

**STANDARDS FOR EVALUATING THE QUALITY OF UNDERGRADUATE NURSING
E-LEARNING PROGRAMMES IN KENYA**

By

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Declaration

I, Moses Mutua Mulu, declare that the thesis (interrelated published and publishable articles) that I hereby submit for the Doctoral degree in Nursing at the University of the Free State is my independent work and that I have not previously submitted it for qualification at another institution of higher learning. I waive the copyright of this document in favour of the University of the Free State. In the event of a written agreement between the University of the Free state and the student, the written agreement must be submitted in lieu of the declaration by the student.

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Declaration by a language editor

To whom it may concern

This is to state that the PhD study titled *STANDARDS FOR EVALUATING THE QUALITY OF UNDERGRADUATE NURSING E-LEARNING PROGRAMMES IN KENYA* by Moses Mutua Mulu has been language edited by me, according to the tenets of academic discourse. The final responsibility for applying any proposed corrections lies with the authors.



B.Bibl.; B.A. Hons. (English)

13-11-2022

Dedication

The work is dedicated to all nurses, especially those upgrading to a degree through the struggle and challenges experienced, be hopeful a brighter day cometh. **Isaiah 43:19** has been a comfort to me and surely will be to you as well.

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First and foremost, all honour and praise to God, who gave me the grace and strength to come thus far. Without God, I wouldn't have made it through this journey. I wish to recognise the following individuals who played a significant role in making the study a reality.

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Abstract

Background: E-learning is redefining the learning and teaching landscape in low- and middle-income countries (LMICs). Nurses with competing interests like family, work and distance can now upgrade from diploma to degree level through e-learning. Evaluating the quality of such undergraduate e-learning nursing programmes remains fundamental to ensure that nurse graduates can meet dynamic healthcare systems' demands. The paucity of standards for evaluating the quality of undergraduate nursing e-learning programmes with consideration of contextual challenges in low- and middle-income countries offers critical underpinning for the development of this study. The critical solutions addressed by these standards provide local solutions to local problems. This study, therefore, aimed to develop standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

Methods: A multiple methods, multi-phase approach underpinned by the standard development framework by the Health Standards Organisation (HSO) was used. In the first phase, an integrative review was conducted to synthesise available evidence related to standards for evaluating undergraduate nursing e-learning programmes in LMICs. The second phase of this study incorporated a modified Delphi technique, including experts drawn from low and middle-income countries (LMICs) to validate the criteria from the first phase. A feasibility study of standards developed in the preceding phase was carried out in a leading university in Kenya to ascertain the standards' feasibility, usability, and practicality in Kenya.

Results: The findings of the integrative review revealed six standards with 109 criteria for evaluating the quality of undergraduate nursing e-learning programmes. The standards were presented to 14 experts drawn from Africa and Asia for a modified Delphi through three rounds leading to a consensus to remove 4 criteria across the various standards. The experts further agreed on the standards being feasible, usable, and practical for use in low- and middle-income countries, a total of six standards and 105 criteria were agreed upon. The study's third phase intended to test the standards feasibility, usability, and practicality in a local university in Kenya. The findings suggested that the standards were feasible, usable, and practical in LMICs. These findings were

further presented to experts with experience in the Kenyan higher education landscape and quality assurance in e-learning and the findings were unanimous on the feasibility, usability, and practicality in LMICs.

Conclusion: Standards developed in this study provide a holistic overview of the quintessential requirements in evaluating the quality of undergraduate nursing e-learning programmes in low- and middle-income settings. The quality of nurses produced is dependent on the quality of teaching offered, and e-learning is one of the teaching modalities to be availed in most institutions of higher learning and middle-level colleges. The intricacies of nursing education programmes having theoretical and clinical components invoke deeper thought on how to evaluate these programmes. The rigorous process that culminated in the development, validation and testing of these standards invokes action in institutions of higher learning seeking to develop e-learning programmes and provide quality e-learning. The contextual concerns of low-resource settings have been meticulously considered to ensure strong scientific evidence to provide local solutions to local problems. The quality of an e-learning programme is evaluated using standards that are feasible, usable, and practical. The holistic multidimensional approach adopted by the standards ensures that all key tenets of e-learning are addressed, and the interplay of each standard is identified. The study recommends adoption and testing of these standards for evaluating e-learning undergraduate nursing programmes in different LMICs to further improve the quality of e-learning.

Key words: e-learning; evaluation; quality; nursing; standards; undergraduate.

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List of abbreviations and acronyms

APA:	American Psychological Association
AMREF:	African Medical and Research Foundation
COVID 19:	Corona Virus 2019
CPD:	Continuous Professional Development
CUE:	Commission of University Education
FAO:	Food and Agriculture Organization
HSO:	Health Standards Organization
HSREC:	Health Science Research Ethics Committee
ICT:	Information, Communication Technology
KeMu:	Kenya Methodist University
KHWF:	Kenya Health Workforce Report
KHWIS:	Kenya Health Workforce Information system
LMIC:	Low- and middle-income countries
LMS:	Learning Management System
MOH:	Ministry of Health
NACOSTI:	National Commission for Science Technology & Innovation
NCK:	Nursing Council of Kenya
PhD:	Doctor of Philosophy
UNESCO:	United Nations Education and Scientific Conference
WHO:	World Health Organization

Conceptual clarification

E-learning: E-learning is defined as an approach to facilitate the application of knowledge information and enhances learning using personal computers, CD-ROMs' and the internet for education (formal and informal) (Valverde-Berrocoso, Arroyo, Videla and Cevalloso, 2020; UNESCO, 2018; Misut & Pribilova, 2014). In this study, when the concept of e-learning is used, it will refer to learning supported by electronic technology.

Programme: According to the UNESCO, (2011), a programme is a coherent set or sequence of educational activities designed and organised to achieve pre-determined learning objectives or accomplish specific academic tasks over a sustained period, resulting in a qualification. When the concept Programme is used in this study, it will refer to undergraduate nursing, involving students upgrading from diploma to degree.

Quality: According to Djouab and Bari (2016), quality is a dynamic conceptualisation of achieving excellent fitness levels for use whilst conforming to user requirements. Quality education focuses on functionality without problems across all users and clear pedagogical principles appropriate to learner needs, types, and contexts and satisfy stated or implied requirements (Alnasraween & Shahadab, 2022; Trakru & Jha, 2019). In this study, when the concept quality is used, it will refer to the functionality of e-learning to meet user needs in line with standards.

Standards: Standards in e-learning are rules, guidelines, or definitions of characteristics to ensure that materials, products, processes, and services are fit for their purpose with specific parameters to make e-learning course apt and useful for its user (Huynh-Cam *et al.*, 2021; Naim, 2022). When the concept standard is used in this study, it will refer to guidelines to ensure that processes are fitted to their purpose in an e-learning context.

Undergraduate Nursing: Undergraduate nursing is an academic programme in nursing conducted after high school education and before post-graduate education in a university (Stone, *et al.*, 2020). In this study, when the concept of undergraduate nursing is used, it will refer to students pursuing a degree in nursing.

Preamble

Standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya

The format of this thesis has been completed in accordance with the recommendations for presenting a PhD through interrelated publishable articles as presented by the Faculty of Health Sciences of the University of the Free state, South Africa. As a result, the format includes the submission of three interrelated publishable articles submitted to specific journals prefaced by an introductory and ended by a concluding chapter. This thesis has five chapters.

The first chapter is an introduction that presents an overview of the study, and a detailed version of the research methodology. The second chapter is a manuscript under review which presents the first phase of the study, which was an integrative literature review aimed at synthesising standards for evaluating the quality of undergraduate e-learning programmes in the health professions in LMICs. The third chapter presents a second manuscript which describes consensus on standards for evaluating the quality of undergraduate nursing e-learning programmes through a modified Delphi technique, engaging experts from LMICs. The fourth chapter presents a manuscript that describes a feasibility study conducted at a university in Kenya related to standards for evaluating the quality of undergraduate e-learning nursing programmes. The conclusions, recommendations, and contributions of the study are then presented in the final chapter.

Each chapter has stylistic differences and individual reference lists based on the guidelines of the journals to which the articles were submitted. The introductory and concluding chapters are aligned as per institutional guidelines and adopt the APA version 7 referencing format. There are noticeable repetitions across chapters in line with the interrelated nature of the work and the format of the thesis.

The scholarly contribution

The scholarly contributions of the study are as follows:

Phases	Scholarly contribution
Phase 1: Identifying standards	1. Mulu, M., & Nyoni, C.N (2022). Undergraduate e-learning programmes in the health professions: an integrative review of evaluation standards in low- and middle-income countries. PLOS ONE (Second peer review) 2. Mulu, M., & Nyoni, C. (2022). Undergraduate e-learning programmes in the health professions: an integrative review of evaluation standards in low- and middle-income countries. (Paper presented at Kirinyaga International University conference held virtually, 24-25 March 2022)
Phase 2: Consensus on standards	1. Mulu, M., & Nyoni, C. (2022). Standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries: a modified Delphi study. BMC Nursing (second review) 2. Mulu, M., & Nyoni, C. (2022). Standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries: a modified Delphi study. (Paper awaiting acceptance for presentation at Kisii International University conference to be held, 9th -11th May 2023).
Phase 3: Feasibility study	1. Mulu, M., & Nyoni, C. (2022). Standards for undergraduate nursing e-learning programmes in low resource settings: a feasibility study. International Journal African Nursing Sciences. (Second review) 2. Mulu, M., & Nyoni, C. (2022). Standards for undergraduate nursing e-learning programmes in low resource settings: a feasibility study (Paper awaiting acceptance for presentation at E-learning Africa conference to be held, 24th -25th May 2023)

1.1 Background

Technology advancements have enabled tremendous growth in all sectors of society, including education (Olimov & Mamurova, 2022; Raja & Nagasubramani, 2018). Electronic learning (e-learning) is a learning process supported by technology through personal computers, CD-ROMs and the internet (Adnan & Al-Ameen, 2016; Kihonza, 2016; Sangra *et al.*, 2016; UNESCO, 2018). There are two general approaches to e-learning, namely synchronous and asynchronous (Angib *et al.*, 2022; Food and Agriculture Organisation of the United Nations [FAO], 2011; Patil & Razdan, 2014; Soyemi *et al.*, 2016; Thiruvengadam, 2012). Synchronous e-learning takes place in real time and requires the educator and student to be present at a given time, for example audio/video conferencing, chat conversations, and live webcasting (Angib *et al.*, 2022; FAO, 2011; Patil, 2014; Perveen, 2016; Tarus *et al.*, 2015) while asynchronous e-learning is time independent, and educator and student do not have to be present at a given time, for example email, blogs, and discussion forums (Angib *et al.*, 2022; FAO, 2011; Hrastinski, 2008; Patil, 2014; Perveen, 2016; Tarus, *et al.*, 2015). E-learning encourages independent skills, allows flexible working, and fosters the development of time management, organisation, and self-pacing skills, providing an opportunity for practising computer abilities (Yangoz *et al.*, 2017).

E-learning is divided into three components: technological, organisational, and pedagogical (Tarus & Gichoya, 2015; Misut & Pribilova, 2014). The technological component includes computers, network connectivity, internet bandwidth, and the learning management system (LMS) (Georgescu, 2006; Kapp, 2003; Tarus & Gichoya, 2015). The organisational component includes operational e-learning policies, financial allocation for e-learning, sensitisation, and training of stakeholders (Gautam & Tiwari, 2016; Georgescu, 2006; Tarus & Gichoya, 2015). The pedagogical component includes learner support and motivation, educator skills on e-learning pedagogy, learning and quality e-learning content (Anderson & McCormick, 2005; Tarus & Gichoya, 2015). Therefore, for e-learning to succeed, all three components need to function optimally.

E-learning is at its infancy stage in Africa and has not yet reached its full potential (Kibuku *et al.*, 2020; Kyari, Brown *et al.*, 2018; Tarus *et al.*, 2015). E-learning has been heralded as a revolutionary force for health professions education, especially in low-resource countries (Barteit *et al.*, 2019). Increased connectivity to the internet and the COVID-19 pandemic has compelled universities to move their entire teaching and learning component online, precipitating the emergency integration of e-learning into nursing education (Ananga, 2020; Yangoz *et al.*, 2017). Nursing education combines theoretical knowledge and practical skills, enabling nursing students to link theory and practice (Kokol *et al.*, 2017; Manal & Mahmoud, 2014; Pourghaznein *et al.*, 2015; Saifan *et al.*, 2021). E-learning has provided an avenue for using videos, virtual realities, animations and graphics, enriching the learning experience in nursing education (Yangoz *et al.*, 2017). Curtis *et al.* (2016) report that e-learning in the clinical training of trauma nurses simulating actual emergencies showed that most nurses had applied new knowledge on physical examinations, identified the risk of serious illness, and improved interdisciplinary communication. Another example of the integration of e-learning in nursing education was demonstrated in Ohio in the USA as a response to the increase in the number of patients with a terminal illness (Harerimana & Mtshali, 2021; Mazanec *et al.*, 2019). The development of e-learning in developed countries has seen improved outcomes in practical skills settings. In low and middle-income countries, however, e-learning in health sciences has not been fully embraced despite the increased uptake of e-learning in the theoretical aspects of nursing education.

Various studies have demonstrated positive outcomes in implementing e-learning strategies in academic and professional programmes in higher education (Al-Rawashdeh *et al.*, 2021; Zalat *et al.* 2021). According to Bahrambeygi *et al.* (2018), who measured the mean behaviour score of a hundred nurses in Iran exposed to e-learning versus those exposed to traditional programmes, revealed that the mean behaviour score of the e-learning group improved from 3.64 before the e-learning programme to 6.84 after the programme, while that of the traditional group advanced from 3.50 before the traditional education to 5.90 after the programme.

Statistical analysis showed a significant relationship between score change and e-learning. Elfaki, Ahmad and Abdelrahim, (2019), who measured the impact of e-learning versus traditional learning on nursing student performance and attitude in Saudi Arabia, found that e-learning significantly improved academic performance. In addition, there was improvement in the learning process and attitude compared to the traditional methods. The findings show that e-learning plays a crucial role in influencing the outcome of learners' knowledge and behaviour, and students are more receptive to new modalities in e-learning (Bahrambeygi *et al.*, 2018). A study in Canada on the impact of e-learning on nurses' professional knowledge and practice showed that e-learning had a positive effect on nurses' knowledge- they were satisfied with the e-learning program (Dalhem & Saleh, 2014). The study also revealed improved knowledge and skill capacity compared to nurses trained traditionally (Dalhem & Saleh, 2014). Despite these advantages, e-learning programmes have had their share of challenges.

According to United Nations Educational Scientific and Cultural Organization [UNESCO] (2020), more than 1.5 billion youths and 63 million educators in more than 188 countries had to stay at home during the closure of schools and higher education institutions due to the global COVID-19 pandemic (Affouneh *et al.*, 2020). In light of the pandemic, most institutions shifted from traditional face-to-face methods to e-learning; and this radical shift was not planned (Affouneh *et al.*, 2020; Lemay *et al.*, 2021). Even in times of crisis, access to quality education is a fundamental human right. However, quality in such turmoil in the absence of standards is often challenging to maintain in LMICs (Affouneh *et al.*, 2020; Frehywot *et al.*, 2013). Standards do not automatically lead to better quality but should be used as a tool for quality improvement as they describe conditions necessary for the successful implementation of e-learning (Martin *et al.*, 2017).

Globally, various models evaluate e-learning (Ruggeri *et al.* 2013). An example of such a model is the e-learning quality (ELQ) model which has ten (10) constructs including material/content, structure environment, communication, cooperation and interactivity, student assessment, flexibility, and adaptability, support (student and staff), staff qualifications and experience, vision and institutional leadership, the holistic and process aspect and resource allocation (Dhouchak & Kumar, 2022; Hadullo *et al.*, 2018). Most of

the models such as the e-learning maturity model, technology-mediated learning evaluation framework and e-learning quality framework developed for the evaluation of e-learning have been developed in high-income countries and might not be applicable in LMICs (Hadullo *et al.* 2018; Naveed *et al.*, 2020). Regionally, several models can be used to evaluate the quality of e-learning programmes', such as the planning, development, process, and product (PDPP) evaluation model (Hadullo *et al.*, 2018; Timbi-Sisalima *et al.*, 2022). Although the PDPP model of evaluating e-learning was developed in Africa, it has not been used in higher education institutions or reported on nursing education programmes. In addition, the e-learning quality evaluation model (EQEM) incorporates most other models for evaluating e-learning. Mapping different models was done to identify common factors and factors not identified in some other models. This makes the EQEM model suitable for evaluating systems quality in developing countries (Hadullo *et al.*, 2018; Timbi-Sisalima *et al.*, 2022). The EQEM model was explicitly designed for LMICs to understand their specific challenges. However, it has not been used to evaluate e-learning in nursing education programmes.

1.1.1 Context of the study: e-learning in nursing education in Kenya

In Kenya, the Nursing Council of Kenya (NCK) sets standards related to the education and practice of nurses (NCK, 2019). As of 2015, Kenya had 102 accredited nurse training institutions (Kenya Health Workforce Report [KHWF], 2015). Of the 102 nurse training institutions, 22 were universities, 80 were mid-level colleges, and 34 were medical training colleges. Some training institutions offer more than one type of programme, including nursing, clinical medicine, and health records at degree or diploma level (Ministry of Health [MOH], 2017). Among the universities, 11 were public, five were private, and six were faith-based (MoH, 2015). Based on the 2017 deployment data from the Kenya Health Workforce Information System (KHWIS), maintained by the Department of Nursing, Ministry of Health (MOH), there are 33,000 nurses deployed at 4,187 health facilities across Kenya (MoH, 2017). In Kenya, entry into nursing education can either be through direct entry or by upgrading existing qualifications. The direct entry candidates have completed high school and met university or college entry criteria.

The direct entry candidates enrol for either the Certificate in Nursing (enrolled nurses), the Diploma in Nursing, or the Bachelor of Science degree in Nursing, while the upgrading students have completed a diploma and register for a degree programme. The Certificate in Nursing is a two-and-a-half-year programme that focuses on basic nursing, community health, and basic midwifery but excludes management of complications during childbirth. The Diploma in Nursing, a three-year programme, prepares students for all aspects of general nursing, community health nursing, and midwifery. These two programs are offered only in medical training colleges and not universities.

The Bachelor of Science in Nursing is a five-year programme offered only in universities focusing on theoretical, clinical, and administrative competency development in Nursing. The Nursing Council of Kenya (NCK) introduced the bachelor's degree in Nursing in 1994 to respond to the shortage of skilled nurses and nurse educators in the country. According to the Kenya Methodist University [KEMU] (2014), the Bachelor of Science Nursing programme has the following learning outcomes:

- ❖ Demonstrate competence in delivering holistic nursing care utilising the nursing process in various health care settings.
- ❖ Demonstrate skills in decision making, using the knowledge from basic, behavioural, and biomedical sciences as a framework
- ❖ Apply skills of critical thinking approach and evidence-based practice.
- ❖ Develop and implement relevant educational and community programmes that promote individual and community responsibility towards holistic health care.
- ❖ Collaborate with other health professionals and the community to promote, maintain, and restore the health of individuals, families, and communities.
- ❖ Carry out research, and utilise relevant findings in different health care settings and
- ❖ Apply acquired virtues reflecting Christian values in the community and delivering health care services.

The programme has 2,970 notional hours of which, 2,250 hours are for theory, and 720 hours are clinical placement (KEMU, 2014). The NCK stipulates the entry requirements into the Bachelor of Science nursing programme. The programme includes a one-year

internship undertaken in public hospitals under the supervision of professional nurses. In 2005, 66% of Kenyan nurses held an enrolled nursing certificate, while only 6% held a degree and 40% held a diploma (Nguku, 2005). In 2015 there were 30,993 nursing students admitted into nursing programmes as new entrants (95.6%), while 4.41% were admitted as upgrading students (4.41%) with 81.9% students being admitted in diploma programmes and 12.4% in bachelors' programmes and 5.6% in certificate programmes (Kenya Health Workforce Report [KHWR], 2015). Nursing stakeholders in Kenya acknowledged that the essential qualification of enrolled nurses failed to adequately prepare nursing graduates for the country's emerging health problems (Nguku, 2005). The lack of theoretical foundations and limited clinical skills with a limited scope of practice resulted in enrolled nurses only following orders and performing minimal tasks under supervision.

