienced more frequent disruptions due to power outages than fifth-year students (Appendix C, supporting information).

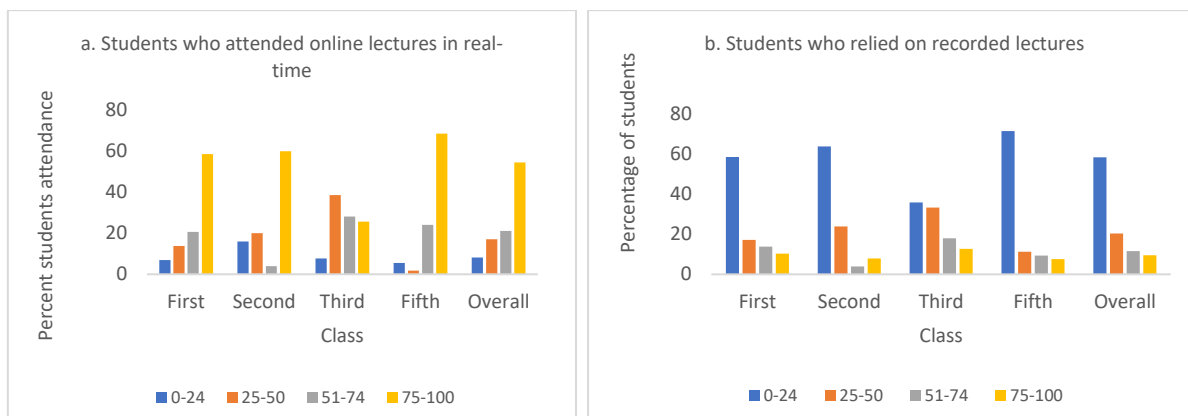


Figure 3: Class-based and overall percentage distribution of students

Table II: Experiences and perceptions towards online learning

Perception	Frequency	Percentage
<i>Affordability</i>		
Unaffordable	77	52.0
Neutral	35	23.7
Affordable	36	24.3
<i>Satisfaction with content coverage</i>		
Dissatisfied	71	48.3
Neutral	45	30.6
Satisfied	31	21.1
<i>Loss of internet connectivity</i>		
Infrequent	26	17.6
Neutral	37	25.0
Frequent	85	57.4
<i>Power outage frequency</i>		
Infrequent	39	26.4
Neutral	46	31.1
Frequent	63	42.6
<i>Willingness towards online learning</i>		
Unwilling	70	53.4
Neutral	28	18.9
Willing	41	27.7
<i>Decreased student-lecturer interaction compared to physical learning</i>		
Agree	102	69.4
Neutral	14	9.5
Disagree	31	21.1
<i>Online learning after COVID-19</i>		
Willing	41	27.7
Neutral	28	18.9
Unwilling	70	53.4
<i>Better understanding compared with face-to-face learning</i>		
Disagree	71	48.3
Neutral	33	22.4
Agree	43	29.3
<i>Adequate lecturer preparedness</i>		
Disagree	46	31.5
Neutral	40	27.4
Agree	60	41.1
<i>More participation compared with physical learning</i>		
Disagree	71	48.3
Neutral	45	30.6
Agree	31	21.1
<i>Student feeling in charge</i>		
Disagree	53	36.9
Neutral	35	23.8
Agree	59	40.1

Table II: Experiences and perceptions towards online learning (continued)

Perception	Frequency	Percentage
<i>Online learning is time-efficient</i>		
Disagree	40	27.2
Neutral	34	23.1
Agree	73	49.7
<i>Credibility of results</i>		
Not credible	57	39.0
Neutral	38	26.0
Credible	51	35.0
<i>Willingness to take end of semester exams</i>		
Unwilling	77	52.4
Neutral	18	12.2
Willing	52	35.4

Comparisons and preference between online and classroom-based learning

The study revealed that most students (102, 69.4%) experienced a reduced student-lecturer interaction during the online classes (Table II). Half of the participants (76, 50.7%) were reluctant to consider studying online after the COVID-19 pandemic (Table II). However, the fifth-year class had higher proportions of students willing to pursue studies using the online platform beyond the COVID-19 pandemic. In contrast, the third-year class stood out as having the highest proportion of students (33, 84.6%) who were unwilling to embrace online learning beyond the pandemic (Appendix D, supporting information).

