









# Perception and Challenges of Health Science Students toward E-learning in a Sub-Saharan African Country: A Multi-institutional Study

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## Abstract

**Background:** E-learning is important in improving access to quality health sciences education. This study aimed to determine the perspectives of Kenyan health science students toward e-learning in a bid to enhance effective learning during the COVID-19 pandemic and beyond. **Methods:** This descriptive cross-sectional study targeted 294 Kenyan health science students. Approval was obtained from the Kenyatta National Hospital–University of Nairobi Ethics Research Committee, and informed consent was obtained from participants. Data were collected using Google Forms and analyzed using SPSS version 27.0. A p value  $\leq 0.05$  was considered significant at 95% confidence interval. **Results:** Most students had good knowledge of online learning; 74.9% reported having received training on the same by their universities and 74.5% further reported to have taken tests on the same. Almost half (45.5%) were knowledgeable of the use of the internet to access materials. Most (79.6%) portrayed a positive attitude

toward online learning, agreeing to its use as an integral part of learning. However, 70.2% noted a decrease in concentration and changes in reading habits (44.7%). Regarding challenges faced, unreliable internet connection (56.9%) and lack of motivation (73.7%) were common. **Conclusion:** The majority of the Kenyan health science students portrayed good knowledge, attitude, and practice toward e-learning amidst challenges.

**Keywords:** Online learning, Health science students, COVID-19; Sub-Saharan Africa  
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## Introduction

Online learning has been a revolutionary educational tool that has propagated the advancement of healthcare training worldwide for a long time. However, its use in low-resource countries such those in sub-Saharan Africa remains under-exploited (1). Unlike developed countries

where it was integrated into health training institutions as early as the start of the 2000s, developing countries have been lagging behind (2) despite advancements in technological development and internet access (3).

Low- and middle-income countries face many challenges in healthcare, among which is low doctor-to-patient ratio due to constrained healthcare workforce (3). As such, online learning has been identified as a feasible tool to increase the capacity of healthcare workers and expand the healthcare workforce to cover underserved areas (4). With improved access to primary healthcare, this is a key strategy in implementing universal health coverage in sub-Saharan Africa. Successful online learning has been noted to promote e-health readiness and reception of telemedicine in resource-constrained countries (5). Online learning is also a reliable and realistic option for continuity of healthcare training during disruptions caused by phenomena such as the ongoing COVID-19 pandemic. Despite its notable benefits in the medical field, training in medical schools has remained largely traditional over the years, mostly employing physical lectures (6). With the onset of COVID-19 pandemic, World Health Organization guidelines and government restrictions, including lockdowns and closure of schools, have hampered the traditional physical face-to-face learning in medical institutions to a great extent. Following the official reporting of the COVID-19 pandemic, learning and assessment in Kenyan universities were halted. With strict measures from the Ministry of Health, online learning resumed at different times, depending on the individual universities' administration organization. At the time of this study, no physical learning had resumed, and each university had to choose the teaching platform and make arrangements for internet infrastructure for their students. Online learning has therefore become a major enabler of learning, even in low-resource areas (7). Kenyan health sciences' learning institutions have been faced with the task of scaling up online learning platforms to meet educational demands during the pandemic. For institutions to be successful in the implementation of online learning, key elements of online learning need to be considered carefully (3). These elements include institutional support, infrastructure, information and communications technology technical expertise, and faculty and student engagement (2, 3).

Despite the importance of students' engagement and perspectives toward the success of institutional online learning (8), there is paucity of data on the same in low- and middle-income countries, particularly in sub-Saharan Africa (3). As such, there is a need for comprehensive evaluation of health science students' perception toward online learning in sub-Saharan Africa through assessment of their knowledge, attitude, practice, and challenges. These findings will not only improve the quality of healthcare training, but also address healthcare workforce shortages and help bridge the gap in e-health readiness in Kenya and sub-Saharan Africa at large.