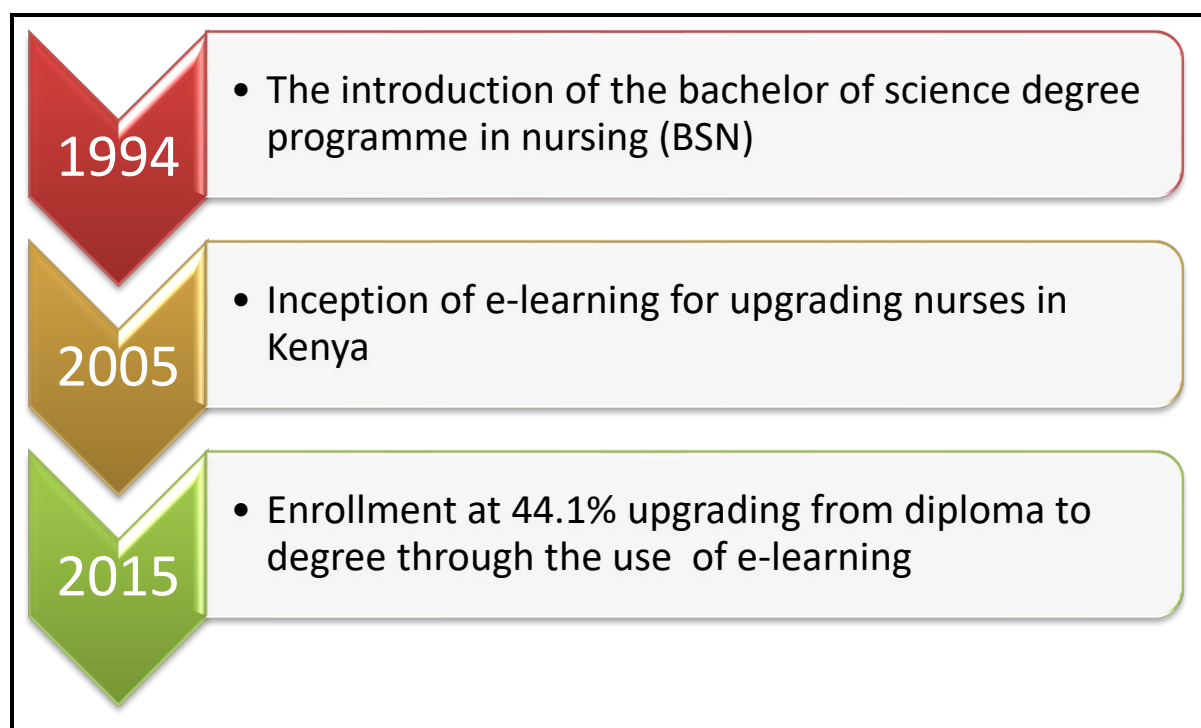


Figure 1.1 Timeline on development of e-learning

The government in Kenya needed to train as many nurses as possible to the degree level to meet the shortfall of nurse educators and nurses with an improved skill set (Nguku, 2005). The need for improved skill sets supported the need for more advanced nurses for

enhanced health outcomes. The need for improved competence and the standardisation of quality nursing education and practice in Kenya propelled the MoH and the NCK in 2001 to develop and adopt a policy to improve competence among the 22,000 enrolled nurses at the time (Nguku 2005; MoH, 2010). This policy set the stage for enrolled nurses to upgrade to higher qualifications such as a Diploma in Nursing and a Bachelor of Science in Nursing. The latter was perceived to have the necessary competencies to meet the country's health needs. The NCK, through its partners, was mandated to oversee the upgrade of these nurses. Nurses completing the Diploma in Nursing programme must work for at least two years before being able to upgrade their qualifications to a degree level. The upgrading programme spans three and a half years and is presented in universities across the country. The focus of the upgrading programme is improving competencies and building knowledge and skill levels among nurses. The upgrading programmes were implemented through e-learning.

At the inception of e-learning for upgrading nurses to the diploma programme in 2005, a total of 3,000 students enrolled for the programme (Nguku, 2005; MoH, 2010). Initially, e-learning was offered through a distance learning model using textbooks, as a computer-based approach to e-learning was a challenge (Nguku, 2005; MoH, 2010). The transition from textbooks to course materials loaded into software and, accessed by students upgrading nurses in their own time offline, was challenging (Nguku, 2005). Nurses who were working also had to travel to the few training hospitals for clinical skill competency training as part of the programme. This was cumbersome for nurses as few hospitals were approved by the NCK (Nguku, 2005). However, there was no public and institutional policy to support e-learning initiatives.

The programme could not be run entirely online because only 5% of Kenya had internet connectivity at the time (Nguku, 2005). Currently, there are more nurses with a degree than in previous years (Appiagyei *et al.*, 2014; Al-Rawashdeh *et al.* 2021). However, no literature supports improved health outcomes. Despite the perceived benefits attached to e-learning programmes as described in the literature Arkorful and Abaidoo (2014) agree there is a consensus that there are still many challenges facing e-learning programmes, especially in upgrading nursing programmes in Kenya (Kithuci, *et al.*, 2017; AMREF,

2011). Hadullo *et al.* (2017) report course development, assessment, learner support, institutional factors, user characteristics and overall system performance. Moreover, in Kenya, there is no policy on developing, operationalising, and monitoring nursing e-learning programmes, which contributes to poor educational outcomes (Tarus, *et al.*, 2015). Most universities in Kenya that have adopted e-learning have not invested sufficiently in the necessary infrastructure and training in course development that can breed success (Fereday & Muir-Cochrane, 2006; Kashorda & Waema, 2014). Students struggle to navigate e-learning systems, some courses are not published on time, and some lecturers do not interact with students adequately to foster learning. This, in turn, leads to poor performance, which may significantly affect health outcomes.

1.2 Statement of the problem

The growing demand for e-learning invites broader discussions for enhancing quality, accountability, value for money, evaluation, and satisfaction, especially in developing countries (Masoumi & Lindstrom, 2012). The need for standards in terms of process to guide the assessment of the quality of e-learning programmes is essential in improving e-learning, especially in nursing programmes (Tarus, *et al.*, 2015; Moumtzoglou & Kastania, 2011). Nursing education underscores the integration of theoretical and clinical competencies, which should also be achieved despite the mode of programme delivery. Therefore, e-learning nursing programmes should be of high quality to guarantee the regulators of competent nurses. Current e-learning models, frameworks, and strategies designed to evaluate the quality of e-learning programmes, such as the EQEM model, are generic and do not cater to the intricacies embedded in nursing education in low and middle-income countries.

Therefore, the study seeks to develop standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya using the Health Standard Organisation (HSO) standards development process.

1.3 Research question

What standards can be developed for evaluating the quality of undergraduate nursing e-learning programmes in Kenya?

1.4 Aim of the study

The study aims to develop standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

1.5 Study objectives

The study will be carried out under the following objectives:

1. Describe the standards used in the evaluation of quality undergraduate e-learning in health sciences programmes in low and middle-income countries (LMIC) through an integrative review
2. Describe the consensus on standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries through a modified Delphi technique
3. Describe the feasibility of the developed standards in evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

1.6 Research Paradigms

Nursing is a practice-based discipline, and the best perspective is evaluating an idea not based on a specific criterion but on its impact (Warms & Schroeder, 2012). The problems addressed by nurses are so diverse that multiple approaches to problem-solving are necessary (Jackson, 2015). The pragmatist research paradigm directs the philosophical underpinnings for this study. Pragmatism favours tolerance, respect for the opinions of others, and collaboration, reflecting the astute appraisal of options and selection of the course of action that will best serve the purpose of the research (Jackson, 2015; Warmes & Schroeder, 2012). In pragmatism, an empirical study is preferred over idealistic or rationalistic approaches (Frega, 2011; Kaushik *et al.*, 2019). A pragmatic approach

stresses the critical analysis of facts, applications, and outcomes rather than abstraction and verbal solutions (Capps, 2019; Weaver & Olson, 2005).

1.6.1 Basic tenets of the pragmatist paradigm

Pragmatists recognise that there are many ways of interpreting the world and undertaking research, that no single point of view can ever give the entire picture, and that there may be multiple realities (Jackson, 2015; Saunders, *et al.*, 2012; Warms & Schroeder, 2012). A pragmatic approach allows researchers to be flexible enough to adopt the most practical approach to address research questions (Morgan, 2007). Careful attention will be drawn to the connection between methodology, epistemology, and methods. The basic tenets of pragmatism are a commitment to what works in practice, the appreciation of plurality, and a desire for integrated results relevant to nursing research (Weaver & Olson, 2005). The belief is that knowledge is a continuum rather than two opposing and mutually exclusive poles of objectivity and subjectivity (Goles & Hirschheim, 2000; Kaushik *et al.*, 2019).

This research will incorporate the pragmatist ideology to identify the best way to solve the problem using the best practice.

1.6.1.1 Ontology

Pragmatist ontology argues that multiple realities are open to empirical inquiry (Kaushik, *et al.*, 2019; Pretorius, 2018). Pragmatist researchers' choice of one version of reality over another is governed by how well that choice results in anticipated or desired outcomes. In this study, knowledge of what exists will be constructed from the experiences of those within the universe under investigation. The study will also identify the best way to solve the problem and in-corporate the beliefs of respondents and how these shape action.

1.6.1.2 Epistemology

The major underpinning of pragmatist epistemology is that knowledge is always based on experience (Kaushik *et al.*, 2019; NurseKillam, 2011). Social experiences influence our world perception (Kaushik *et al.*, 2019). Our unique experiences create our knowledge (Kaushik *et al.*, 2019; NurseKillam, 2011; Pretorius, 2018). Pragmatist epistemology does

not view knowledge as a reality; instead, it regards it as socially constructed (Kaushik *et al.*, 2019; NurseKillam, 2011). Epistemological foundations in the pragmatist paradigm draw from Dewey's concept of inquiry which links beliefs and actions through a process of inquiry (Kaushik *et al.*, 2019; NurseKillam, 2011). In this study, the experience of stakeholders will shape knowledge that will be socially constructed based on interaction and consensus-building.

1.6.1.3. Methodology

Pragmatism embraces a flexible approach to research design. The researcher can therefore, select the research design and the methodology most appropriate to address the research question (Morgan, 2007; Kaushik *et al.*, 2019). The pragmatist methodology connects the process of designing the research to the core research question and combines the design concerns with the choice of methods (Kaushik *et al.*, 2019; Morgan, 2014). This research design is crucial in bridging the gap between the research questions and the methodology (Kaushik *et al.*, 2019; Morgan, 2014).

The research will be guided by a multiple methods design incorporating qualitative and quantitative designs underpinned by the HSO standards development process. Data was collected through an integrative literature review, a modified Delphi, and interviews. The pragmatic approach offers more comprehensive options for problem-solving and the flexibility to explore different options to solve the problems.

1.7 Research design

The study adopted a multiple methods research design. Multiple methods design refers to a combination of quantitative and qualitative methods in conducting research (Creswell, 2003). Using a multiple methods research design leads to knowledge about different aspects of a phenomenon and, therefore, an overall better and more complete explanation of the phenomenon (see table 1.2 overall research plan).

1.7.1 Conceptual framework

A conceptual framework is the total, logical orientation and association of all concepts that underpin the underlying thinking of the entire research (Kivunja, 2018). The conceptual framework logically conceptualises the entire study. The study is underpinned by the Health Standard Organisation (HSO) framework for standards development. The HSO framework states seven steps in the development of standards. These are: identify opportunities for a review of standards, establish technical committees, prepare a draft, build consensus on draft standards, review drafts, approve draft standards and publish standards. The first phase involves identifying standards which was actualised through an integrative review. The second phase involves the use of experts to validate the developed standards through consensus building. The third phase is feasibility testing to ascertain the usability of the standards and practicality within contextual settings. The HSO framework was adopted to inform objectives and phases of the study (see Table 1.1 HSO standards development framework).

Table 1.1 HSO standards development framework

HSO framework steps	Phases of the study	Objectives of the study
Step1: Identify opportunities for the review of standards	Pre-phase of the study including statement of the problem	
Step 2: Establish technical committees		
Step 3: Preparation of draft,	Phase 1	Describe the standards used in the evaluation of quality undergraduate e-learning in health sciences programmes in low and middle-income countries (LMIC) through an integrative review

Step 4: Consensus building on draft standards	Phase 2	Describe the consensus on standards for evaluating the quality of undergraduate nursing e-learning programmes in low- and middle-income countries through a modified Delphi technique
Step 5: Review of the draft standards		
Step 6: Approval of draft standards	Phase 3	Describe the feasibility of the developed standards in evaluating the quality of undergraduate e-learning nursing programmes in Kenya.
Step 7: Publishing standards	Post phase	Publications of the standards on a website

Table 1.2 Overall research plan

Phase	Objective	Design	Population	Sampling	Data Collection	Data analysis	Outcome
1.	Describe the standards used in the evaluation of quality undergraduate e-learning in health sciences programmes in low and middle-income countries (LMIC) through an integrative review	Integrative review	Literature	Documents that meet the inclusion criteria	Integrative review	Inductive data analysis	Identifying standards for evaluating the quality of undergraduate e-learning nursing programmes in LMICs' Article 1
2.	Describe the consensus on standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries through a modified Delphi	Modified Delphi design	20 participants	Purposive and snowballing	Modified Delphi	Descriptive analysis and consensus on the developed standards	Consensus on standards for evaluating the quality undergraduate e-learning nursing programmes in LMICs Article 2
3.	Describe the feasibility of the developed standards in evaluating the quality of undergraduate e-learning nursing	Multiple methods design	One undergraduate e-learning nursing programme	Purposive sampling	Focus group discussion and interviews	Inductive data analysis	Feasible, usable, and practical standards for evaluating the quality of e-learning in nursing programmes in Kenya. Article 3

	programmes in Kenya						
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1.8 Phase 1: Undergraduate e-learning programmes in the health professions: An integrative review of evaluation standards in low- and middle-income countries

1.8.1 Purpose of the phase

This phase aimed to describe standards used to evaluate the quality of e-learning programmes in health professions in low and middle-income countries.

1.8.2 Research question

What standards are used to evaluate undergraduate e-learning in health professions in low- and middle-income countries?

1.8.3 Design

The study utilised the integrative review methodology described by Whitemore and Knafl (2005) to describe what is known about standards used in evaluating e-learning in undergraduate health science programmes in LMICs. An integrative review is a specific review method that summarises past empirical or theoretical literature to provide a comprehensive methodology. It allows the inclusion of quantitative and qualitative research articles (Whitemore & Knafl, 2005; Broome, 2000). The integrative review is a non-experimental design in which the researchers objectively critique, summarise and make conclusions about a subject through a systematic search, categorisation and thematic analysis of past qualitative and quantitative research studies on the subject (Christmals *et al.*, 2017; LoBiondo-Wood & Haber, 2010; Sparbel & Anderson, 2000; Torraco, 2005). The following section describes the execution of each step as it applies to the study (Figure 1.1).

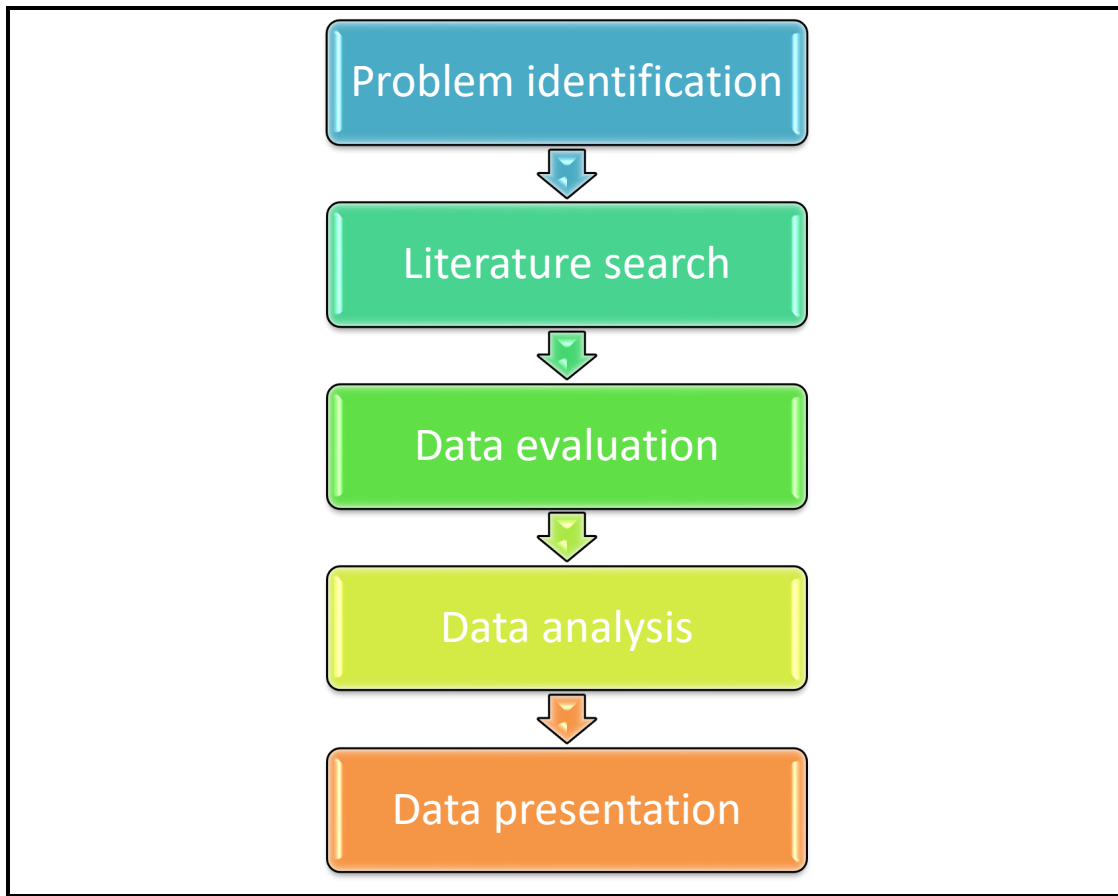


Figure 1:2 Integrative review steps (Whittemore & Knafl, 2005)

1.8.4 Problem identification

The initial stage of the integrative review identified the problem, and the purpose the review was addressed (Whittemore & Knafl, 2005). Process standards to guide the evaluation of the quality of e-learning programmes are essential in improving e-learning, especially in nursing programmes. The lack of standards affects the quality of graduates produce, further affecting the health outcomes of patients and communities at large.

1.8.5 Literature search

Integrative reviews summarise the latest research, and a twelve-year overview seemed sufficient to provide information that would be useful for this study, taking into account the relatively new field of e-learning. The literature search included a research question, search terms and a search string as described below.

1.8.5.1 Review question

The following review question guided the integrative review:

What standards are used to evaluate undergraduate e-Learning in health sciences programmes in low- and middle-income countries?

1.8.5.2. Search terms

The following search terms were used to generate the search strategy using the population, intervention, comparison and outcomes (PICO) approach. The following were the key terms:

- ❖ Population: health science programmes
- ❖ Interest: standards of e-learning and evaluation
- ❖ Context: Low-and middle-income countries

1.8.5.3 Search string

The search string was generated using the main concepts of the study, their synonyms, and Boolean operators:

(assess evaluat* measur* licen* accredit*) n3 ("electronic teaching" "online education" "internet-based learning" "blended education" e-learning "Online learning" "Distance learning" "Blended learning" "Computer-assisted instruction" "Computer-assisted learning") (Policy policies Benchmark* Qualit* criter* Principle* Descriptor* "quality standard*") ("health science*" Nurs* medic* healthcare)*

1.8.5.4 Additional search strategies

An ancestry search examined the reference lists of included literature sources for additional literature.

1.8.5.5 Databases

The literature search was done through the assistance of a information specialist from the University of the Free State Library and Information Services. The search was done on the EBSCO Host interface, allowing access to several databases. The search output was presented as titles and abstracts of the literature sources. The following databases were consulted on the EBSCO Host platform: MEDLINE, CINAHL with full text, Academic Search Ultimate, APA PsycInfo, ERIC, Health source: Nursing/academic edition, CAB Abstracts, Africa-wide Information, Sociology Source Ultimate, and Communication and Mass Media Complete.