Most students (71, 48.3%) agreed that they did not understand the content covered online to the same extent they would have understood had the class been held face-to-face. In addition, most students declared that lecturers were well prepared for online learning sessions (60, 41.1%) and in control of their learning when classes were conducted online compared to physical learning (59, 40.1%). They also believed that online classes were more time-efficient than classroom-based learning (73, 49.7%) (Table II).

There was no difference between the number of students who felt that the results from assessments conducted online were either credible (51, 35%) or not credible (57, 39%). However, slightly more than half of the students (77, 52.4%) were not in favour of undertaking end of term exams using the online platform (Table II).

The appeal of online learning

Students were asked to give reasons that made their online learning experience likeable (Table III). The most common reasons revolved around the fact that the sessions were convenient and time-efficient. Some students noted that the lecturers were generally more punctual and that there were no challenges associated with locating and clashing venues, as often happens with face-to-face classes. Clashing venues occur when a single venue is found to have been assigned to more than one group of students at the same time. Other students liked the fact they could access notes for reference after the lectures and that it was easy to follow the class and notes during lectures as these were displayed conveniently on their respective online learning gadgets. Usually, during classroom-based

lectures, only frontbenchers benefit from hearing and seeing the lecturer's content adequately, as reported by some students. Other participants also highlighted the fact that lecturers took time to explain the concepts and facts rather than simple dictation of notes, as it often happens in the classroom setting during physical learning. Other features that students found appealing in the online learning experience were the use of extra videos and quizzes, the inclusion of student presentations, and the integrity of assessments.

Dislikeable features of online learning

Several reasons were reported as to why students found some subjects or the online learning experience less enjoyable (Table III). Non-interactive lectures, excessive course content, lack of note sharing, and lecture recordings by the lecturers were among the frequent points identified for their dislike of some units. Poor delivery of course content, inability to articulate the course content via the online platform compared to classroom-based learning and challenges with internet connectivity and clarity of presentation by the lecturers contributed to the reasons for students disliking some courses.

Table III: Likeable and dislikeable features and recommendations by study participants for improving online learning

Aspect of online learning	Sample responses from students
Likeable features of online learning	<ul style="list-style-type: none"> • Convenience in that students can learn from anywhere and inclement weather does not affect their learning schedule • New exposure: students appreciated the role of technology in learning • Integrity of assessments conducted via digital platforms improving credibility of results due to decreased exam malpractice • Time efficient with regard to lecturer punctuality and class duration • No venue challenges • Access to notes and lecture recordings • Continuation of studies even with closure of schools • Easy to follow online content during class: better visibility and audibility of the lecture notes and lecturer (not a privilege of frontbenchers only as often happens in physical learning) • The demand for self-discipline • Feeling in control of the learning • Better explanation by lecturers rather than dictation of notes as often happens in classroom setting • Lecturers took time to relate to real-life experiences more • Use of extra videos and quizzes to enhance the learning • Easier interaction with lecturers due to provision of private chats in the online learning platforms • The prompt for further personal research and reading
Dislikeable features of online learning	<ul style="list-style-type: none"> • Expensive hence not readily and fairly accessible to all students • Unsuitable learning hours with regards to the timing and duration • Unavoidable inconveniences due to distractions around the home environment • Lack of interaction with lecturers and peers • Challenges with internet connectivity and power outage with both students and lecturers • Lack of practical sessions • Difficulty in understanding concepts not easy to articulate through the online platform (such as drawing of chemical structures)

Table III: Likeable and dislikeable features and recommendations by study participants for improving online learning (continued)