### **Material and methods**

This study employed a descriptive cross-sectional design involving 294 (first to final years) medical, dental, pharmacy, and nursing schools in Kenya from the University of Nairobi, Kenyatta, Jomo Kenyatta, Moi, Mount Kenya, Maseno, Uzima, Egerton, and Kisii Universities. Two of these are private institutions (Mount Kenya and Uzima), and the rest are public institutions. A non-random sampling (snowballing) technique was used to select participants, since this was the best method to reach students online during the pandemic. In this case, an online link to the questionnaire was sent to the students' class representatives, who then shared it to their colleagues. Prior to data collection, approval was obtained from the Kenyatta National Hospital–University of Nairobi Ethics Research Committee. Permission to conduct the study was also sought from all relevant authorities where the study was undertaken. A detailed description of the study was provided to the participants before they filled in the questionnaire. All participants provided informed consent. The questionnaire, which was adapted from similar studies, was divided into five sections (9–11). The first asked about socio-demographic information (age, sex, year of study, and university). The second assessed their knowledge by asking whether they received any training on online learning, if they had taken tests to assess their ability to use online learning, and if they were knowledgeable of the use of the internet to access online materials. The third assessed their

attitude by asking whether they would like online learning platforms to be an integral part of university education, if they felt that university was ready for the provision of online learning, and if they preferred physical to online examinations. The fourth part assessed their practice by asking whether they were comfortable using online learning and if they had noted changes in concentration and reading habits since its implementation. The final part assessed for challenges by asking whether there was consistency of university lectures, if they benefited from the audio-visual aids, whether they were able to download the required online learning materials, whether the lecturers were well versed with the online learning platforms, and how they were aided given technical difficulties. They were also asked whether the difficulty of purchasing gadgets used for online learning placed them at an academic disadvantage. To assure confidentiality, individuals were not required to give their names or any form of identification.

The data collected were entered into SPSS version 27.0 (IBM Corp., Armonk, NY, USA) for analysis. Data derived were summarized in means and percentages. Mann-Whitney T test was used to assess for statistically significant differences based on sex, whether they had undergone training or not, and year of study (pre-clinical years: first to third years; clinical years: fourth to sixth years). Kruskal-Wallis test was used to determine statistically significant differences based on the age of the students as well as course of study. A p value  $\leq 0.05$  was considered significant at 95% confidence interval.

## Results

### *Demographical data on the students*

There were more female participants (58.4%) than male participants (41.6%). The median age was 23 years (17.6%), with most individuals falling in the 21–24 age bracket (56%). Most of the students (64.3%) were pursuing bachelors of medicine and surgery, whereas 19.6%, 11.8%, 1.6%, and 2.7% were pursuing dentistry, pharmacy, nursing, and other health science-related courses, respectively. Most students (29.4%) were in their first year of study, whereas the least (2.4%) were in their sixth year. Preclinical students comprised 59.7%,

whereas clinical-year students comprised 40.3%. Of the universities assessed, most students were from the University of Nairobi (70.6%).

On assessing whether training on online learning had been offered by the universities, 74.5% of the students affirmed, with a further 40% of them reporting learning how to use Google Meet, whereas 18%, 15%, 12%, and 10% reported learning how to use Zoom, University eClass, GoToMeeting, and GoToWebinar, respectively. The rest denied any training, citing that training had not been offered by the university (5%). The majority of these were in their fifth year and pursuing bachelors of medicine and surgery. Once they had been trained, a further 74.5% reported taking tests to assess their ability to use online learning, whereas the rest did not.

### *Knowledge on online learning*

A majority of the students (79.6%) know how to make Word documents or PowerPoint presentations for submission as part of assessments. However, only 45.5% of the students were knowledgeable of the use of the internet to access online materials. Most of these were in their fifth year and pursuing bachelors of medicine and surgery (Figure 1).

There were no statistically significant differences in sex ( $p=0.741$  and  $p=0.950$ , respectively), course of study ( $p=0.362$  and  $p=0.802$ , respectively), or whether they had been trained on online learning ( $p=0.182$  and  $p=0.182$ , respectively) in terms of the ability to make PowerPoint presentations and being knowledgeable of the internet, respectively. On assessing differences based on year of study (pre-clinical versus clinical), more pre-clinical students than clinical were able to make PowerPoint presentations ( $p=0.006$ ). There were no noted differences based on the year of study on their knowledge of internet use ( $p=0.431$ ).

### *Attitudes toward online learning*

A majority (79.6%) of students were in agreement that they would like online learning platforms to be an integral part of university education, with 52.3% preferring its use largely in pre-clinical sciences. Of the rest, 14% and 0.4% preferred it for all units and clinical sciences, respectively. The remaining did not want it to be used in the teaching of any units. When assessed for possible differences based on the year of study as well

as course of study, our results showed that even though first, third, fourth, and fifth year students preferred online learning mostly for basic sciences, a majority (47%) of the second year students did not prefer it for any unit, whereas the majority of the sixth years (50%) preferred it for all units. More pre-clinical than clinical year students agreed to online learning being part of learning (54%) ( $p=0.047$ ).

