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## RESEARCH ARTICLE

### The Responses of Rural Learner Nurses to Virtual Learning in a COVID-19 Era

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#### Abstract:

#### Background:

The COVID-19 pandemic resulted in many universities suspending their academic activities, making virtual learning an option for saving the disrupted academic year. The pandemic presented an opportunity to assess the implementation of virtual learning at this university, thus forcing rural-based universities to enhance their learning management system, including their clinical disciplines. This paper explores the use of virtual learning amongst learner nurses in a rural-based university by following the el-CDDO framework.

#### Methods:

A quantitative descriptive design was applied to describe the barriers experienced to virtual learning in a rural university. The purposive convenience sampling method was used to select learner nurses from the Faculty of Healthcare Sciences. An electronic survey questionnaire with both open and closed-ended questions sent via WhatsApp messenger was used to collect data. Data were analyzed using descriptive statistics with SPSS version 26.

#### Results:

The el-CDDO components affected in the study included the Context, Delivery, and Outcomes of virtual learning in a rural-based university. The Context demonstrated geographically disadvantaged learner nurses, which affects virtual learning delivery. Thus, the Outcomes included various barriers to virtual learning, such as weak networks for connecting to Blackboard, the lack of ICT facilities, such as laptops and tablets, by learner nurses, a lack of skills for using Blackboard, and ageing academics.

#### Conclusion:

The study findings provide a baseline reference for future digital health in the clinical area and the use of virtual learning in a rural-based university. Though we noted complex challenges such as the lack of gadgets, our findings provide a significant contribution to the planning for virtual learning in universities and the use of digital health care in the clinical area. Addressing the virtual learning barriers discussed in this paper will be a significant step in equipping learner nurses with digital knowledge and skills as future healthcare professionals. There is a need to develop strategies to enhance virtual learning in rural-based universities to ensure future digital health.

**Keywords:** Barriers, Virtual learning, Online learning, COVID-19, Perceptions, Nurses.

#### Article History

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## 1. INTRODUCTION

The progressive global impact of COVID-19 resulted in many countries, such as the United Kingdom, India, China, France, Italy, New Zealand, Poland, and South Africa, implementing the world's largest and most restrictive mass quarantines. It included national lockdowns as a control measure to detect and test potential COVID-19 victims [1, 2]. According to Hendricks [3], the global lockdown of education institutions caused a significant (and likely unequal) interrup-

tion in the learner nurses' learning, a disruption in internal assessments, and the cancellation of public assessments. Even with the interruption of academic activities, the universities were obliged to honour their undertaking of educating the community with a proper completion plan for the 2020 academic year. The transition from traditional face-to-face to online learning was a significant step for many universities worldwide to ensure the continuity of the teaching, learning, and assessment processes – through online learning [4]. The Department of Higher Education and Training of South Africa (DHET) [5] describes “online learning” or “virtual learning” as a “digitally supported, digitally dependent, internet supported

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and dependent, and fully online” learning process.

Virtual learning in many developed countries is a well-established practice that has helped those countries adapt to the current pandemic demands [6]. But, for many universities, including rural-based universities, online learning is a promising avenue to explore due to its obvious benefits - providing the opportunity for a variety of choices and increasing self-learning for learner nurses allowing them to take more responsibility for their learning [7 - 9], which in the current Covid-19 pandemic, becomes relevant for discussion. Online learning provides learner nurses with easier and more effective access to a wider variety and greater quantity of learning resources, utilizing technology – regardless of the learner nurses’ geographical locations [10 - 12]. According to O’Doherty *et al.* [8], the transition from conventional classroom learning to virtual learning is not simple since the virtual learning process presents different barriers. For example, Naeem and other scholars [13, 14] questioned the effectiveness of online learning in health education, arguing that online learning is ineffective, especially since certain health science disciplines require clinical teaching or practice dynamics. Some authors [10 - 12] believe that a lack of motivation and skills related to the use of Information and Communication Technology might further render online learning ineffective in health disciplines such as nursing, which reported online learning challenges experienced by learner nurses from low-income families [10]. Learner nurses from low-income families in the United States were unprepared for a sudden shift to online learning due to difficulties finding off-campus housing at short notice and losing access to campus-based healthcare learning facilities [11]. Naeem *et al.* [13] further reported that more than 200,000 learner nurses in the United Kingdom had signed a petition demanding refunds of their tuition payments – claiming that online instruction is not what they paid for.