1.8.6 Data evaluation

Data evaluation involves evaluating the quality of the empirical and theoretical sources used in the research to evaluate their authenticity, methodological quality, informational value, and the representativeness of literature sources considered. The theoretical reports were evaluated using critical evaluation methods such as inclusion and exclusion criteria detailed below.

1.8.7 Inclusion and exclusion criteria

Certain inclusion and exclusion criteria guided the integrative review process. The following were inclusion criteria for literature sources to be included in the study:

1. About evaluation of undergraduate e-learning in health professions
2. Should have been published between 2010 and 2022
3. Grey literature
4. Literature from LMICs

Literature was excluded from the review based on the following criteria:

1. Not related to health sciences
2. Literature on post-graduate programs
3. Not accessible from the university library

4. Literature dated before 2010

1.8.8 Article screening and selection process

Screening entailed selecting suitable literature sources that would be best suited to answer the review question (Pare & Kitsiou, 2017). In the initial step, the review team of three reviewers screened the titles and abstracts independently for relevance to the research question and inclusion criteria. Discussion and consensus guided the final list of included titles and abstracts. The subsequent step focused on screening full-text articles by the same three researchers, guided by the inclusion criteria.

1.8.9 Data extraction

Data extraction from the included literature was guided by a data extraction table (Addendum 2.5). The data extraction table was derived from the review questions and the purpose of the review.

1.8.10 Data analysis

Data analysis in integrative reviews require that the data from primary sources are read, coded, categorised, and summarised into a unified and integrated conclusion about the research problem (Whittemore & Knafl, 2005).

Data analysis in integrative reviews involve data reduction, data display, data comparison, conclusion, drawing, and verification.

1.8.10.1 Data reduction

The first phase of data reduction involves determining an overall classification system for managing the data from diverse methodologies (Whittemore & Knafl, 2005). The primary sources included in the integrative review were grouped based on research design (descriptive, correlational, and experimental). The next step involved extracting and coding data from primary sources into a meaningful framework which were added to a spreadsheet.

1.8.10.2 Data display

Data display involves converting extracted data from individual sources into a display that assembles the data from multiple primary sources around a particular variable (Whittemore & Knafl, 2005). The data display enhanced the visualisation of patterns and relationships within and across primary data sources in this study and served as a starting point for interpretation (Whittemore & Knafl, 2005).

1.8.10.3 Data comparison

This involves an iterative process of examining the data obtained from primary sources data to identify patterns, themes, or relationships. Once patterns are discerned, a conceptual map is drawn (Whittemore & Knafl, 2005). Similar variables are grouped together, and a temporal order is displayed. A record is kept during analysis that documents data analysis decisions or any ideas that may directly relate to the interpretation of data (Toronto & Remington, 2020; Whittemore & Knafl, 2005).

1.8.10.4 Presentation

Conclusions of integrative reviews are reported on a table or other diagrammatic form (Toronto & Remington, 2020; Whittemore & Knafl, 2005). The outcome of this stage were standards for e-learning in LMIC (see Chapter 2).

1.8.11 Rigor

Integrative reviews require a standard of excellence regarding methodological rigor so that the product can contribute significantly to science and clinical practice (Soares *et al.*, 2014). Rigor in this phase was established by following Whittemore and Knafl's (2005) process. Various approaches were involved to enhance the rigor of the review. A clearly defined question for the integrative review was stated. A well-defined literature search strategy was used in the review. There were three reviewers, consensus building among reviewers, and verbatim data extraction from the articles. There was a clear selection criterion of the studies to be included in the review, and a clear definition and description of the characteristics of the analysed articles were provided. Transparency in the

procedures of identification, inclusion, and classification of the articles to be reviewed guarantees rigor in an integrative review (Soares *et al.*, 2014; Whitemore & Knafl, 2005). The outcome of the integrative review was standards for evaluating undergraduate nursing e-learning programmes.

1.9 Phase 2: Standards for evaluating the quality of undergraduate nursing eLearning programme in low- and middle-income countries: A modified Delphi study

1.9.1 Purpose

This phase aimed to develop standards for evaluating the quality of undergraduate nursing e-learning education in low and middle-income countries.

1.9.2 Design

A modified Delphi technique embodied in a methodological research design for standard development adapted from the Health Standards Organization [HSO] (2020) was used in the study. Initially, the researcher applied the outcomes of the integrative review (Phase 1) to develop process-based standards for evaluating the quality of e-learning in undergraduate nursing. This process was guided by the supervisor, an expert in accreditation and quality assurance in health professions education.

1.9.3 The modified Delphi technique

A modified Delphi technique was applied to generate consensus from experts in LMICs on the developed standards (Shariff, 2015) (see figure 1.3 modified Delphi technique).

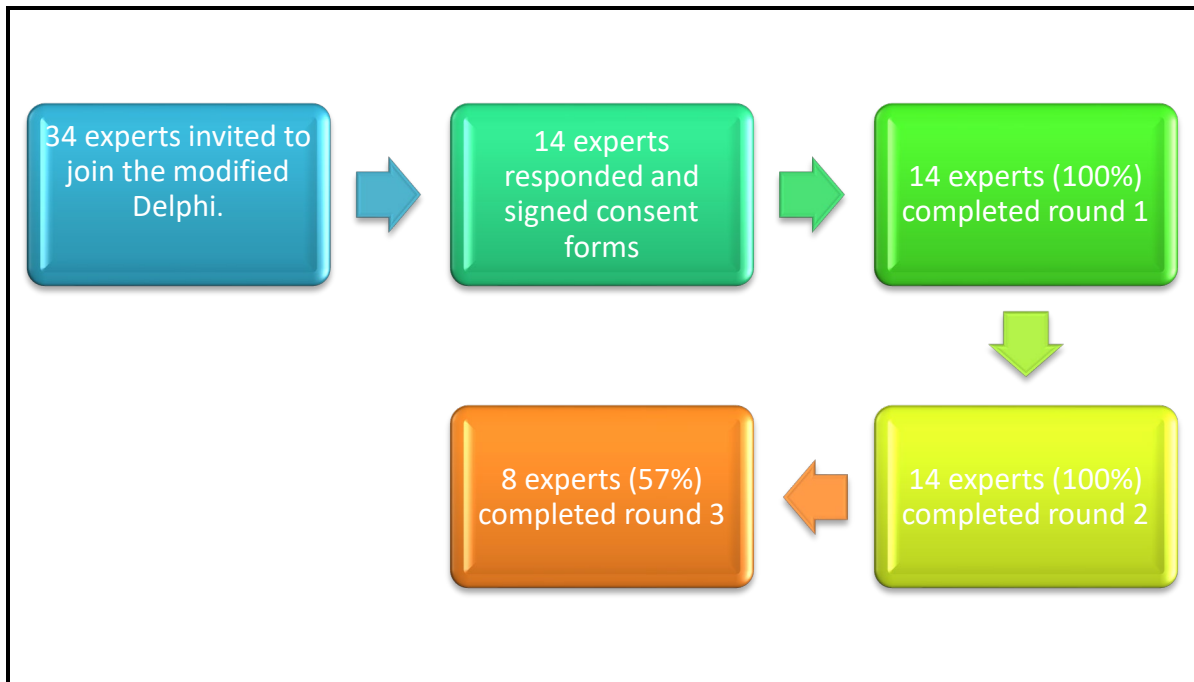


Figure 1.3 Modified Delphi technique

1.9.4 The population of the modified Delphi

The population of the modified Delphi constituted experts with experience in e-learning in LMICs through teaching and/or policy formulation related to e-learning, recent publication history in e-learning in LMICs, a nursing or health sciences background, and technical knowledge of e-learning in LMICs'. The population was selected based on an inclusion criterion to ensure inclusivity and equity.

1.9.5 Identifying the experts

The selection of experts for the modified Delphi directly relates to the quality of the results (Vishwanath & Begum, 2019). The researcher will identify experts to be part of the modified Delphi using specific criteria. They were individuals with expertise, experience, and a background in e-learning in health sciences in LMICs. The inclusion criteria for participants for this modified Delphi were:

- ❖ Experts actively teaching in higher education.
- ❖ Experience in e-learning in LMICs either through teaching or policy in e-learning

- ❖ Technical knowledge of e-learning, and could include administrators, and, digital campus, and e-learning support personnel across LMICs.

1.9.6 Process of the modified Delphi technique

The process of the modified Delphi technique involves the following steps recruitment of experts, data collection process, data analysis and outcome of the modified Delphi technique.

1.9.6.1 Recruitment of experts

Initially, the researcher identified potential experts from university databases and authors of articles included in the integrative review. These experts were composed of specialists in nursing education from Africa and Asia. Secondly, the experts were requested to nominate other experts who met the inclusion criteria, and these nominated experts were also invited to participate in the study if they met the inclusion criteria. These experts were pooled from various universities in Africa and Asia. A total of 25 experts were selected to participate in the modified Delphi. The researcher personally contacted and invited each possible expert through e-mail. The e-mail contained an information leaflet (Addendum 3.3), the expected outcomes of the modified Delphi's and a request for a commitment to the process. A total of 14 experts were included in the modified Delphi.

1.9.6.2 Data collection process

In the first round, the experts included in the study received a copy of the standards via the REDCap ® application. The panellists were blinded to each other. For each of the standards, there were three options, 'agree', 'not sure', 'disagree,' and a section for comments. The experts were expected to make decisions on each criteria, and if they were unsure or disagreed, they were expected to provide or suggest an alternative criteria. Consensus was set at 80% with areas of disagreement providing an opportunity for a second round.

In the second round, any criteria reaching the threshold of 80% was regarded as finalised and was not included in the third round. In cases where 80% consensus was not reached

by the experts, or if they were unsure about a standard or its criterion, the standard and its criterion were reformulated based on the feedback and included in the questionnaire for the second round. The experts were required to review the standards that did not reach the consensus threshold, and decide on whether to keep, discard or suggest alternatives or modifications. At the end of the second round, the standards proposed by the experts were deliberated, decisions to retain or remove standards were made in line with expert opinion and the final standards were developed.

The third and final round aimed to provide the experts with the finalised standards. Experts were requested to comment on their feasibility, usability, and practicality in LMICs. The experts agreed that the standards were feasible, usable, and practical within the LMIC context.

The round three panellists were emailed the final standards with changes made per the consensus in round two. A thank you note was sent to all stakeholders (Brady, 2016).

1.9.6.3 Data analysis

Once the information was returned, it was analysed, and each item was analysed separately (Brady, 2016; Crawford & Wright, 2016; Shariff, 2015). Data from the modified Delphi rounds were analysed quantitatively by descriptive statistics and qualitatively using qualitative content analysis. Data analysis involved analysing each criterion for consensus (Crawford & Wright, 2016; Shariff, 2015; Woodcock *et al.*, 2020). After each rating round, analysis was done on each standard, and those standards with a consensus of 80% across all the responses were moved to the final draft. The standards and criteria that did not reach 80% consensus and areas of disagreement were rerated in the second round, and the recommendations and comments made by experts were considered. Responses from the second round provided ratings with areas of agreement with modifications, and the standards moved to the final draft.

All areas of agreement from the second round were incorporated, and those that did not reach the threshold were eliminated from the standards. The third round presented the final standards through the iterative process.

1.9.6.4 Outcome of the modified Delphi

The outcome of the modified Delphi was validated standards for evaluating the quality of undergraduate nursing e-learning programmes in low and middle-income countries (see chapter 3).

1.9.7 Ethical considerations

All experts signed an informed consent form and were requested to keep their participation in the study confidential and remain in the study until the end of the modified Delphi process (Millar *et al.*, 2006). The participants in the modified Delphi were blinded to each other. This reduced bias and dominant pressure and ensured that the responses of all members were considered in the final draft (Hasson *et al.*, 2000; Millar *et al.*, 2006). The iteration of responses ensured that experts could change their opinions and judgements. In controlled feedback, the results of each round were summarised and reported to the group, and they were required to discuss the feedback (Millar *et al.*, 2006). The experts were free to withdraw from the study at any time with no victimisation. Experts were not remunerated for participating in the study, but a thank you note was sent to all participants at the end of the process.

1.9.8 Rigor of the modified Delphi

In modified Delphi studies, it is widely accepted to use the term trustworthiness compared to the term's reliability and validity (Keeney & Hasson, 2011). The modified Delphi ensured trustworthiness by formulating the research question, transcribing responses, and recording responses over successive rounds. Furthermore, trustworthiness was to be established through the following: (Keeney & Hasson, 2011):

Credibility: Credibility is enhanced by ensuring all the experts meet the inclusion criteria, ongoing iteration, and providing feedback to panellists

Dependability: is enhanced by ensuring a range and representative sample of experts within the modified Delphi

Conformability: is achieved by ensuring a detailed description of the modified Delphi data collection and analysis process

1.10 Phase 3: Standards for undergraduate nursing e-learning programmes in Kenya: A feasibility study.

1.10.1 Purpose

This phase aims to describe the feasibility of developed standards in evaluating e-learning in a nursing programme in Kenya

1.10.2 Design

A multiple methods design was used for this study, integrating both qualitative and quantitative approaches (Creswell, 2013).

1.10.3 Population

The researchers aimed to recruit participants with experience related to undergraduate e-learning nursing programmes, either as educators, learners, or support staff. A total of 20 learners, three educators and five support staff were eligible and purposive sampling was used to include participants in the study. The learners were invited to participate through class representatives who informed them of the data collection process. Those interested gave their names and phone numbers and were invited to the focus group discussions. The educators and support staff were initially recruited via email, and those who agreed were telephoned to set up interview appointment dates. The quality assurance manager was invited to provide answers to quality issues surrounding e-learning. Nurse educators were invited to provide insight on their role as educators and how they were integrating e-learning. Digital campus staff were invited to provide information on the Learning Management System (LMS) and overall e-learning management. Learners who utilised e-learning as a tool for learning were invited to give feedback on the process and identify how these standards are incorporated into improving their learning experience. Finally, ICT staff provided infrastructural and support information. All the participants were informed about the aims and methods of the study,

and a consent form was provided. The six standards had criteria under each, and these were intertwined. The research assistant and researcher identified criteria for the different populations and mapped out which standards applied to which section of the population. This ensured the study's relevance to the specific population and facilitated to answer the research question (see Table 1.3 Population).

Table 1.3: Population

	UNIVERSITY A
Population	Number
Quality assurance manager	1
Nurse Educators	3
Digital campus staff	2
Students (alumni and current)	20
ICT department	2
Total	28

1.10.4 Sampling

Purposive sampling was used to select a university offering a degree in nursing upgrading program through e-learning. The university with the highest number of student nurses were selected for the study. Purposive sampling was used to select nurse educators who have taught using the e-learning programme.

Purposive sampling was used to select digital department staff, ICT and quality assurance managers who are actively involved in running e-learning programs. They also interact and engage with students and educator issues, as well as and the day- to- day running of the digital platform (Ames *et al.*, 2019)

1.10.5 Data collection plan

A research assistant with experience in e-learning programme design and quality assurance was selected and trained over three months on the expectations of the study, and on how to complete the standards checklist. Under each specific standard, a checklist (Addendum 4.6) was developed by the researcher following an integrative literature review and a modified Delphi of experts drawn from LMICs. The checklist had six standards.: curriculum planning, proficiency of the educator, learner proficiency, infrastructure for learning, support, and evaluation. Each of these standards had criteria, and the research assistant was required through interviews and focus group discussions with relevant individuals to decide 'yes', 'no' or 'unclear' about every standard. For each standard, the research assistant was required to provide a narration of the current situation in the institution and supporting evidence, if applicable, in the checklist. The researcher supervised and coordinated the activity, and the research assistant collected the data. Data collection involved interviews with the following personnel: digital campus staff, nursing educators, the ICT department and quality assurance managers. The participating respondents were asked about specific standards in their field of expertise. Their responses were recorded alongside the narration, and requests for supporting evidence where applicable. Learners were pursuing their degree qualification in nursing education. Learners were subjected to a focus group discussion in a classroom setting in two separate sessions of 10 students each for 40 minutes on specific standards and experiences from theme three on learner proficiency, and their responses were recorded on the checklist. The educators were interviewed based on the curriculum planning and educator proficiency and attitude standards. There were aspects of quality cutting across the various standards, and the quality assurance manager was interviewed on these standards. Digital campus staff and ICT staff were interviewed on support and infrastructure standards. After the data collection process, the research assistant prepared a self-evaluation report.

After data collection, a panel of three experts with expertise in Kenyan higher education e-learning programmes and quality assurance mechanisms were sent the self-evaluation

report findings. They were requested to interpret the report and provide opinions on the feasibility, usability, and practicality of the developed standards.

1.10.6 Data analysis plan

The data collected was primarily quantitative and qualitative data, guided by the checklist. Descriptive data analysis was used to describe the responses received per standard across the various criteria, and to establish constructs of interest and associations between these concepts, allowing the presentation of insights from the data in a logical and meaningful way (Sheard, 2018).

1.10.7 Ethical considerations

Research approval was obtained from the University of the Free State Health Sciences Research Ethics Committee (HSREC) with the ethical clearance number UFS-HSD2021/0370/2809 (Addendum 1.1). Approval was also obtained from the Kenya Methodist University (Addendum 4.1). The participants were invited to participate voluntarily. Respondents were free to leave the study at any point with no victimisation. Pseudonyms were used to improve the confidentiality of participants in the FGDs. All research data was stored securely to ensure privacy.

The research was guided by an overarching ethical framework based on the Belmont Report (1978) following three principles, namely:

Respect of persons: the research participants had to sign an informed consent form before participating in the study. The research participants were treated with autonomy, as they were freely to consent or decline to participate in the study without coercion or remuneration. The participants were free to withdraw from the study without victimisation. Confidentiality and anonymity were maintained by ensuring that no identifying data were included on the questionnaires.

Beneficence: the researcher ensured that no harm befell the participants during data collection. In the study, the researcher ensured that the study participants were safe, and their opinions protected during data collection.

Justice: In the study, the selection of research participants was purposive to be able to answer the problem under study.

The participants were blinded to each other. This reduced bias and dominant pressure of others and ensured that the response of all members were considered in the final draft (Hasson *et al.*, 2000; Millar *et al.*, 2006). A research permit to conduct the research was sought from the National Commission for Science and Technology and Innovation (NACOSTI) (Addendum 1.2) which oversees ethics clearance for all projects conducted in Kenya.

1.10.8 Significance of the study

The COVID-19 pandemic had a silver lining in the growth of e-learning, as most higher education institutions shut down physical operations as a containment measure (Affouneh *et al.*, 2020). A few institutions resorted to e-learning to foster student academic progress. Universities were not left behind, with medical and nursing schools resorting to e-learning, despite the challenges in rolling out such programmes. This research is pivotal in providing standards and influencing the quality of e-learning in nursing upgrading programmes in Kenya. In addition, presentations in various educational seminars and workshops enabled the adoption of the standards. The publication of research findings in accredited journals also provided an avenue for the dissemination of the findings at a global level. The novelty of these standards in evaluating the quality of undergraduate e-learning programmes is quintessential in low- and middle-income countries. The feasibility, usability, and practicality of these standards having been tested in a low resource setting, ensures the ability of the standards to be integrated in LMICs. The study also contributed to the body of knowledge in an area with limited knowledge offering robust, detailed, and holistic standards for the evaluation of the quality of e-learning programmes in LMICs. The testing of these standards has further anchored the dominance of the study in reporting a novel approach with a context- specific focus on quality of undergraduate e-learning programmes in LMICs through holistic standards. These standards also benefit accreditation bodies, universities educators, learners and support staff in not only evaluating their e-learning programmes using standards but also

strengthening the e-learning landscape for the continuous improvement of nursing science.

1.11 Layout of the thesis

The layout of this thesis is as follows:

Chapter 1: Overview of the study

Chapter 2: Identifying the standards evaluating the quality of undergraduate e-learning nursing programmes

Chapter 3: Consensus on the standards for evaluating the quality of undergraduate e-learning nursing programmes.

Chapter 4: Feasibility of the standards evaluating the quality of undergraduate e-learning nursing programmes.

Chapter 5: Conclusions and recommendations

1.12 References

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Chapter 2

Article 1: Undergraduate e-learning programmes in the health professions: An integrative review of evaluation standards in low- and middle-income countries

2.1 Article details

Title	UNDERGRADUATE E-LEARNING PROGRAMMES IN THE HEALTH PROFESSIONS: AN INTEGRATIVE REVIEW OF EVALUATION STANDARDS IN LOW- AND MIDDLE-INCOME COUNTRIES
Authors	Moses M. Mulu, Dr Champion N. Nyoni
Journal	PLoS One
Journal details	Open access, Peer- reviewed journal
Impact factor	3.24, Q1
Status	Second round of peer review

The purpose of the study was to synthesis standards used to evaluate the quality of e-learning programmes in health professions in low and middle-income countries.

