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COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF MEDICINE AND
PHARMACY, DEPARTMENT OF SURGERY

**“BARRIERS AND FACILITATORS TO THE USE OF MOODLE PLATFORM AS AN
ONLINE LEARNING PLATFORM FOR FIRST YEAR RESIDENTS IN SURGERY AT
THE UNIVERSITY OF RWANDA**

*Dissertation submitted in partial fulfillment of the requirements for the award of
the degree of Master of Medicine in General surgery, University of RWANDA*

By

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DECLARATION

I, UMUTONIWASE Bernard, hereby declare and certify that the work presented in this dissertation entitled “**BARRIERS AND FACILITATORS TO THE USE OF MOODLE PLATFORM AS AN ONLINE LEARNING PLATFORM FOR FIRST YEAR RESIDENTS IN SURGERY AT THE UNIVERSITY OF RWANDA**” is entirely my original work and it has never been presented or submitted in a whole or in part to any other university.

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I, hereby declare that this dissertation has been submitted with my approval as supervisor.

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DEDICATION

To God the Almighty

To my Parents

To my sisters and brothers

To my relatives and friends

To my classmates

I dedicate this work

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LIST OF ABBREVIATIONS

| |
|--|
| CHUB: Centre Hospitalier Universitaire de Butare |
| CHUK: Centre Hospitalier Universitaire de Kigali |
| CMS: Course Management System |
| HRH: Human Resources for Health |
| ICT: Information and Communication Technology |
| KFH: King Faisal Hospital |
| LMS: Learning Management Systems |
| MLE: Managed Learning Environment |
| RMH: Rwanda Military Hospital |
| TEL: Technology Enhanced Learning |
| VLE: Virtual Learning Environment |
| UN: United Nations |

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Abstract

Background: Information and Communication Technologies, and especially those supported by E-Learning Management Systems, like Moodle have a significant contribution to education. They help educators to create effective learning communities, with flexible teaching and enhanced individualized and self-directed learning. Moodle has been adopted by the University of Rwanda for its cost-effectiveness, and easy accessibility by users and its being used in education of residents in surgery department aiming to replace the traditional learning system where residents are requested to travel from different training sites to meet the lecturers. Since the implementation of Moodle online learning training model, there is no study conducted to evaluate barriers and facilitators of using it by both teachers and students.

Methods: The study used a mixed-method sequential explanatory design, combining questionnaire-survey and individual face to face in-depth interviews, to explore attitudes towards Moodle usage in online learning and teaching among teachers (n = 13) and postgraduate students in surgery (n = 23) at University of Rwanda. First, a Likert scale questionnaire was used: with attitudes, beliefs scale. Secondly, all participants from the first phase were contacted and individual face-to-face in-depth interviews were conducted. Descriptive statistics were used in quantitative part and the qualitative data were analyzed through thematic analysis.

Results: Overall, Moodle is not highly used by both trainees and trainers as found by the results of this study where only 13% of the trainees use Moodle in 4 out of 5 lessons and 54% of the trainers do not use Moodle frequently due to lack of expertise and training of using it.

With similar patterns between trainers and trainees, majority, 10/13 trainers agreed that Moodle is important in delivering courses in short time... and facilitates communication with students. Nine of thirteen trainers agreed that it is easy to grade students on Moodle and 19/23 participants agreed that it is easy to complete the assignment on Moodle and while only one trainee participant disagreed. Participants highlighted cost-effectiveness, flexibility and easy access to teaching materials as benefits of using Moodle platform. Participants also mentioned the inadequate evaluation and follow up of students, lack or poor internet connectivity, lack of training and lack of satisfaction in explanations from trainers as disadvantages of using Moodle. The majority of participants suggested more training sessions to the users of this platform.

Conclusions: Moodle is still under used but well perceived by the lecturers and trainees in surgical training at UR. Major barriers to the use of Moodle are lack of training for its users, inadequate evaluation of students by their lecturers, lack of good internet connection and inadequate communication between students and lecturers. Moodle can be a valuable alternative or complement to the traditional face to face theoretical teaching which is time and money consuming.

Keywords: Moodle, E-learning, Barriers, Facilitators

CHAPTER I: INTRODUCTION

1.1. Background

Information and Communication Technologies, and especially those supported by E-Learning Management Systems (LMS), like Moodle have a significant role in education [1]. Moodle, an open source Course Management System (CMS), facilitates educators in creating triumphant online learning and teaching communities [2]. With an introduction of World Wide Web, e-learning methodologies started to emerge though still being adopted in some communities with difficulties [3]. Getting new technology infrastructure into educational provider institutions to support student learning is an important goal [4].

Flexibility, enhanced individualized learning and decreased university staff are some of the advantages of e-learning [5]. Due to the flexibility of e-learning systems, teaching materials are easily accessed by trainees on their conveniences [6]. Moodle, as an online teaching and learning platform, enables tutoring through distance electronic portfolio [7]. However, where e-learning cannot replace traditional methods, the online teaching can be mixed with the traditional teaching making a blended teaching method that can empower this traditional education [8].

Moodle has many advantages as showed previously in different universities including easy access to teaching materials by its users, and its cost effectiveness where it is cheaper to its users and even to the universities [5,7,8]. However, currently there is no published data about moodle learning system at university of Rwanda. We want to know how moodle is perceived by the lectures and trainees, barriers and facilitators which they encounter.

During postgraduate studies, residents rotate all around the country in different hospitals. In traditional learning system they need to travel to meet the lecturer which is costly and time consuming. These barriers can be resolved by the use of Moodle.

1.2. Problem statement

There have been changes over time in medical education at the University of Rwanda regarding the way the teachings are done, accommodating students, increasing the number of students in

medical education especially postgraduate students in order to decrease the patient health provider ratio and meeting with population demand of medical doctors and other health providers. In 2000s there were very few postgraduate students in surgery (surgical residents) who were only rotating in four teaching hospitals which existed in Rwanda where at least one hospital could have one resident rotating in surgery department with maximum supervision from the existent consultants and university staff and where it was easy to organize trainings for these students with minimum expenses and easy supervision but now the number of surgery residents increased but with the number of academic staff and consultants supervising those residents remaining constant.

With significant increase of surgical residents, it has been necessary to increase the number of training sites at other hospitals with university staff and consultants who are able to train them where for now we have ten training sites where surgery residents can do their training rotations.