The challenges with online teaching implementation were also reported in Tunisia - the union boycotted the online platforms after labelling them as discriminatory [12]. Macupe [15] reported that most South African universities, especially those in rural areas, are not ready to transition to online teaching. This is because only a few privileged learner nurses will benefit, while the majority from poor, marginalized and living in remote rural areas would not benefit. Learner nurses’ from different universities in South Africa might further be disadvantaged by difficulties experienced in accessing online learning [14]. For example, Rakoma’s [11] study concluded that the two historically disadvantaged universities were not conducive to offering virtual learning because rural-based universities presented many challenges for the learner nurses. A lack of structural support that included the unavailability of community centres and internet cafés and the high costs of data bundles are primary barriers to online learning. Understanding the challenges experienced by the learner nurses concerning virtual learning will improve nursing education training by incorporating digital learning into the curriculum development and its competencies. Addressing the barriers to virtual learning will significantly contribute to improved clinical learning in rural healthcare settings, especially since learner nurses will have access to scientific learning materials such as

simulated internet videos and images. Thus, learner nurses can complete their undergraduate degree by being digitally equipped to function in the nursing profession across the globe. Technologically advanced graduates can apply their digital skills to improve their nursing practice to avoid being replaced by humanoid robots [16, 17].

According to Booth [18], there is a need for the nursing profession to develop adaptation strategies for future digital health, including informatics in undergraduate training. To our knowledge, this paper responds to the desired digital health needs by providing a baseline reference for using technological skills in the clinical area. Learner nurses are future healthcare professionals in the clinical area, and addressing the virtual learning barriers as discussed in this paper, is a significant step toward equipping them with digital knowledge and skills. Learner nurses are critical stakeholders in the use of digital health in the clinical area, which could impact the future quality of service delivery, such as electronic record keeping. Our paper focuses on learner nurses from a rural-based university in the Limpopo Province. We question the readiness of the learner nurses within the Faculty of Healthcare Sciences regarding their online learning during the COVID-19 pandemic, the paper reports on the response of the healthcare learner nurses regarding virtual learning at a rural-based university.

The study has adopted the E-learning Context, Design, Delivery, and Outcomes framework (CDDO) to report on the response of the healthcare learner nurses regarding their virtual learning at a rural-based university. Regmi and Jones [7], the pioneers of the framework, describe the outlined six major components: a) potential influencers, b) institutional barriers or enablers, c) learners or instructors – barriers or enablers, d) delivery mechanisms, e) potential outcomes and f) impact under three broad categories, *i.e.*, institutional policy context, instructional design and delivery, and learning outcomes (improved achievements and learning engagement; developing a sense of community) as significant to studying the e-learning of the Health System Education. The framework is relevant to the paper as it focuses on making e-learning for Health System Education effective from the perspective of the learners, the instructors and the healthcare professionals. This framework sufficiently maps the connections between e-learning and its outcomes, reflecting the learning context, potential influencing factors, reported enablers, barriers, and delivery mechanisms associated with instructional design and delivery [7]. This paper reports on the responses of healthcare learner nurses regarding virtual learning at a rural-based university.

## **2. MATERIALS AND METHODS**

### **2.1. Study Design**

A descriptive quantitative design was used to accurately describe the learner nurses’ characteristics for utilising virtual learning at a rural-based university during the COVID-19 pandemic [19]. The descriptive design allowed the authors to provide detailed descriptive information about the responses to online learning received from the learner nurses’ reflecting their perspective during the COVID-19 pandemic as recommended by the el-CDDO framework. Following the

components of the framework, the paper identified and described the perceived barriers to virtual learning from the learner nurses' perspective within the Faculty of Healthcare Sciences at a rural-based university.

**2.2. Population and Sampling**

The CDDO framework outlines that the e-learning of healthcare System Education could be implemented effectively when studying the perspective of learners and health instructors [7]. The paper's target population was only 1.490 healthcare learners registered at a rural-based university for the 2020 academic year. The Slovin formula for the calculation of sample size was used to obtain a sample size of 366 from the 1490 learner nurses. Using registration criteria (as inclusion criteria), undergraduate learner nurses registered for the 2020 academic year and, due to their exposure to the learning management system, were purposively and conveniently sampled to participate in the study. Unregistered learner nurses for the 2020 academic year were excluded since they did not have formal online sessions [19]. Non-probability purposive convenience sampling was used to select the learner nurses who were available to participate in the study electronically during the Covid-19 pandemic lockdown period.