Aspect of online learning	Sample responses from students
Dislikeable features of online learning	<ul style="list-style-type: none"> • Too fast-paced lectures and late starting of some lectures which made it cumbersome for students • The lack of sharing lecture notes and recordings for some units • Poor coordination and planning by some lecturers regarding lecture schedule and timings making planning for the sessions a challenge • Inadequate time allocation for online assessments and lack of backup strategy in case of blackouts (students would lose their answers) • Non-interactive lecturers who dominated the sessions • Lack of opportunity to give feedback to the lecturers' teaching • Online learning was more mentally draining
Recommendations to improve the appeal of online learning	<ul style="list-style-type: none"> • Subsidising of internet bundles to improve affordability and hence accessibility • Proper lesson and assessment planning with the timing and schedule communicated in advance to the students • Timing of lessons to a reasonable duration and not holding classes in the afternoon • Improvements on content delivery by diversifying to include other teaching resources in addition to slides • Exercising leniency in case of technological hitches during assessments • Provision of notes and recordings for the lectures • Conduct continuous assessments but not Exams using the online platform to level the playing field • Explore possibility of online exams • Undertake lecturer training on online presentations to improve audibility, clarity and student engagement • Proportionate assignment of lecture hours and content (more time for bulky units) • Combine online and face-to-face learning • Explore other online teaching platforms like Zoom since KENET audio kept breaking.

Discussion

Online learning has emerged as a critical alternative to higher education access, especially with limitations to face-to-face learning imposed by pandemics such as COVID-19. In developing countries, frequently beset by resource and infrastructural constraints, access to online learning can be challenging (Ifenthaler *et al.*, 2018). This study was conducted to evaluate the online learning experience at a Kenyan School of Pharmacy during the academic year 2020.

There was higher participation of female students compared to their male counterparts, an observation that likely mirrors the student composition at the School of Pharmacy. Considering specific classes, students in senior classes participated more than those in lower classes, a feature possibly influenced by differential ease of access to the internet for online courses and the depicted positive attitude towards online learning by senior students.

There was a balanced distribution of students who were either urban or rural dwellers. A higher proportion of senior students resided in urban areas compared to students in lower classes. Notably, the third-year class had the highest proportion of students living in rural areas. This variation in the residential

distribution of the students, whether urban or rural dwellers, is essential in enabling the school to anticipate and appreciate the challenges that the students may encounter in their quest to access online learning. For instance, episodes of power outages, network connectivity issues or even affordability of online learning are, predictably, related to the physical address of the learners, with rural dwellers being more disadvantaged than those living in urban areas (Alaneme *et al.*, 2010), explaining why students in senior classes seemed to experience fewer challenges with accessing online learning. Consequently, they appeared to enjoy online learning more than their junior counterparts, most of whom had a rural dwelling. Unsurprisingly, a similar study in Mozambique found that a rural residence affected access to information and communications technology and that the students found more difficulties affording and having a conducive environment for online learning (Mawere & Rambe, 2011).

Among the sources of energy, electricity was the principal source of power supply for online learning among students, thus explaining why rural dwellers, especially the third-year class, experienced frequent challenges accessing and finding satisfaction with the online learning system.

Most students relied on smartphones for online learning, with only about one-third using laptops. Although portable and convenient to use, smartphones can be easily distracting (Baticulon *et al.*, 2021). There should be plans for the universal provision of laptops to students at tertiary levels of education to enhance online learning. Such a program can be effectively embedded within the University's fee structure and through appropriate private-public partnership arrangements with companies that manufacture or sell laptops.

Despite cheaper internet products provided by Airtel and Telkom, Safaricom, having relatively more expensive internet products, commanded a lion share of the bundles market among online learners. This observation could mirror the network coverage and internet signal strength by the respective service providers. The revelation that Safaricom is the most preferred internet service provider makes it the most suitable telecommunication partner to consider when seeking discounted bundles to support online learning (Gitonga, 2013).

In each of the classes, less than 75% of the students achieved the required 75% lecture attendance, as stipulated by the country's Commission for University Education, to be allowed to sit for university examinations. Interestingly, among the students who met this lecture attendance criterion, the majority were female students (48, 60.8%), as has been observed elsewhere (Im & Lee, 2003).