To facilitate in the training of students, there have been innovations in the academic activities and technology and among them there is online learning system (e-learning platform) that has been adopted to facilitate the learning and teaching in postgraduate program where students can follow and access same teaching materials from their supervisors from different academic training locations with direct communication and supervision.

The online learning in university of Rwanda has started around 2001. At the school of medicine and pharmacy, department of surgery, Moodle online learning and training model has been implemented to teach surgery to students allocated to different training sites, to improve consistency and quality of learning and teaching at all sites and to reduce time spent in delivering courses by few available teachers.

Since the implementation of Moodle online learning training model, there is no study conducted to evaluate barriers and facilitators of using it by both teachers and students.

1.3. Objectives

1.3.1. General objective

This study aimed to evaluate the role of Moodle platform in improving theoretical teaching and learning in postgraduate students in Surgery

1.3.2. Specific objectives

- 1) To identify barriers and facilitators of using Moodle E-learning platform as expressed by both teachers and students.
- 2) To report trainees and trainers' perceptions on the knowledge acquired through this model.
- 3) To assess the availability and quality of teaching material uploaded on Moodle

CHAPTER II: LITERATURE REVIEW

2.1. Introduction

Internet and software-based platforms or E-learning is widely being used worldwide in different institutions like academic, legal and medical institutions in different forms that include Managed Learning Environment (MLE), Technology Enhanced Learning (TEL), Virtual Learning Environment (VLE) and many more in videoconferencing, blogging and learning activities [9]. Facilities like Moodle, one of the popular MLE platforms, are not widely used in many developing countries which are still using the traditional didactic approach in learning and teaching activities [9, 10, 11].

Around 1990s, the learning management systems (LMS) were initiated with increasing availability of technology. When online course teachings started, it was the only technology allowed to ready contents and later to improve basic discussions with possibility of uploading the pre-recorded materials and text contents in that time. The next generation of web technology started in early 2000s with possibility of a two-way communication (read and writes communication) [12]. Considering the flexibility of Moodle platform, in developing countries where there is limited access to resources, they should shift to the use of it [9].

2.2. Surgical residencies historical overview

Surgery training evolved progressively from apprenticeship mode in the 16th century when surgery was being done as a trade without any principles or guidelines for the training and students learned surgery by initiating their skilled mentors either in clinical practice or in the operating rooms until the end of 19th century where surgery started to be practiced as a profession with Halsted's model which was more structured and effective [13].

There have been changes in global surgery practice where the traditional paradigm has been replaced by long term partnerships that enhanced reduced workforce needs especially in developing countries [11].

Before the enhancement of residency trainings in the developing countries, medical school graduates migrated outside their countries due to the lack of training sites or due to financial considerations [11]. Currently residents are required to learn more in short period of time due to an increase in surgically treated diseases [13].

In Rwanda, surgery residents are highly trained through emergency and trauma operations as 45% of the operations done at referral hospitals are done by residents as primary surgeons [14]. In 2012, it was estimated that 50 fully practicing surgeons were present in Rwanda and since this time the number of specialties also increased and now there are around six sub specialties namely neurosurgery, general surgery, plastic surgery, orthopedic surgery, urology and pediatric surgery [15]

Females do not show high interest in surgical training worldwide [13, 16] and in Rwanda it is estimated that females only occupy one in twenty positions in surgical residence [17].

2.3. Information Communication and Technology in medicine.

Despite technology inaccessibility as a challenge, technology (computer, smart devices like tablets or telephone) plays an important role in education in developing countries [12].

There has been changes in medical learning and teaching over time with progressive changes in technologies where different universities and schools all over the world adopted different e-LMSs [18]. ICT is actively evolving in its forms either by e-learning or when it is blended and is replacing the traditional mode of teaching which is limited by small number of lecturers and teachers in health professional education [12].

Both blended and e-learning modes help in reducing the costs associated with delivering courses and enhances personalization to the courses and removes all forms of barriers that can limit the delivery of courses [12].

Worldwide, medical schools are experimenting the usage of online learning to supplement the existent traditional, face to face, teaching method [19]. In a study done in Equator by Ivan et al. on the perceptions and use of ICT among health care providers, showed that ICT is highly used among physicians and that non specialist doctors have strong positive perceptions towards ICT usage [20].

E-learning is acknowledged by WHO and United Nations (UN) as an important in education in the countries under development [12]. The requirement for change, insufficient technology, costs, inadequate skills and the need for face to face components are among the main barriers to e-learning in developing counties [21]. Affordable and effective teaching strategies are needed in

low- and middle-income countries with an existent health care worker shortage, despite the limited access to equipment and infrastructures among these countries [22, 23].

Lack of group discussions, time consumption, lack of interaction between students and teachers, inability to clarify more with the tutor and feelings of isolation are the main reported disadvantages of e-learning [12]

A study done by Nyla et al. on the individual differences and e-learning acceptance found that personal experiences with internet and computer was not associated with e-learning acceptance [24]. The use of ICT for the continuous health care providers' education in different forms has been put in place in medical schools in South Africa with effective and sustainable result [25]. Using e-learning in medical education can enhance faculty staff effectiveness and efficiency and also can increase the educational opportunities for students [10].

E-learning methodology is being implemented as small scale projects not as an educational method in developing countries [23]. If well adopted and implemented, e-learning management systems can increase the quality in medical education and solve the problem of scarcity of medical teachers [23].

2.4. E-learning in surgical training

The shortage of physicians including surgeons in many countries in Sub-Saharan Africa and in low and middle income countries in general, is estimated to be 0.056 physicians per 1000 population [16].

Medical and surgical education in Rwanda underwent several changes in the past years [16, 26]. Surgery training has been expended over time since 2005 when residency program started at University of Rwanda with the target of increasing of the specialist doctors in Rwanda. Prior this time, all Rwandan specialists were being trained abroad [16].

The dispersion of surgical residents across duty areas that are geographically different made e-learning more attractive to both trainers and trainees [27]. The e-learning was found to be equal and sometimes better than traditional learning when considering the skills and knowledge gained by students [12]. E-learning has an advantage of being accessed from anywhere and trainees can be assessed easily [28]. Despite the differences among the e-learning platforms, the latter is an

effective way of teaching as other methods of training [29]. Residency in Rwanda was further enhanced in 2012 when Human Resources for Health (HRH) program started with the objective of empowering residency program and since the start of this program surgery residents increased significantly from 2-6 residents to 20 surgical residents only in 2 years of its initiation [16].

E-learning showed to be less costly, more effective and more appreciated by surgical students in a study done by Kamal and Jerome in India [27, 30].

