

**E-LEARNING EXPERIENCE AMONG POSTGRADUATE, MEDICAL STUDENTS
AND TEACHING STAFF IN DEPARTMENTS IMPARTING KNOWLEDGE ON
CHILDHOOD CONDITIONS AT THE SCHOOL OF MEDICINE, UNIVERSITY OF
NAIROBI MULTIMETHOD STUDY**


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degree of Master of Medicine, Department of Paediatrics and Child Health,
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2023

Declaration

I declare that this proposal is my original work and has not, to the best of my knowledge, been presented to any other university for the award of a degree.

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LIST OF ABBREVIATIONS

CL Classroom Learning

CMC Computer-mediated communication

CITC Correct Item Total Correction

DL Distance Learning

EMAS E-Learning Management System

FGD Focused Group discussion

HEIs Higher Education Institutions

ICT Information and Communication Technology IT

Information Technology

ODEL Open and Distance – E-Learning

PBL Problem-Based Learning

QBL Question-Based Learning

SCAL Student Centered Active Learning

UN United Nations

UNESCO United Nations Educational, Scientific and Cultural Organization

UoN University of Nairobi

VTC Video Conferencing Centre

WHO World Health Organization

Abstract

Background: The disruption of learning due to lockdown measure brought on by the COVID-19 global pandemic forced educational institutions to accelerate the use and adoption of eLearning technology tool as a medium of learning including at the Faculty of Health Sciences at the University of Nairobi. Though this mode of teaching has been going on for over two years at the University of Nairobi Medical school, evaluation of experiences and challenges faced by learners has not been done. Even though the incidence of Covid 19 has gone down, eLearning has continued. The aim of this study was to assess the experiences and challenges in using this mode of learning in order to optimize delivery of eLearning.

Objectives: The primary objective was to describe the experience of undergraduate and postgraduate students, and teaching staff towards eLearning during COVID-19 pandemic at the University of Nairobi. The secondary objectives were: (1) To identify student and staff-related factors associated with positive experience of eLearning and (2) to describe barriers to eLearning among medical students and teaching staff at the UoN Faculty of Health Sciences.

Methods: A cross-sectional study was conducted that enrolled undergraduate and postgraduate students and teaching staff from the departments of Paediatrics and Child health, Obstetrics and Gynaecology, and paediatric surgery in the School of Medicine at the UoN. The study examined data on experiences through online questionnaires of eLearning used by students and faculty members. Four focused group discussion were conducted among the students and six in-depth interviews among the teaching staff to identify challenges to eLearning.

Result: One hundred and fifty-two participants were enrolled into the study. Students enrolled were 139, and teaching staff were 13. Ninety-five students reported positive experience of whom 75(70.1%) were postgraduate students and 20(62.5%) undergraduate students. Among the teaching staff, the overall positive experience was 59.7%, this was based on assessing the benefits of eLearning, online assessment of medical content and technical skills gained by the teaching staff. Postgraduate students were more likely to have positive experience (aOR 1.4 95% CI 0.6-3.2) compared to undergraduate students, males were more likely to have positive experience (aOR 1.1 95%CI 0.5-2.4) compared to females and students from obstetrics and gynaecology (aOR 0.4 95%CI 0.1-1.0) and paediatric surgery (aOR 0.9 95%CI 0.3-2.7) were less likely to have positive experience compared to those from paediatric and child health department. Accessibility and student engagement were among the challenges found in the study.

Conclusion: Majority of the students reported positive experience and the factors associated with positive experience in the study were male gender, postgraduate student and students in paediatrics and child health department. Accessibility and limited student engagement were the main challenges reported.

CHAPTER ONE: INTRODUCTION

Paediatricians, paediatric medical subspecialties, and paediatric surgical specialists play a key role in providing clinical leadership of multidisciplinary teams, management, and supervision of healthcare workers of different cadres involved in managing paediatric conditions. To achieve optimal health and well-being for all infants, children, adolescents and young adults, sufficient number of paediatricians, paediatric subspecialties and paediatric surgical specialties must be available to provide the full spectrum care(1). This health workforce is essential to attaining the universal health coverage (UHC) epitomized by the third UN Sustainable Development Goal. They are essential to ensuring equitable access to health services for paediatric population. Scaling-up of the health workforce is contingent on high-quality, relevant, and up-to-date health science education, aimed at building the knowledge, skills, attitudes, behaviours, and core values of health workers. However, health science education is faced with a number of important challenges, including a widespread shortage of faculty, educators, administrators, infrastructure and resources(2). eLearning enables access to learning for geographically isolated people or those who have poor local training facilities and can improve the quality of education.

eLearning is defined as the delivery of learning, training, and education programmes through use of electronic means. It can also be described as provision of education using Information Communication and Technology (ICT) both outside and inside the classroom (3). It is a mode of instruction that supports learning through a variety of digital instructional designs. It has been used as an alternative to face-to-face teaching which is referred to as pure eLearning or 'Blended learning' where eLearning is used in combination with face-to-face learning. WHO and UN has recognized eLearning as a key strategy for bridging education needs among healthcare workers in developing countries which are faced with shortage of competent healthcare professionals (4).

The increased availability and access of electronic information technologies in resource constrained countries has opened an opportunity for its use for education purposes especially in the medical field. It allows content access in various settings like home and workplace, making it popular among health workers (5). eLearning enables access to learning materials for healthcare workers in the marginalized regions and ensures quality training for those in areas with poor access to training facilities. It has the potential to ensure sustained long-term professional development through access to high quality educational content at a low cost per student(6,7)

COVID-19 was declared a pandemic by the World Health Organization (WHO) in March

2020. Due to its high rate of transmission, certain infection prevention measures were put into place to flatten the curve. The disruptive nature of the COVID-19 pandemic on hospital knowledge sharing routines, medical education and training programs has forced educational institutions to come up with creative and innovative ways to ensure continued learning within short notice thereby accelerating the use and adoption of eLearning tools as a medium of knowledge transfer within the education fraternity(8). eLearning has been shown to be as effective traditional face to face method of acquiring knowledge (5).

The virtual learning platform provides a sustainable, high-quality educational infrastructure that fosters participation and collaboration. In the post-COVID-19 era, medical training programs will benefit tremendously from incorporating virtual learning platform. It's successful implementation and continuous use requires positive perception and attitude towards eLearning among learners as use of this medium may become the norm post COVID 19. In this regard a study on the experiences and challenges of the eLearning users will provide knowledge on what motivates students and teaching to attend and participate in eLearning sessions.

This is one of the first studies that will assess eLearning experiences and challenges of medical students and teaching staff at University of Nairobi during this pandemic period in Kenya.

CHAPTER TWO: LITERATURE REVIEW

COVID-19 AND LEARNING

The novel coronavirus disease named Covid 19 is an infectious viral respiratory disease first identified in Wuhan, China in December 2019. It was declared a global pandemic by the WHO on 11th March 2020(9). Its high rate of transmission led to various safety measures being instituted following advice from WHO. Some of the measures instituted to reduce viral transmission included wearing of masks, social distancing, and imposing restrictions on movement. Kenya confirmed its first COVID-19 case on 13th March 2020 and saw a gradual increase in the number of cases over the course of a few weeks. This led to the government implementing public health measures through a gazette notice by the health cabinet secretary on 6th April 2020 to contain the spread of the virus which included closure of educational institutions (10). This changed the everyday life of citizens while also disrupting learning in various institutions including the medical training institutions. According to UNESCO, 186 countries had implemented closure of schools by the end of April 2020 affecting approximately 73.8% of learners enrolled(11). The closure of learning institutions deprived students of the opportunity to learn which subsequently interfered with their right to growth and development(8) .

Figure below shows the fact that between February 2020 and end of March in the same year the number learners whose learning was disrupted increased from 0.3 billion to 1.38 billion(12).