2.2 Associated addenda:

Addendum 2.1: Author guidelines and scope

2.2: Confirmation of article submission

2.3: Peer review comments

2.4: Response to reviewer comments

Undergraduate e-learning programmes in in the health professions: An integrative review of evaluation standards in low- and middle-income countries

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Abstract

Background

Before the Coronavirus COVID-19, universities offered blended learning as a mode of study. However, with the closure of all educational institutions, after the pandemic, most of these institutions were required to transition to e-learning to support continuous student learning. This transition was challenging to most institutions, as there were no standards to ensure the quality of e-learning. During this literature review, the researcher aimed to explore relevant literature and provide insight into the standards for undergraduate e-learning programmes in the health professions.

Design

An integrative review of literature.

Data sources

Online databases MEDLINE, CINAHL with full text, Academic search ultimate, APA PsycInfo, ERIC, health source: Nursing/academic edition, CAB abstracts, Africa-wide information, Sociology source ultimate, and Communication and Mass media complete were searched.

Review methods

Studies pertaining to low- and middle-income countries (LMICs) on standards in evaluating undergraduate e-learning programmes in health professions, published between January 2010 to June 2022 were considered. A two-step process was followed involving three reviewers and guided by an inclusion criterion focused on the evaluation

of undergraduate e-learning programmes in the health professions. The initial hit produced 610 articles altogether, and eight articles that met the inclusion criteria were included in the study. Data was then extracted and analysed, and key themes identified.

Results

Eight Key themes related to LMIC standards emerged from the eight selected articles: curriculum planning, proficiency of educator, learner proficiency and attitude, infrastructure for learning, support and evaluation.

Conclusion

In this review, we synthesised standards that have been used for evaluating undergraduate e-learning programmes in health professions in LMICs. A gap in standards related to clinical teaching and learning in undergraduate e-learning programmes in the health professions was evident from all the included articles. The identification of the eight unique LMIC standards in this review could contribute to guiding towards contextually appropriate quality e-learning programmes in the health professions.

Keywords: e-learning; standards; quality; health professions; undergraduate; COVID-19; universities

Background

Employers are sceptical about hiring health professionals whose qualifications are obtained through e-learning (Delva *et al.*, 2019). Clinical incompetence and poor quality of assessments are often used to support arguments against the employment of such health professionals (Gemuhay *et al.*, 2019). These narratives are palatable to the regulators of health professions, who often argue in line with protecting the public from poorly trained and incompetent health professionals (Delva *et al.*, 2019, Gemuhay *et al.*, 2019, Gaupp *et al.*, 2019). However, technological advancements and the recent COVID-19 pandemic have effectuated the rapid uptake of e-learning and distance education into mainstream programmes in the health professions. Strategies need to be in place to evaluate and guarantee quality in these programmes.

An educational programme is evaluated against standards to determine its quality (Delva *et al.*, 2019, Gaupp *et al.*, 2019, Kumar *et al.*, 2019). The literature describes various models and frameworks used for assessing the quality of e-learning programmes. The quality matters (QM) model is a prominent model for evaluating e-learning quality and has generated widespread interest through several studies that support its impact (Kumar *et al.*, 2019). The QM model applies eight standards: the course overview, learning objectives, assessment and measurement, resources, materials, learning engagement, course technology, learner support, and accessibility in evaluating the quality of e-learning programmes. The context, inputs, processes and product (CIPP) model was initially developed by Stufflebeam (1968). Fishbain *et al* (2019) operationalised it in describing the process of evaluating online programmes, considering the structure, complexity, and cultural differences. Furthermore, essential elements in evaluating the quality of e-learning programmes such as technological infrastructure, institutional support, course design, support of instruction and learning, assessment, educators, administration, and curricular structure have been reported (Kumar *et al.*, 2019, Capacho *et al.*, 2019, Bergeron & Fornero, 2017). Fishbain *et al* (2019) make a futuristic recommendation related to evaluating e-learning programmes for the health professions by including patient outcomes. The above models and frameworks present a plethora of approaches used to evaluate e-learning programmes reflecting various areas of chiasm and divergence. However, the operationalisation of these models and frameworks within undergraduate e-learning programmes in health professions education is complex.

Undergraduate education programmes in the health professions integrate clinical and theoretical components (Delva *et al.*, 2019). The clinical detail adds an absorbing layer of complexity in evaluating and maintaining quality in an e-learning programme. The clinical environment where students learn is often distant from the online educator, who relies on the clinicians to support students to develop clinical competence (Delva *et al.*, 2019, Rad *et al.*, 2021). Kolb & Kolb (2013) argue that classroom activities must align with the clinical experience to enhance learning and avoid cognitive dissonance, which interferes with learning and hinders competence development (Klein & McColl, 2019). Thus, students enrolled in undergraduate e-learning in the health professions programmes may experience cognitive dissonance in the clinical setting due to differing resources,

approaches to healthcare, disease profile, student support and online educators who may apply different standards. The literature confirms the influence of cognitive dissonance on the perceptions of the quality of educational programmes (Alam *et al.*, 2021, Yang *et al.*, 2021). Therefore, more specific standards and approaches in determining and ensuring quality in e-learning nursing education may be needed in health professions programmes to learn and demonstrate skills and competencies (Delva *et al.*, 2019). However, at the time of Delva *et al.* (2019) study, there were no reported standards specific to evaluating the quality of undergraduate nursing programmes and no reported entity in the United States responsible for the oversight and continuous evaluation of the quality of online nursing programmes. The unavailability of explicit strategies for evaluating e-learning undergraduate programmes in the United States may be similar in other countries, including Low- and middle-income countries (LMICs). The uniqueness of LMICs is that their challenges are dissimilar from developed countries. Hence context-specific standards will enhance the quality of e-learning.

E-learning provides greater flexibility concerning times, space, language, content, and administrative power than traditional face-to-face learning (De Leeuw *et al.*, 2018). Technological advances in various areas, including education in the health professions, the integration of e-learning and online distance education is inevitable. However, there is a need to understand the determinants of quality standards in e-learning programmes in the health professions underpinned by the complexity brought on by educators, students, variations in resources, regulations, and clinical outcomes. This article presents an integrative review that synthesised evidence related to standards used to determine quality in undergraduate e-learning programmes in the health professions from LMICs. We argue that low-resource settings contribute to the discourse related to evaluating quality in undergraduate e-learning programmes in the health professions, which could guide the development of contextually appropriate interventions. Such interventions need to enhance quality and should assure regulators and the public of the competence of health professionals trained through e-learning programmes.

Methods

This section seeks to present the approach used in the integrative review for evaluating undergraduate e-learning programmes in the health professions in LMICs.

Design

The purpose of the current review was to synthesise available literature related to standards for evaluating undergraduate e-learning programmes in the health professions in LMICs. An integrative review approach included theoretical and empirical literature on varied methodologies and designs (Rodgers & Knafl, 2000, Toronto *et al.*, 2020, Whittermore & knafl, 2005). In the sections below, we report the five main steps of the integrative review:

Problem identification

The following research question guided this integrative review:

‘Which standards are used in evaluating undergraduate e-learning programmes in the health professions in LMICs?’

Literature search

The research question was operationalised by identifying keywords and their synonyms linked through Boolean operators and modifiers to generate a search string. The keywords were ‘evaluating’, ‘e-learning’, and ‘health professions’. After being piloted, the search string was refined through a ‘quick and dirty’ search by an information specialist. The final search string in this review was:

(assess evaluat* measur* licen* accredit*) n3 (“electronic teaching” “online education” “internet-based learning” “blended education” e-learning “Online learning” “Distance learning” “Blended learning” “Computer-assisted instruction” “Computer-assisted learning”) (Policy policies Benchmark* Qualit* criter* Principle* Descriptor* “quality standard*”) (“health science*” Nurs* medic* healthcare)*

The search string was used to search for the literature through a university library. The EBSCOhost interface was used to access databases for this review. The following

databases generated 610 hits: MEDLINE, CINAHL with full text, academic search ultimate, APA PsycInfo, ERIC, Health source: Nursing/academic edition, CAB abstracts, Africa-wide information, Sociology Source Ultimate, and Communication and Mass Media Complete. The hits generated are presented as titles and abstracts.

Selecting the articles

A two-step process involving three reviewers and guided by an inclusion criterion was applied in selecting articles to be included in this review. The two authors and an expert in the education of health professions from a low-income country screened and selected the articles. Included articles had to be focused on the evaluation of undergraduate e-learning programmes in the health professions, should have been published between January 2010 and December 2020 and had to be from LMICs. Prior to the screening, 305 records were excluded through automatic and physical deduplication. Of the remaining 295 records, 269 were eliminated for various reasons, including inappropriate context and different subjects. Full texts were sought from 24 remaining records of which 16 were eliminated as they did not meet the inclusion criteria. Six articles met the criteria and were included in this review. The search process was updated in June 2022 and a similar screening and selection process was followed. An additional two articles met the criteria resulting in a total of eight articles included in this review. (see Figure 1).

Data extraction

An author-generated custom-made Google form was used to extract data from the included articles. The form was piloted on two articles by both authors and refined to their satisfaction. The characteristics of the articles were author name, the title of the study, and country, but also the purpose of the study, population group, the study design and results or outcomes which were also identified from the included articles. The evaluation models, data collection and data analysis methods, as well as recommendations and limitations, were identified (Table 1). The first author extracted data from the included articles, and the second author checked the work and resolved discrepancies through discussions.

Table 1. This is the table 1 title. Data extraction table

Data analysis

This integrative review was underpinned by the contemporary framework for integrative reviews, which was applied throughout the process of analysing data (Whittemore & Knafl, 2005). Whittemore & Knafl (2005) suggest a multi-step process for analysing data for an integrative review. Frequencies related to study characteristics were tallied, while an inductive thematic approach was used to identify standards for evaluating e-learning as presented by the included articles (Table 2).

Table 2. This is the table 2 title. Data analysis table

Author	Standard used in evaluating e-learning (theme)
Babadi and Ehrasz (2018)	Needs assessment, educational goals, learning, content, curriculum course plan, equipment, infrastructures, evaluation, motivation of learners, interest of learners, stimulation for learners
Jebraeily et al. (2020)	Focusing on learning needs, flexibility of the virtual component, variety of teaching and evaluation methods, improved self-learning and problem-solving skills, improved lecturer– student interactions, matching with student interests in digital tools, IT and network infrastructure, human resources, institutionalisation of virtual education, independent learning management system, sufficient suitable feedback, develop regional and international cooperation, health education and transformation plan, administrative support, compliance with copyright and intellectual property
Mousavi et al. (2020)	Programme effectiveness, teaching skills, professionalism and professional ethics, learner support, safety and convenience, learning academic meta-skills, educator training
Raghuveer and Nirgude (2016)	Pattern on computer and internet usage, self-perceived computer skills, proficiency of e-learning use, attitudes on e-learning, usefulness of various e-learning resources, such as teaching and learning resources, easy access to learning material, accessibility outside campus, variety in content material to include videos, clinical scenarios, demonstration, and illustrations
Sowan and Jenkins (2013)	Course design, delivery process, student satisfaction, quality of instruction, active and collaborative learning experiences, instructor support
Saiboon et al. (2021)	Higher flexibility, personalised learning, usefulness, ease of use, perception of scores in e-learning affects knowledge scores

Wasfy <i>et al.</i> (2021)	Organizational capacity, resources, organizational bylaws, effective learning and assessment, course design, course delivery, student assessment, evaluation, human resources (faculty, students, and administration), digital tools, academic counselling
Saleh <i>et al.</i> (2022)	Online learning modality, the significance of Diploma, course content, instructors, transfer of learning into performance, personal development

The identified standards were further synthesised through pattern coding to reflect broader themes and domains related to evaluating e-learning in undergraduate programmes in the health professions.

Results

Study selection

The primary search strategy identified 610 studies, from which 205 duplicates were excluded through automatic and physical deduplication. Of the remaining 295 records, 269 were eliminated for various reasons, including inappropriate context and different subjects. Full texts articles were sought from 24 remaining records, of which 16 were eliminated as they did not meet the inclusion criteria. A total of eight articles met the criteria and are included in this review (Figure 1)

Figure 1. This is the Figure 1 title. PRISMA (modified flow diagram)

Study characteristics

Based on the studies' characteristics, three articles from Iran were selected. The other articles were from India, Jordan, and Malaysia. There was a paucity of articles from Africa and South America, where many countries are classified in the low- and middle-income brackets. Most of the studies (n=3) were published in 2020 and 2021. One article reported on an undergraduate nursing programme (Sowan & Jenkins, 2013), while the other three journals reported on an undergraduate medical programme (Saiboon *et al.*, 2021). Only two studies mentioned using models to underpin their evaluation processes, namely, the SWOT analysis (Jebraeily *et al.*, 2020), the Kirk Patrick model (Saleh *et al.*, 2022) and the force field analysis (Mousavi *et al.*, 2020). Most of the studies applied mixed methods research (Sowan & Jenkins, 2013, Mousavi *et al.*, 2020, Raghuveer & Nirgude, 2016),

while others used quantitative methods (Sowan & Jenkins, 2013, Babadi & Ehraz, 2019) and qualitative methods (Jebraeily *et al.*, 2020). Seven domains, each with a specific theme, were generated inductively after engaging with the individual themes from each included article (Wasfy *et al.*, 2021). Seven domains, each with a specific theme were generated inductively after engaging with the individual themes from each included article. The seven domains are presented in Table 3.

Table 3. This is the table 3 title. Domains in the evaluation of e-learning

Domains	Themes
<i>Curriculum planning</i>	Curriculum course plan and course design (Babadi and Ehraz, 2018) Quality of assignments (Sowan and Jenkins, 2013) Course content (Babadi and Ehraz, 2018) Improve self-learning and problem-solving skills (Jebraeily <i>et al.</i> , 2020) Education goals and outcomes (Babadi and Ehraz, 2018) Learning academic meta skills (Mousavi <i>et al.</i> , 2020) Course specifications linked to the methodology of the online teaching and the method of assessment (Wasfy <i>et al.</i> , 2021) Written policies & procedures of all online courses (Wasfy <i>et al.</i> , 2021) Course content comprehensive and inclusive (Saleh <i>et al.</i> , 2022)
<i>Proficiency of educator</i>	Self-perceived computer skills (Raghuveer and Nirgude, 2016) Needs assessment (Babadi and Ehraz, 2018) Professionalism and professional ethics (Mousavi <i>et al.</i> , 2020) Matching with student interests in digital tools (Jebraeily <i>et al.</i> , 2020) Perception (Saiboon <i>et al.</i> , 2021) Attitudes on e-learning (Raghuveer and Nirgude, 2016) Teaching skills (Mousavi <i>et al.</i> , 2020) Training educators (Mousavi <i>et al.</i> , 2020) Delivery process (Saiboon <i>et al.</i> , 2021) Clarity on faculty roles and responsibilities (Wasfy <i>et al.</i> , 2021) Programme for continuous faculty training on skills for online teaching (Wasfy <i>et al.</i> , 2021) Assigned faculty numbers are reasonable, sufficient, and aligned with the student number and educational activities (Wasfy <i>et al.</i> , 2021) Instructors provide constructive feedback in a timely manner (Saleh <i>et al.</i> , 2022)
<i>Learner proficiency and attitude</i>	Lecturer-student interactions (Jebraeily <i>et al.</i> , 2020) Active and collaborative learning experiences (Sowan, and Jenkins, 2013)

	Variety of teaching and evaluation methods (Jebraeily <i>et al.</i>, 2020) Personalised learning (Saiboon <i>et al.</i>, 2021) Student satisfaction (Sowan and Jenkins, 2013) Focus on learning needs (Jebraeily <i>et al.</i>, 2020) Interest of the learners (Babadi and Ehraz, 2018) Established programme for student training (Wasfy <i>et al.</i>, 2021) Plan for academic counselling that is clear, manageable, and executed (Wasfy <i>et al.</i>, 2021) Learner confidence because of proper guidance in teaching (Saleh <i>et al.</i>, 2022)
Infrastructure for learning	Equipment (Babadi and Ehraz, 2018) Accessibility outside campus (Raghuveer and Nirgude, 2016) Easy access to learning materials (Raghuveer and Nirgude, 2016) Flexibility of the virtual component (Jebraeily <i>et al.</i>, 2020) Ease of use of materials (Saiboon <i>et al.</i>, 2021) IT and network infrastructure and human resources (Jebraeily <i>et al.</i>, 2020) Independent learning management system (Jebraeily <i>et al.</i>, 2020) Infrastructure and skilful human resource (Jebraeily <i>et al.</i>, 2020) Compliance principle and intellectual property (Jebraeily <i>et al.</i>, 2020) Ease of use (Sowan and Jenkins, 2013) Variety of content material to include: videos, clinical scenarios, demonstrations, illustrations. (Raghuveer and Nirgude, 2016) Usefulness of various e-learning resources such as teaching and learning resources (Raghuveer and Nirgude, 2016) Financial resources allocated to online learning (Wasfy <i>et al.</i>, 2021)
Support	Learner support (Mousavi <i>et al.</i>, 2020) Instructor support (Sowan and Jenkins, 2013) Institutional plan and policy (Raghuveer and Nirgude, 2016) Administrative support (Jebraeily <i>et al.</i>, 2020) Trained technical support team (Wasfy <i>et al.</i>, 2021)
Evaluation	Pattern on computer and internet usage (Raghuveer and Nirgude, 2016) Student online experience (Mousavi <i>et al.</i>, 2020) Effectiveness of programme (Mousavi <i>et al.</i>, 2020) Safety and convenience (Mousavi <i>et al.</i>, 2020) Monitoring and evaluation for the online learning materials/ process by internal reviewers for continuous improvement (Wasfy <i>et al.</i>, 2021) Evaluation data drives decisions for continuous improvement (Wasfy <i>et al.</i>, 2021)

As expected, a relatively low number of articles were included in this review. This finding could be attributed to the low uptake of e-learning programmes in low-resource settings versus the resource-intensive nature of e-learning programmes (Mutsiya & Makokha, 2016, Frehywot *et al.*, 2013, Zalat *et al.*, 2021). Brooks *et al.* (2016) further explain that

the scepticism around the quality of health profession graduates from e-learning or distance learning programmes hampers national investments in e-learning programmes, with educational institutions preferring face-to-face programmes. In the same vein, research outputs from low-resource settings are often low; hence there are limited publications in general (Gemuhay *et al.*, 2019).

Discussions

The purpose of this review was to synthesise available evidence related to standards for evaluating undergraduate e-learning programmes in the health professions in LMICs. The results of the integrated review of standards presented characteristics of the eight studies. They then focused on the seven domains related to the evaluation of undergraduate e-learning programmes in the health professions in LMICs.

The seven evaluation-related domains were curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation. There are similarities between the domains from this review and some of the popular standards used in high-income countries (Perris & Mohee, 2020). The similarity in these standards may be due to models and theories related to evaluation that are often transferred from high-income countries to low-income countries under the guise of confirmed validity (Jebraeily *et al.*, 2020, Raghuveer & Nirgude, 2016). In addition, there are reported similarities among undergraduate e-learning programmes in the health professions between high- and low-income countries, supporting the findings from this review on the similarity of evaluation standards.

The domain related to curriculum planning encompasses various aspects of the structure of e-learning programmes. Babadi & Ehrasz (2019) reflect on the curriculum course plan and course design, educational outcomes and goals, and course content, while Sowan & Jenkins (2013), as well as Rodgers & knafl (2000) describe assignments as part of curriculum planning. Wasfy *et al.* (2021) describe course specifications linked to the methodology of online teaching and the method of assessment with well-formulated policies and procedures for online courses as desired requirements for e-learning programmes. This domain for evaluating undergraduate e-learning programmes in the health professions in LMICs is aligned with the course overview and standards of learning

objectives as defined by the QM model (Delva *et al.*, 2019). The domain further aligns with the curricular structure of Capacho *et al.* (2019) and the course design (Bergeron & fornero, 2017). Prideaux (2003) notes three levels of a curriculum: planned, prescribed, or implemented curriculum, which the former is often operationalised in educational programmes through specific outcomes, goals, designs and even assessments. Therefore, it seems common that the structure of the programme – specifically the curriculum plan for an e-learning programme must be included as part of the standards for evaluating undergraduate e-learning programmes in the health professions.