2.5. Moodle e-learning platform

Modular object-oriented dynamic learning environment (Moodle) is defined as “a learning platform designed to provide learners, educators, and administrators with a single robust, secure and integrated system to create personalized learning environment” which is a flexible and make users adaptive to learning by using even simple tools like cell phones, tablets or computers [9].

Moodle which can be used in different education activities by transmission of the contents from the lecturers to students, it goes beyond that and provides interactions between people [31]. From a systematic review done in 2007 that evaluated e-learning for medical education, Moodle was found to be the most used e-learning management system that at 25% from different studies evaluated (22, 23).

Moodle is perceived differently according to different universities. Carolina costa, *et al* showed among 278 students that the frequency of access to the Moodle platform monthly varies where the majority had low frequency of access. Ninety-three percent were able to access internet at home. Eight seven percent used the internet from university, opposed to 35% using internet from the public space[1]. Heraklion on the other hand in his study showed that students preferring online courses and booklets to hard copy courses and booklets was increasing yearly rising from 50% to 90% in one year [32].

In a study done at Melaka Manipal Medical College, the opinions of teachers were asked about e-learning. They found that 49.1% of staff up-load module contents. The majority held a positive opinion towards e-learning. The minority felt that e-learning should not replace traditional education [5]. Using a Likert scale questionnaire, Leonardo et al found that teachers got more student inquiries from the online course compared to the traditional lectures. Eighty-six percent of students felt that the online course was superior to teacher-centered expositive model [33].

Some studies have shown that Moodle can be a solution to the problem of faculty shortage, and e-learning can be cost effective to the student, since information is provided to student without any additional cost [34].

There are some challenges associated with e-learning especially in resource-limited countries which include slow speed of internet, poor video quality, and poor speed in downloading documents [34]. E-learning requires also high initial cost and programming expertise .[36] Courses delivered by e-learning need repetition especially in delivering information which is crucial like cardiac life support.[36] In a study done by Monireh Eskandari, participants reported that MOODLE platform operations are limited by low internet quality [35]. It has been shown that e-learning cannot replace traditional methods of education, and instead a blended learning model is favored.[37]. Moodle is recognized as an important tool in promoting successful teaching and learning in Malaysia [38].

CHAPTER III. METHODOLOGY

3.1. Study design

In this study, we used a mixed-method sequential explanatory design which has advantage of straightforwardness and exploring quantitative data with qualitative data [39] where in one part, quantitative, we used semi-structured questionnaire with Likert scale questions and where in the other part, qualitative, open-ended questions were asked to the participants through individual face-to-face in-depth interviews.

3.2. Selection of study participants

3.2.1. Inclusion criteria

The eligibility criteria include:

First year residents in Surgery and trainers in ten hospitals (**CHUK, CHUB, RMH, KFH, KIBUYE** Hospital, **KIBUNGO** hospital, **RWAMAGANA** Hospital, **RUHENGERI** Hospital **KIBOGORA** Hospital and **BUSHENGE** Hospital).

3.2.2. Exclusion criteria

No exclusion criteria

3.3. Study site

The study was conducted from ten teaching hospitals where surgery residents rotate during their academic trainings and these hospitals are **CHUK, CHUB, RMH, KFH, KIBUYE** Hospital, **KIBUNGO** hospital, **RWAMAGANA** Hospital, **RUHENGERI** Hospital **KIBOGORA** Hospital and **BUSHENGE** Hospital.

3.4. Sampling

All first-year residents in Surgery and all trainers/surgeons in ten hospitals were recruited in this study: during the period of October - November 2019 meeting inclusion criteria. This study used convenience sampling where all first year residents from all training sites were recruited

3.5. Sample size

The final size of our study sample was 36 participants with 23 residents and 13 trainers

3.6. Main outcomes

Expressed barriers and facilitators for the use of the Moodle online micro learning training model by both teachers and students.

3.7. Data Management

Quantitative data were collected using self-administered questionnaire. Data were entered in Epidata 3.1 and then exported to SPSS version 25 for analysis.

After the analysis of quantitative data, qualitative data collection started with individual in-depth interviews and field notes were taken as necessary. Answers to open-ended semi-structured questions were grouped according to different themes, codes, and then analyzed in the Atlas.ti software version 7.1.4.

The data have been collected in two different phases: in quantitative phase, which was the first phase, data were collected then analyzed and results were interpreted, then in the second phase, qualitative phase, all participants from quantitative phase were contacted for to explain and compliment the quantitative results.

At the end of the data collection, data were centered in the password-protected computer of the principal investigator; other copies were deleted. Data will be safely stored for a period of 5 years following the presentation of the project.

3.8. Data analysis

Quantitative data were analyzed using IBM SPSS version 25 for the sociodemographic characteristics of participants and answers given by participants on their attitudes towards using Moodle platform.

For qualitative data, thematic analysis is the type of analysis which was used for this study. Information and opinions collected from interviewees were recorded into transcripts in English. A codebook was developed to facilitate interpretation of responses provided by participants. The coding and analysis of the data was done using “Atlas.ti” software version 7.1.4.

Frequencies and percentages were reported for the response to each question in quantitative part.

The qualitative analysis answers were grouped according to the themes as quotations.

3.9. Ethical considerations

The consent form was signed by each participant prior to participation in the study.

3.9.1. Confidentiality

Confidentiality of participants was assumed throughout the research process where participants were assigned codes for identification protection.

All respondents were identifiable by a research ID number and their names did not appear at any step of analysis or publication of the results.

3.9.2. Informed consent

Participants were approached for consent by Principal investigator, who recruited and administered the consent form in English. Participants were asked to sign a consent form once agreed to participate.

3.9.3. Ethical approval

This study has been approved by the Institutional Review Board (CMHS/IRB) of College of Medicine and Health Sciences, University of Rwanda.