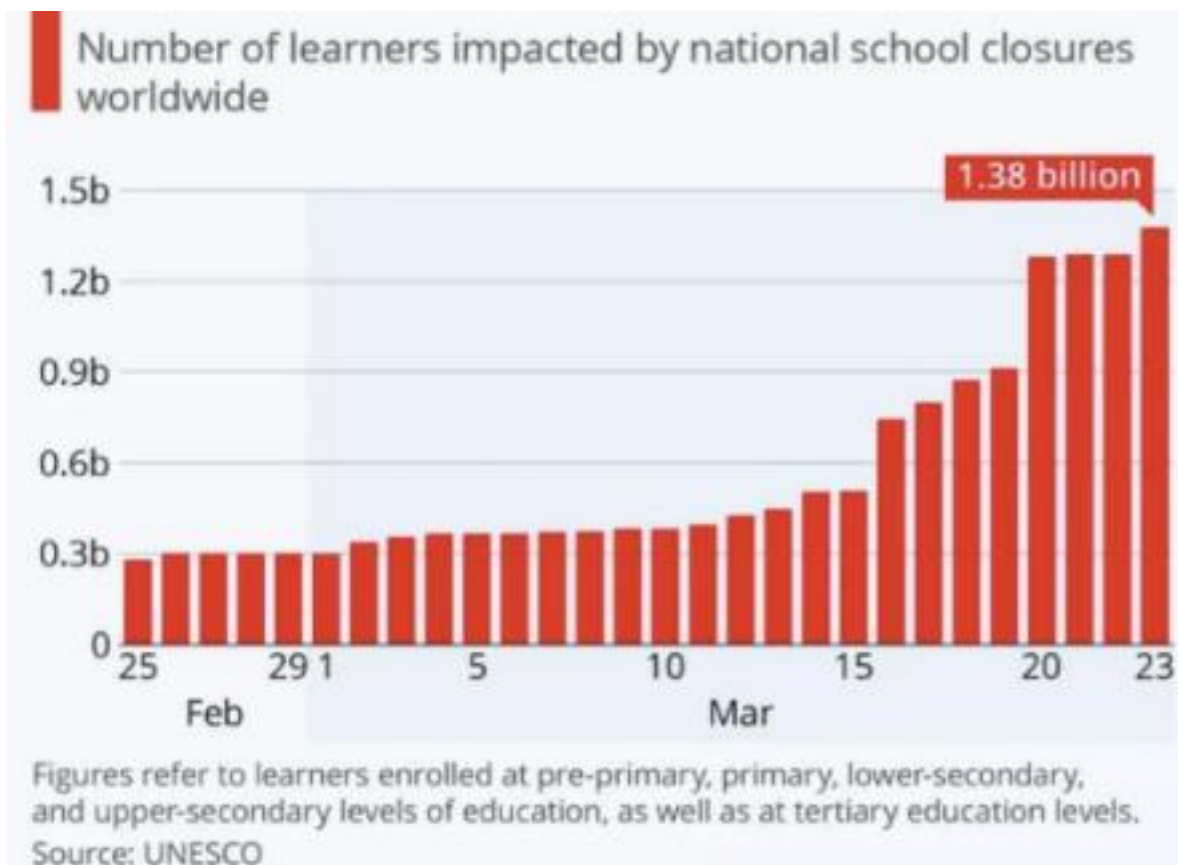


Figure 1: *impact of COVID-19 on global education published on 29th April 2020*

The postgraduate medical students form an indispensable part of the medical fraternity and are the pillars of strength of any teaching medical institute. These students were the first line health workers in providing clinical care to COVID patients and in addition were most affected in terms of disruption of their medical education. Medical education, which is a hands-on learning experience tailored to each speciality, suffered from severe impediment due to the disruption of classes, lack of variety of cases, limited hands on training and continuous pandemic related clinical duties(13)

The disruptive nature of the COVID-19 pandemic on hospital knowledge sharing routines, medical education programs and training pushed education institutions to come up with creative and innovative ways to ensure learning proceeded within short notice. This led to the accelerated use and adoption of technology like eLearning tools as a medium of knowledge transfer within the education fraternity (14).

ELEARNING DURING COVID 19 PANDEMIC

eLearning is defined as the delivery of learning, training, and education programmes through use of electronic means. WHO and UN have recognized eLearning as a key strategy for bridging education needs among healthcare workers in developing countries where there is need for continuous medical education among healthcare professionals. Increased availability and access to ICT hardware and software in resource constrained

settings provides an opportunity for its use in education especially within the medical field(4).

eLearning enables access to learning for geographically isolated people or those who have poor local training facilities and can improve the quality of education. It conveys health sciences education to a broader audience and promotes collaboration and better use of existing educational resources. eLearning can support health systems reforms by facilitating increased training and effective dissemination of information needed for redesign of health professionals' responsibilities and roles(2)

Following the onset of the COVID pandemic, medical schools globally enforced changes like cancellation of in-person clinical clerkship for the undergraduate students to reduce exposure within the hospital setting. This resulted in shifting to online conferences and eLearning through recorded lectures and live streaming(15). Various platforms have been used during the global transition to eLearning like Zoom, google classroom and Microsoft Teams(11). Paediatric Surgery trainees' learning has also been greatly affected in many countries, since only urgent emergency cases were attended to, and elective cases were often postponed hence reducing the opportunities for students to learn (16).

Teleconferencing and webinars had been introduced before COVID-19 as a means of collaborative teaching between specialized institutions in the developed countries and others in the developing countries(16). The scope of use has increased during the pandemic as videoconferencing has proved to be paramount for clinical education and can be applied to interdisciplinary collaboration learning. eLearning bridges the knowledge gap among doctors and trainees brought on by COVID restrictions and provides an opportunity to maintain competency in essential services and develop professionally. This is crucial especially for postgraduate trainees who work for long hours and are often unable to attend the classroom didactic sessions. It also provides a venue for timely dissemination of up-to-date evidence based clinical information(17).

Following the onset of the COVID pandemic Imperial college London gave medical students access to the online video library containing patients' experiences and encouraged clinicians to deliver online teaching from a hospital setting to make up for the lack of hands-on experience among the students. "The Neurosurgical Atlas", an online atlas for neurosurgical anatomy and operational images, reported an increase in subscribers since the onset of the pandemic (16).

This trend is expected to continue as early research done during this pandemic period among residents and attendings in the neurology department at an Iranian medical training

institute had very positive attitudes towards eLearning as a way to learn and collaborate with others, a finding that encouraged the school to increase the number of available courses(18). A study done by Agarwal et al assessing students' perspective on online learning during Covid pandemic found that most participants, who were mainly postgraduates, found the sessions relevant to their learning. They found the sessions interesting, enjoyable, and tailored to their level of learning (19).

COLLEGE OF HEALTH SCIENCE, UNIVERSITY OF NAIROBI RESPONSE TO COVID-19

Responding to the directive issued by the president on the closure of learning institutions in order to reduce the spread of COVID-19, University of Nairobi senate had a special meeting held on 16th March 2020 and members came up with the resolution of immediate closure of the institution(20). This led to a disruption in training for all medical students including postgraduate medical students and lack of access to library resources.

Off campus access to electronic information resources within the University of Nairobi library was the first eLearning resource to be made available to the students. A circular on the procedure of registering was released to enable the students to access the information. A few weeks later the senate approved the use of eLearning for both undergraduate and postgraduate students to commence and follow approves regulations. A committee of senate was also set up to review regulatory frameworks applicable and propose further online services(21). Several mandatory online training sessions were carried out by the Information and communications technology (ICT) department to ensure the students were familiar with the various eLearning platforms(22). By 1st April 2020, 92% of faculty were reported to have received training on use of online teaching platforms. Local partnerships between the University of Nairobi, private firms like Kenya Education Network Trust (KENET) and mobile service providers occurred in order to increase access to eLearning (23).

Online learning has provided another opportunity for medical groups like Kenya Paediatric Association and Kenya Medical Association, and top referral hospitals like Kenyatta National Hospital to offer free eLearning classes on various topics relevant to our local setting. It has provided a venue for continuous education of healthcare workers from all regions of the country including the marginalized areas to gain up to date knowledge and interact with the top specialists in the various fields. This was possible before only during conferences which were held physically annually and only few healthcare workers could attend them due to financial constraints.

WHO devised a framework of domains targeted at improving the quality of care for children and adolescents under 18 years of age, and having competent, motivated, and empathic health care personnel is a key domain for reducing morbidity and death among paediatric patients (24). eLearning facilitates the acquisition of evidence-based medical information and the application of this knowledge to guide patient care. Through interactions with peers and teachers, there is collaboration and communication with other healthcare professionals in the management of patients. Paediatricians are leaders in the care of paediatric patients and teach patients, caregivers, and other healthcare professionals of various cadres on a daily basis. To improve healthcare, they must be able to adapt to novel teaching approaches that encourage effective learning skills. In the competency-based medical education practice, these qualities were established (25,26).

Several paediatric training programs globally have used eLearning tools to provide training to the various participants. Soon et al conducted a randomized control study among 45 paediatric ICU and paediatric emergency medicine physician fellows and attending physicians at Children's hospital Colorado on effectiveness of eLearning vs face to face teaching on use of lung ultrasound to diagnose pneumothorax and pleural effusion. eLearning was shown to be as effective as traditional classroom teaching in sharing of knowledge and skills among paediatricians and paediatric trainees, furthermore it increased confidence on the use of Point of care ultrasound (POCUS) to manage pleural effusion and pneumothorax(24). This was also demonstrated among paediatric care trainees and fellows tasked with providing parenteral nutrition in a study carried out in Geneva(25).

The International Society for Paediatric and Adolescent Diabetes-European Society for Paediatric Endocrinology (ISPAD-ESPE) developed an eLearning platform, accessible from mobile devices and computers, which cover paediatric endocrine and diabetes topics. As of May 2021, it had over 150,000 users from more than 150 countries globally creating free access to UpToDate information for those in resource limited settings(17)

Preterm survival rate has been on the increase globally due to the provision of good essential care at all hospital levels by the various stakeholders who include doctors, nurses, and mothers. Training them through eLearning during COVID-19 has shown to be crucial in disseminating standard care protocols in a cost-effective way(26). It can also be effective in knowledge retention since the sessions are available to learners at their own convenient time(17,26).

In Kenya eLearning has also been used to train clinicians across the country on evidence based paediatric care and management. These trainings begun in April 2020 and were an initiative of the Emergency, Triage, Assessment and Treatment plus admission care (ETAT+) trainers from the University of Nairobi Department of Paediatrics and Child Health and were provided through various webinars. The trainers were able to reach healthcare workers of various cadres throughout the various counties and beyond thus showing the potential of eLearning in a developing country.

The figure below is an example of the eLearning presentations prepared by the ETAT plus trainers and demonstrates how it provided an opportunity for collaboration with various public health organizations whose aim is to increase knowledge among healthcare workers in Kenya.



Figure 2: Showing a sample of ETAT training presentation and collaborators

ELEARNING EXPERIENCE AMONG UNIVERSITY STUDENTS AND TEACHING STAFF DURING COVID-19 PANDEMIC

Anecdotal to the COVID-19 pandemic, eLearning adoption and use within the developing countries was slow due to various challenges. Mutisya et al did a study in Kenya universities and found that with the increase in demand for university education, public universities had embraced eLearning to increase access. Only 2 out of 7 universities had policies approved on eLearning with 32% lecturers and 35% students who used eLearning(27).

Puljak et al. did a study in Croatia among undergraduates in health sciences and found that over 70% of the students adapted to eLearning fast and noted its potential to compensate for practical education. Students felt connected to their peers and teachers and were motivated to participate in the classes the longer they attended. Majority of the students had

sufficient IT skills to participate in the eLearning classes without requiring assistance although technical assistance from the learning institution was accessible if needed. The learning institution organized the sessions and trained the students adequately on the eLearning platforms(28).

Maphosa et al did a study on factors influencing the perception of undergraduate students towards eLearning in Zimbabwe and identified access to smart devices, ease of use of the platform, communication between students and lecturers and cost of internet to be associated factors. Most students attended the sessions using their smartphone devices and laptop ownership was low. Students also preferred blended learning(29).