The uptake of e-learning in undergraduate education in the health professions in LMICs has been hampered by the resource-intensive nature of such programmes (Frehywot *et al.*, 2013, Glanville *et al.*, 2021). The second domain from this review relates to the infrastructure for learning. Several authors described the necessary infrastructure for learning as part of the evaluation standards for their e-learning programmes (Jebraeily *et al.*, 2020, Raghuveer & Nirgude, 2016, Babadi & Ehraz, 2016, Franzen *et al.*, 2017). This infrastructure included equipment, information technology (IT) and network infrastructure, an independent learning management system and skilful human resources. In addition, other authors focused on the ease of accessing and using a specific infrastructure for learning (Jebraeily *et al.*, 2020, Raghuveer & Nirgude, 2016, Babadi & Ehraz, 2016). Raghuveer and Nirgude (2016) further mention the need for a variety of content material to be included and for compliance with principles and intellectual property. Wafsy *et al.* (Wafsy *et al.*, 2021) describe the need for financial resources allocated for online learning. Infrastructure for e-learning is aligned with resources, materials and course technology as described by the QM model, with technology as described by Capacho *et al.* (2019) and with technological infrastructure (Kumar *et al.*, 2019). As e-learning is based on the integration of technology in an educational programme, the standards for evaluating e-learning should have a specific focus on technological resources and use within a programme. Insufficient resources for learning, typical in resource-limited settings, compromise the quality of e-learning programmes.

The proficiency of educators is reported as a domain in this study and focuses on the educators facilitating e-learning. Raghuveer and Nirgude (2016) reported that educators must be proficient and competent in facilitating e-learning. Authors of all included studies

evaluated the online teaching and delivery skills of educators (Sowan & Jenkins, 2013, Saiboon *et al.*, 2021, Jebraeily *et al.*, 2020, Mousavi *et al.*, 2020, Raghuveer & Nirgude, 2016, Babadi & Ehraz, 2016). Moreover, the requirement of educators related to e-learning, including their perception and attitude, was included as part of needs assessments. Additionally, an evaluation of professionalism and ethics during the delivery of content was reported as well as the ability of educators to match students' interests with digital tools. The role of educators in implementing e-learning programmes successfully cannot be overemphasised, as educators have the potential to influence the programme negatively. As part of educator development, continuous training on skills for online teaching is essential (Wafsy *et al.*, 2021). Feedback provided by educators should be constructive and timely to foster efficient implementation by learners (Saleh *et al.*, 2022). The proficiency of the educator domain identified in this study is similar to that reported by Capacho *et al.* (2019), while the QM model and Kumar *et al.* (2019) are silent regarding the educator's proficiency. In LMICs, educators are often not well versed in advancements in educational technology and may be pressured to copy and paste face-to-face teaching modalities into the online or e-learning space. Strategies need to be designed and implemented that focus on determining educator needs, developing the educator, and continuously monitoring and evaluating educators on their effectiveness in the online space.

The learners enrolled in an e-learning programme must be proficient in learning through digital means and possess the appropriate attitudes (Babadi & Ehraz, 2016). In this review, the domain of learner proficiency and attitude reflected standards used to evaluate learners in the e-learning space. The sub-themes were active and collaborative learning experiences, personalised learning, focus on learning needs, and the interest and motivation of learners to learn through electronic means. Jebraeily *et al.* (2020) further focused on the process of improved self-learning and problem-solving skills. The learner proficiency domain was not reported in the other popular models for evaluating e-learning (Kumar *et al.*, 2019, Capacho *et al.* 2019). Learners are expected to have some degree of proficiency specifically related to the technology used in their learning. Babadi and Ehraz (2016), as well as Sowan and Jenkins (2013), state that orienting learners to the learning technologies and subsequent support or maintenance of proficiency is an

essential element in student learning. Learner proficiency should be an indispensable standard where institutions must focus on the competence of learners regarding learning technologies. Furthermore, Raghuveer & Nirgude (2016) mention the role and value of attitudes towards e-learning, as learners should have an interest in the learning approaches. Moreover, a programme for learner training and a plan for academic counselling that is clear, manageable, and executed is required (Wasfy *et al.*, 2021). Just as in the case of educators, the literature by Babadi and Ehraz (2016) specifies that the uptake, use and usefulness of such technology are poor when the learners' interest in the technology is limited, thus compromising the quality of e-learning. Therefore, standards for e-learning should evaluate learner interest in addition to learner proficiency.

Support is understood as specific strategies, techniques and approaches that assist the attainment of a specific outcome. In this review, the included articles reflected the application of support as part of the standards used in evaluating the quality of e-learning programmes. Learners and their educators are expected to be supported during the teaching and learning activities (Sowan & Jenkins, 2013, Jebraeily *et al.*, 2020, Mousavi *et al.*, 2020). The support should be from trained technical teams (Wasfy *et al.*, 2021). The support is focused on learners, specifically relating to technical support (Mousavi *et al.*, 2020) and instructor support (Sowan & Jenkins, 2013). Jebraeily *et al.* (2020) further mention the role of administrative support and the need for support gleaned from institutional plans and policies that direct the nature and type of support for learners and educators. These findings are aligned with other models for describing quality in e-learning programmes. The QM model refers to learner support and accessibility as a standard for evaluating the quality of e-learning support. Capacho *et al.* (2019) relate to support in general, while Kumar *et al.* (2019) relate to support of instruction and learning and institutional support. All e-learning programmes should support learners, and in the evaluation of quality, the nature and type of support need to be made explicit and should be accessible for learners and educators. The support should facilitate quality e-learning within the expected contextual remits.

The last domain, which focuses on the evaluation, provides institutions, programmes, and educators with information on the engagement with learners and the value of their e-learning programmes. In evaluating the quality of e-learning programmes, studies

included in this review reflected evaluation elements using various parameters. Raghuvver & Nirgude (2016) relate to the pattern of computer and internet usage, while Mousavi *et al.* (Mousavi *et al.*, 2020) comment on issues related to programme [effectiveness, safety, convenience, and student satisfaction (Sowan & Jenkins, 2013). The integration of internal reviewers, to monitor online learning materials and processes, and the data generated from the reviews drives decisions for continuous improvement (Wasfy *et al.*, 2021). Only Kumar *et al.* (2019) applied standards aligned with evaluation, namely effectiveness of learning and satisfaction of learners and educators. The standards related to evaluation emphasise an interplay of process and outcome monitoring (Mousavi *et al.*, 2020, Raghuvver & Nirgude, 2016). However, there are gaps related to the longitudinal outcome of undergraduate e-learning programmes in the health professions.

Studies included in this review reported a wide array of standards and indicators of quality within undergraduate e-learning programmes in the health professions (Sowan & Jenkins, 2013, Saiboon *et al.*, 2021, Jebraeily *et al.*, 2020, Mousavi *et al.*, 2020, Babadi & Ehraz, 2019). However, none of the included articles described evaluation standards related to teaching and learning of clinical skills within undergraduate e-learning programmes in the health professions. The lack of standards for evaluating teaching and learning clinical skills is a significant gap within the literature from LMICs (Frehywot *et al.*, 2013). The generic standards used in undergraduate e-learning programmes in the health professions often miss the intricacies of clinical education (Delva *et al.*, 2019). There is a need for the development and integration of standards for evaluating undergraduate e-learning programmes in the health professions that include the evaluation of clinical education. These standards would support education institutions in determining the quality of their programmes and in professing that their graduates are as competent as graduates from face-to-face programmes.

Standards for undergraduate e-learning programmes in the health professions should be distinct from face-to-face programmes. The adoption of standards of face-to-face programmes in undergraduate e-learning is detrimental to the development of e-learning in LMICs (Zalat *et al.*, 2021). The need for standards for evaluating undergraduate e-learning programmes in the health professions is vital in ensuring quality health

professionals. Further research should focus on quality standards in teaching and learning clinical skills in e-learning programmes.

Conclusion

Learners graduating from e-learning and online programmes are currently viewed with scepticism, especially in terms of their clinical competence. However, the integration of digital technology in undergraduate education in the health professions has become inevitable. In most low-resource settings, face-to-face programmes remain superior and dominant as regulators and programme directors struggle to define and apply standards that comprehensively assess e-learning programmes' quality. Delva *et al* (2019) noted that undergraduate e-learning programmes in the health professions must be comparable to face-to-face programmes. Still, caution should be taken regarding adopting face-to-face standards for online settings.

In this review, we synthesised standards that have been used for evaluating e-learning programmes in the health professions in LMICs to improve the quality of e-learning programmes. Only eight articles met the inclusion criteria – predominantly from the Middle East, North Africa and South-East Asia. Most of the standards described by the included articles aligned with popular models for evaluating e-learning programmes, with a few exceptions. A gap in clinical teaching and learning standards in undergraduate e-learning programmes in the health professions was evident in all the included articles.

Further research in this field should focus specifically on developing, expanding, and testing standards for evaluating the quality of e-learning that integrate teaching and learning of clinical skills. Such standards should allow evaluators to access clinical teaching sites, the educators within clinical teaching sites, and the nature and quality of clinical practice.

The contribution of this review is to identify themes used in evaluating the quality of undergraduate e-learning programmes in the health professions. The themes are curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation. When developing contextually appropriate interventions, it would be valuable to include teaching and learning of clinical skills.

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List of abbreviations

LMICs: Low- and middle-income countries

COVID 19: Coronavirus 2019

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis

CINAHL: Cumulative Index of Nursing and Allied Health Literature

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Chapter 3

Standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries: A modified Delphi study

3.1 Overview of the chapter

Title	STANDARDS FOR EVALUATING THE QUALITY OF UNDERGRADUATE NURSING E-LEARNING PROGRAMME IN LOW- AND MIDDLE-INCOME COUNTRIES: A MODIFIED DELPHI STUDY
Authors	Moses M. Mulu, Dr Champion N. Nyoni
Journal	BMC NURSING
Journal details	Open access, Peer- reviewed journal
Impact factor	3.189, Q1
Status	Under review

The article reports on a consensus study on standards for evaluating the quality of undergraduate nursing e-learning programmes in LMICs.

3.2 Associated addenda

Addendum 3.1: Author guidelines and scope

3.2 Confirmation of article submission

Standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries: A modified Delphi study.

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Abstract

Background

Lack of standards hamper the evaluation of e-learning programmes in low- and middle-income countries. Fragmented approaches to evaluation coupled with a lack of uniform criteria have been a major deterrent to the growth of e-learning. Adopting standards from high-income countries has contextual challenges in low- and middle-income countries. Holistic approaches coupled with uniform standards provide holistic information to stakeholders hence the quality of the programmes is measurable. The e-learning situation in low-and middle-income countries provided an impetus to develop and validate these standards.

Design

A modified Delphi technique.

Review methods

Fourteen experts with experience and expertise in e-learning and regulation of undergraduate nursing from fourteen countries in low-and middle-income countries participated in three rounds of the modified Delphi process. A pre-described set of standards was shared electronically for independent and blinded ratings. An 80% agreement influenced consensus decisions. The standards were modified based on experts' comments, and two subsequent rounds were used to refine the standards and criteria.

Results

At the end of round one, the expert consensus was to keep 67, modify 29 and remove three criteria. At the end of the second round, the consensus was to modify 28 and remove four criteria. In the third round, experts agreed that the standards were feasible, usable, and practical in LMICs. A total of six broad standards with 105 criteria were developed.

Conclusion

The Technological bloom permeating all spheres of society, including education is an essential component in the development of e-learning programmes. The standards are quintessential to evaluating the quality of undergraduate nursing programmes. E-learning in nursing education requires critical evaluation to ensure quality in undergraduate nursing programmes. The intricacies of the Low and middle-income context were taken into consideration in developing the standards to offer sustainable evaluation of the quality of e-learning in LMICs, and local solutions to local problems.

Keywords: Experts; Nursing; Quality; modified Delphi; Standards; Low and middle-income countries (LMICs);

Introduction

The mere availability of nurses is insufficient to meet the global needs for high-quality nursing staff to respond effectively to current health challenges (Drennan & Ross, 2019). They in fact also need the required competencies and must be effectively trained to meet the health needs of communities (World Health Organization, 2016). There is an increased demand for high-quality degreed nurses with improved skill sets across various contexts, including low- and middle-income settings (Azad *et al.*, 2020). According to Choi *et al.* (2021); Porat- Dahlerbruch *et al.* (2022); Drasiku *et al.* (2021) and Harrison *et al.* (2019), nurses with a degree qualification offer better nursing care and improved patient health outcomes, including reduced preventable hospital deaths. Therefore, numerous strategies are used to accelerate the upgrading of nurses from diploma or associate degree qualifications to bachelor's degrees (Blegen *et al.*, 2013). Most of these upgrading programmes are offered through e-learning or open distance learning approaches, taking advantage of the nurses' prior knowledge and skills (Yangsoz, 2017). The flexibility provided by e-learning allows student nurses to navigate various competing interests such as work, family, and professional development (Agu *et al.*, 2021).

E-learning has challenged conventional teaching approaches and revolutionised learning with ease and accessibility otherwise unimagined in education (Khalil *et al.*, 2020). E-

learning is an approach to facilitate the application of knowledge and information and enhance learning using personal computers, CD-ROMs' and the internet for education (Valverde-Berrocoso *et al.*, 2020). The critical components of an e-learning programme are divided into four broad categories: curriculum, learners, educators, and, support, and evaluation (Misut & Pribilova, 2014; Gautam & Tiwari, 2016). Nursing education curricula have also been significantly influenced by technological advances Risling (2017) and will be shaped by e-learning in the future as the technological landscape is growing with advances in all spheres of human interaction (Risling, 2017). Murebwanyire *et al.* (2015) and Harerimana & Mtshali (2020) describe how e-learning was identified as a large-scale method to upgrade nurses to a diploma and higher diplomas (Murebwanyire *et al.*, 2015, Harerimana & Mtshali, 2020). The demand for nurses with a degree has resulted in unprecedented increase in the number of nurses upgrading qualifications from diploma to degree. This gap has been met by e-learning, enabling many nurses to access opportunities for learning (Rouleau *et al.*, 2019). E-learning has been instrumental in developing the capacity for an alternative learning environment for continuing professional development and lifelong learning, especially for those whose work schedules offer limited time to travel over long distances to acquire knowledge (Paul Maichiki *et al.*, 2022, Sarli *et al.*, 2022). Regmi & Jones (2020) state that the ability of e-learning to transcend barriers and enhance learning has modelled it to be a mainstream approach in health sciences (Regmi & Jones, 2020).

The shifting dynamics of the learner, educator, and environment have led to unprecedented and transformative approaches to teaching and redefined nursing education, thus shaping e-learning (Li *et al.*, 2021, Bvumbwe & Mtshali, 2018). Using e-learning programmes, therefore, provides appropriate learning experiences that can support clinical learning experiences with demonstratable teamwork, leadership, practical knowledge, and an emphasis on work readiness (Thompson *et al.*, 2021). The delicate balance between what constitutes a successful e-learning programme and quality evaluation in undergraduate nursing programmes provides an avenue for deliberations and developing quality assessment tools applicable in LMICs.

Africa is experiencing significant growth in e-learning, especially since the COVID-19 pandemic, even though e-learning is still in its infancy in many LMICs (Kyari *et al.*, 2018,

Tarus *et al.*, 2015). The proliferation of internet usage in Africa is dissimilar to undergraduate learners who consider e-learning as a mode of study; whilst the former figures are surging greatly, the latter is slowly gaining familiarity among undergraduate learners in LMICs (Kotoua *et al.*, 2015). E-learning in Africa developed in 1996 with centres in Ethiopia, Ghana, Kenya, Uganda, and Zimbabwe. The initial programmes were on science, engineering, and business (Kotoua *et al.*, 2015). In Kenya e-learning programmes in nursing education were offered through a distance learning model using textbooks, as a computer-based approach to e-learning was a challenge (Nguku, 2005). However, there was no public and institutional policy and standards to support e-learning initiatives in most LMICs during those early days. This lack of support was further complicated by a lack of infrastructure, poor internet proliferation, a lack of capacity among institutions, educators and learners, limited familiarity with technology in education and a negative attitude to e-learning (Barteit *et al.*, 2020, Syed *et al.*, 2021).

Standards offer a yardstick for evaluating the quality of an educational programme. Thus, e-learning programmes must be evaluated to determine their quality (McDonald *et al.*, 2018). Standards in e-learning are documented agreements containing technical specifications including rules, guidelines, and definitions of characteristics to ensure that materials, products, processes, and services are fit for their purpose with specific parameters in order to ensure that e-learning courses are apt and useful for their user (International Standards Organisation, (2015). Quality standards for assessing e-learning programmes should be anticipated while developing the programme to provide methodological, valid, and objective assessment criteria (Roddy *et al.*, 2017). Delva *et al.*, (2019) describes that standards provide a roadmap to assess the quality of e-learning (Delva *et al.*, 2019). The quality of an e-learning programme includes learners who are ready to learn and supported to learn, environments with adequate resources, content reflected in relevant curricula for the acquisition of relevant skills, educators able to carry out roles in skill acquisition, assessment and outcomes that demonstrate knowledge, effective use of ICT by learners and educators, and skills and attitudes linked to desired results (Harerimana & Mtshali, 2021, Timbi-Sisalima *et al.*, 2022, Regmi & Jones, 2020). Standards for evaluating the quality of undergraduate e-learning programmes can be adapted for nursing education and broadened to include clinical components. These

standards could, therefore, redefine how quality in nursing education should be evaluated specifically in LMICs (Lawn *et al.*, 2017, Regmi & Jones, 2020).

Evaluating the effectiveness of e-learning programmes can guide the development of nursing education in order to determine its value and importance. This can be best done by making use of a set of standards. This set of standards will inform stakeholders on the excellence of these programmes (Abuatiq, 2019, Garba *et al.*, 2022). As e-learning programmes develop, so does the need to monitor the quality of e-learning and its components to provide an effective programme. However, the evaluation of e-learning should not consider constituent parts only, but a holistic evaluation of the e-learning programme (Prosen *et al.*, 2022). A common pitfall of most evaluations in LMICs is the lack of uniform criteria for evaluating the quality of the e-learning programmes, coupled with the lack of standards.

This has led to the inability of regulatory bodies to evaluate such programmes in nursing education (Prosen *et al.*, 2022). The lack of holistic standards has been a stumbling block in establishing quality evaluation tools in e-learning programmes in LMICs, as most evaluations focus more on the components of e-learning than on the entire programme collectively.

The use of fragmented approaches to assess e-learning in LMICs is rooted in an over-emphasis on specific areas of e-learning rather than on the programme as a whole. This fragmentation is attributed to a lack of standards (Barteit *et al.* 2020, Frehywot *et al.*, 2013, Rawashdeh *et al.*, 2021). Barteit *et al.* (2020) further identified that most evaluations of e-learning in LMICs are small-scale, and more rigorous evaluation methods are required to understand the strengths and shortcomings of e-learning programmes (Barteit *et al.* 2020). Baker *et al.* (2021) describe that standards provide a clear delineation of the requirements of programmes to meet the global needs of high-quality nursing personnel able to respond effectively to current health challenges (Baker *et al.*, 2021). Therefore, the lack of direct standards for evaluating e-learning programmes across LMICs can explain the intransigence of evaluating these programmes.

The need for context-specific standards for e-learning to meet the specific needs of the programme whilst matching with international standards of quality is required in LMICs (Frehywot *et al.*, 2013, Wasfy *et al.*, 2021). The paucity of standard evaluation tools for e-learning in LMICs limits the validity of evaluation results (Barteit *et al.* 2020, Frehywot *et al.*, 2013). However, e-learning can be evaluated against established standards which already exist and might not be specific to LMICs (Delva *et al.*, 2019). We contend that adopting evaluation criteria from developed countries to be applied in LMICs offers context-specific challenges to the development of e-learning. The adopted evaluation criteria, albeit contextually sound in the developed country, could mollify other features that may potentially inform more robust e-learning systems in LMIC contexts. The novelty of these developed and validated standards in LMICs, keeping in mind the contextual challenges compounding LMICs, offers feasible, usable, and practical techniques to holistically evaluate the quality of undergraduate e-learning nursing programmes.