3.9.4. Conceptual framework: Visual model for our mixed-method sequential explanatory study

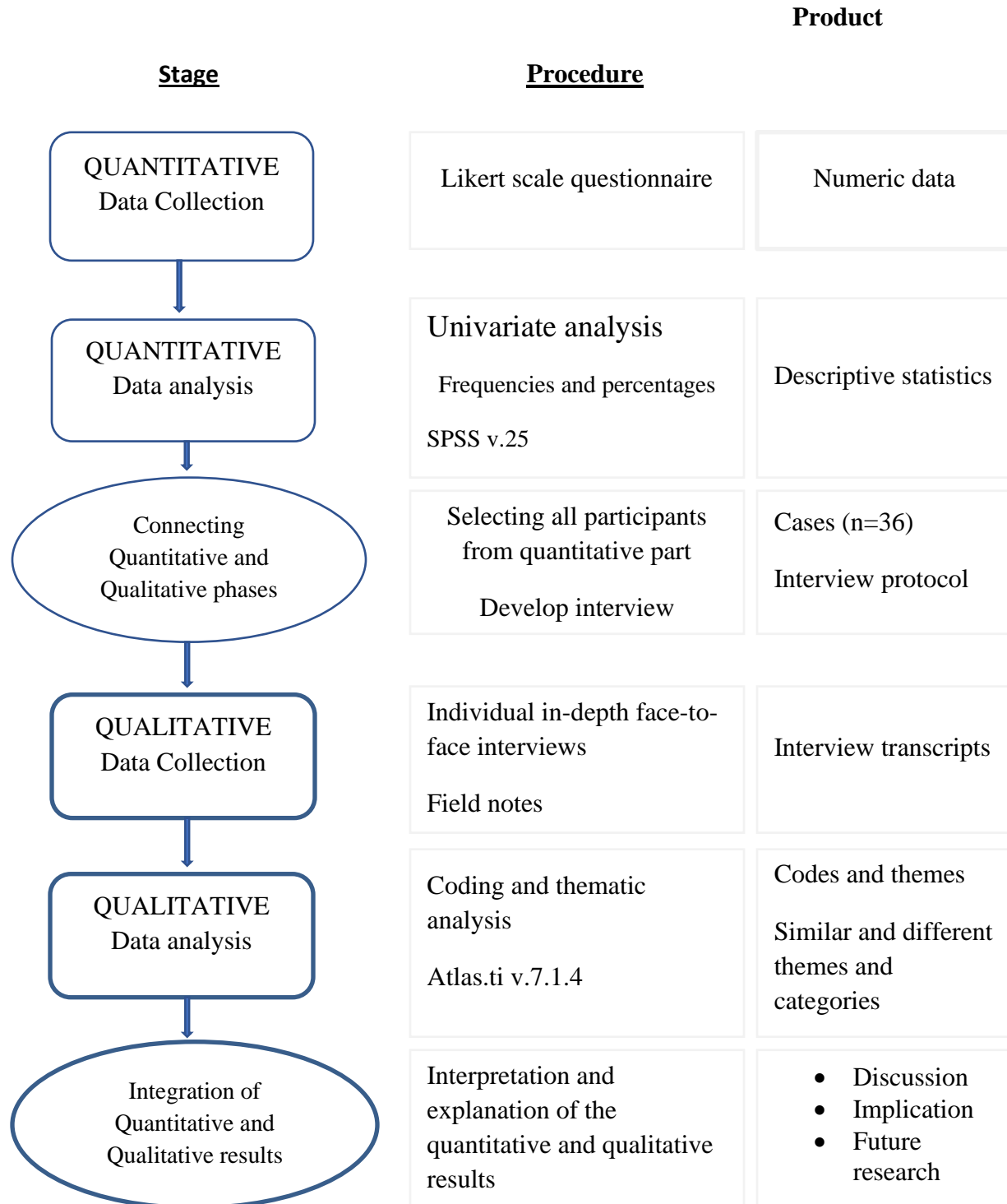


Figure 1: Conceptual framework: Adopted and modified from the conceptual framework model for mixed-method sequential explanatory study (19).

CHAPTER IV: RESULTS

The study was conducted on the 36 participants in total where among them 23 participants were trainees and 13 participants were trainers. The interviews were conducted in all teaching hospital sites where surgical residents do their rotations.

1. Respondents distribution per sites

Table 1: Hospital sites and e-learning system use frequency by study participants

| Variable | N | % |
|---|----------|----------|
| Trainees (n=23) | | |
| Training site | | |
| CHUK | 11 | 47.8 |
| CHUB | 1 | 4.3 |
| KFH | 3 | 13.0 |
| RMH | 3 | 13.0 |
| KIBUNGO | 1 | 4.3 |
| RWAMAGANA | 1 | 4.3 |
| KIBUYE | 1 | 4.3 |
| BUSHENGE | 1 | 4.3 |
| RUHENGERI | 1 | 4.3 |
| Of 5 lessons, how many times would you use Moodle? | | |
| 1 | 13 | 56.5 |
| 2 | 3 | 13.0 |
| 3 | 4 | 17.4 |
| 4 | 3 | 13.0 |
| Trainers (n=13) | | |
| Training site | | |
| CHUK | 4 | 30.8 |
| KFH | 2 | 15.4 |
| RMH | 2 | 15.4 |
| KIBOGORA | 2 | 15.4 |
| RUHENGERI | 1 | 7.7 |
| CHUB | 1 | 7.7 |
| KIBUNGO | 1 | 7.7 |
| Reason of not using Moodle | | |
| No expertise | 7 | 53.8 |
| Do not trust its efficacy | 5 | 38.5 |
| Time consuming | 1 | 7.7 |

Among the trainee respondents, 56% of them stated to use Moodle online learning only once in five lessons and 13% only can use Moodle system four lessons out of five lessons. Trainers

describe that the reasons they may not use Moodle system in teaching are lack of expertise in 53.8%, lack of trust in its efficiency in 38.5% and that it is time consuming in 7.7%.

2. Participants' attitudes towards use of Moodle platform in teaching

Table 2: Trainers' attitudes towards the use of Moodle online teaching/learning (n=13)