Zalat et al did a study on eLearning experiences of medical teaching staff in basic science and clinical departments in Egypt and found they all agreed that eLearning provided time flexibility and self-paced learning. They also felt the technical skills acquired increased value of educational experience among them and enhanced learning experience. More than 80% of the teaching staff found the eLearning system easy to use and this increased its acceptance among them(30).

Gupta et al did a study among undergraduate medical students and staff of medical colleges in Delhi on their perspective and 88.3% students found eLearning to be useful in facilitating education during the COVID-19 pandemic period. They also had good student lecturer interaction and had their questions clarified during the sessions, increased access to important medical information and convenience. However, he found that most students preferred the face-to-face learning. Fifty four percent of students wanted to continue with eLearning for cognitive knowledge after the lockdown period together with the face-to-face learning. Less than half wanted to continue with online assessment while majority of teachers wanted it to continue after the pandemic. The teaching staff also wanted the eLearning classes to continue together with the classroom session, thus their overall experience was good(31)

Table 1: Summary of e-learning in selected settings before and after COVID

Author setting, year	Design, population of study and sample size	Key findings
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Mutisya Kenya 2012-2014	Mixed method study public universities N=210 lecturers and 420 students	<ul style="list-style-type: none"> • Adoption was new and 2 out of 7 universities had eLearning policies • 32% and 35% lecturers and teaching staff and students respectively used eLearning
Puljak Croatia 2020	Cross sectional study Health science baccalaureate and master's students N=3582	<ul style="list-style-type: none"> • 70% rapid adoption to eLearning • connected to teachers and fellow students • motivated to continue with eLearning classes overtime
Maphosa Zimbabwe 2020	Cross sectional study Undergraduate students N=600	<ul style="list-style-type: none"> • 72% were not satisfied with eLearning since lecturers had no experience • 55% had poor access to technological devices
Zalat Egypt 2020	Cross sectional study medical staff in basic science and clinical department N=346	<ul style="list-style-type: none"> • 100% reported it provided time flexibility & self-pace for staff • 88% reported technical skills acquired increased value of educational experience among majority of teachers • Challenges: Insufficient and unstable internet connectivity, inadequate computer labs and lack of computers
Gupta Egypt 2020	Cross sectional study Undergraduate medical teachers and students N=248 students and 23 lecturers	<ul style="list-style-type: none"> • 88.3% stated it is useful in facilitating education • 35.4 % reported preference for online teaching • 54.4% wanted online classes to be continued in addition to classrooms for lectures • 51.2% lecturers found overall experience of online class to be good

ELEARNING CHALLENGES EXPERIENCED BY STUDENTS AND TEACHING STAFF DURING COVID-19 PANDEMIC

Prior to the pandemic, the majority of Pakistani students were not prepared for the abrupt shift to online learning, according to Farooq et al. With no option for face-to-face instruction, there were challenges. Poor infrastructure was a common obstacle in developing countries that hindered the delivery of online education. Lack of prior

experience with technology among Department members, maintaining learner engagement during sessions, and low internet connectivity and very low bandwidth were also barriers(32).

The main challenges reported in the study by Regmi et al was poor communication between the learner and teacher which is critical for the eLearning experience to be beneficial and effective. Access to technology tools, lack of experience with eLearning and fear of using IT tools, which was closely related to the level of education of the user were other challenges reported (33).

Access to good network coverage, difficulty using the eLearning platform and data costs for buying were other challenges experienced by students in Namibia and Ghana. Some had to purchase new devices to increase their access to the learning site. Feelings of being alone and separated from colleagues was a common challenge many experienced. eLearning brought on social isolation since there was minimal interactions like group works and working together on assignments that occurred during traditional learning. Thus, students and teachers were unwilling to adopt eLearning since they were accustomed to the face-to-face learning(34,35).

STUDY JUSTIFICATION

Following the declaration of COVID-19 disease as a global pandemic by WHO in March 2020, unprecedented interruption of medical education among medical students due to measures put in place to curb the spread of the pandemic occurred. This seriously affected medical knowledge dissemination within learning institutions and continuous education of healthcare workers using traditional in-person approaches. eLearning was set up in in all faculties including health science departments that knowledge in paediatric diseases to

replace face learning as students and faculty adhered to Covid 19 guidelines. This study endeavours to shed light on the experiences and challenges amongst students and teaching staff.

Understanding their experiences with regards to eLearning is important in guiding how future eLearning training should be adapted to increase acceptance and utilisation and by extension facilitate the process of paediatric training.

The results from this study will be presented to the policy makers at the University of Nairobi. They will also help guide the development of online syllabi at the University.

STUDY QUESTION:

- What is the experience of undergraduate, and postgraduate students and teaching staff in departments imparting knowledge on childhood conditions at the School of medicine, University of Nairobi towards eLearning during COVID-19 pandemic?
- What are the demographic factors of students and teaching staff associated with positive eLearning experience?
- What are the barriers to utilization of available eLearning tools among undergraduate and postgraduate medical students involved in management of paediatric conditions?

PRIMARY OBJECTIVE:

- To determine the proportion of undergraduate and postgraduate students and teaching staff from departments imparting knowledge on childhood conditions at the school of medicine, University of Nairobi who report positive eLearning experience during COVID-19 pandemic.

SECONDARY OBJECTIVE:

- To determine the demographic characteristics of students and staff that are associated with positive experience of eLearning (factors of interest include age, sex, previous exposure to IT, department, year of study)
- To describe barriers to the utilization of available eLearning tools among undergraduate and postgraduate medical students and teaching staff in departments imparting knowledge on childhood conditions at the School of medicine, University of Nairobi during COVID-19 pandemic (infrastructure, internet connectivity, schedules).

CHAPTER THREE: METHODOLOGY

STUDY DESIGN

This was a multimethod study combining qualitative and descriptive e cross-sectional study

STUDY SETTING:

This study was conducted at the faculty of Health Sciences, University of Nairobi, Kenya. The University of Nairobi is a public tertiary learning institution based in Nairobi and has 10 faculties. The Faculty of Health Sciences offers undergraduate and postgraduate training programs within various clinical and non-clinical departments. Students within the clinical programs are required to interact with patients as part of their training in order to gain clinical skills and receive face to face mentorship from teaching staff who guide them and provide bed side teaching in addition to didactic theory sessions.

STUDY POPULATION

The study population comprised undergraduate, and postgraduate medical students as well as teaching staff from the department of paediatrics and child health, postgraduate students from department of paediatric surgery and obstetrics and gynaecology at the University of Nairobi. These departments are housed within the school of medicine, faculty of Health Sciences at the University of Nairobi.

The study targeted medical students and teaching staff who are trained or provide training on paediatric medical conditions within the University of Nairobi starting from pregnancy(antepartum) and delivery of babies to providing medical care and ensuring good health and wellbeing of children as well as management of paediatric surgical emergency cases. Undergraduate students in medicine at the University of Nairobi undertake an 11-week training course in the department of Paediatrics and child health during their 5th year of study where they receive theoretical course work delivered through didactic lectures combined with face-to-face clinical training in the wards. The postgraduate training program for the various departments is an intense 3–5-year program consisting also of didactic lectures combined with on job clinical training in the wards under guidance from the teaching staff. The postgraduate students cover long workday shifts within the hospital, prepare for and attend grand rounds, mini rounds, and journal clubs in addition to ensuring they complete the assigned curriculum requirements.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria: The study included undergraduate students who had just completed their rotation in the department, postgraduate students within the departments of paediatrics, paediatric surgery and obstetrics and gynaecology and all teaching staff who have participated in eLearning during COVID-19 pandemic in the same departments.

Exclusion criteria: Postgraduate students and teaching staff who were away due to

deferral or retirement were excluded from the study. Also, those who were on leave during the shift to eLearning during COVID-19 did not participate.

SAMPLE SIZE DETERMINATION:

Quantitative study aspect

The sample size for this study aspect was determined using a single population proportion formula with finite population correction, where:

Z - is the standard normal deviation of the 95% CI, (1.96).

p = the proportion of students or teaching staff in our study population that we estimated will report positive experience towards eLearning resources. Using p of = 88.3% (based on study by Gupta et al)

d – represents precision (desired margin of error – 5% or 0.05 level of significance. thus, the sample size derived for the number of students in the

study is 158. $n = Z^2 p(1 - p) / d^2$

$$= (1.96)^2 (0.883) (1-0.883) / .05^2$$

$$= 158$$

A non-response rate of approximately 10% is anticipated hence the sample size is adjusted upwards by 10% to give a final sample size of

$$158 * 0.1 + 158$$

$$= 174$$

A sample of 139 undergraduate and postgraduate students were recruited into the study using stratified proportional random sampling, where the number of students recruited from each year of study were proportional to the total number of the students in that class. Response rate was about 80%.

Proportionate weighted sampling technique was used to determine the number of participants from each of the study departments and degree programs.

The total number of staff members in the paediatrics and child health department, paediatric surgery department and obstetrics and gynaecology department recruited into the study were 13.

SAMPLING TECHNIQUE FOR THE QUANTITATIVE STUDY ASPECT:

Qualitative sampling method.

Four Focus Group Discussions were conducted among the students each comprising of 6-8 students who were purposively sampled. FGDs were conducted until saturation point was achieved, meaning no further data was obtained on the topics of interest.

Six In depth interviews were carried out among the lecturers. Two lecturers from each department were interviewed.

study outcomes:

Independent variables:

- I. Postgraduate students: age, gender, department, year of study, self-sponsored or government sponsored, ownership of electronic gadgets (smartphone and computer)
- II. Teaching staff: age, gender, department, years of teaching experience, previous online teaching experience.