**2.3. Data Collection**

A self-developed online survey questionnaire with twenty-one both open and closed-ended questions was sent for data collection over four weeks to the learner nurses as a link using an email system and WhatsApp messenger [20]. The selection of the data collection variables was based on the six components of the el-CDDO framework. To ensure that all learner nurses could access the link, the learner nurses' leadership, such as class representatives and association members, voluntarily helped distribute the link to all the learner nurses within the faculty. The English written survey questionnaire contained demographic questions and questions relating to the use of Information and Communication Technological resources like laptops and smartphones for learning.

**2.4. Data Analysis**

Data analysis was done using the descriptive statistics method of data analysis using SPSS version 26 [21]. Descriptive statistics helped the authors organize and summarize the findings using frequency distributions such as percentages and pie charts [21].

**3. RESULTS**

**3.1. Section A**

**3.1.1. Geographical Origin of Respondents**

The el-CDDO framework listed the context as one of the components significant to the effective implementation of virtual learning [7]. The paper took into consideration the context for virtual learning – a rural-based university whose responses demonstrated that the majority of learner nurses (246; 67.2%) were originally based in deep rural areas, with 120 (32.7%) learner nurses based in urban areas. Fig. (1) below demonstrates the geographical origin of these learner nurses.

**3.1.2. Learner Nurses' Access to the Internet**

Accessibility of the Internet to the learner nurses represents the Delivery component of the el-CCDO framework [7]. The learner nurses were asked about internet accessibility during the covid-19 lockdown period when they were outside the university. Only 71 (19%) indicated that they could access the Internet in their different respective residential areas. While most learner nurses (156, 43%) were unsure about the accessibility of the Internet while being at home. Whereas 139 (38%) specified that they do not have access to the Internet while away from the university. These responses indicate that the delivery and use of virtual learning for learner nurses at a rural-based university is very low and need to be relooked at. Another component that was studied is the type of technological devices used by the learner nurses for accessing virtual learning.

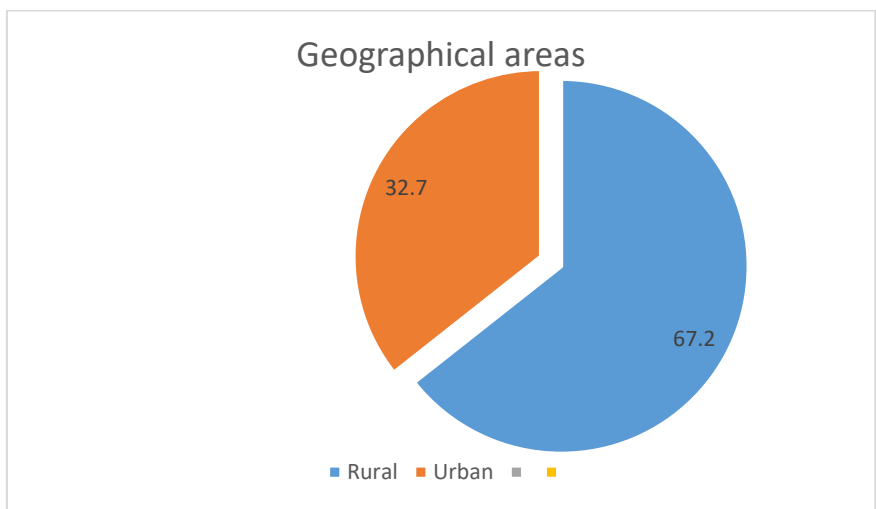


Fig. (1). Geographical origin of learner nurses.

### 3.1.3. The Type of Technological Devices Used for Learning and the Residential Setting

Most learner nurses (354; 97%) had smartphones, while 12,3% of the learner nurses used laptops, Tablets and desktops for Information and Communication Technology. Therefore, the majority of the learner nurses utilised virtual learning using a smartphone rather than a laptop.

### 3.1.4. Departmental Readiness to Implement Online Teaching (el-CDDO Component - Deliver)

A total of 187 (50,7%) learner nurses indicated that their department was not ready for online teaching during the Covid-19 pandemic. While only 179 (49,3%) agreed that their departments were ready.

### 3.1.5. Departmental Staff (Lecturers) Interest in the use of Blackboard (The Learner Nurses' Perspective on Virtual Learning)

The perspective of learners has a significant role in the effective delivery of virtual learning at a rural-based university [7]. The learners were asked to reflect on departmental staff interests in Blackboard for teaching, learning, and assessment processes. The majority (298, 81.4%) indicated that most lecturers lack interest in using Blackboard to facilitate teaching, learning, and assessment processes.