3.3. Methods

3.3.1 Aim

This paper reports on a consensus study on standards for evaluating the quality of undergraduate nursing e-learning programmes in LMICs.

3.3.2 Design

This paper is drawn from an overarching project which sought to develop, validate, and test standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya. Preliminary work was conducted in an earlier phase of the study through an integrative review which identified six broad thematic areas with a total of 109 criteria for consideration (see Additional file 1). The standards were divided into six categories: curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation. Each of the standards had different criteria. This study applied a modified Delphi technique used to achieve consensus on standards or quality indicators, especially in areas with no recommended guidelines for a specific problem (Nieverberger & Spranger, 2020, Vishwanath & Begum, internet source). For a modified Delphi to be successful and maintain quality, it was important to identify the problem, meticulously select the panel of experts, ensure the anonymity of experts,

obtain controlled feedback, conduct iterative Delphi rounds, gain consensus on the criteria, analysis of the consensus, closing criteria and result stability (Nasa *et al.*,2021). In line with Brown and Crookes (2016), equal anonymous contributions for minimising power differentials and reducing bias were applied in the modified Delphi (Brown and Crookes, 2016). Consensus-building was developed by:

- applying the three steps of identifying potential experts for inclusion in the expert panel,
- conducting a modified Delphi and
- presentation of the final standards.

3.3.2.1 Step 1: Identifying the experts to include in the panel

Experts were selected based on the following inclusion criteria: experience in e-learning in LMICs through teaching and/or policy formulation related to e-learning, recent publication history in e-learning in LMICs, a nursing or health sciences background and technical knowledge of e-learning. This selection involved administrators, digital campus, and e-learning support personnel from a number of LMICs.

The inclusion criteria were used in the selection process to ensure that objectivity was maintained throughout the process.

Firstly, the authors from the studies identified in the integrative review stage were included. The total number of experts in this first phase was ten. Secondly, both authors identified individuals within their networks who met the inclusion criterion. The total of 15 experts identified were composed of specialists in nursing education from Africa and Asia. These 25 identified experts were invited to be part of the study through an email with a participation information leaflet and a consent form.

The experts were also requested to nominate other experts who met the inclusion criteria, and these nominated experts were also invited participate in the study. The 14 experts who volunteered were included in the modified Delphi.

3.3.2.2 Step 2: Data collection

The data collection tool for the first round was developed using the REDCap application ® and Survey Monkey ®. A total of six standards with a total of 109 criteria were used. The modified Delphi had three rounds of ratings, reviews, and reflections by the experts over sixteen weeks between May and August 2022.

3.3.2.3 Modified Delphi round 1

Round 1 of the modified Delphi had an online questionnaire, The experts were presented with all six standards and 109 criteria and asked to state whether they agreed, disagreed or were not sure about a stated criterion. We used 3-point Likert scale questions and additional space for the experts to provide their opinions on the standards in their own words, this would assist in a clear interpretation and actionable results for the next phase of the study. Experts had two weeks to complete the questionnaire. Fourteen responses were received, translating to a 100% response rate. The consensus was set at 80%, with areas of disagreement providing an opportunity for a second round (Stewart *et al.*, 2017). Responses to the modified Delphi, phase 1, were analysed by the authors over two weeks. Any question reaching the consensus threshold was regarded as finalised and was not included in the second round. In cases where at least 80% consensus was not reached by the experts, if they were unsure about a standard and-or were unsure about a standard and or its criterion, the standard and its criterion were reformulated based on the feedback from this round and included in the questionnaires for the second round

3.3.2.4 Modified Delphi round 2

The questionnaire for the second round required the experts to review the standards that did not reach the consensus threshold. They could either keep or, discard standards and criteria or suggest alternatives or modifications. The standards were presented in RED Cap format with a similar 3-point Likert scale approach. At the end of the second round, the standards proposed by the experts were deliberated, the decisions to retain or remove were made in line with the expert opinion, and the final standards were developed. The consensus reached in the second phase was considered final.

3.3.2.5 Modified Delphi round 3

This final round aimed to provide the experts with the finalised standards after the iterative process. Experts were requested to comment on their feasibility, usability, and practicality in LMICs. The experts agreed that the standards were feasible, usable, and practical within the context of LMICs.

3.3.3 Data analysis

Data from the modified Delphi rounds were analysed quantitatively by descriptive statistics and qualitatively using qualitative content analysis.

Data analysis involved analysing each criterion for consensus (Woodcock *et al.*, 2020). After each rating round, analysis was done on each standard, and those standards with a consensus of 80% across all the responses were moved to the final draft. The standards and criteria that did not reach 80% consensus and areas of disagreement were rerated in the second round, and the recommendations and comments made by experts were considered. Responses from the second round provided ratings with areas of agreement with modifications, and the standards moved to the final draft.

All areas of agreement from the second round were incorporated, and those that did not reach the threshold were eliminated from the standards. The third round presented the final standards through the iterative process.

3.3.4 Rigour

Trustworthiness reflects the rigour of a study and concerns ensuring its credibility, dependability, confirmability, and transferability (Adebiyi *et al.*, 2018). The initial findings of the study were discussed to identify opinions and feedback and to determine dependability. The views of experts were sought who are leaders in nursing education and e-learning and are familiar with the evaluation of e-learning. Rigour was thus maintained by selecting a heterogeneous sample of experts with different backgrounds but relevant experience and the capacity to validate expert opinion (Keeney *et al.*, 2011). All activities were documented to determine the confirmability of the findings, and a report of the process was prepared. The results were shared amongst individuals of similar situations

and experiences (LMICs) to determine transferability, and the results were confirmed to be feasible and useable. A blinded review process ensured that experts' identities were hidden to avoid group bias (Keeney *et al.*, 2011). Rigour is further maintained by consistency and meticulous adherence to the process (Keeney *et al.*, 2011).

3.4 Results

Most of the participating experts from Africa and Asia were female n=8 (57%) with roles in nursing education regulation, directors of e-learning, nursing, and midwifery education. The male participants n=6 (43%) had roles in nursing and midwifery education, health professions education backgrounds in nursing education and e-learning (see Table 1.)

Table 1. Demographic characteristics of experts

Gender	
Male	6 (43%)
Female	8 (57%)
Continents of residence	
Africa	10 (71%)
Asia	4 (29%)
Educational qualification	
PhD	12(86%)
Masters	2(14%)
Roles of experts	
Nursing education regulation	1 (0.07%)
Director of e-learning	1 (0.07%)
Nursing education	6 (43%)
Midwifery education	2 (14%)
Health professions research education	3 (21%)
E-learning	1(0.07%)

A total of 14 experts consented to participate (see Figure 1:)



Figure 1: Expert flow throughout the study

A total of 109 criteria were presented to the experts at the start of the modified Delphi process. At the end of round 1, experts agreed to keep 67, modify 29 and remove three criteria. The 67 criteria were included in the final standards and were not entered into the second round. The remaining 29 criteria were amended based on the experts' choice and proceeded to the second round. At the end of the second round, the expert panel reviewed 29 criteria from the six different domains and either agreed, or disagreed, with the criteria and had the option to offer alternative criteria. The panel suggested the modification of 28 criteria and removal of one. The expert panel reached consensus on all the presented standards, and a final draft was developed. The third stage was the presentation of the final standards to the experts for final approval. A total of eight (57%) experts responded to the final survey and they were required to reflect on the usability,

feasibility, and practicality of the standards. The consensus on the three aspects was 100% (see Figure 2).

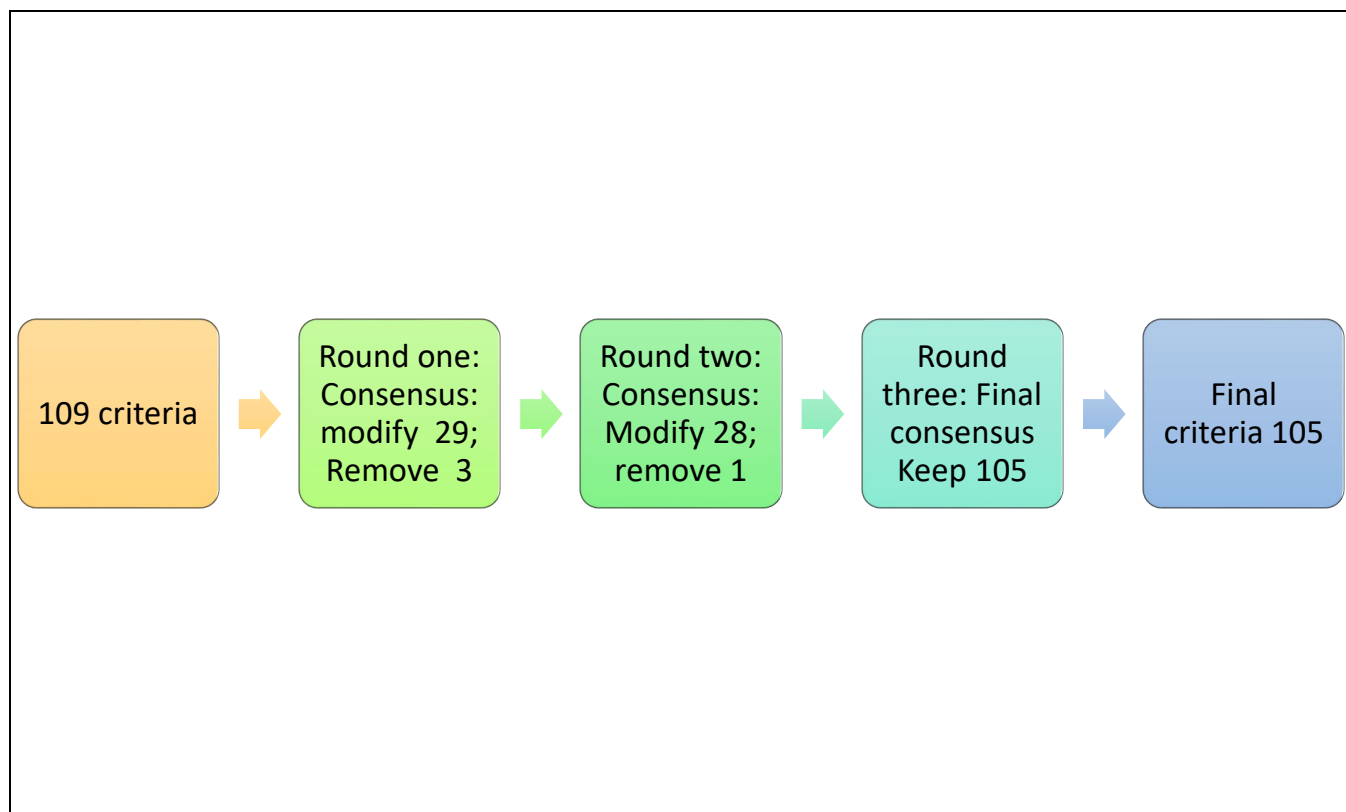


Figure 2. The flow of standards throughout the process

In the modified Delphi process, 105 standards across six domains were developed. The feasibility, usability, and practicability across LMICs were at 100%, with the experts agreeing that the standards were applicable in LMICs (see Table 2).

Table 2. Summary of standards through the stages of the study

Standards	Round 1		Round 2			Round 3	
	Total criteria	Criteria with consensus	Total criteria	Criteria with consensus	Criteria removed	Total criteria	Feasibility, usability & practicality
Curriculum planning	30	21 (70%)	30	29 (96%)	1	29	8 (100%)
Proficiency of educator	20	9 (45%)	19	19 (100%)	0	19	8(100%)

Learner proficiency and attitude	14	11 (78%)	14	11 (78%)	3	14	8(100%)
Infrastructure for Learning	17	14 (82%)	18	18 (100%)	3	18	8(100%)
Support	15	11 (73%)	13	13 (100%)	2	13	8 (100%)
Evaluation	12	10 (83%)	12	12 (100%)	2	12	8 (100%)

The standards were divided into six categories namely: curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation. Each of the standards had different criteria (see additional file 1 shows this in more detail).

3.5 Discussion

The success of e-learning in high-income countries is anchored on a combination of models such as Delone and McLean's information systems success model, user satisfaction models and technology acceptance models (Al-Fraihat *et al.*, 2020, Alotaibi & Alshahrani, 2022). Certain challenges were reported regarding the model of Delone and Mclean (2003) due to complexity for implementors (Delone & Mclean, 2003). Several revisions were made to the model with evident integration challenges. The technology acceptance models have been widely used to evaluate e-learning success. However, criticism has been directed towards the application of these models and attempts to expand these models leading to theoretical challenges and confusion (Abdullah & Ward, 2016). User satisfaction models, focusing on learner satisfaction have been extensively used in various disciplines, including health sciences (Sun *et al.*, 2008). The standards developed in this study differ extensively from those readily utilized in high-income countries. Despite this, the authors' specific focus was the LMIC context, which differs immensely in terms of curriculum, availability of resources, contextual culture, infrastructure, educators, learners, and technical support. A plethora of models are available for evaluating e-learning quality in high-income countries with comprehensive criteria that are successful in that context. The standards developed in high-income countries, are applicable in contextually similar settings and have been challenging to apply in LMICs (Olayemi *et al.*, 2017). This is the quintessential focus behind the

development of these standards namely to provide quality standards for evaluating undergraduate nursing programmes in LMICs and involvement of experts within LMICs.

The urgency to develop standards for e-learning in LMICs is anchored in its rapid expansion, especially post-pandemic, and the need to maintain quality in the education of nurses who are critical determinants of health outcomes in communities and the health of the patients they serve (Naciri *et al.*, 2021). Currently, there are no standards for evaluating the e-learning quality in LMICs. The central focus in developing such standards was to bridge a gap and develop a holistic evaluation of e-learning, as opposed to a fragmented approach model (Timbi-Sisalima *et al.*, 2022). The focus was on highlighting the challenges regarding e-learning in LMICs, the available opportunities, and best practices across various LMIC settings. These perspectives shaped the foundation of the study and grounded the process of developing e-learning standards in LMICs. This approach was pragmatic in developing the quality of e-learning, especially in LMICs which are beset by a host of challenges. It offers a systematic perspective for university boards of management approach regarding the needs of e-learning rather than a fragmented perspective which obscures the development of e-learning (Oliver, 2005, Zalat *et al.*, 2021). Widyanti *et al.* (2020) found that most university management structures realized the value of e-learning educators when the COVID-19 pandemic led to the global closure of universities (Widyanti *et al.*, 2020). This led to a higher mental workload in e-learning compared to face-to-face learning, coupled with the weight of designing content, teaching, evaluating learners, and infrastructural challenges (Zalat *et al.*, 2021). The ensuing pandemonium led to some universities opting to close indefinitely, while those that managed to remain open had difficulty manoeuvring the e-learning landscape with no standards to guide the transition process (Nyerere, Internet source). The timing of these standards is perfectly interwoven with the desire of most universities to actualise e-learning as a mode of study. It is quickly becoming and reality in the health science departments and the quality of the programmes is critical.

The current study reports the findings of a modified Delphi on standards for evaluating the quality of undergraduate e-learning programmes. The study accentuates expert opinion and consensus on the standards in LMICs and highlights various spheres of concern to experts across the different criteria. Shifting learning practices and the advent

of e-learning and virtual learning are shaping contemporary approaches to understanding the curriculum (Viana & Peralta, 2021). The curricula in use were developed in previous years and were subject-centred. While it was quintessential at the time, the shift to learner-centred approaches in e-learning demands a change in the approach to curriculum design (Adirika & Okolie, 2020). The two interacting constructs of societal needs and learners are critical factors in shaping a curriculum. The former is the foundation of the traditional curriculum, while the latter shapes the e-learning curriculum (Viana & Peralta, 2021). Integrating technology into the curriculum, blending thinking, innovation, and ICT skills is inevitable in engaging the millennial learner who is central to the organisation of learning whilst the educator supports learning. The use of a traditional face-to-face curriculum in e-learning has therefore been a huge impediment to the growth of e-learning, and undermines the progress made toward improving e-learning quality in LMICs (Susam *et al.*, 2020). A curriculum specific to e-learning is a starting point for quality undergraduate e-learning programmes, as the curriculum would provide all stakeholders with a measurable structural plan for the programme's accountability and social responsibility, especially in LMIC settings (Al-Shdaifat *et al.*, 2022, Viana & Peralta, 2021). Furthermore, the novelty, clarity and comprehensiveness of these standards will enable the development of an e-learning curriculum. We argue that with the shifting dynamics of the learners, content, teaching approaches and demands of modern-day education, a rigid traditional face-to-face curriculum would be impractical in e-learning.

The second standard regarding the proficiency of educators in is a common but often overlooked concept in e-learning. The following aspects are important: the attitude of the educator; learners who consider educators as role models, and the educators' attitude toward e-learning that rigorously affects the learners' attitude (Al-Shdaifat *et al.*, 2022, Sun *et al.*, 2008). Experts agree that the increased workload associated with e-learning, class size issues, teaching resource availability, mental workload and educator motivation are critical factors in educators' perceptions of e-learning (Kibuku *et al.*, 2020, Lwoga, 2021). Almahasees *et al.* (2021) identified differences in training and e-learning delivery between high-income and low-income countries. The lack of teaching resources available to educators, reduced knowledge of ICT and the challenges of class control emerged as areas of agreement among most experts (Almahasees *et al.*, 2021). This has been a

problem in the development of e-learning in low-income countries (Hasan *et al.*, 2017, Kibuku *et al.*, 2020, Tarus *et al.*, 2015). The educators' motivation for the use of e-learning, teaching styles, their perception of e-learning and control of technology will shape the behaviour of learners and significantly improve learner satisfaction (Goh *et al.*, 2020, Mailzar *et al.*, 2021).

The experts agreed on the use of e-learning to advance the continuing professional development (CPD) of educators to ensure a commitment to continuously improve their knowledge and skills. This is supported by Mlambo *et al.* (2021) who found that the accessibility and availability of CPD through e-learning for educators greatly improved their competence in the use of e-learning tools (Mlambo *et al.*, 2021). The role played by educators in shaping learners' perceptions cannot be overestimated, especially in e-learning.

The third standard, the relationship between learner proficiency and attitude and the use of e-learning and consequent success in e-learning is significant and leads to the satisfaction of learners (McGill & Klobas, 2009, Al-Fraihat *et al.*, 2020). Perceived satisfaction of learners regarding the use of e-learning is an essential measure of the success of e-learning and will lead to the optimal use of the system (Hassanzadeh *et al.*, 2012). Usefulness is a key determinant of the success of e-learning among learners, because if they perceive e-learning to be useful, it will increase to the likelihood of their use of e-learning and significantly influence satisfaction (Hassanzadeh *et al.*, 2012, Islam, 2013). The ability of learners to objectively evaluate teaching and learning was an area of concern as most of the learners were not actively involved in the evaluation of e-learning programmes compared with learner challenges limiting the objective evaluation of e-learning. However, this contrasts with Al-Fraihat *et al.* (2021); Penna and Stara (2007), who identified that learner-centred evaluation is essential to the quality of e-learning (Al-Fraihat *et al.*, 2020, Penna & Starra, 2007). Experts agreed that learners should be prepared in advance for e-learning and notified on how to navigate the course and its expectations. The developed standards focus on the learner preparedness, equipment, and evaluation of e-learning to ensure satisfaction and actualise the maximum benefits. Furthermore, sufficient, concise, and clear information contributes immensely to satisfaction.

Fourthly, the myriad of infrastructural e-learning challenges faced by universities in LMICs requires contextually sound standards and comprehensive evaluation, although progress in this regard is evident (Joseph, 2019). Policy issues surrounding e-learning infrastructure were an area of contention as most of the experts agreed that operationalising policies in e-learning is challenging in LMICs. Commitment by key stakeholders is often tenuous. This view was similarly shared by Kibuku *et al.* (2020) and Mbugua (2014), who identified that policy gaps have hampered higher education in the Kenyan context (Kibuku *et al.*, 2020, Mbugua, 2014). The impetus to develop these standards with a focus on policy is to ensure that stakeholder commitment is captured from the start when developing e-learning programmes. The availability of infrastructure to support e-learning was described as challenging for most LMICs, with funding and systemic challenges overshadowing meaningful progress to improve e-learning. Despite the promising internet penetration in LMICs, especially in Africa, the concentration is mostly in urban areas. In addition, the cost of internet access is prohibitive (Joseph, 2019). The learning management systems (LMS) in most developed countries are customised to suit their specific needs, but in LMICs, reliance on open source LMS limits the ability to customisable options (Thuseethan & Kuhanesan, 2014, Chandra & Napitupulu, 2021). The ease of use, system quality and satisfaction of learning management systems (LMS) by educators and learners are critical in improving e-learning (Thuseethan & Kuhanesan, 2014, Chandra & Napitupulu, 2021). We argue for the commitment of governments and university management boards to strengthen the resolve toward improving e-learning which has enormous potential to scale up health workers.