Dependent variable: -

- I. Experiences towards eLearning was assessed using a set of 21 questions from a validated tool obtained from previous research(30,36). Different domains were assessed and presented as positive experience.
- II. Challenges were assessed using focused group discussion and in-depth interviews

DATA COLLECTION AND ANALYSIS

Data Collection tools:

A self-administered structured questionnaire containing questions adapted from previous studies by Zalat et al and Obidat et al was used to assess experiences(30,36).

Separate structured and validated questionnaires, one for students and the other for lecturers were availed online to study participants with clear instructions. The questionnaires were used to obtain information on sociodemographic characteristics, and participants' experiences. Experience focused on ease of use, perceived usefulness, the intention to use in the future, content learned through eLearning, the interaction with other learners and teaching staff, personalization of eLearning system, benefits of eLearning and online assessment of students.

Four Focus Group Discussions were conducted each comprising 6-8 students who were

purposely sampled. A focus group discussion guide with open ended questions were used to guide discussions that lasted approximately 1 hour each. An expert with experience in conducting FGDs assisted the PI in conducting them. Handwritten notes were taken during discussions and sessions were audio-recorded.

Six In depth interviews were carried out by the PI among the lecturers and they lasted 20 minutes. Two lecturers from each department were interviewed. Consent to participate in the study and record the session was obtained before proceeding with the interview. Handwritten notes were also taken during the session. The audio-recordings were saved in a password protected laptop in which only the PI had access to it.

STUDY PROCEDURE FOR THE QUANTITATIVE ASPECT:

Clinical officers were recruited as research assistants to help with data collection. They were then trained by the PI on research conduct and ethics. The principal investigator obtained the register of the number of undergraduate, postgraduate students and teaching staff in the department of paediatrics and child health, department of obstetrics and gynaecology and paediatric surgery from the dean of the Faculty of Health sciences at the University of Nairobi. Study participants were randomly selected from the register and proportionate stratified sampling by department was used to achieve the desired sample size.

The principal investigator and research assistants reached out to the participants via email and WhatsApp to inform them of the study using a participant information sheet. They then proceeded to send out the online questionnaire which included a consent form to be completed by those willing to take part in the study before proceeding with the study enrolment. A reminder was sent out after 2 weeks to study participants to complete and return study questionnaires to ensure good participant response.

STUDY PROCEDURE FOR THE QUALITATIVE ASPECT:

A research assistant was recruited, one who had experience in conducting qualitative research to work with the PI. The principal investigator used purposive sampling to identify students and staff to participate in the FGDs. The number of focus group discussions was guided by the saturation point with regards to barriers. Four focus group discussions were carried out with 6-8 students per group and 6 in-depth interviews among the lecturers.

Participants were contacted one week before to set a convenient time for a 20minutes face to face discussion. Consent forms were distributed before the beginning of the session. It was made clear the study is voluntary and participants can choose to not participate in the

study.

DATA ANALYSIS:

Data collected was analysed using SPSS version 22.0. Description of socio-demographic characteristics of the study population was done using frequencies and percentages for categorical variables and continuous variables was summarized using means with standard deviation or medians with inter-quartile ranges as measures of central tendencies where applicable.

Categorical variables were analysed using frequencies and percentages as applicable and results were presented in tables. Analysis of the experiences was largely descriptive using the Ritcher scale and binary logistic regression analysis was used to assess for association between participant characteristics and their experiences towards eLearning. Multivariable logistic regression was done to determine factors independently associated with positive eLearning experiences while controlling for potential confounders.

Qualitative analysis was used to characterize contextual factors within each level affecting eLearning challenges among students and teaching staff.

ATLAS.ti software used for qualitative data management and analysis. Analysis used interpretive description and thematic network analysis approaches to map the main topics of discussion and identify challenges of eLearning.

We used an iterative process of reading and coding transcripts simultaneously with data collection. The qualitative analysis team performed several close readings of the transcripts, and established a preliminary codebook based deductively on previously identified challenges of eLearning literature

An open coding approach was used to capture additional concepts and expand the codebook. Using a modified constant comparative approach, newly emerging themes identified early during interviews were integrated into subsequent qualitative data collection procedures.

After coding is completed, transcripts were re-read and codes across transcripts used to identify a network of related themes that was used to generate a network of factors influencing uptake of eLearning among teaching staff and students involved in management of paediatric patients.

ETHICAL CONSIDERATION

Prior to data collection, official written ethical approval was obtained from the UoN ERC. Permission to conduct the study was obtained from UoN administration. At the time of

recruitment of study participants, prior informed consent from the undergraduate, postgraduate students and teaching staff was obtained after an explanation of the aims and objectives of the study. Participation in the study was completely voluntary and the participants could withdraw at any point during the process.

Identification information was delinked from study data prior to analysis. The study was strictly confidential and anonymous. All the information collected about the participants during the study was stored away & only the principal researcher had to access to it. All information stored in soft copy was kept secured using a secure password.

STUDY RESULTS DISSEMINATION PLAN

The results compiled will be submitted to the department of Paediatrics and Child health, department of paediatric surgery and department of Obstetrics and Gynaecology as hard and soft copies. These shall be presented as a poster to the faculty at the conclusion of the study. Copies of the results shall also be sent to the University of Nairobi repository for storage. The investigator shall also seek channels to share the results with the department of paediatrics at KNH as well as the Division of Child Health

CHAPTER 4: RESULTS

Sociodemographic characteristics of participants

We enrolled 139 students, 32 undergraduate and 107 postgraduate students from 3 departments. Majority of the respondents 50 were from the department of paediatrics and child health while 29 were from obstetrics and gynaecology department and only 28 number from paediatric surgery.

Among the students most respondents were females at (79)56.8% while male were (60) 43.2%. Majority were self-sponsored at 67.3% while 31.7% were government sponsored.

Table 2: Sociodemographic characteristics of medical students

Study variable	Frequency, <i>n</i>=139	Percent
Gender		
Male	60	43.2
Female	79	56.8
Age		
<30 years	39	28.1
31-35 years	60	43.2
36-40 years	29	20.9
41-45 years	10	7.2
46-50 years	1	0.7
Academic level		
Undergraduate	32	23.0
Postgraduate	107	77.0
Academic funding module		
Government sponsored	44	31.7
Self-sponsored	95	68.3

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Sociodemographic characteristics of teaching staff

We enrolled 13 participants among the teaching staff, majority of whom were from the department of paediatrics and child health at 61.5%, with 30.8% from obstetrics and gynaecology and 7.7% from paediatric surgery. Females were the majority respondents at 53.8% and males were at 46.2%. Most of the teaching staff were lecturers at 84.6% with most (46.2%) having more than 10 years teaching experience.

Table 3: Sociodemographic Characteristics of Teaching Staff

Study variable	Frequency, n=13	Percent
Gender		
Male	6	46.2
Female	7	53.8
Age category		
<35 years	3	23.1
36-40 years	2	7.7
41-45 years	2	15.4
46-50 years	4	30.8
>50 years	3	23.1
Teaching department		
Obstetrics and gynaecology	4	30.8
Paediatric surgery	1	7.7
Paediatrics and child health	8	61.5
Rank		
Lecturer	11	84.6
Assistant Professor	1	7.7
Professor	1	7.7
Years of teaching experience		
<5 years	4	30.8

5-10 years	3	23.1
>10 years	6	46.2

Device ownership among medical students

One hundred and thirty-three (95.7%) students own a smart phone and 6 (4.3%) did not own any. About 3.3% had to purchase a new device during the COVID-19 pandemic.

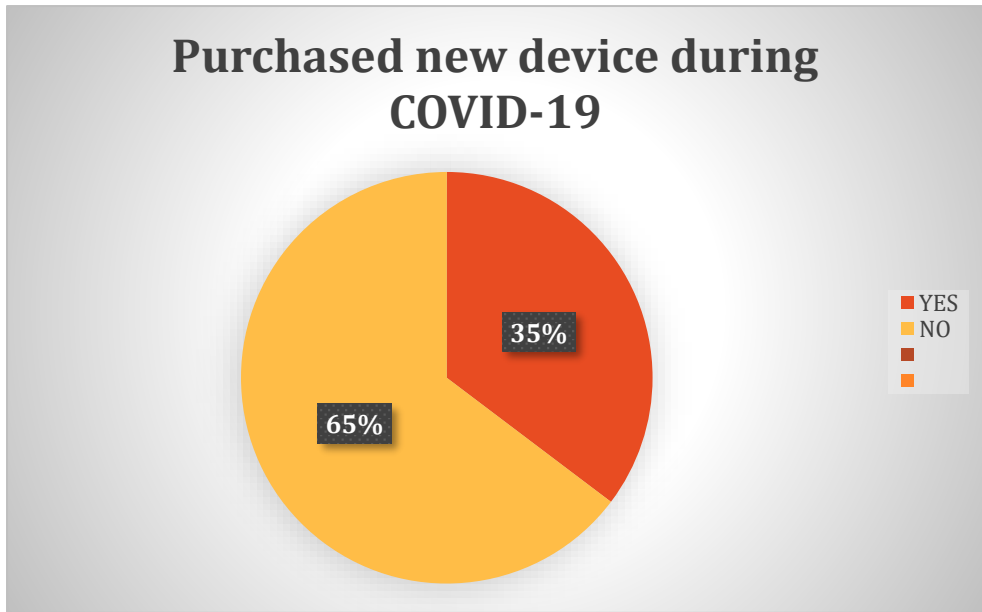


Figure 3: purchase of new devices among students during COVID-19 pandemic

Majority of students (80.6%) attended other online classes besides those offered by the university and 45.3% attended more than 6 hours per week.

Table 4: General information on eLearning platforms among students

Devices owned	Frequency N=152	Percentage
Laptop		
Yes	124	89.2
No	15	10.8
IPad		
Yes	26	18.7
No	113	81.3

Tablet		
Yes	3	2.2
No	136	97.8
Attend other eLearning classes		
Yes	112	80.6
No	27	19.4
Hours per week attending eLearning classes		
1-2 hours	10	7.2
2-4 hours	26	18.7
4-6 hours	40	28.8
>6 hours	63	45.3

ONLINE TEACHING EXPERIENCE AMONG STAFF:

Majority (84.6%) of the teaching staff had not taught online before COVID-19 and 7.7% had to purchase a new device during this period. Nine of the teaching staff felt they had a good understanding of computers and 53.8% said that they would recommend online platforms for internal assessment.