## 3.2. Section B

The majority (297, 81.2%) of the learner nurses perceived online learning as not equal to traditional classroom learning. The learner nurses were asked to describe the perceived barriers to virtual learning based on their current experiences with using Blackboard to facilitate the teaching, learning, and assessment process. The findings of the perceived barriers to virtual learning in a rural-based university of Limpopo Province are presented in Table 1 below.

**Table 1. Barriers to virtual learning by healthcare learner nurses.**

Learner Related Barriers	Number of Learner Nurses	Percentage
1. Unstable network coverage	296	81%
2. Lack of mobile data	266	72.6%
3. Lack of ICT skills by learner nurses (uncomfortable in using ICT facilities)	207	56.8%
4. Lack of clinical learning	202	55.2%
<b>Lecturer Related Barriers</b>		
5. Lack of interest in the use of Blackboard by departmental lecturers	298	81.4%
6. Lack of IT skills by ageing academics	188	51%
7. Insufficient guidance by the lecturer	140	38.2%
8. Limited interaction between lecturer and learner nurses	82	22.4%

The learner nurses were asked five questions related to how they perceived the barriers to virtual learning. As illustrated in Table 1, the majority of barriers to virtual learning highlighted by the learner nurses include unstable network

coverage (296; 81%), a lack of mobile data (266; 72.6%), lack of ICT skills (207; 56.8%), and lack of clinical learning (202; 55.2%). Table 1 further outlines findings of the perceived barriers related to the lecturers. To establish the perceived barriers related to the lecturers, four questions were asked of the learner nurses, as indicated in Table 1. The main barriers related to the lecturers, as perceived by Faculty of Healthcare Sciences learner nurses, included a lack of interest in the use of Blackboard to teach (298; 81.4%) and a lack of IT skills by the ageing academics (188; 51%).

## 4. DISCUSSION

The paper presented the responses of learner nurses' using the el-CDDO framework. According to Regmi and Jones (2020) [7], the el-CDDO acronym stands for Context, Design, Delivery, and Outcomes of e-learning in Healthcare System Education. In terms of the context of the respondents' geographical origin, most of the learner nurses (246, 67.2%) reside in deep rural areas, whereas 120 (32.7%) are from urban areas. The study results are in line with Mdepa [22], who outlined that South Africa's higher education sector draws learner nurses from different backgrounds, with most of the university's learner nurses coming from deep rural areas, which has varied implications for using online learning.

The component of Delivery demonstrated that most learner nurses either do not have internet coverage or the internet coverage is unstable. Only 71 (19%) learner nurses indicated that they have access to the Internet in their different respective residential areas. Lack of network coverage affects access to the learning resources such as PowerPoint notes, video demonstrations for clinical learning, and assessments. Outcomes demonstrated the influence of lack of access to virtual learning due to various barriers. The limited access or unstable network impacted the majority of learner nurses within the Faculty of Healthcare Sciences, especially since the majority (246, 67.2%) of the learner nurses are originally from deep rural areas with unstable network coverage - thus a barrier to virtual learning as indicated in Table 1. Cloete [23] outlined that internet connectivity due to poor signal reception is a major barrier to online studies amongst SA university learner nurses in rural areas.

Most learner nurses perceived a lack of mobile data to connect to the Blackboard Learning System as a barrier to virtual learning. 354 (97%) students owned smartphones and only 216 (57%) had laptops. The cost associated with purchasing data greatly concerns learner nurses with limited funding opportunities. The institutions must ensure that the students are well equipped with home-based teaching and learning equipment for proper and effective online teaching [24, 25]. In a study by Willemse [26], the lack of data was a negative factor as some students were coded saying, "When we tried submitting, our data ran out and we had to make alternative arrangements for submission" (participant 22) while participant 21 was coded as follows "We experienced signal problems at work and not everyone had data, so it caused somewhat confusion and chaos".

Learner nurses perceive a lack of clinical learning for respective modules as a barrier to virtual learning in rural-

based universities. Various authors have indicated that online teaching effectively conveys clinical skills and knowledge through virtual clinical case studies [24, 27, 27, 28]. However, they also argued that in healthcare science, online teaching for clinical learning is more effective when combined with a mixed learning approach, using different styles and modes not only to facilitate learning but also to bring positive change in practice. Barriers to virtual learning could be a point of reference for policymakers regarding the implementation of digital health in the healthcare sectors and nursing schools.