A majority of the students (56.9%) reported feeling that their university was prepared for the provision of online learning. Of those who did not, most were in their third, fourth, or fifth year of training and pursuing bachelors of medicine and surgery.

A follow-up question to the preference of physical to online examinations showed that 65.9% preferred online examinations. Of those who did not, most were first, third, and fifth year students, male, and pursuing bachelors of medicine and surgery. More pre-clinical than clinical year students preferred online to physical examinations (69.8%;  $p=0.018$ ) (Figure 1 and Table 1).

#### ***Practices and challenges toward online learning***

The majority of the students (53.6%) reported being comfortable using the platforms offered by the university, whereas the remainder were not. On assessing for changes in concentration and reading habits since implementation of online learning, the majority (70.2%) reported a decrease (mostly first, third, and fifth male students taking bachelors of medicine and surgery), whereas for 16.9% and 10.6%, it had increased or did not change at all, respectively. As concerns change in readiness levels for examinations, 57.6% reported a change, whereas the rest did not. Of those who did report a change, 44.7% reported that it had reduced, whereas for 16.9% and 15.3%, it had either not changed at all or had increased, respectively (Figure 2). There was a noted statistically significant difference based on sex in terms of being comfortable in using the online learning platforms provided by the university, with females (67%) being more comfortable than males (33%) ( $p=0.001$ ) (Table 1).

Of the challenges assessed, they were student related or related to the institution.

#### ***Student-related challenges***

A majority (56.9%) reported challenges with reliable internet connection. Most of these were in their pre-clinical years (first and third years), male, and pursuing bachelors of medicine and surgery. More females (65%) than males had better reliable internet connection ( $p=0.004$ ). The challenges with internet connection were attributed to poor network (20%), limited bandwidth to access the internet (14.1%), having a device that could not access the internet (1.6%), and regular power outages in the remaining.

Students also reported lack of motivation (73.7%) with implementation of online learning. In those who reported this, 38.8% attributed it to too many distractions at home or that the online lectures lacked the seriousness associated with class-based lectures (16.5%). This was majorly observed among the first and fifth year medical students. Pre-clinical students (63.8%) lacked motivation more than clinical students ( $p=0.020$ ) (Figure 2) (Table 1).

A further 50.2% reported being able to download the required online learning materials, and those who were unable to download cited slow internet speeds (65%) and failure of their device to support document formats (15%) as major causes.

#### ***Institutional challenges***

Regarding the consistency of university lectures, 80% reported that the lectures were consistent, with 70% being able to clearly benefit from the audio-visual aids that were both visible and audible. Females (66.9%) reported benefitting more than males (33.1%) ( $p=0.005$ ). Additionally, 72.2% reported that their lecturers were well versed with the online learning platforms (Figure 2).

In the case of technical difficulties, 78% reported receiving assistance from the university, with more pre-clinical students (68%) than clinical students ( $p=0.011$ ). When assessed as to whether purchasing gadgets used for online learning placed them at an academic disadvantage compared to face to face, a majority (64.7%) reported that it did (Table 1).

#### **Discussion**

This study analyzed responses from 294 participants,

who had a median age of 23 years, and were mostly female. These findings were consistent with existing literature.

From the study, it was shown that prior to the implementation of online learning, most of the students had undergone training in the use of online learning platforms by their universities. This training might have had an influence on the knowledge of the students, which subsequently might have influenced their attitude and practices.

#### ***Knowledge on online learning***

Findings from our study revealed that the majority of students had good knowledge on online learning as evidenced by the majority who had received training, taken assessment tests on the same, and could make PowerPoint presentations for submission of assessments. Our findings were similar to a study performed among Saudi Arabian medical students, where a majority (70.4%) did agree/strongly agree to have the knowledge on how to open, modify, and upload online documents (9). Our findings were consistent with existing literature (11).

Several studies done among healthcare personnel and medical students at undergraduate and postgraduate levels have shown that basic knowledge in the use of technology/computers is necessary during the implementation of online learning because it influences students' perception of online learning (12–14). Studies done among medical students in India, South Africa, and Egypt revealed that students who lacked computer usage skills were not entirely receptive to the online learning platform introduced to them (12, 13). Another study done among medics in the University of Malaya showed that even with computer skills, unfamiliarity with the online learning platform being used discouraged medics from using the online learning platforms efficiently (15). We also observed that more pre-clinical students than clinical students were able to make PowerPoint presentations. The difference observed might be attributed to the fact that assessment of clinical year students are mostly physical, and as such, they might have forgotten how to do the aforementioned tasks using skills taught earlier. Studies have shown that despite students undergoing training, some may later report

insufficient skills, possibly due to a prolonged duration between the training and usage of skills learned. Regarding this, Greenhalgh commented that students tend to use “just-in-time learning,” wherein most of them try to learn the required features of software when they need to use them (16). Therefore, even when learned, if learning occurs much earlier, these skills might be lost with time. This emphasizes the need for continuous and intermittent training sessions, especially on tools that are important, yet rarely used by students.