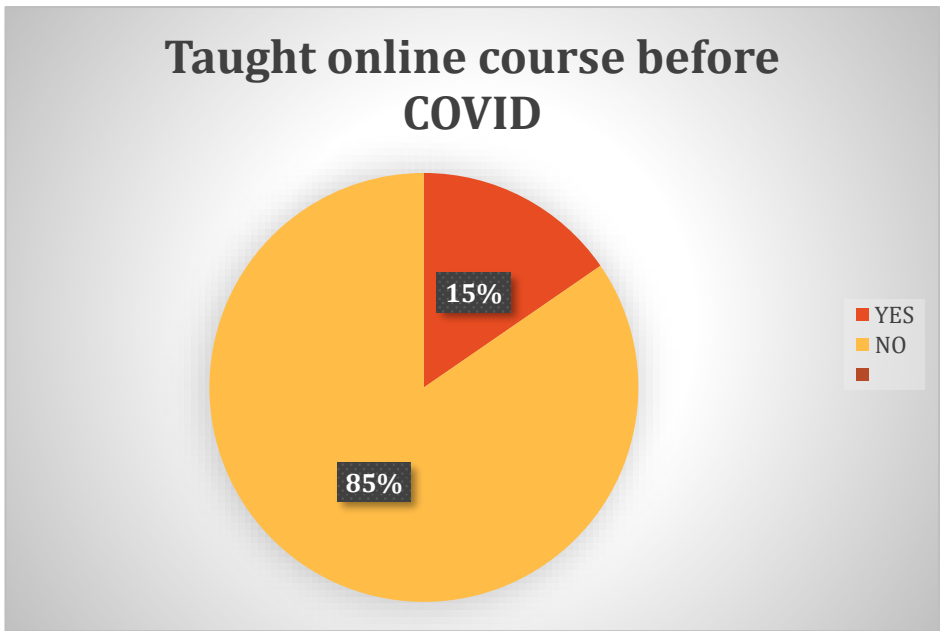


Figure 4:teaching staff who had taught online before covid-19 pandemic

Table 5:General information on eLearning among teaching staff

Characteristics	Number N=13	Percentage
Availability high Internet speed at home		
Yes	12	92.3
No	1	7.7
Devices owned		
Smart phone		
Yes	13	100.0
Laptop		
Yes	12	92.3
No	1	7.7
IPad		
Yes	6	46.2
No	7	53.8
Purchased new device for teaching		
Yes	1	7.7
No	12	92.3
Previous knowledge of computers		
Good understanding	9	69.2
Very good understanding	4	30.8
Recommend online platforms for internal assessment		
Yes	7	53.8
No	2	15.4
Maybe	4	30.8

OBJECTIVE 1: PROPORTION OF STUDENTS AND TEACHING STAFF WITH POSITIVE LEARNING EXPERIENCE

The results of the study showed 94 students had an overall positive experience with (75) 70.1% among postgraduate students and (20) 62.5% among undergraduate students.

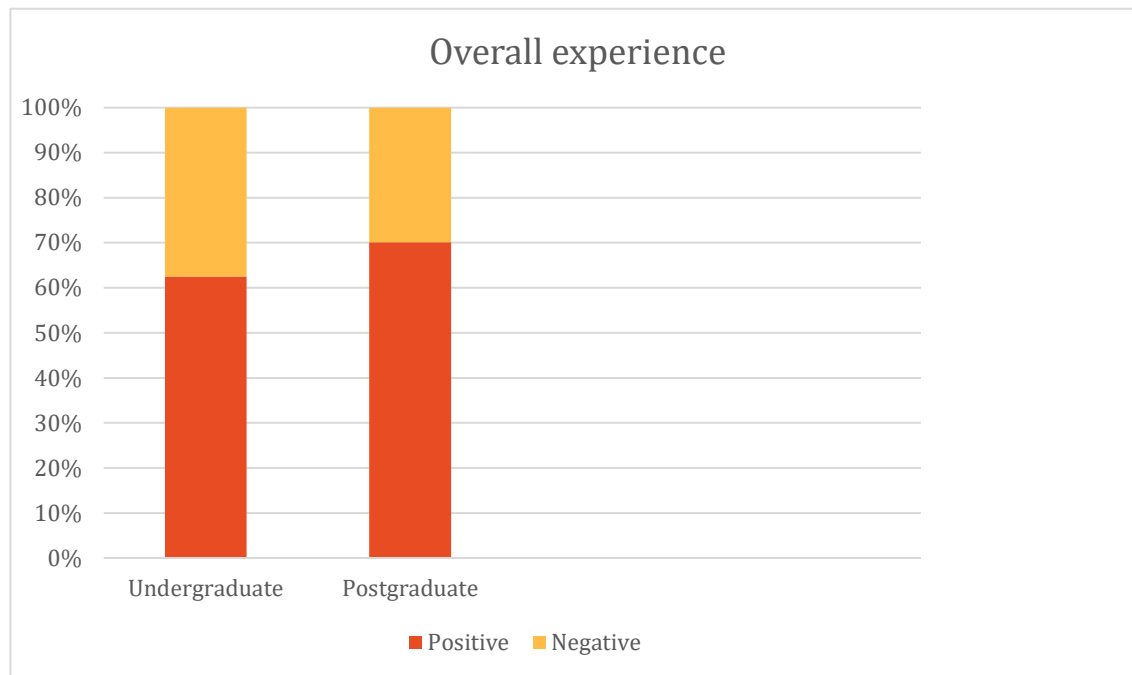


Figure 5: Overall eLearning experience among students

Among students, their eLearning experience was assessed using various domains and positive experience was based on the percentage of agree and strongly agree responses. Thus, the study showed a positive experience of 67.6% among the students found the eLearning platform easy to use and 64.8% found it easy to become skilled at the eLearning platform. This domain assessed how easy it was to learn to operate the system and gain the skills required to use the platform. The study also showed 66.9% perceived positive usefulness of eLearning platforms, as 52.5% reported that it improved their use of eLearning has increased their productivity and enhanced their effectiveness during learning was seen in 52.5% and hence 77% had the intention to continue using it.

Regarding the learning interaction, 72.7% expressed that eLearning made it easy to discuss questions with other students and 61.1% could effectively have discussion with the instructors. The platform made provided a venue for most of the students (76.3%) to share with colleagues what they learnt and 89.9% could access the shared paediatric medical content through the platforms.

Regarding the content learned, 81.3% of the students stated that eLearning provided access to up-to-date paediatric medical content and 61.2% reported it provided the paediatric medical content which exactly fit their needs. Seventy-one (51.1%) students noted that eLearning improved communication with instructors and tutors.

Table 6: various domains assessing experience among students

Perceived ease of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Positive experience
Learning to operate the eLearning platforms has been easy for me	6 (4.3)	20 (14.4)	19 (13.7)	64 (46.0)	30 (21.6)	67.6
It has been easy for me to become skilled at using the eLearning platforms	4 (2.9)	20 (14.4)	25 (18.0)	61 (43.9)	29 (20.9)	64.8
Perceived Usefulness						
Using the eLearning platforms has improved my learning	7 (5.0)	19 (13.7)	20 (14.4)	55 (39.6)	38 (27.3)	66.9
Using the eLearning platforms in learning has increased my productivity in learning	9 (6.5)	29 (20.9)	28 (20.1)	47 (33.8)	26 (18.7)	52.5
Using the eLearning platforms has enhanced my effectiveness in learning	9 (6.5)	28 (20.1)	21 (15.1)	57 (41.0)	24 (17.3)	58.3
Intention to continue use						
I intend to continue using eLearning platforms	5 (3.6)	6 (4.3)	21 (15.1)	56 (40.3)	51 (36.7)	77
Learner's interaction						
It has made it easy to discuss questions with other students	8 (5.8)	19 (13.7)	11 (7.9)	50 (36.0)	51 (36.7)	72.7
It has made it easy to access the shared content from my colleagues	1 (0.7)	8 (5.8)	5 (3.6)	66 (47.5)	59 (42.4)	89.9
It has made it easy to discuss questions with my instructors	9 (6.5)	23 (16.5)	22 (15.8)	52 (37.4)	33 (23.7)	61.1
It has made it easy to share what I learn with my fellow students	5 (3.6)	11 (7.9)	17 (12.2)	67 (48.2)	39 (28.1)	76.3
Learning content						
Provides Up-to-date paediatric medical content	1 (0.7)	8 (5.8)	17 (12.2)	68 (48.9)	45 (32.4)	81.3
Provides the paediatric medical content that exactly fits my needs	5 (3.6)	19 (13.7)	30 (21.6)	61 (43.9)	24 (17.3)	61.2
Personalization of learning						
Enables me to learn the paediatric content I need	3 (2.2)	10 (7.2)	16 (11.5)	86 (61.9)	24 (17.3)	79.2
Enables me to have more control of my learning progress	3 (2.2)	14 (10.1)	22 (15.8)	67 (48.2)	33 (23.7)	71.9
Communication						
The use of the eLearning has improved communication with teachers and tutors	16 (11.5)	27 (19.4)	25 (18.0)	44 (31.7)	27 (19.4)	51.1

OBJECTIVE 1B: PROPORTION OF FACULTY WITH POSITIVE LEARNING EXPERIENCE

Among the teaching staff, the overall positive experience was 59.7%, this was based on assessing the benefits of eLearning, online assessment of medical content and technical skills gained by the teaching staff. The study

results revealed that 12 (92.4%) agreed that among the benefits of teaching online was flexibility and 9 (69.3%) noted that it permitted staff to teach at their own speed. While 11 (84.6%) disagreed that exams conducted for online course are harder for students to pass, six (46.2%) teaching staff agreed that the technical skills they gained from online experience improved their teaching experience. More than half the teaching staff 9 (69.2%) agreed that lack of student-to-student contact in an online class minimized interaction during the learning experience.