Fifthly, support systems for educators and learners were an area of concern. In most LMICs, there's is not adequate e-learning support for educators and learners (Nawaz & Zubair Khan, 2012). Wang *et al.* (2018) identified that support for e-learning resources is an area of interest in e-learning (Wang *et al.*, 2018). Experts agreed that e-learning support is a critical and essential standard for evaluating e-learning, and its accessibility is crucial for learners' satisfaction. Experts agree that e-learning support is essential to the operation of e-learning. There is a need to improve internet bandwidth, although better bandwidth doesn't necessarily mean that learners and educators will use this for learning purposes. The need for control of content and site restriction is crucial in ensuring

appropriate utilisation. According to the findings of Chanboulapha and Islam (2012), who compared the relationship between internet usage and learning and found that the internet has a positive relationship with learners' knowledge (Chanboulapha and Islam, 2012). The absence of social media in their study can be attributed to when the study was conducted. However, Waweru (2018) found that learners spend most of their time on social media, during the time which they could be studying, leading to poor academic performance academically (Waweru, 2018). The site access restriction should be so that learning is not impaired. These are some of the areas in which the panel of experts expressed concern, and it was worth noting that the changes to the standards improved the quality and applications of LMICs.

Lastly, these standards will be critical for evaluating the quality of undergraduate e-learning nursing programmes. They will also assist in shaping the intricate capacity to develop local solutions to local problems in LMICs (Bvumbwe & Mtshali, 2018). Based on the iterative process, the experts reached consensus on six broad categories: curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation, with 105 criteria for evaluating the quality of e-learning in undergraduate nursing programmes in LMICs. These standards will provide schools of nursing seeking to evaluate the quality of e-learning with a guide to practical evaluation. The standards are comprehensive and broader covering wider range of criteria than those available in developed countries. They align with nursing education at a degree level. Consequently, educators and learners will have better learning experiences with e-learning leading to quality in e-learning in nursing education hence improving patient outcomes. The feasibility, usability, and practicability of the standards are crucial in ensuring they are easily usable and practical for the context-specific challenges in LMICs. The complete agreement (100%) by the experts (100%) on the final standards' feasibility, usability, and practicability is critical in applying these standards in LMICs. The crux of this study is standards for quality evaluation. The feasibility, usability, and practicality of these standards have a high propensity to improve the quality of e-learning holistically in LMICs.

3.5.1 Limitations

Despite numerous efforts to recruit more experts from more LMICs, this did not materialise. This hesitation to volunteer may be due to busy work schedules and unavailability and can be explained by the critical roles of most of the experts identified in nursing education and e-learning. A further limitation was that the experts drawn from different LMICs had to be proficient speak in English.

3.6 Conclusion

The opportunities provided by e-learning outweigh the challenges as it presents no geographic barriers, flexibility, while accommodating flexibility, creativity and critical thinking. It utilised online resources, offers an effective approach to transferring clinical knowledge, and improves the teaching experience (Gama *et al.*, 2022, Matuuk *et al.*, 2021, Li *et al.*, 2021). However, many challenges impact the implementation of e-learning in LMICs. The salient challenges include the lack of a relevant curriculum, lack of infrastructure, lack of ICT knowledge, weakness of content development, educators and learners' culture and lack of regular online training and seminars for educators and students to support the application of e-learning (Eli-Chukwu *et al.*, 2022, Gama *et al.*, 2022) The rather inconspicuous challenges affecting e-learning are financial, managerial, insufficient professional development, copyright issues, and stakeholder motivation. This last aspect is rarely addressed but has an immense impact on the growth of e-learning in LMICs (Aung & Khaing, 2015, Aiken *et al.*, 2014). Critical reflection of these challenges towards developing sustainable solutions for e-learning is essential in improving the quality of e-learning in LMICs. The identification of these standards culminated in an iterative process with experts drawn from various LMICs with expertise in e-learning and quality assurance and an understanding of the challenges in the field.

The quality of an e-learning programme is evaluated using standards. Undergraduate nursing programmes have a theoretical and clinical component that further complicates such evaluation. The modified Delphi reported in this article refined standards for evaluating the quality of undergraduate nursing e-learning programmes in LMICs. The final product consisted of six standards with 105 criteria. The six standards identified were curriculum planning, proficiency of the educator, learner proficiency and attitude,

infrastructure for learning, support and evaluation. These offer critical domains in evaluating the quality of undergraduate nursing programmes, and these are essential areas when evaluating the quality of e-learning. The intricacies of the LMIC context require a thorough understanding of the challenges to meticulously develop feasible, usable, and practical standards. These standards further demonstrate adaptability in low-resource settings. The standards developed are recommended for use in LMICs to evaluate the quality of undergraduate e-learning programmes. Additionally, the standards provide researchers with a basis for further research, with the evolving technological landscape, it will be thought-provoking to see the transitional changes over time. Therefore, these developed standards are contextualised to offer sustainable evaluation of the quality of e-learning in LMICs as well as local solutions to local problems.

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List of abbreviation

COVID-19: corona virus 2019

CPD: Continuous professional development

ICT: information, communication, and technology

LMS: Learning management system

LMIC: low- and middle-income countries

Declarations

Ethical approval

The research confirms that all methods were carried out in accordance with the Declaration of Helsinki. Ethical approval was sought from the University of Free State, Health Sciences Research Ethics Committee (HSREC) clearance number UFS-HSD2021/0370/2809. The experts signed an informed consent form to participate in the study (see Additional file 2) and were free to withdraw from the panel at any time during the discussions without victimization.

Consent for publication

“Not applicable”

Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Declaration of competing interests

The authors declare that they have no known conflict of interest

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Credit authorship contribution statement

MM Conceptualisation, methodology, writing original draft, writing-review, and editing. CN Conceptualisation, methodology, writing original draft, writing-review, and editing.

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Chapter 4

Standards for undergraduate nursing e-learning programmes in low resource settings: A feasibility study

4.1 Overview of the study

Title	STANDARDS FOR UNDERGRADUATE NURSING E-LEARNING PROGRAMMES IN LOW RESOURCE SETTINGS: A FEASIBILITY STUDY
Authors	Moses M. Mulu, Dr Champion N. Nyoni
Journal	International Journal of African Nursing Sciences
Journal details	Open access, Peer- reviewed journal
Impact factor	1.33
Status	Under review

The article reports on a feasibility study conducted to ascertain the study's feasibility, in Kenya.

4.2 Associated addendum

Addendum 4.1: Author guidelines and scope

4.2 Confirmation of article submission

Standards for undergraduate nursing e-learning programmes in low resource settings: A feasibility study

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4.3 Introduction

Technology integration into nursing education has opened new frontiers for training nurses and preparing them for the demands of a modern-day healthcare landscape (Singh & Masango 2020). Therefore, the addition of e-learning as a training option in higher education institutions are necessary due to the intricacies of the nursing curriculum which needs to integrate theory and clinical components (Frehywot *et al.*, 2013). Additional aspects to consider include the shifting dynamics of the learner, who is technologically savvy with a preference for the multimedia environment compared to previous generations (Van Laar *et al.*, 2020). Furthermore, there is a global shift from traditional to online platforms catalysed by the COVID-19 pandemic and the proliferation of the internet that has been instrumental in the inception and incorporation of e-learning into nursing education, especially in low and middle-income countries (LMICs) (Kabir *et al.*, 2022; Salta *et al.*, 2021). According to Sheth (2021), the shift in the preference for instructional design with an interactive approach has transformed teaching in e-learning platforms. The flexibility brought about by e-learning has enabled nurses in the academic advancement continuum to progress despite competing interests such as nursing practice, professional development, and family (Mlambo *et al.*, 2021). This flexibility has bridged the gap in scaling up human resources for health with requisite knowledge and skills (Harerimana & Mtshali, 2021; Bvumbwe & Mtshali, 2018). E-learning in nursing education has been lauded for: improving critical thinking and problem-solving skills, changing nurses' attitudes toward lifelong learning, the interaction between educator and learner, improving patient outcomes and interactive learning (Hosseini *et al.*, 2016; Javadi-Pashaki Ghazanfar & Karkha, 2021).

The paradigm shift in academia is no longer whether e-learning should be incorporated into nursing education but rather the quality of e-learning programmes and how these can be meticulously evaluated (Jokiaho *et al.*, 2017). The demand for quality, feasible, usable, and practical standards offer a roadmap for evaluating the effectiveness of e-learning programmes' (Abuatiq, 2019; Bahrambeygi *et al.*, 2019). The steady transition from a chaotic phase encumbered by a lack of standards is progressively becoming a well-defined e-learning programme with consensus and clarity in standards-defining implementation and evaluation (Varlamis & Apostolakis, 2006; Zalat *et al.*, 2021).

Standards managed to reduce conceptual confusion on what e-learning is, the requirements for success, and quality evaluation, putting an end to the 'babel syndrome' (Bawaneh, 2020) that hampered e-learning since its inception, thus contributing to its low uptake in different contexts. Standards offer support for the development of quality as they specify suitable criteria and requirements for use in distinctive contexts and situations for desired outcomes in the training of nurses (Stracke, 2009). The demand for standards is essential to the interoperability of e-learning in universities, and clarity of standards needs to be evident to enable sustainable growth and development of e-learning programmes (Muna & Jihan, 2022; Timbi-Sisalima *et al.*, 2022). The benefits of standards are essential in shaping the trajectory of nursing education and the future of nurses (Schwartz, 2019). Standards will contribute essential competencies and opportunities for continuing development of nursing education, transcending challenges such as flexibility, time, and cost in traditional education (Kavanagh & Sharpnack, 2021; Narayan, 2018). These benefits are impossible to actualise if the requisite feasibility, usability, accessibility, and practicality of developed standards for e-learning are not maintained specifically in low and middle-income countries (LMICs).

Although LMICs experience several challenges in implementing and evaluating e-learning in nursing education, the benefits outweigh the challenges, and a commitment to strengthening e-learning in nursing education from all stakeholders offers greater opportunities (Sasmal & Roy, 2021; Subedi *et al.*, 2020). In LMICs, there are currently no standards specific to e-learning and nursing education (Frehywot *et al.*, 2013). There is a need to make standards applicable in the context of LMICs by involving country-specific experts in quality assurance as this would help to establish the feasibility, usability, and practicality of such standards. Feasibility tests of standards offer clarity for institutions seeking to evaluate the quality of their undergraduate e-learning nursing programmes. Evaluating e-learning requires valid, reliable, and tested standards to guide and improve e-learning interventions in LMICs (Barteit *et al.*, 2020).

Consequently, the paucity of literature surrounding testing standards in LMICs strategically positions this studies' significance, relevance, and its novelty. The standards described here were conceptualised through a modified framework developed by the health standards organisation (HSO) (Health Standards Organization [HSO], 2020).

According to this framework, the initial process of the development of the standards includes the identification of standards followed by validating the standards through expert analysis and, finally, testing these standards (HSO, 2020).

This study reports on the feasibility of implementing the standards developed for evaluating undergraduate e-learning nursing programmes. This could make a contribution to the quality of undergraduate nursing e-learning programmes in LMIC contexts. We argue that the feasibility, usability, and practicality of studies carried out to test these standards demonstrate evidence of practical and achievable interventions and provide guidelines for quality undergraduate e-learning nursing programmes in LMICs.

4.4 Methods

4.4.1 Background of the study

As background to the feasibility study reported in this article, the larger study entailed firstly conducting an integrative review using literature sources from LMICs to formulate standards (see Mulu & Nyoni, 2022). These standards were clustered as broad statements, each with associated criteria. Subsequently, experts drawn from various LMICs validated the developed standards through a modified Delphi approach (Mulu & Nyoni, 2022). As a final stage of the study, the standards were tested for their feasibility, usability, and practicality within an LMIC setting (reported in this article). Morris and Rosenbloom (2017); Oka *et al.* (2021) indicate that the inherent complexity of conducting a feasibility study for novel interventions must be anchored on an iterative, formative, and adaptive methodology, essentially grounding the efficacy of the standards for usage in proposed settings. Feasibility studies focus on evaluating the process and defining the workability of these specific standards (Morris & Rosenbloom, 2017; Orsmond & Cohn, 2015). The usability of these standards to achieve e-learning success effectively and efficiently with satisfaction by users was determined within the context of intended their usage in LMICs (Farzandipour *et al.*, 2022).

4.4.2 Purpose

To describe the feasibility of developed standards in evaluating undergraduate e-learning nursing programmes in a middle-income setting.

4.4.3 Study design

A multiple-methods design was used for this study, integrating qualitative and quantitative approaches (Creswell, 2013).

4.4.4 Context

There is a high demand for degreed nurses in Kenya, as they are reported to offer better nursing care and are associated with improved patient outcomes. Upgrading programmes for nurses with diploma qualifications are popular in most health sciences universities and are focused on practising nurses who aim to pursue degree studies. The majority of these upgrading programmes are presented through distance or e-learning programmes. However, at the time of this study, there were no standards to ascertain the quality of these upgrading undergraduate e-learning nursing programmes. The lack of such standards influences the assumption of the quality of e-learning programmes in similar face-to-face degree programmes.

The study was conducted at a private multi-campus university in Kenya which offers undergraduate e-learning programme aimed at upgrading registered practicing diploma nurses to degree nurses. The e-learning three-year nursing programme enrolls about 1000 students on various campuses annually. Educators in the programme are expected to have at least a master's degree in nursing and some understanding of e-learning. The programme is offered through the CANVAS learning management system (LMS), which is supported by a digital campus. Clinical teaching is the responsibility of educators and is not regulated by the university.

4.4.5 Participants and recruitment

The authors aimed to recruit participants with experience related to the undergraduate e-learning nursing programme either as educators, learners or support staff. A total of 20 learners, three educators and five support staff were eligible and purposive sampling was used to include participants in the study. The learners were invited to participate through class representatives who informed class members of the data collection process. Those interested gave their names and phone numbers and were invited to the focus group

discussions. The educators and support staff were initially recruited via email, and those who agreed were telephoned to set up interview appointment dates.

4.4.6 Data collection process

The aim of collection of data was to describe the feasibility and usability of the developed standards by the participants with experience in undergraduate e-learning nursing programmes at a university in Kenya.

The data were collected through focus group discussions and individual interviews with participants. A research assistant with experience in e-learning nursing programme design and quality assurance was identified and trained over a three-month period regarding the purpose of the study and the data collection process. An author-generated data collection tool, based on the standards and criteria, was used for the data collection process (see Appendix 1). As detailed in the tool, the participants were expected to use their experience to comment on the feasibility, usability and practicality of the standards and criteria in the local context and setting. Additionally, a discussion of their reasoning would be captured in the same tool, including supporting evidence.

Learners participated in a focus group discussion in a classroom setting in two separate sessions of 10 students each. Their responses on each of the specific standards and experiences from the learner proficiency theme were recorded on the checklist. The educators were interviewed based on the curriculum planning and educator proficiency and attitude standards. There were aspects of quality cutting across the various standards, and the quality assurance manager was interviewed on these standards. After the data collection process, the research assistant prepared a self-evaluation report.

The self-evaluation report was sent to a panel of three experts with experience in Kenyan higher education e-learning programmes and quality assurance mechanisms. They were requested to interpret the self-evaluation report and provide opinions on the feasibility, usability, and practicality of the developed standards.

4.4.7 Data analysis

The data were analysed through frequencies of descriptive data to describe responses received per standard across the various criteria. Constructs of interest and associations between these concepts were established, allowing the logical and meaningful presentation of insights from the data (Sheard, 2018).

4.4.8 Ethical considerations

Research approval was obtained from the local university's Health Sciences Research Ethics Committee (HSREC) with clearance number UFS-HSD2021/0370/2809 and from the relevant Kenyan university (addendum 1.1). Respondents were invited to voluntarily participate in the study. They were free to leave the study at any point without any repercussions. Pseudonyms were used to enhance the confidentiality of the participants in the FGDs. All research data was stored securely in a locked space to ensure privacy. The research study was guided by an overarching ethical framework based on the Belmont Report (1978) following three principles. *Respect of persons*: the research participants signed an informed consent form before participating in the study. The research participants retained their autonomy and they freely consented to participate in the study without coercion or remuneration. They were also free to withdraw from the study at any point without victimisation. Confidentiality and anonymity were maintained by ensuring that no identifying data were included in the interview or FGD discussions. *Beneficence*: the researcher was obligated to ensure that no harm came to the participants during data collection and that their opinions were protected during data collection. *Justice*: in the study, the selection of research participants was random

4.5Result

The following section reports the research findings based on the six standards and 105 criteria. Each standard has an accompanying table that reports the findings of the study per criteria. The six standards for evaluating the quality of undergraduate e-learning nursing programmes are curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support and evaluation (see figure 1).



Figure 1: Standards

4.5.1 Evaluation of standards

The findings of the evaluation of the six standards during interviews with educators and support staff and focus group discussions with learners are reported below as per standard.

Standard 1: Curriculum planning

The standard had 29 criteria. A total of 10 criteria were marked 'yes', 17 criteria were marked 'no' and two criteria were marked 'not clear'. Most of the criteria in this standard had a narrative but no supportive data, as documentary evidence was unavailable. Criteria 1.7, 1.23 and 1.25 were marked both yes and no because the institution was in the process of external approval by the local accreditation body. The programme was socially responsive but hadn't been measured for accountability; the university had an e-learning policy; but educators and learners were not aware of the policy since it cascaded through deans and chairs of departments (Table 1).

Place table 1 here

Standard 2: Proficiency of the educator

The standard had 19 criteria. A total of eight criteria were identified as 'yes', with a total of 10 criteria being identified as unavailable, with one criterion being unclear. Criteria 2.9 was marked as both yes and no because local professional bodies have registered educators for health sciences, but those teaching common courses have not been registered.

Place table 2 here

Standard 3: Learner proficiency and attitude

The standard had 14 criteria, a total of seven criteria were identified with a 'yes', and a total of seven criteria were identified with a 'no'. The criteria had no supporting evidence.

Place table 3 here

Standard 4: Infrastructure for Learning

The standard had 18 criteria, a total of 11 criteria were identified with a 'yes', and six criteria were identified with a 'no'. Criteria 4.4 was identified as being both 'yes and no' since the stability of internet connectivity on and off campus was unreliable. Criteria 4.17 was identified as unclear since the participants could not answer a question related to technology and infrastructure as this was the responsibility of top management.

Place table 4 here

Standard 5: Support

The standard had 13 criteria, a total of 10 criteria were identified as 'yes' with three criteria identified as 'no'. Most criteria lacked supporting evidence, with only criterium 5.10 related to continuing professional development being supported by inclusion in the university calendar.

Place table 5 here

Standard 6: Evaluation

The standard had 10 criteria, a total of seven criteria were identified as 'yes' with three criteria identified as 'no'. Criteria 6.5 allowed learners to evaluate learning but could not evaluate the assessment techniques and technology required for e-learning. The reports from student evaluation were available.

Place table 6 here

4.6 Self evaluation report

After the self-evaluation process, the research assistants, with the help of the researcher, prepared a self-evaluation report (Appendix 2) which was shared with three local experts with experience in Kenyan higher education and quality assurance mechanisms. The responses obtained are presented in Table 7.