| Characteristic | Likert scale | n | % |
|--|-------------------|---|------|
| I have difficulties in uploading the files due to lack of internet | Strongly disagree | 2 | 15.4 |
| | Disagree | 2 | 15.4 |
| | Undecided | 6 | 46.2 |
| | Agree | 1 | 7.7 |
| | Strongly agree | 2 | 15.4 |
| I have experienced technical difficulties in uploading documents | Disagree | 2 | 15.4 |
| | Undecided | 7 | 53.8 |
| | Agree | 2 | 15.4 |
| | Strongly agree | 2 | 15.4 |
| Explanations on Moodle are easy | Strongly disagree | 1 | 7.7 |
| | Undecided | 7 | 53.8 |
| | Agree | 3 | 23.1 |
| | Strongly agree | 2 | 15.4 |
| Moodle is helpful to deliver many courses in short period | Undecided | 3 | 23.1 |
| | Agree | 5 | 38.5 |
| | Strongly agree | 5 | 38.5 |
| I would recommend Moodle system to other universities | Undecided | 2 | 15.4 |
| | Agree | 7 | 53.8 |
| | Strongly agree | 4 | 30.8 |
| Moodle platform facilitates communication with students | Undecided | 2 | 15.4 |
| | Agree | 9 | 69.2 |
| | Strongly agree | 2 | 15.4 |
| Demonstration is easy on Moodle compared to face-to-face | Disagree | 3 | 23.1 |
| | Undecided | 6 | 46.2 |
| | Agree | 3 | 23.1 |
| | Strongly agree | 1 | 7.7 |
| Moodle platform is easy way to interact with students | Undecided | 3 | 23.1 |
| | Agree | 7 | 53.8 |
| | Strongly agree | 3 | 23.1 |
| Moodle platform makes easy to assess students in assignments | Disagree | 3 | 23.1 |
| | Undecided | 4 | 30.8 |
| | Agree | 3 | 23.1 |
| | Strongly agree | 3 | 23.1 |
| Do you find active participation on Moodle than face-to-face | Undecided | 7 | 53.8 |
| | Agree | 3 | 23.1 |
| | Strongly agree | 3 | 23.1 |
| It easy to grade students on Moodle platform | Undecided | 4 | 30.8 |
| | Agree | 8 | 61.5 |
| | Strongly agree | 1 | 7.7 |

When trainers were asked about whether they have difficulties with uploading files due to lack of network, 23% agreed while 46% were undecided. Thirty eight percent of the trainers agreed that the explanations on Moodle are easy and 77% of them agreed that Moodle is important in delivering courses in short time.

Eighty five percent of the trainers agreed that they would recommend Moodle system to other universities and 84% of the trainers agreed that Moodle platform facilitates communication with students.

Only 30% of the trainers agreed that demonstration on Moodle is easy in comparison with face to face teaching. Ten of thirteen trainers agreed that Moodle platform is an easy and simple way to communicate with trainees. Six of the thirteen trainers agreed that the assessing the assignments given to students are easy on Moodle while three of the remaining disagreed.

Six of the trainers (46%) agreed that they find the active participation on Moodle than on face to face and seven remaining were undecided. Nine trainers (69%) agreed that it is easy for them to grade students on Moodle platform.

Table 3: Trainees’ attitudes towards the use of Moodle online teaching/learning (n=23)

| Characteristic | Likert scale | n | % |
|---|-------------------|----|------|
| I experience the difficulties in uploading/downloading the course materials on the Moodle platform due to lack of internet. | Strongly disagree | 2 | 8.7 |
| | Disagree | 13 | 56.5 |
| | Undecided | 4 | 17.4 |
| | Agree | 4 | 17.4 |
| I have experienced technical difficulties in uploading resources (documents, video, web link, images, etc) using the Moodle platform | Strongly disagree | 4 | 17.4 |
| | Disagree | 5 | 21.7 |
| | Undecided | 6 | 26.1 |
| | Agree | 7 | 30.4 |
| I usually need more explanation from the lecturer or colleagues than what is given on the Moodle platform. | Strongly agree | 1 | 4.3 |
| | Disagree | 1 | 4.3 |
| | Undecided | 9 | 39.1 |
| | Agree | 10 | 43.5 |
| I am more comfortable practicing on a human being after a face-to-face practice session with my teacher, compared to a learning the same lesson on the Moodle platform. | Strongly agree | 3 | 13.0 |
| | Disagree | 8 | 34.8 |
| | Undecided | 7 | 30.4 |
| | Agree | 6 | 26.1 |
| It is easier to express myself on the Moodle platform than in a face-to-face teaching environment. | Strongly agree | 2 | 8.7 |
| | Strongly disagree | 1 | 4.3 |
| | Disagree | 11 | 47.8 |
| | Undecided | 3 | 13.0 |
| It is more difficult to complete assignments on the Moodle platform than with traditional face-to-face teaching methods | Agree | 5 | 21.7 |
| | Strongly agree | 3 | 13.0 |
| | Strongly disagree | 5 | 21.7 |
| | Disagree | 14 | 60.9 |
| | Undecided | 3 | 13.0 |
| | Agree | 1 | 4.3 |

| | | | |
|---|----------------------------|----|------|
| It takes less time to use the Moodle platform to complete lessons than it does to attend live courses | Strongly disagree | 1 | 4.3 |
| | Disagree | 5 | 21.7 |
| | Undecided | 5 | 21.7 |
| | Agree | 3 | 13.0 |
| | Strongly agree | 9 | 39.1 |
| Are you satisfied with the way Moodle is updated regularly? | Strongly disagree | 2 | 8.7 |
| | Disagree | 1 | 4.3 |
| | Undecided | 5 | 21.7 |
| | Agree | 10 | 43.5 |
| | Strongly agree | 5 | 21.7 |
| What is made easier by the Moodle platform for your learning process compared to live teaching? | Communication with teacher | 15 | 65.2 |
| | Exchange with colleagues | 8 | 34.8 |

When trainees were asked if they experience difficulties in uploading or downloading the teaching materials from Moodle platform, 65% of them disagreed and 17% agreed. Thirty four percent of them agreed that they have experienced technical difficulties while uploading the resources. Thirteen of the twenty three trainee participants (56%) agreed that they usually need more explanations from lecturers or colleagues than what is given on Moodle platform and other 39% were undecided.

Only 8 of trainee participants (35%) agreed that they are more comfortable practicing on human being after face to face practice with the teacher compare to when they used Moodle platform while 35% disagreed. Fifty percent of the trainees disagreed it is easy for them to express themselves on Moodle platform than on face to face teaching and 34% agreed with it.

Only one trainee participant agreed that it is more difficult to complete the assignment on Moodle platform than with face to face while 19 participants (82%) disagreed with the statement. Twelve participants (52%) agreed that it takes less time to use Moodle platform to complete lessons than it does with face to face while 25% disagreed.

Fifteen participants (65%) are satisfied with the way Moodle platform is updated regularly, while 3 of the remaining disagree with it. Sixty five percent of trainees said that Moodle made easy their communication with lecturers while other 35% said that Moodle made easy the exchange with colleagues

3. Participants opinions on cost effectiveness comparison between face-to-face and e-learning (Moodle) systems

When trainee participants were asked about the comparison of cost effectiveness between Moodle platform and face to face teaching, all participants mentioned that Moodle platform is less expensive compared to traditional face to face teaching.