Table 7: eLearning experience among the teaching staff

Study variable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Positive experience
One of the benefits of teaching an online course is flexibility.	1 (7.7)	0(0)	0(0)	6 (46.2)	6 (46.2)	12(92.4)
In the classroom environment, face-to-face contact with students is favoured over an online classroom setting.	0 (0)	2 (15.4)	5 (38.5)	4 (30.8)	2 (15.4)	6(46.2)
Practical courses in an online course are among the most difficult for medical staff members	2 (15.4)	1 (7.7)	2 (15.4)	2 (15.4)	6 (46.2)	8(61.6)
The online course design permits staff to educate at their own speed	0(0)	4 (30.8)	0(0)	6 (46.2)	3 (23.1)	9(69.3)
Theoretical courses should be offered online	0(0)	1 (7.7)	1 (7.7)	7 (53.8)	4 (30.8)	11(84.6)
Online courses attract learners because there is no needed set up for the classroom	0(0)	1 (7.7)	2 (15.4)	7 (53.8)	3 (23.1)	10(76.9)
The lack of student-to-student contact in an online class will minimize their experience of learning.	1 (7.7)	3 (23.1)	0(0)	8 (61.5)	1 (7.7)	9(69.2)
Exams in an online course are harder for students	2 (15.4)	9 (69.2)	1 (7.7)	1 (7.7)	0(0)	11(84.6)
It's harder to administer exams in an online course	2 (15.4)	2 (15.4)	0(0)	6 (46.2)	3 (23.1)	4(30.8)
Online courses enable content self-learning more than "classic" face-to-face course	0(0)	6 (46.2)	3 (23.1)	3 (23.1)	1 (7.7)	4(30.8)
The technical skills of an online course improve the educational efficiency of the university staffs experience.	0(0)	2 (15.4)	5 (38.5)	5 (38.5)	1 (7.7)	6(46.2)
Online courses require more discipline from students more than in conventional courses.	0(0)	3 (23.1)	1 (7.7)	5 (38.5)	4 (30.8)	9(69.3)

OBJECTIVE 2: DEMOGRAPHIC FACTORS OF STUDENTS THAT ARE ASSOCIATED WITH POSITIVE EXPERIENCE OF ELEARNING:

On univariate analysis, the study found that postgraduate students were more likely to have positive experience compared to undergraduate students, cOR 1.4(95%CI0.6-3.2). Males were more likely to have positive experience compared to females, cOR 1.1(95%CI 0.6-2.4).

Students from obstetrics and gynaecology and paediatric surgery were less likely to have positive experience compared to students from paediatrics and child health, cOR0.4(95%CI0.1-1.0) and cOR 1.0(95%CI 0.3-2.8).

Table 8:univariate analysis of sociodemographic characteristics and positive experience

All students	Positive, n=95	Negative, n=44	OR (95% CI)	p-value
Student, n (%)				
Undergraduate	20 (62.5)	12 (37.5)	Reference	
Postgraduate	75 (70.1)	32 (29.9)	1.4 (0.6 – 3.2)	0.419
Gender, n (%)				
Male	42 (70.0)	18 (30.0)	1.1 (0.6 – 2.4)	0.715
Female	53 (67.1)	26 (32.9)	Reference	
Postgraduate Students	Positive, n=75	Negative, n=32	OR (95% CI)	p-value
Department among PGS, n (%)				
Pediatrics and child health	38 (76.0)	12 (24.0)	Reference	
Obstetrics and Gynecology	16 (55.2)	13 (44.8)	0.4 (0.1 – 1.0)	0.058
Paediatric surgery	21 (75.0)	7 (25.0)	1.0 (0.3 – 2.8)	0.921
Year of study among PGS, n (%)				
Level 1	14 (66.7)	7 (33.3)	Reference	
Level 2	14 (63.6)	8 (36.4)	0.9 (0.2 – 3.1)	0.835
Level 3	28 (70.0)	12 (30.0)	1.2 (0.4 – 3.6)	0.789
Level 4	19 (79.2)	5 (20.8)	1.9 (0.5 – 7.3)	0.348

Factors associated with perceived usefulness

On univariate analysis, the study found that postgraduate students were three times more likely to perceive eLearning as useful compared to undergraduate students. This association was statistically significant with an OR of 3 (95% CI 1.4-6.9) and p value of 0.007 (<0.05). Male students were 1.5 times more likely to perceive eLearning as useful compared to female. This association was not statistically significant with an OR of 1.5 and p value of 0.300 (>0.05).

Postgraduate Students from obstetrics and gynaecology and paediatric surgery were less likely to perceive eLearning as useful compared to students form the department of paediatrics and child health OR 0.3 (95%CI 0.1-0.9) and OR 0.5(95%CI 0.2-1.6) respectively.

Table 9:Univariate analysis of perceived usefulness

Study variable	Positive perception, n=93	Negative perception, n=46	Crude OR (95% CI)	p-value
All Students, n (%)				
Undergraduate	15 (46.9)	17 (53.1)	Reference	
Postgraduate	78 (72.9)	29 (27.1)	3.0 (1.4 – 6.9)	0.007
Gender, n (%)				
Male	43 (71.7)	17 (28.3)	1.5 (0.7 – 3.0)	0.300
Female	50 (63.3)	29 (36.7)	Reference	
Postgraduate students	Positive perception, n=78	Negative perception, n=29	Crude OR (95% CI)	p-value
Department n (%)				
Pediatrics and child health	41 (82.0)	9 (18.0)	Reference	
Obstetrics and Gynecology	17 (58.6)	12 (41.4)	0.3 (0.1 – 0.9)	0.027
Pediatric surgery	20 (71.4)	8 (28.6)	0.5 (0.2 – 1.6)	0.282
Year of study n (%)				
Level 1	15 (71.4)	6 (28.6)	Reference	
Level 2	17 (77.3)	5 (22.7)	1.4 (0.3 – 5.4)	0.661
Level 3	27 (67.5)	13 (32.5)	0.8 (0.3 – 2.6)	0.753
Level 4	19 (79.2)	5 (20.8)	1.5 (0.4 – 6.0)	0.548

Factors associated with perceived ease of use:

The students' level of education, gender and department of study were not significantly associated with perceived ease of use of eLearning.

Table 10: univariate analysis on perceived ease of use

Study variable	Positive perception, n=94	Negative perception, n=45	Crude OR (95% CI)	p-value
All Students, n (%)				
Program				
Undergraduate	22 (68.8)	10 (31.3)	Reference	
Postgraduate	72 (67.3)	35 (32.7)	0.9 (0.4 – 2.2)	0.877
Gender, n (%)				
Male	42 (70.0)	18 (30.0)	1.2 (0.6 – 2.5)	0.602
Female	52 (65.8)	27 (34.2)	Reference	

	Positive perception, n=72	Negative perception, n=35	Crude OR (95% CI)	p-value
Postgraduate students				
Department n (%)				
Pediatrics and child health	34 (68.0)	16 (32.0)	Reference	
Obstetrics and Gynecology	20 (69.0)	9 (31.0)	1.0 (0.4 – 2.8)	0.929
Pediatric surgery	18 (64.3)	10 (35.7)	0.8 (0.3 – 2.2)	0.739
Year of study n (%)				
Level 1	13 (61.9)	8 (38.1)	Reference	
Level 2	15 (68.2)	7 (31.8)	1.3 (0.4 – 4.6)	0.666
Level 3	28 (70.0)	12 (30.0)	1.4 (0.5 – 4.4)	0.523
Level 4	16 (66.7)	8 (33.3)	1.2 (0.4 – 4.2)	0.739

On multivariate analysis, we found that postgraduate students were more likely to have positive experience compared to undergraduate students, aOR 1.4(95%CI0.6-3.2). Males were more likely to have positive experience compared to females, aOR 1.1(95%CI 0.5-2.4).

Government sponsored students were more likely to have positive experience compared to self-sponsored students, aOR 1.1(95%CI 0.5-2.5). students from obstetrics and gynaecology and paediatric surgery were less likely to have positive experience compared to students from paediatrics and child health, aOR0.4(95%CI0.1-1.0) and aOR 0.9(95%CI 0.3-2.7).

Table 11:Multivariate analysis showing characteristics independently associated with positive experience

All students	Positive, n=95	Negative, n=44	cOR (95% CI)	p-value	aOR (95% CI)	p-value
Student, n (%)						
Undergraduate	20 (62.5)	12 (37.5)	Reference		Reference	
Postgraduate	75 (70.1)	32 (29.9)	1.4 (0.6 – 3.2)	0.419	1.4 (0.6 – 3.2)	0.425
Gender, n (%)						
Male	42 (70.0)	18 (30.0)	1.1 (0.6 – 2.4)	0.715	1.1 (0.5 – 2.4)	0.740
Female	53 (67.1)	26 (32.9)	Reference		Reference	
Funding, n (%)						
Government	31 (70.5)	13 (29.5)	1.2 (0.5 – 2.5)	0.716	1.1 (0.5 – 2.5)	0.775

Self-sponsor	64 (67.4)	31 (32.6)	Reference		Reference	
Postgraduate Students	Positive, n=75	Negative, n=32	OR (95% CI)	p-value	OR (95% CI)	p-value
Department among PGS, n (%)						
Paediatrics and child health	38 (76.0)	12 (24.0)	Reference		Reference	
Obstetrics and Gynaecology	16 (55.2)	13 (44.8)	0.4 (0.1 – 1.0)	0.058	0.4 (0.1 – 1.0)	0.058
Paediatric surgery	21 (75.0)	7 (25.0)	1.0 (0.3 – 2.8)	0.921	0.9 (0.3 – 2.7)	0.796
Year of study among PGS, n (%)						
Level 1	14 (66.7)	7 (33.3)	Reference		Reference	
Level 2	14 (63.6)	8 (36.4)	0.9 (0.2 – 3.1)	0.835	0.7 (0.2 – 2.7)	0.624
Level 3	28 (70.0)	12 (30.0)	1.2 (0.4 – 3.6)	0.789	1.1 (0.3 – 3.5)	0.906
Level 4	19 (79.2)	5 (20.8)	1.9 (0.5 – 7.3)	0.348	1.7 (0.4 – 6.6)	0.483

OBJECTIVE 3: BARRIERS TO UTILIZATION OF AVAILABLE ELEARNING TOOLS

The focused group discussions and in-depth interviews among the medical students and teaching staff respectively revealed one of the main themes that emerged as a barrier was lack of infrastructure and resources due to poor access to technology devices and cost of internet bundles

“Telcom bundles issued by the school do not work in all areas and its expensive to buy Safaricom. “Zoom consumes more bundles than google meet hence 1gb of bundles will not fit for 1 week”

“Failure of infrastructure- many a times our learners not having bundles or access to internet wired places”

“.... the disadvantaged students may be having a harder time learning because they may not have, uh, the privilege of having enough internet to cover all their needs and devices that are good enough for them to follow on the classes and also be able to do their exams.”