The majority of learner nurses perceive the lack of interest by departmental staff members regarding the system's use as a barrier to the envisaged implementation of virtual learning. The learner nurses expressed concern about the staff members who showed no interest in using Blackboard to teach, learn, and assess activities. The current studies' findings are consistent with those of other scholars. For example, Moonsamy [29] showed concern regarding the staff members who do not use Blackboard to learn despite the universities' evolving technology. Other scholars [24, 26, 27] highlighted that the departmental staff are the role players in the implementation of online teaching. Therefore, departmental staff's perceptions, attitudes, and skills are essential in the effective integration of online teaching, communication, and assessment [25]. Learner nurses perceived a lack of ICT skills as a barrier to virtual learning. The learner nurses reported that the departmental staff, most of them who are ageing, also lack the skills to navigate the Blackboard learning management system, affecting the teaching, learning, and assessment activities. The findings are congruent to those of other studies, including Moonsamy & Govender [29], who reported a lack of ICT skills as a barrier when implementing Blackboard learning, especially with the aged, who often find it challenging to navigate the system.

## CONCLUSION AND RECOMMENDATIONS

To our best knowledge, this is the first study to evaluate the implementation of virtual learning for learner nurses in rural-based universities during the COVID-19 era. According to the findings, there are barriers identified by the learner nurses regarding the implementation of online teaching during Covid-19. These barriers can be attributed to the fact that although the adoption of online teaching platforms, such as Blackboard, was long introduced in higher education, it was only enforced during the unforeseen Covid-19 lockdown pandemic, wherein the higher institutions were ill-prepared. The fact that the nature of healthcare professional learning involves both theory and practical online learning has robbed the learners of the opportunity to practice and learn in real-life situations. The following recommendations are made as a way of overcoming the barriers of online teaching amongst health care learner nurses in rural-based universities as suggested by the study results and the Context, Design, Delivery and Outcomes framework which guided this study:

- The barriers to accessibility to the internet/unstable network should be considered and addressed 1) to improve the implementation of virtual learning in rural-based universities and clinical practice. and 2) to

prepare future nurses who will positively impact the clinical practice during the 4<sup>th</sup> Industrial Revolution.

- To achieve effective implementation of virtual learning, all nursing lecturers should be equipped with online teaching material and information that will impact clinical learning.
- Interaction and collaboration between learner nurses and lecturers are also recommended through constructive feedback and e-learning peer support (Raegni & Jones [7], 2020).
- The study also recommends the effective implementation of e-learning that will address the diverse needs of learner nurses and facilitators, thereby producing professionals who are globally competitive in health care.

Rural-based institutions and the concerned departments need to develop suitable policies and strategies to provide adequate resources and training for effective e-learning amongst health care learner nurses (Raegni & Jones [7] 2020).

## LIMITATIONS OF THE STUDY

Although the study findings promise a positive impact as a point of reference for digital health in nursing, we noted a few limitations. The study was conducted in one rural-based university, therefore, the findings cannot be generalized to other rural universities within the country. The responses were explored using a quantitative research approach, which is regarded as a limitation to providing narrative aspects of utilizing ICT facilities for virtual learning.

## LIST OF ABBREVIATION

**CDDO** = Context, Design, Delivery, and Outcomes framework

## AUTHORS' CONTRIBUTIONS

MOM wrote and conceptualised the study, completing the final draft of the article. LM performed data capturing and analysis. TAP completed the methodology section.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The permission to conduct the study was obtained from the Turfloop Research Ethics Committee (TREC) of the University of Limpopo with ethical clearance TREC/59/2020: PG.

## HUMAN AND ANIMAL RIGHTS

No animals were used for studies that are the basis of this research. All human procedures followed were per the guidelines of the Helsinki Declaration of 1975.

## CONSENT FOR PUBLICATION

The link sent to the learner nurses did not require any names and personal details of the respondents to be recorded on the questionnaire. The respondents were also informed that the results would only be published in aggregate/group format without revealing participants' identities or names [18]. To ensure anonymity, the authors confirmed that the questionnaire did not contain any information that could be traced back to the

respondents [18].

## FUNDING

This study did not receive grants from any funding agencies in the public, commercial, or not-for-profit sectors.

## STANDARDS OF REPORTING

STROBE guideline has been followed.

## AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this study are available within the manuscript.

## CONFLICT OF INTERESTS

The authors declare no conflict of interest, financial or otherwise.

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