As established in the results, most students supplemented their online learning experience by following the recorded lectures. Thus, recording and availing the lecture recordings after the online sessions should be encouraged among academic staff members when online learning is pursued as an alternative or additional form of teaching. This observation is in tandem with the report based on a study, which assessed various universities across the globe and found that students have strong positive perceptions about the value of lecture recordings in enhancing their learning and supporting their education (Morris *et al.*, 2019).

Compared to the fifth-year senior class, the lower satisfaction among junior classes towards online learning is concerning and should prompt inquiry as to whether, or by how much, the teaching approach, students' digital competency, the workload, or lecturer preparedness contributed to the aversion to the online mode of teaching. A study conducted in Europe found that students who had ease of access to the digital platforms and were motivated and confident in using technology were satisfied with online learning outcomes (Rodriguez *et al.*, 2008).

In all classes, except the third-year cohort, most students found online learning efficient and convenient. For this reason, it is logical to consider adopting blended learning comprising of face-to-face and online learning sessions, even after the COVID-19 pandemic is over.

The affordability of online classes emerged as a challenge to a considerable proportion of students, especially those in the lower classes. Based on this observation, the university could embark on a proactive plan to engage with internet service providers, such as telecommunication companies, to subsidise the cost of bundles so that students can equally access online classes even after the pandemic. If the University secures adequate and reliable internet connectivity within the campus, the discrepancy in affordability can be corrected, and equal access to online learning would be guaranteed when online learning is to be pursued after resuming face-to-face learning. Similarly, the revelation that only about one-third of the students used laptops for online learning, while most of the participants relied on smartphones, indicate the low coverage of universal laptop ownership among university students. More efforts should be exerted to improve laptop ownership, given that the University has a laptop assembly plant, as contracted by the government of Kenya, for the free primary education program (Nyamai, 2015).

The convenience of online learning was the main likeable feature among students who found online learning appealing. Some of the aspects pointed out by students include not having to waste time looking for lecture venues, as this is usually not fixed. Also, there were no challenges with clashing venues, as happens when the same lecture room assigned to a class is found to have been allocated to another one. This issue often leads to a waste of time and, sometimes, the postponement of the lecture for students who lose access to the room. The ability to proceed with the scheduled lectures, even in inclement weather, contributed to the convenience of online learning. For example, classes were unaffected by rainy weather, and students did not have to present to the University for lectures, only for the lecturer to fail to turn up for whatever reason.

Additional teaching aids, such as the use of videos and quizzes, as reported before, added to the appeal of online learning to the students (Manthra *et al.*, 2018). Some lecturers sent in extra reference notes, copies of lecture slides, and recordings of the lecture sessions, adding to students ability to internalise and comprehend even the seemingly complex concepts, as averred by the participants.

Chief among the dislikeable features of online learning were challenges with affordability and connectivity. The challenge with connectivity involved lecturers as well, whereby some of them could not deliver their sessions with clarity and some experienced power outages and were unable to conduct their sessions as scheduled.

For some topics like pharmaceutical chemistry, several students felt that other platforms and teaching aids, which could enhance the understanding of such subjects, should be explored. The proposed platforms should allow for demonstrations and structure drawing as happens in a face-to-face classroom session.

Students also decried the late start of some lectures, forcing them to grapple with extended learning hours, some of which were poorly timed. This point, together with the unavailability of lecture notes or slides, further compounded the learning experience.

Although providing helpful insights, the current study has some limitations. For instance, not all students in the pharmacy school participated, making absolute generalisations of the findings inaccurate. It was also not possible to evaluate if students may have changed their physical location, between urban and rural settings, during the online learning study period, which may provide mixed results.

Conclusion

This study is the first to assess the perceptions of pharmacy students towards the e-learning system used during the COVID-19 pandemic at the Kenyan Public University. Student perceptions regarding the benefits of online learning, including convenience, time-efficiency, and the diversity of teaching approaches, were identified. Areas of concern, particularly related to costs, internet connectivity challenges, and inadequate digital competency by some lecturers, were also reported. Mitigating the highlighted challenges through increasing access to the online platform and enhancing the competence of lecturers in using it can improve the appeal of online learning even post-COVID-19.