Lack of face-to-face interaction meaning lecturers felt found it difficult to gauge the

attention of students.

“As lecturer our main concern, I would say, is difficulty in knowing the level of engagement of the students because people can put on their gadgets, and they are not there so you are not seeing that 20 logged in and maybe only two people are actually listening or participating so the difficulty with the knowing whether people are really engaged or not” **Teachers IDI**

The challenges in student engagement who struggled with staying focused due to distractions around them. One student noted,

“...distraction is a challenge for some of us who are at the age of having an ADHD. So, you realize, um, when someone flips through 1, 2, 3 slides, you start feeling like, yeah, I need, I need to check my phone. You know, as in then you start scrolling. That's another zoning out ... the subject matter expert seeming to be ranting rather than to to be like communicating.”

“Or background that is not conducive so you might find one of the students is sitting at home environment and there are kids interfering, television, traffic.” **Teaching IDI**

Time management challenges was one that was expressed among students during the focused group discussion

“Where the lecturers schedule classes when the students are in transit or late in the evening when the lecturer is available but not convenient for the student”

“...if somebody... if a lecturer changes their class, um, and you, you'll sit in your mind that it's supposed to be at two and then it's now according to their schedule, it's not yours. It's not the school schedule, it's the lecturer schedule.”

CHAPTER SIX: DISCUSSION

It is essential to understand how to operate the eLearning platform, and 67.6% of respondents found it easy to do so, while 64.8% found it simple to become proficient with it. Understanding and evaluating the success of an eLearning system is dependent on the system's utilization. An individual's estimation of the effort necessary to run a system is the perceived ease of usage. It depicts the user's perceptions of the system's interaction process. Students reported that eLearning platforms increased their exposure to learning, productivity, and learning effectiveness; thus, 77% of those surveyed wanted to continue using it. Perceived utility quantifies the user's subjective impression of how adopting a

particular information system will enhance work performance and productivity. Not only can users' perspectives affect later behaviour, but they are also sensitive to managerial interventions such as system design and training(37).

In our study, 72.7% of students and 61.1% of teachers believed that eLearning made it easier to address questions with other students and teachers, respectively. This could be due to the anonymity of online contact, which is less intimidating than face-to-face interaction. Our research demonstrated an improvement in teacher, tutor, and student communication. Interaction among students and between instructors and students is one of the most essential aspects of online learning. A study done by Moore(38) described three primary types of interactions in an online environment: learner–content interaction, learner–instructor interaction, and learner–learner interaction. These interactions are essential to eLearning because they facilitate peer interactions, collaborative learning, and peer review. Peer interactions are vital to learning because they enable students to participate in the learning process. This style of communication is beneficial for problem-solving and contributes to learner satisfaction and interaction frequency in online education. It enhances learning by making it more integrated and context - dependent, and it has the ability to give learners a highly engaging and entertaining learning experience(38). E-learning enables instructors or teachers to educate more effectively by granting them access to a variety of technological and pedagogical teaching resources. E-learning is increasingly recognized as a tool or approach for continuing professional development (CPD), particularly among medical, nursing, and allied healthcare professionals, due to its nature of frequently benefiting from up-to-date content sent quickly and in a number of forms. Some studies believe that online communication enhances student-centered learning, encourages higher student participation, and promotes more in-depth and reasoned discussions. Cheung and Kan et al found that student performance is positively connected with the extent of ownership over the learning process(39). Our study findings were contrast to a study among UK medical students that revealed that students did not perceive online training to be fascinating or enjoyable and had little opportunity to ask questions. In addition, when asked if online training should be more participatory, students were, on average, indifferent, but felt it was not as effective as face-to-face instruction(37,40–42).

In our study, 66.9% of participants thought that eLearning improved productivity, learning, and effective learning, similar to the findings made by Gupta et al. among Indian medical students. According to a study conducted among nursing students, eLearning also improved educational efficacy and accelerated learning acquisition. Through a survey of undergraduate medical students, the efficiency of e-learning in developing clinical skills was evaluated, and the results indicated that students found e-learning particularly

beneficial because they could access and examine the materials prior to learning. Students who indicated they were likely to use e-learning resources throughout their education also acknowledged the convenience of e-extensive learning's information access. This finding contrasts with the 86% of dental students who responded to a survey in Pakistan who said that eLearning had little impact on their learning.

Our study indicated that 79.2% of paediatric care practitioners found eLearning sessions to cover the knowledge necessary for their practice. Agarwal et al. likewise observed this among postgraduate paediatric trainees in India(43).

The majority of the teaching staff thought that one of the benefits of eLearning was the flexibility it offered; the same was true of the medical teaching personnel in Egypt. The teaching staff in a comparable study discovered that eLearning required a great deal of time, interfering with their ability to teach and resulting in inadequate student monitoring. This was believed to be attributable to smart device knowledge and proficiency.

Our study also discovered that eLearning enables instructors to teach at their own pace, which was found to increase learning effectiveness and achievement(30,44).

Consistent with past research, our study indicated that the teaching staff did not believe that online assessments were more difficult. This may be because online tests consist primarily of multiple-choice questions, which can be administered to a large number of students, and marking can be automated, saving time during evaluation.

In our study, postgraduate students were more likely to have a positive experience than undergraduate students, males were more likely to have a positive experience than females, and students from the departments of obstetrics and gynaecology and paediatric surgery were less likely to have a positive experience than those from the department of paediatrics and child health. Students' attitudes toward eLearning were influenced by environmental factors such as interpersonal and academic persuasion, transfer of knowledge, identification, and compliance, this was according to a South African study assessing factors linked with eLearning acceptance. In addition, the results indicated that perceptions of usefulness (expected outcomes), satisfaction, and value addition were significant determinants of students' acceptance of eLearning(45).

Accessibility owing to the expense of purchasing internet bundles was identified as a key obstacle that prevented many students from attending lectures, hence contributing to unequal knowledge acquisition based on socioeconomic position. The high cost of internet packages was also identified as a challenge in studies conducted in Malaysia and Zimbabwe(29,34), both of which are developing nations. Owing to the high cost of internet data during COVID-19, it was difficult for the students to purchase internet packages. In addition, a reduction in monthly income due to the loss of income sources made the purchase of internet data for educational reasons a strain for many students(46). In contrast

to Muilenberg et al., a study was conducted in a developed nation where portable internet-navigation devices are readily available(47). Additionally, children from economically disadvantaged groups may not have access to smart devices (laptops, tablets, and smartphones) for online teaching and learning(48).

One of the major obstacles noted in our survey among the teaching staff interviewed was difficulty with the use of the eLearning platforms. In a study conducted in India among teaching staff on online teaching, lack of technical skills was identified as the primary obstacle(48). Inadequate computer and/or writing abilities have exacerbated academics' negative perception toward the new e-learning system, which has a negative impact on the delivery of online learning(48). Farooq et al. observed It is extremely difficult for these faculty members to engage in effective online medical teaching given their lack of prior expertise, training, and IT assistance(32).

Changes in lecturer-student interaction resulting from the inability of the teaching team to assess student participation and comprehension of the paediatric themes they are studying was another finding in the study. Poon et al indicated that its participants at several local universities were not entirely comfortable with eLearning as a teaching tool, and linked this perspective to a number of variables, including challenging interactions with students(30). This could also be linked to the fact that many students struggled to maintain concentration in an online classroom owing to family or environmental distractions(48).

STRENGTHS

This study was carried out among both undergraduate and postgraduate medical students hence the results can be generalized to medical students in the University of Nairobi. The study was done among the paediatric physicians and surgical fields hence had a wide variety of view from a developing country.

STUDY LIMITATIONS

This study has some potential limitations. Being a cross-sectional study, the participants' perceptions and experiences may change overtime. Also, the present study was conducted in one medical school. The views from the teaching staff were limited hence cannot be generalizable and another study needs to be done with focus on their perception.

Conclusions

1. Majority of undergraduate and postgraduate students as well as teaching staff reported positive eLearning experience.
2. Factors associated with positive eLearning experience were study within the postgraduate program, studying within department of paediatric and male gender.

3. The main barriers associated with eLearning were accessibility, student engagement and inability to gauge students' attention were some challenges faced by both medical students and teaching staff as they utilised eLearning.

Recommendations

1. eLearning should be adopted as part of training in medical school post COVID-19 era.
2. The departments involved in imparting knowledge on childhood conditions should look into ways of improving eLearning experiences to further improve learning.
3. Develop standardized eLearning training materials among all departments involved in imparting knowledge on childhood condition to ensure standard experience among the students from all departments.
4. University of Nairobi should investigate ways to improve accessibility among students.