“Attending courses by Moodle platform is very cheap as it doesn’t require someone to move from his rotation site to the study site as it is required for face to face, it just needs regular internet connection which we need in our daily life whether on Moodle or not” [Participant 14, trainee]

“My point of view here is that some times to meet a lecturer requires a ticket while for Moodle it is only requires internet and can use it even in my bed room” [Participant 2, trainee]

“Moodle platform is way better on cost effectiveness” [Participant 12, trainee]

“Moodle platform is cost effective than attending face to face courses” [Participant 9, trainee]

However, one participant mentioned that the difference in cost effectiveness of Moodle platform compared to face to face teaching system is not significant.

“I could say that the costs are almost the same because the internet we use looks like weak and spend more time loading the contents. But the cost would be even low with Moodle because you can access it wherever you are” [Participant 3, trainee]

4. Benefits of using Moodle

4.1. Cost effectiveness and time management

Most of the participants mentioned that the benefits of using Moodle platform in teaching is that it is very cheap and with good time management when comparing it to face-to-face teaching.

“... the use of Moodle is cheaper, it doesn’t take long time to get resources” [Participant 13, trainee]

“Using Moodle is cost effective, time management, daily and timely course updates” [Participant 9, trainee]

“The benefit is that it is not time consuming and in terms of money it less expensive compared to moving looking for the lecturer” Participant 2, trainee]

“It is cheap to students, Accessibility to material is easy worldwide” [Participant 19, trainer]

“It is time serving for learning of residents, Monitoring of residents participation is easier and less requirement of infrastructures like lectures rooms” [Participant 21, trainer]

4.2. Flexibility

Many participants mentioned about the flexibility of Moodle platform in teaching compared to face to face

“Yes, I can attend the course (online) wherever I get time, I can attend the course anywhere I can be” [Participant 11, trainee]

“It is friendly, it alleviates the burden of attending live face to face courses while you are away from main teaching hospital” [Participant 10, trainee]

“With Moodle platform, you take your time to understand things” [Participant 4, trainee]

4.3. Easy access to course materials

Some participants stated that while using Moodle platform, it is easy to access the teaching materials

“Easy access of the course contents when using Moodle platform” [Participant 22, trainer].

“It is easier to upload documents and download these from teacher” [Participant 5, trainee].

However, two participants mentioned that face to face teaching has benefits over e-learning system because in face to face teachings, students can get the time discuss with other students or with their lecturers.

“Mass education, obliges students to respond on time (time management), free discussion with the lecturer” [Participant 3, trainee]

“Face to face make you to ask more questions as long as you don’t understand well” [Participant 4, trainee]

One third (30%) of trainer participants highlighted that they never used Moodle platform in their teaching activities, so they cannot know the benefits of using it. For example, one trainer said:

“I never use Moodle system but I think that it is good way to communicate and to follow up students on the site they are rotating” [Participant 18, trainer]

“I have not used Moodle in Rwanda, so I don’t know its benefits” [Participant 23, trainer]

5. Disadvantages or weaknesses of using Moodle

5.1. Inadequate evaluation and follow up of students

Trainer participants highlighted that one of the disadvantages of using Moodle it is difficult to evaluate regular participation of students in e-learning platform in their classes and examination and to evaluate the performance or quality of the students.

“I don’t know how students are consulting the course on Moodle” [Participant 22, trainer]

“I think that the disadvantage of Moodle platform is that you cannot evaluate the real performance of students” [Participant 18, trainer]

“You can’t know the quality of reading of students” [Participant 17, trainer]

5.2. Lack or poor internet connectivity

Participants mentioned that poor internet or inability to use Moodle platform offline is one of the disadvantages of using it.

“Some residents may not have access due to no or inconsistent internet connection. Therefore, mentorship by the trainers will be affected” [Participant 21, trainer]

“Inability to be accessed offline and Delay of responses from lecturers” [Participant 14, trainee]

“The disadvantage is when there is a poor internet you can't access it properly....” [Participant 2, trainee]

“Difficulties uploading course and assignments, competing with deadline for assignments” [Participant 9, trainee]

“Among the disadvantages of using Moodle platform, there is a need of network, instability of University of Rwanda websites, and inability to use offline” [Participant 1, trainee]

5.3. Lack of training and experience

Participants highlighted that there is lack of training to the users of Moodle platform both trainers and trainees and they find this as the disadvantage in using this e-learning system.

“.....Inability to communicate especially when you are not fully trained” [Participant 2, trainee]

“No training gained before, lack of internet, auto-lock to deadline in sub mission” [Participant 7, trainee]

“Needs more lecturer involvement, needs internet and PC literacy, needs explanation on how to use” [Participant 6, trainee]

5.4. Lack of satisfaction in explanations from trainers

Some participants mentioned that there is poor interaction between students and lecturers which results in lack of deep explanations from trainers on certain topics.

“It is not easy to get explanation of the lectures uploaded on Moodle as it is for face to face lectures” [Participant 13, trainee]

“Provide less contact by teacher and so less explanation” [Participant 5, trainee]

One of the participants mentioned that the weakness of Moodle platform is that the training system does not provide enough time for students to access the Moodle platform otherwise, there are no disadvantages of using it.

“The weakness resides in the teaching system if only residents can get a day per week for reading, then no disadvantages for the Moodle platform” [Participant 12, trainee]

6. Suggestions to improving current Moodle platform

The majority of participants suggested that the users either lecturers or students need to be trained to use this e-learning platform so that they can all benefit from its use.

“To give teaching sessions to the users on how appropriately use the platform, make the Moodle users friendly,” [Participant 3, trainee]

“Training of how to use the Moodle platform for trainers and trainees” [Participant 21, trainer]

“Regular sessions of teaching on how to use Moodle platform” [Participant 2, trainee]

“Add some explanatory video and train participant about its use” [Participant 14, trainee]

“To make its users friendly for all trainers (surgeons) because it is a good tool for teaching” [Participant 19, trainer]

Other participants suggested enhancing the Moodle platform and increasing its use so that it can be used for all the teaching activities at the university.

“I suggest populating Moodle to all faculties for future use” [Participant 21, trainer]

“My suggestion is that all lecturers at the University of Rwanda can use Moodle in their teaching activities” [Participant 13, trainee]

CHAPTER V: DISCUSSION

Moodle, as platform for distance learning, is currently playing a major role as a teaching tool in different teaching institutions especially in the University of Rwanda where this e-learning platform is highly emerging. The study was conducted to highlight barriers and facilitators of this Moodle platform to its use as an E- learning training model for first year residents in surgery department, University of Rwanda and in addition to those barriers, the challenges that either student or lecturers are facing while using this Moodle platform.