#### ***Attitude toward online learning***

From our study, the majority of students had a positive attitude toward online learning, since the majority liked the idea of online learning and examination being an integral part of their education and felt that their university was ready for the same.

Our findings contrasted those from other populations in which the majority of the students preferred in-person learning to online learning, as observed among Arabian (9), Indian (17), German (11), and Filipino (10) medical students. It should be noted that a majority of these studies were done in scenarios where physical learning had not been hampered, whereas ours was done during the lockdown period following COVID-19. This might explain the differences observed. The differences may also be due to the preparedness of institutions in offering efficient online learning. For comparison, academic medical centers in Singapore have clearly laid out allowable undergraduate education activities and assessments depending on their pandemic alert level, and these have seen the universities prepare efficiently for students' learning and students' good reception to the same (18). Owing to the meticulous preparation of the Kenyan universities to online learning, this might also explain the better reception observed.

The differences observed among the different years of study might be due to the previous structure of the medical curriculum. In the pre-clinical years, most of the units covered do not require interaction with the patients as compared to units covered in the clinical years. As such, it might be easier for students in the pre-clinical years to adopt an online learning system when compared to their counterparts.

Students' attitude with regards to online learning is an important issue when implementing online learning strategies. Even though students in most settings have been shown to have positive attitudes toward online learning, the minority bearing negative attitudes might have a poor reception of online learning (14); thus, understanding their attitudes might help change this.

#### ***Practices and challenges toward online learning***

Most students (53.6%) reported being comfortable using the platforms offered by the university, with females being more comfortable than males. Despite this, most reported a decrease in their concentration and reading habits as well as readiness for examinations. Our findings mirrored that of the Indonesian (19) and Indian populations (17), where most students reported a reduction in concentration during online learning.

The changes noted in reading and concentration might be due to abrupt shifts in curriculum delivery, which necessitated adjustment in learning styles. This is further supported by Baticulon et al. (10). It might be possible that students who were not previously used to long hours of online learning have difficulty in adjusting to the same. Additionally, it is possible that lecturers do not allow for sufficient breaks in between sessions, as was often practiced in the in-person teaching style; this might affect the concentration of students in the long run. The changes noted could also arise from lack of self-discipline among students and low drive to study, as noted among Filipino students (10).

Universities should still consider the reduction in levels of concentration as noted and try to address this challenge. They must therefore understand learners' needs, motivations, and past experiences in order to maintain engagement in an online curriculum. To achieve academic success, students need to be guided in the development of self-regulated learning strategies, which include time management, meta-cognition, critical thinking, and effort regulation.

From our findings, the majority of students (mostly females) identified challenges with reliable internet connection, lack of motivation, distractions at home, and lack of seriousness by some lecturers. Similar findings were noted in the Filipino population (10), where most students cited difficulty adjusting to learning styles,

reading from home, poor communication and lack of direction from the lecturers, and lack of device ownership as major challenges. Medics from the Arabian populace noted poor quality of lecture videos and audios (9), while Indian medics also mentioned internet problems as major challenges being faced.

Some of the challenges faced in online learning such as lack of motivation can be easily managed with consistent training and mentoring of the students; however, some problems such as unreliable internet connections may require multisectoral approaches to tackle. These factors should be taken seriously by learning institutions in order to ensure successful delivery of online content during the COVID-19 pandemic and beyond.

#### **Limitations**

This was an online study that relied on snowballing for distribution of questionnaires. Thus, equal representation from different universities was a challenge. For the same reason, we were unable to compare the responses from different universities.

#### **Conclusion**

Online learning in the sub-Saharan setting has a critical role in education, now more than ever, owing to unexpected interruptions in learning brought about by the pandemic. Our data support that university students pursuing medical courses are ready for the same. As such, further collaboration between the university and other stakeholders is advised in order to better understand the attitudes and practices of, as well as challenges faced by, students so as to customize the online learning process in the most efficient and effective way for online learners.

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