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APPENDICES

APPENDIX 1a: CONSENT FORM FOR PARTICIPATION IN THE STUDY

STUDY TITLE: E-LEARNING EXPERIENCE OF POSTGRADUATE, MEDICAL STUDENTS AND TEACHING STAFF IN DEPARTMENTS IMPARTING KNOWLEDGE ON CHILDHOOD CONDITIONS AT THE SCHOOL OF MEDICINE, THE UNIVERSITY OF NAIROBI

NAME OF RESEARCHER: DR MONICA NDUNGU

I am a postgraduate student at the **University of Nairobi** pursuing a **Master of Medicine degree in Paediatrics and Child Health**.

I am conducting a study on the experience and perception of undergraduate and postgraduate students, and teaching staff towards eLearning during COVID-19 pandemic at the University of Nairobi. The purpose of this consent form is to give you the information you will need to help you decide whether or not you should participate in the study. The results of this study will help us guiding how future eLearning training should be

conducted so as to increase acceptance and utilization and by extension facilitate the process of knowledge acquisition.

Kindly understand the following: -

- i. Participation is entirely voluntary.
- ii. Confidentiality will be maintained. We will use a code number to identify you in a password protected computer database and will keep all of our paper records in a locked file cabinet.
- iii. Refusal of any participation in the study will not attract any penalties.
- iv. **Risks:** There is no risk to participating in this study
- v. **Benefits:** Patients will benefit from effective eLearning practices as a form of knowledge acquiring medium in medical setting in Kenya within the paediatrics. The study will foster a continuity of care model of care, providing an opportunity to healthcare workers involved in management of paediatrics patients disseminating knowledge among various

PLEASE READ AND CLICK YES IF YOU HAVE AGREED TO PARTICIPATE IN THIS STUDY.

I confirm that I read the above information for this study, and I have fully understood the purpose of the survey. I am aware I will not suffer any injury or harm during the process of participation. The information I provide will not be used maliciously. I am cognizant that I possess the freedom to withdraw from the study at any given point in time with no explanation or justification. I acknowledge the information shared will be confidential and only be accessible by the researcher and those affiliated with the study. I understand I won't benefit financially by participating in this study. I am informed and aware that in case of queries or clarifications that I may reach the principal investigator to raise concern. I agree to answer to the best of my knowledge, voluntarily and without coercion.

Do you agree to taking the questionnaire?

YES

NO

APPENDIX I: FOCUS GROUP DISCUSSION TOPIC GUIDE FOR STUDENTS

Welcome and thank you for volunteering to take part in this focus group. You have been asked to participate in this group as your point of view is important to us.

Introduction

The aim of this discussion will be to explore your describe barriers to utilization of available eLearning tools among undergraduate and postgraduate medical students and

teaching staff involved in paediatric care management at the UoN College of Health Sciences. The information from this study will be used to provide information with regards to e-learning is important in guiding how future eLearning training should be conducted so as to increase acceptance and utilisation and by extension facilitate the process of knowledge acquisition. The FDG will take about an hour.

Anonymity

Despite being voice recorded, I would like to assure you that the discussion will be anonymous. The voice records will be kept safely in a locked facility, and they are transcribed word for word, then they will be destroyed. The notes taken during the FGD will not record individuals'

names. Try to answer and comment accurately and truthfully as possible. Kindly refrain from discussing the comments of other group members outside the focus group. If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as much as possible.

Ground rules

- Only one person speaks at a time. If someone is talking, please wait until they have finished before you start.
- There are no wrong or write answers.
- You do not have to speak in any particular order.
- When you do have something to say, please do so, regardless of the other group members' opinions.
- You do not have to agree with the views of other people in the group.
- Does anyone have any questions? (Answers).
- Okay let's begin

Ice breaker: What is your favourite food?

1. What would you describe eLearning as?
2. Which eLearning platforms have you used?
3. Did you have experience with eLearning before COVID-19?
4. How would you describe your experience?
5. have you faced any challenges while using eLearning platforms?
6. What do you think may have contributed to these challenges?
7. What in your opinion are likely solutions to address these challenges?

APPENDIX 2: STUDY QUESTIONNAIRE FOR CROSS-SECTIONAL STUDY

University student's questionnaire

: Study Id number

Gender

Male

Female

How old are you

- <30 years
- 31-35years
- 36-40 years
- 40-45 years
- 45-50 years
- >50 years

What is your academic level? (Please select one)

- Undergraduate student
- Postgraduate: First year
- Second year
- Third year
- Fourth year
- Fifth year
- Sixth year

Which department are you studying in?

- Paediatrics and child health
- Obstetrics and gynaecology
- Paediatric surgery

How are you paying for school?

- Self-sponsorship
- Government sponsored

- N/A

Which electronic devices do you own?

- Smartphone
- Laptop
- Ipad
- Others.....

Did you purchase a new device in order to enable you to attend the eLearning class? Yes

No

Do you have previous eLearning experience before COVID-19

Yes

No

Do you have previous knowledge of computers?

- no knowledge
- basic knowledge
- good knowledge
- very good knowledge

1. Learning to operate the eLearning system has been easy for me

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

2. I find it easy to get the eLearning system to do what I want it to do

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

3. It has been easy for me to become skilful at using the e-learning system 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

4. I find the e-learning system easy to use

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

5. Using the eLearning system has improved my learning

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

6. Using the eLearning system in learning has increased my productivity in learning

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

7. Using the eLearning system has enhanced my effectiveness in learning

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

8. I find the eLearning system useful in learning

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

9. I intend to continue using eLearning system

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

10. The eLearning system makes it easy for me to discuss questions with other students

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

11. The eLearning system makes it easy for me to access the shared content from the learning community

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

12. The eLearning system makes it easy for me to discuss questions with my instructors

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

13. The eLearning system makes it easy for me to share what I learn with the learning community

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

14. The eLearning system provides up to-date content

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

15. The eLearning system provides content that exactly fits my needs

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

16. The eLearning system provides sufficient content

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

17. The eLearning system enables me to learn the content I need

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

18. The eLearning system enables me to choose what I want to learn

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

19. The eLearning system enables me to control my learning progress

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

20. The eLearning system records my learning progress and performance

1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

21. The use of the eLearning has improved communication with teachers and tutors
1. Strongly disagree 2. Disagree. 3. Neutral 4. Agree 5. Strongly agree

22. How do you feel about your overall experience of the e-learning system use?
1. Very dissatisfied 1....2....3....4....5. Very satisfied
2. Very displeased 1....2....3....4....5. Very pleased
3. Very frustrated 1....2....3....4....5. Very contented
4. Absolutely terrible 1....2....3....4....5. Absolutely Delighted

23. What were the facilitating factors during online classes?

1- not helpful to 5- Most helpful

Convenience & Access 1.....2.....3.....4.....5

Better understanding 1.....2.....3.....4.....5

Interesting 1.....2.....3.....4.....5

Presentation 1.....2.....3.....4.....5

Interaction with educator 1.....2.....3.....4.....5

Interaction with Peers 1....2....3.....4.....5

APPENDIX :3 STUDY QUESTIONNAIRE FOR CROSS-SECTIONAL STUDY AMONG UNIVERSITY TEACHING STAFF QUESTIONNAIRE

Study Id number:

Gender:

Male

Female

Rank:

lecturer

Assistant professor

Associate professor

Professor

Years of teaching experience

>5 years

5-10 years
>10 years

Do you have high internet speed at home:

No

Yes

Have you ever taught a course online before Covid-19?

No

Yes

If yes, in which areas?

Practical sessions

Theoretical sessions

Both

If yes, what is the duration?

< year

1-2 years

>2 year

Which electronic devices do you own?

- Smartphone
- Laptop
- Ipad
- Others.....

Did you purchase a new device in order to enable you to teach online classes? Yes

No

Do you have previous knowledge of computers?

- no knowledge
- basic knowledge

- good knowledge
- very good knowledge

Would you recommend online platforms for internal assessments in routine curriculum?

- Yes
- No
- Maybe

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
One of the benefits of teaching an online course is flexibility.					
In the classroom environment, face-to-face contact with students is favoured over an online classroom setting.					
Practical courses in an online course are among the most difficult for medical staff members					
The online course design permits staff to educate at their own speed					
Theoretical courses should be offered online					
Online courses attract learners because there is no needed set up for the classroom					

The lack of student-to-student contact in an online class will minimize their experience of learning. Exams in an online course are harder for students					
It's harder to administer exams in an online course					
Online courses enable content self-learning more than "classic" face-to-face course					

The technical skills of an online course improve the educational efficiency of the college staffs experience.					
Online courses require more discipline from students more than in conventional courses.					

APPENDIX 4: INTERVIEW GUIDE FOR TEACHING STAFF INTERVIEW GUIDE:

1. How many years have you been a lecturer?
2. How was your experience been teaching in the face-to-face classes?
3. What would you describe eLearning as?
4. Did you have experience with eLearning before COVID-19?
5. Which eLearning platforms have you used before COVID-19?
6. How would you describe the shift to eLearning during COVID-19?
7. How would you describe your experience?
8. Have you faced any challenges while using eLearning platforms?
9. What do you think may have contributed to these challenges?

10. What in your opinion are likely solutions to address these challenges?

Ethical approval letter



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6th September, 2022

Dr. Monica Njeri Ndungu
Reg. No. H58/11354/2018
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University of Nairobi



Dear Dr. Ndungu,

RESEARCH PROPOSAL: E-LEARNING EXPERIENCE OF MEDICAL STUDENTS AND TEACHING STAFF INVOLVED IN PEDIATRIC CARE MANAGEMENT DURING THE COVID-19 PANDEMIC AT THE SCHOOL OF MEDICINE, FACULTY OF HEALTH SCIENCES, THE UNIVERSITY OF NAIROBI (P474/05/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P474/05/2022**. The approval period is 6th September 2022 – 5th September 2023.


This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

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Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely,


DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
 The Senior Director, CS, KNH
 The Assistant Director, Health Information Dept., KNH
 The Chairperson, KNH- UoN ERC
 The Chair, Dept. of Paediatrics and Child Health, UoN
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