MOODLE platform at the University of Rwanda is being used to make easy access to teaching materials like power point slides and other types of documents, clinical case discussions, videos and audio/video recorded lectures, links of readings like websites, articles and books, and the discussions between students and lecturers.

The students who were described as trainees and lecturers who were described as trainers in this study were asked using a Likert scale based questionnaire on their perceptions of the knowledge acquired through this model, availability and quality of teaching material uploaded on Moodle platform.

Only 17% of the trainer participants agreed to have difficulties in uploading or downloading the teaching materials from Moodle and among the trainers 23% of the participants agreed to have had difficulties with uploading materials however, 46% of them had reservations or were undecided about it and this might be attributed to the quality of internet in the low and middle income settings as described by Frehywot et al. [11,12]. In our study, only 13% have high frequency in using Moodle platform and 30% have an intermediate frequency in using Moodle and these results are the same to the findings from Carolina et al who reported that 7% of the students have high access and 41% hve intermediate access [1].

The majority of the trainees revealed that it is easy to express themselves and to complete lessons on Moodle platform and that it takes less time when compared to face to face course teachings and this can reflect the usefulness of this tool in the cademic activities and that the tool might have been positively accepted.

The majority of the trainers are satisfied with Moodle platform where 77% of them agreed that Moodle is important in delivering courses in short time and this is accordance with the findings from the study done at Melaka Manipal Medical College, the opinion of teachers where the majority of the participants

had positive opinions toward e-learning platform and to the finding from the study done by Teresa et al. [5,16].

Among the trainers, 6 of 13 trainers agreed that they find the active participation on Moodle than on face to face and seven remaining were undecided and this finding is almost the same to the findings from the study done by Leonardo et al who found that teachers received more inquiries and participation of students more from online courses compared to face to face lectures [10].

Moodle e-learning platform was recognized by all the participants as less expensive compared to face-to-face teaching because it does not require any other additional expenses from both students and lecturers like travel and living expenses and even better regarding time management and these results reinforce the similar findings from other studies [5, 10]. Participants also mentioned flexibility as one the benefits of Moodle where they can access the teaching materials anytime, they are available. Easy access to teaching materials was another benefit highlighted by many participants by either downloading or uploading them at any time they need to do so and this can be justified by the way that residents and their lecturers become available at different occasions according to their working areas or rotations in different teaching hospitals and Moodle based teaching can be flexible in accessing the teaching material.

Even though Moodle was appreciated generally, participants expressed their disadvantages and weakness that they met using Moodle e-learning platform that include the inadequate evaluation and follow up of students when using this platform where the trainers revealed that it is not easy to know the quality and real performance of their students. The internet quality across all settings was the other disadvantage that was mentioned by the participants and the inability to access Moodle offline was the weakness of the platform and considering the conditions in which the students and lecturers normally live in.

Lack of training and experience from both trainers and trainees was another disadvantage that limits the excessive use of the platform and for the students, the inability to directly communicate with the lecturers to seek for more clarifications and explanations is the challenge that was expressed by the trainees this was similar to suggestions from other studies [5, 17, 18]. There is necessity of standardized and continuous training system which was suggested by all participants for strengthening the successful use of Moodle in surgical residents.

There is a need of a large additional study, evaluating the effectiveness of Moodle e-learning model on all users at the University of Rwanda so that it can be scaled up to all other departments at the university of Rwanda as it is less time and money demanding.

CHAPTER VI. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

Moodle is well perceived by the lectures and trainees in surgical trainings according to the participants of our study. Major barriers to the use of Moodle are lack of training for its users, inadequate evaluation of students by their lecturers, lack of good internet connection and inadequate communication between students and lecturers.

However, Moodle is very important compared to the usual face to face teaching system as it is used with less time and resources use for the users and teachings can be delivered to many students at their normal training sites as residents are scattered all around the country in different hospitals. Moodle can be a better solution to barriers met in the traditional teaching which is time and money consuming if its users are timely trained. Some lecturers in surgical department do not know the existence of Moodle platform and therefore do not use this e-learning platform model.

5.2. Recommendations

There is a need for periodic and sustainable formal training sessions and workshops for the users of e-learning so that Moodle platform can be scaled up and replace the traditional classroom teaching.

There is a need for advocacy on the strengthening the internet connectivity among the university staff and surgical residents at their rotation sites so that they can easily access teaching materials on Moodle.

To sensitize the existence of Moodle platform among lecturers and trainers of surgical residents and encourage them to frequently use it.

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ANNEXES

1. Data collection tools

1.1. QUESTIONNAIRE FOR TRAINERS (Surgeons)

I. Identification

- No: Teacher

- Site of clerkship: CHUK CHUB KFH RMH KIBUNGO RWAMAGANA
RUHENGERI KIBUYE BUSHENGE KIBOGORA

II. Barriers and facilitators

1. How often do you use Moodle online learning to teach surgery to surgical residents? Of 5 lessons, how many times would you use Moodle? (Circle the corresponding number)

0 1 2 3 4 5

2. If you don't use it for all lessons, what is the reason of not using it?

- No expertise
- Time consuming
- Do not trust its efficiency
- No connectivity

Please circle your response to the following statements based on your level of agreement or disagreement with the statement.

3. I experience difficulties in uploading course materials on the Moodle platform due to lack of internet.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.

5. Strong agree

4. I have experienced technical difficulties in uploading resources (documents, video, weblink, images, etc) using the Moodle platform.

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree

5. The explanation of courses on the Moodle platform Are easy

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree.

6. The Moodle platform is helpful to deliver many courses in a short period of time.

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree

7. I would recommend the Moodle platform for e-learning at other universities.

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree

8. The Moodle platform facilitates good communication with students.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree.

9. Demonstration on the Moodle platform is easier than traditional face-to-face teaching.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree

10. The Moodle platform is an effective way to interact with students.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree.

11. The Moodle platform makes it easy to assess the students' level of participation on assignments.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree.

12. Do you find this participation more active than in the traditional face-to-face approach?

1. Strong disagree.
2. Disagree.

- 3. Undecided.
- 4. Agree.
- 5. Strong agree.

12. It is easy to grade students using the Moodle platform.

- 1. Strong disagree.
- 2. Disagree.
- 3. Undecided.
- 4. Agree.
- 5. Strong agree.

13. In summary could you give us the benefits you find by using moodle?

14. in summary could you give us the disadvantages or weakness you find by using moodle?