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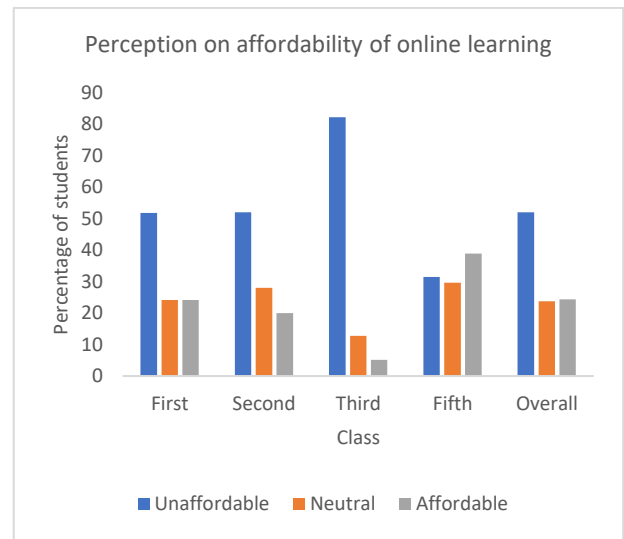
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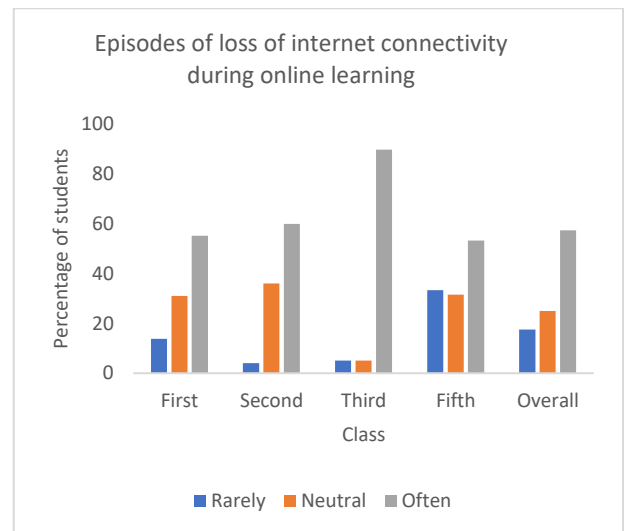
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Appendices

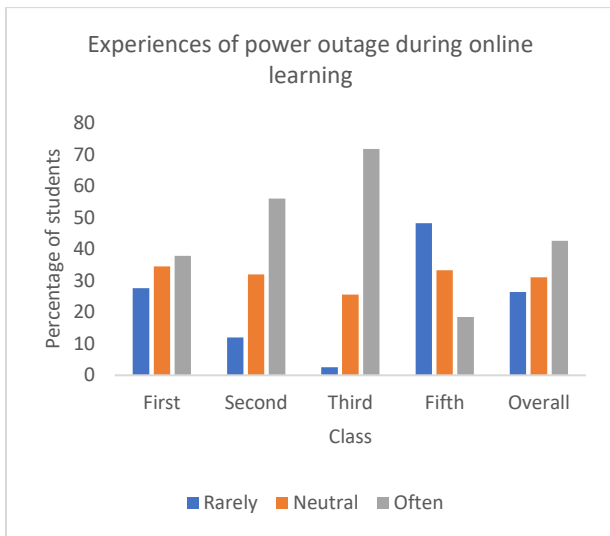
Appendix A: Percentage of distribution of class-based and overall perceptions on the affordability of online learning by study students



Appendix B: Class-based and overall percentages of the incidences of loss of internet connectivity during online learning



Appendix C: Class-based and overall power outage cases among study participants, expressed as percentages



Appendix D: Distribution of the willingness of students to consider online learning after the COVID-19 pandemic