.....
.....
.....

15. What could you suggest to improve the current moodle platform?

1.2. QUESTIONNAIRE FOR TRAINEES (Residents)

I. Identification

- No:Trainee

-**Surgical Resident**

- **Site of clerkship:** CHUK CHUB KFH RMH KIBUNGO RWAMAGANA
RUHENGERI KIBUYE BUSHENGE KIBOGORA

II. Barriers and facilitators

1. In all courses for how many do you use the Moodle platform?

1 2 3 4 5

2. I have difficulty uploading resources on the Moodle platform due to lack of internet.

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree

3. I have experienced technical difficulties in uploading resources (documents, video, weblink, images, etc) using the Moodle platform.

1. Strong disagree.

2. Disagree.

3. Undecided.

4. Agree.

5. Strong agree.

4. I usually need more explanation from the lecturer or colleagues than what is given on the Moodle platform.

1. Strong disagree.

2. Disagree.

3. Undecided.
4. Agree.
5. Strong agree.

5. I am more comfortable practicing on a human being after a face-to-face practice session with my teacher, compared to a learning the same lesson on the Moodle platform.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree.

6. It is easier to express myself on the Moodle platform than in a face-to-face teaching environment.

1. Strong disagree.
2. Disagree.
3. Undecided.
4. Agree.
5. Strong agree.

7. Could you make a statement on a comparative cost between attending face-to-face course versus moodle platform?

8. What is made easier by the Moodle platform for your learning process compared to live teaching?

- communication with teacher
- exchange with colleagues

9. It is more difficult to complete assignments on the Moodle platform than with traditional face-to-face teaching methods.

1. Strong disagree.

- 2. Disagree.
- 3. Undecided.
- 4. Agree.
- 5. Strong agree

10. It takes less time to use the Moodle platform to complete lessons than it does to attend live courses.

- 1. Strong disagree.
- 2. Disagree.
- 3. Undecided.
- 4. Agree.
- 5. Strong agree

11. Are you satisfied with the way moodle is updated regularly?

- 1. Strong disagree.
- 2. Disagree.
- 3. Undecided.
- 4. Agree.
- 5. Strong agree.

12. In summary could you give us the benefits you find by using moodle?

13. In summary could you give us the disadvantages or weakness you find by using moodle?

.....
.....
.....

14. What could you suggest to improve the current moodle platform?

2. INFORMED CONSENT FORM

PART I: INFORMATION SHEET

RESEARCH:” Barriers and facilitators to the use of Moodle platform as an online micro learning training model for first year residents in Surgery department at the University of Rwanda”

Principal investigator: Dr. UMUTONIWASE Bernard, Senior resident in general surgery
I am conducting the above-mentioned research at University of Rwanda

The aim of this study is to evaluate the barriers, facilitators, and opportunities for e-learning (Moodle platform) in training of first year surgical residents in Rwanda.

- Participation in this study is out of your own free will. Your participation will not have any impact about your job in surgical postgraduate training. You may terminate participation at any time with no consequences whatsoever.
- You will be asked a series of question using a questionnaire form and interviews.
- The participant is free to refuse to consent for his/her participation in this study and refusal to participate will not affect his/her title or job.
- The study results will be published, and policy makers informed for possible use of information to improve quality of education in surgery at University of Rwanda.

PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I (or witness) have had the opportunity to ask questions about it and any questions that I have asked, have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant/Witness.....

Signature of Participant/Witness

Date/..... /..... (Day/month/year)

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that Filling a Questionnaire will be done

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Name of Researcher/person taking the consent.....

Signature of Researcher /person taking the consent.....

Date...../...../..... (Day/month/year)

Researcher contact:

Dr. UMUTONIWASE Bernard

Tel: + 250 783644976

E-mail: mutonibernardo@gmail.com

If you have questions about your rights in the study, contact

CMHS / University of Rwanda

Directorate of Research, Technology Transfer and Consultancy

PO Box 3286 Kigali


E-mail : esearchcenter@ur.ac.rw

Tel: + (250) 788563312

Chairperson - IRB, CMHS / University of Rwanda

Prof Kato J. NJUNWA Tel 0788490522

3. IRB approval



UNIVERSITY of
RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES
DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 5th/December/2019

Dr Bernard UMUTONIWASE
School of Medicine and Pharmacy, CMHS, UR

Approval Notice: No 532/CMHS IRB/2019

Your Project Title *“Barriers and Facilitators to the Use of Moodle platform as an online Micro Learning Training Model for First Year Residents in Surgery Department at the University Of Rwanda”* has been evaluated by CMHS Institutional Review Board.

| Name of Members | Institute | Involved in the decision | | |
|-----------------------------|----------------------|--------------------------|--------------|-------------------------------|
| | | Yes | No (Reason) | |
| | | | Absent | Withdrawn from the proceeding |
| Prof Kato J. Njunwa | UR-CMHS | X | | |
| Prof Jean Bosco Gahutu | UR-CMHS | X | | |
| Dr Brenda Asimwe-Kateera | UR-CMHS | X | | |
| Prof Ntaganira Joseph | UR-CMHS | X | | |
| Dr Tumusiime K. David | UR-CMHS | X | | |
| Dr Kayonga N. Egide | UR-CMHS | X | | |
| Mr Kanyoni Maurice | UR-CMHS | | X | |
| Prof Munyanshongore Cyprien | UR-CMHS | X | | |
| Mrs Ruzindana Landrine | Kicukiro district | | X | |
| Dr Gishoma Darius | UR-CMHS | X | | |
| Dr Donatilla Mukamana | UR-CMHS | X | | |
| Prof Kyamanywa Patrick | UR-CMHS | | X | |
| Prof Condo Umutesi Jeannine | UR-CMHS | | X | |
| Dr Nyirazinyoye Lactitia | UR-CMHS | X | | |
| Dr Nkeramihigo Emmanuel | UR-CMHS | | X | |
| Sr Maliboli Marie Josee | CHUK | X | | |
| Dr Mudenge Charles | Centre Psycho-Social | X | | |

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 5th December 2019, **Approval has been granted to your study.**

Please note that approval of the protocol and consent form is valid for **12 months**.

Email: researchcenter@ur.ac.rw

P.O Box 3286 Kigali, Rwanda

www.ur.ac.rw

You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 5th December 2019

Expiration date: The 5th December 2020


Professor GAHUTU
Chairperson Institutional Review Board
College of Medicine and Health Sciences, UR



Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate Studies, UR