Table 7: Expert opinion on the self-evaluation report

Questions asked	Expert 1	Expert 2	Expert 3
Are the standards useful?	Very useful The gap is there, and hopefully, dissemination and implementation of the research findings will bridge the gaps For example, 1.7 is very relevant and resonates across all tertiary institutions in Kenya	The standards are instrumental. They have touched on every detail that needs to be measured for the standards to be sound	The standards are instrumental and timely given the digitisation. The process that is ongoing in the country, including in education
Are the standards easy to understand?	YES	The standards are easy to understand.	YES
Is the evidence generated aligned with the reporting on the standards?	YES The column on Not clear, such as the evidence generated in 1.9, 1.22, 2.11, 4.17 and 5.4, needs attention in terms of grammar, and phrasing. Note: regarding 5.4 is not clear, you could probably separate the two standards namely,	Yes, although, it is inadequate as some parts of the evidence are missing. However, some narratives mention little information that would be used as evidence.	YES

	evaluate counselling and career instead of regarding them as a single cohort		
Are the standards practical for use in your setting?	YES The Covid -19 pandemic and present era make this very relevant	Absolutely. They are convenient	YES
Are the standards usable in the Kenyan context?	YES	YES.	YES
What are your overall scores on the standards (1 lowest, 10 highest)	9	Standard 1 - 7 Standard 2 - 9 Standard 3 - 8 Standard 4 - 8 Standard 5 - 8 Standard 6 - 9	8

4.7 Discussion

The increase in universities offering e-learning has been exponential, with success demonstrated in training health workers to adopt e-learning for nursing education (Wang *et al.*, 2021). According to Bashir *et. al* (2021), the demand for testing standards in the contextual settings dominates the discourse in LMIC universities post-pandemic. This demand precipitated the development and testing of standards in a middle-income resource setting to check the feasibility, usability, and practicality of filling the gap identified in LMICs. Standards need to be applicable and sustainable in local contexts. Through multiple data collection approaches at a university in Kenya, including local expert opinion, the developed standards for evaluating the quality of undergraduate e-learning nursing programmes overall were deemed useable, feasible, and practical to the local context. The purpose of the discussion is to provide information regarding pertinent aspects to bear in mind for the various standards. It further provides support from the literature to contextualise the understanding of quality e-learning nursing programmes such as the tenets of reimagining nursing education through technology. The ideal of quality e-learning are often hindered by the current predicament in LMICs and this study aims to provide actionable solutions.

Many institutions adapt the existing traditional face-to-face **curriculum** to create e-learning instruction, regurgitating pages of text pulled from books and classroom courses (Schneiderheinze, 2005). The fundamental question arises as to whether a relevant curriculum is in place to support e-learning. This study reports a lack of curriculum for e-learning coupled with a lack of policy, a lack of content specific to e-learning, and a lack of best practices in e-learning for educators and learners (Appendix 1). Most studies focus on fragmented aspects of the curriculum, such as student perception, educator needs and interactive content for teaching, but do not address the entirety of a curriculum for e-learning (Alashwal, 2020; Wasfy *et al.*, 2021). A curriculum for the current e-learning environment is essential because of fundamental differences between the traditional and the e-learning learner (Schneiderheinze, 2005). The accreditation of e-learning programmes by accreditation bodies was a challenge in the context, which can be attributed to a lack of tested standards for evaluating e-learning (Barteit *et al.*, 2020).

The current learner is adept with technology, having grown up actively using the internet, mobile phones, and social networking. The curriculum therefore needs to adapt to these changes by ensuring that the learner becomes a moderator of e-learning supported by educators (Kumar *et al.*, 2021; Ogrizek *et al.*, 2012). Traditional learners were accustomed to lecture methods and the educator as the originator of knowledge. This fundamental shift in learners, coupled with a change in content requirements for e-learning, necessitates the development of curricula specific to e-learning (Mpungose, 2020). As illustrated in an e-learning paediatric cardiology curriculum developed for low-resource settings by Rusingiza *et al.* (2022), there were improved scores in knowledge assessment. The e-learning curriculum was relevant as learning material, the presentations were clear, and learners could review the material at their own pace.

The incorporation of augmented reality (AR), virtual reality (VR) and robotics allow e-learning curricula to have a mix of virtual and real-world experiences in varied combinations stimulating dynamic and personalised learning (Alzahrani, 2020; Botha *et al.*, 2021). Yildiz and Demiray (2022) used virtual reality in teaching intravenous catheterisation, and the outcome was that virtual reality was compelling, and its use in nursing training was recommended. Course content for e-learning needs to be regularly updated, and the use of interactive content in terms of videos, chats, online discussions,

and game-based learning activities offers an opportunity to boost learner engagement and direct application and retention of knowledge (Kosa *et al.*, 2020; Rusingiza *et al.*, 2022). Incorporating these strategies into the curriculum ensures that learners engage with learning content and enhances the general learning experience. The uniqueness of nursing education, integrating both theoretical and clinical competencies, requires a curriculum as a foundation for e-learning and as the glue that binds all the components together. E-learning is taking shape, albeit with numerous challenges. Standards that are tested provide dexterity in implementing e-learning programmes in LMICs.

The proficiency and attitude of educators in shaping nursing graduates to become future health providers is critical and cannot be underestimated, as this determines the quality of the graduates (Alanazi & Alshaalan, 2020). The e-learning educator role is more complex than of the traditional educator (Koch, 2014). The central driving force of how learners learn is embedded in the educator's ability to integrate learning theories into e-learning programmes to shape learning activities and outcomes based on the different approaches (Picciano, 2017). Behavioural approaches require learner activities and interactive content, while quality evaluation and feedback are essential considerations in this approach (Kumar & Sharma, 2021). The crucial role played by educators in the cognitive approach requires the educator to design learning content into smaller components and incorporate different learning styles to reduce cognitive overload in learners (Mödrtscher, 2006; Narayan, 2018). In addition, the role of educators as mediators of the e-learning process, facilitating the transfer of knowledge, underpins the cognitive approach. The social constructivism approach views the learner as able to construct knowledge rather than being given the knowledge through instruction (Chuang, 2021; Huang, 2002).

The educator must offer academic support to both strong and weak learners, as well as academic counselling and flexible timelines for formative assessment (Mousavi *et al.*, 2020). Increased class sizes have hampered the educator role on e-learning platforms, and this reduces individual active learner focus (Wright *et al.*, 2017). The quality of teaching required for e-learning involves using innovative teaching strategies, proper assignments with suitable, timely feedback, and interactive sessions with learners on different online platforms to improve learners' motivation (Mousavi *et al.*, 2020).

For educators to provide quality instruction, there must be activities geared towards professional development for faculty relating to skills required for e-learning, and the number of assigned educators must be reasonable, sufficient, and aligned with the learner numbers and training needs (Wasfy *et al.*, 2022). The clarity of educator roles and responsibilities is anchored in a robust commitment to effectively induct new educators into e-learning and offer constructive feedback on performance. This provides an opportunity to strengthen capacity and improve the quality of e-learning (Mousavi *et al.*, 2020; Saleh *et al.*, 2022; Wasfy *et al.*, 2022). Equipping educators with the necessary tools is essential for improving the quality of e-learning. Lakshmi *et al.*, (2020), in assessing the readiness of educators, found that 90% of the staff had computers connected to the internet, 54% had e-learning content authoring tools, and 100% expressed satisfaction with internet bandwidth to support e-learning. This is in line with Nwagwu (2020), who identified that training, equipment, and materials were significant influencers in developing e-learning.

Educators play a vital role in determining the success of e-learning programmes, and interaction with students can be an avenue to strengthen morale among students (Farid *et al.*, 2018). The lack of support by educators could be detrimental to e-learning and this view is supported by Farazkish and Montazer (2019). They identified that a lack of educator support was the leading cause of the failed development of e-learning programmes in 23 Iranian universities. Educators have been able to utilise what little resources they have and the available equipment to find their way around the challenges of e-learning by using of offline content in areas of sporadic and unreliable internet, mobile phones in remote areas where access to computers is challenging and scheduling classes in the evening when most learners are available (Mishra Gupta and Shree 2020; Zalat *et al.*, 2021)

E-learning positively impacts **learner proficiency and attitude** compared to traditional approaches, with higher scores, satisfaction and positive attitude among learners supported by improved interaction and collaboration among learners and educators (Hamdan & Amorri, 2020). Learners expressed their challenges with e-learning as expecting higher levels of active learning, access challenges, and the operability of e-learning learning management systems (LMS). This was similarly identified by Elfaki *et*

al., (2019) and Regmi & Jones (2020) who identified learners to be strategically at the centre of learning with the use of interactive approaches that invoke interest. The expected roles of the student on the e-learning platform include are but are not limited to, active participation, access to material and learning, doing assignments, participating in continuous assessments opportunities, and giving feedback (Rajkumar & Vivekananthamoorthy, 2014).

To facilitate the wider integration of learning theories into nursing education, learners are expected to be active learners and apply information in practical situations and reflect on learning content. The learner as an inventor of knowledge is essential to the development of e-learning (Kumar & Sharma, 2021; Mödritscher, 2006). An expanded role requires learners to be oriented to structured computer and information technology access and the skills they need to utilise e-learning in a desirable manner (Raghuveer *et al.*, 2016). Emphasis on the interaction between learners and educators, matched with interest, accessibility, and availability of e-learning before they enrol for programmes, will ensure maximum usability (Jebraeily *et al.*, 2020; Wasfy *et al.*, 2022).

Learners expressed low morale with e-learning, with concern about the uploaded learning content, educator teaching strategies and interaction levels between learners. These findings differ from those of Sanchez & Karaksha (2022), they found that learners' attitude, coupled with high motivation and satisfaction levels toward e-learning, provided an avenue for the growth of e-learning. Course content among health sciences professions can be overwhelming even to the strongest of learners. The ability to support self-directed learning and problem-solving skills can be harnessed using e-learning to improve students learning self-efficacy, helping them to achieve professional competencies in nursing (Bankar, 2021). This calls for learners' increased level of commitment to ensure e-learning success. The learner is an integral part of the process and outcome of e-learning programmes.

Infrastructure for e-learning should focus on policy frameworks crucial in implementing e-learning programmes. Institutional policies should be adapted from national statutory policies and modified to fit specific university needs (Hudson *et al.*, 2018). Guidelines and strategies should complement existing teaching modalities to amend inconsistencies at

any level that would negatively affect e-learning (Alhassan *et al.*, 2021). Clarity and disseminating e-learning policies to key stakeholders are essential to ensuring quality. Furthermore, policy formulation on its own might not be sufficient to strengthen e-learning approaches but a commitment to improving continuously, funding and benchmarking for the quality of e-learning programmes are also needed (Rajabalee & Santally, 2021). The unavailability of funding has hampered e-readiness among Kenyan universities as have budgetary constraints and inadequate information and communication technology (ICT) infrastructure development for e-learning (Kibuku *et al.*, 2020). E-learning infrastructure should be available before initiating these programmes including an internet connection with supportive bandwidth, e-learning content and a learning management system (LMS), human resource needs and capacity building (Harerimana & Mtshali 2021). Challenges of access to the internet, software choice, power and devices are a setback in the delivery of e-learning as a result of inadequate funding to institutions. This leads to the inability to invest in technological infrastructure, content development and software upgrades (Koi-Akrofi *et al.*, 2020). ICT support staff must be aligned with best practices in e-learning to build an efficient and adequate system that ensures troubleshooting and support when required.

Technical skills are indispensable in operating e-learning infrastructure and require professionals with technical expertise to maintain, upgrade and train users to **support** academic goals (Nawaz & Khan, 2012). Financial constraints affecting LMICs should be an impetus to university boards of management to choose technology that is effective over the long term with periodic updates to improve performance (Liu *et al.*, 2022). According to Vershitskaya *et al.* (2020), technical support is essential to the success of e-learning and presents a challenge that is often overlooked. Technological sustainability requires technology that will be effective in the long run (Anadon *et al.*, 2016). Despite the initial technological investment, the success of e-learning will depend on the skills and quality of technical support to educators and learners requiring immediate, extensive, and sustained support to actualise operability (Dhawan, 2020; Nawaz & Siddique, 2013). An effective technical support team available to learners improves the learners' ease and ability to interact and use e-learning, addresses perceptions to use and develops confidence in the programmes (Ameen *et al.*, 2019). Thapa *et al.*, (2021) assert that

technical support limitation is among the leading causes of learner dissatisfaction with e-learning. E-learning technical support is much more than merely issuing telephone numbers to call when support is needed. Support implies providing assistance on course content development, online and face-to-face tutorials or training to assist learners and educators with supported technology, and walk-in, email, and phone assistance (Swan, 2017). The importance of appropriate support for e-learning cannot be overemphasised. Frequent training, research support and growth opportunities are essential in ensuring that support staff are up to date with current trends surrounding e-learning programmes.

Evaluating e-learning is critical to ensure the successful delivery, practical use and positive impact on educators and learners (Al Fraihat *et al.*, 2020). Most of the evaluations of e-learning in LMICs produce weak evidence as they are anchored in unidimensional approaches compounded by a lack of standards that offers common ground evaluation criteria (Barteit *et al.*, 2020; Gama *et al.*, 2022). These shortcomings in evaluation are hampered by a lack of feasible standards in LMICs. They are further impaired by the deductive unidimensional approach to identifying an acceptable description of what successful e-learning should be. Some perspectives are shaped by user satisfaction, opinion, and learner feedback derived from subjective evaluation approaches. Such evaluation offers short-term solutions, and essential components are often overlooked, leading to lower uptake of e-learning (Barteit *et al.*, 2020; Ruggeri *et al.*, 2013). Evaluation of e-learning should be holistic to include all the specific components. In LMICs, however, the majority of the assessments are on resources, accessibility, infrastructure and the essential roles of satisfaction of the learners and educators (Al Fraihat *et al.*, 2020). The lack of holistic approaches in evaluation culminates in diminishing effectiveness and sustainability of e-learning as the all-inclusive needs of all stakeholders are not considered, leading to the sabotage and eventual failure of programmes (Barteit *et al.*, 2020). There is an increased awareness that the evaluation should be based on a comprehensive understanding of what constitutes successful e-learning and should incorporate a multi-dimensional approach to evaluating the e-learning environment (Prosen *et al.*, 2022).

In this study, Kenyan higher education and quality assurance experts confirmed that the standards are useful in the contextual setting, especially now that most universities have

opted to fully introduce e-learning courses. The standards developed are easy to comprehend and are usable and practical for the Kenyan context. According to the experts, the average score suggests that these standards are methodologically sound, tested and established to be of high quality and applicable in Kenya and LMICs in general. The need for quality standards for evaluating undergraduate e-learning nursing programmes, especially in LMICs, is critical to improve the training of nurses in order to improve the outcomes of patients and communities.

4.8 Conclusion

E-learning offers an avenue to improve nurse's qualifications. The use of e-learning in nursing education provides an opportunity to develop their knowledge and skills without the limitations that once inhibited their professional growth. The quality of nursing graduates produced is dependent on the quality of training based on the training modalities used, mostly e-learning. The novelty of testing these standards in Kenya as a model for greater LMIC integration provides an avenue for building robust e-learning programmes with a broadened scope of quality in undergraduate nursing programmes. Integrating the three learning theories into e-learning supports the diverse needs of learners, directs the educators' role, and makes provisions for testing the effectiveness of programmes (Edmonds *et al.*, 2006; Gama *et al.*, 2022). Documented evidence on testing standards is limited in LMICs, and this study provides novel evidence and guidance towards quality e-learning nursing programmes.

The development, validation and feasibility study of standards is the result of a rigorous process that seeks to invoke action to ensure that e-learning is methodologically developed to be a realistic option in the training of nurses and other health workers. These standards have been developed with contextual challenges in mind to offer local solutions to local problems. Generating strong scientific evidence is key to successfully implementing e-learning, especially in LMICs. This will provide stakeholders with the information required to strategically plan for change and understand the interplay of each element in an e-learning programme (Barteit *et al.*, 2020). Standards are essential tools in the evaluation process as they provide holistic perspectives of individual components required to ensure successful outcomes and introduce novel information to enable

decision-makers, educators, and learners to redefine the quality of e-learning within the context of LMICs. The research tested standards to evaluate the quality of undergraduate e-learning nursing programmes in LMICs. The contribution of this larger research study to the body of knowledge is multidimensional. Firstly, through the development of the six standards. Secondly, validation using experts from LMICs, and finally, a feasibility study to evaluate the usability and practicality of these standards in LMICs. The overall agreement drawn from the entire process is that the paucity of feasible, usable, and practical evaluation of e-learning has been bridged through the novelty of these standards, which would contribute to quality programmes in LMICs.

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Chapter 5

Discussion, recommendations, and conclusion

5.1 Introduction

In this final chapter, the conclusions are based on the overarching research question:

What standards can be developed for evaluating the quality of undergraduate nursing e-learning programmes in Kenya?

This question guided the entire study. The chapter will briefly explain the aims, objectives and methodological underpinnings applied in each phase in addressing the research question. Finally, recommendations, conclusions, and contributions of the study to the body of knowledge are discussed.

5.2 Overview

The universal need to scale up nursing education to train more nurses to the degree level is essential in improving the health outcomes of patients and communities (Bvumbwe & Mtshali, 2018; Rumsey *et al.*, 2022). The demand for nurses with improved knowledge and skills requires nurses with a bachelor's degree Fawaz *et al.* (2018) identified this demand to have led to the influx of low- and middle-income countries (LMICs) in developing upgrading programmes for nurses seeking to transition from a diploma to a degree certification (Azad *et al.*, 2020; Fitzgerald *et al.*, 2020).

E-learning has been lauded as a modality to facilitate the transition from a diploma to degree qualification because of the flexibility it offers nurses when taking into consideration their competing interests such as work, family, and educational advancement (Lawn *et al.*, 2017). Ensuring that quality is maintained in the training of nurses will significantly influence the health outcomes of populations and communities (Couper *et al.*, 2018; Oldland *et al.*, 2020). The evaluation and quality of e-learning programmes have been difficult to evaluate in Kenya according to Barteit *et al.* (2020). Frehywot *et al.* (2013) identified that a lack of standards for evaluating the quality of

undergraduate e-learning nursing programmes and the unidimensional focus of most evaluations of e-learning led Regmi and Jones (2020) to identify that the focus is mainly on learner needs and satisfaction. Educator needs, coupled with adopted standards originating in high-income countries, which lack contextual considerations further confound the problem (Bahrambeygi *et al.*, 2019; Belzer & Grotlüschen, 2022).

The problem addressed in this study is the lack of standards to guide the evaluation of undergraduate e-learning nursing programmes in Kenya. The paucity of standards to guide the process has been a significant hindrance to the development of e-learning in LMIC (Almaiah *et al.*, 2020; Mutisya & Makokha, 2016). The identified need sparked the motivation to develop context-specific multidimensional standards that focus on providing sustainable solutions. Therefore, this study sought to develop standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

The researcher adopted the Health Standards Organization framework (HSO) for the development of the standards. According to this framework, the initial process of standards development includes identifying the opportunity for reviewing standards followed by establishing a technical committee, then developing a draft outline, consensus building, review of the draft, approval of the standards and publishing the standards (see Figure 1: HSO standards development)



Figure 5.1 HSO standard development

The seven-step process of the HSO was applied in the study as follows: steps 1 and 2 of the HSO framework represent the prephase of the study to include the statement of the problem. The third step represents the first phase of the study. Steps 4 and 5 represent the second phase of the study. Step 6 represents the third phase of the study. Step 7 represents the post-phase of the study.

The study was underpinned by a pragmatic approach allowing researchers to be flexible enough to adopt the most practical approach to address a research question (Lynch *et al.*, 2018; Morgan, 2007). The focus here was commitment to what works in practice, appreciation of plurality, and a desire for integrated results relevant to nursing research (Kaushik, *et al.*, 2019; Weaver & Olson, 2005). Each phase of the study addressed one objective and utilised one methodological approach to gather data. The output of each phase informed the next, ensuring the development of standards that are feasible, usable, and practical.

5.3 Study objectives

This study unfolded in three phases, underpinned by the following objectives:

- a) Describe the standards used in the evaluation of quality undergraduate e-learning in health sciences programmes in low and middle-income countries (LMIC) through an integrative review (phase 1).
- b) Describe the consensus on standards for evaluating the quality of undergraduate nursing e-learning programme in low- and middle-income countries through a modified Delphi technique (phase 2).
- c) Describe the feasibility of the developed standards in evaluating the quality of undergraduate nursing e-learning programmes in Kenya (phase 3).

5.4 Review and summary of main findings

The review and summary of findings presents a summary of the different phases of the study.

5.4.1 Phase one: Identify standards

5.4.1.1 Purpose:

The purpose of the review was to synthesise available evidence related to standards for evaluating undergraduate e-learning programmes in the health professions in LMICs.

5.4.1.2 Design:

An integrative review approach was applied to include theoretical and empirical literature utilising varied methodologies and designs (Whittemore and Knafl 2005)

5.4.1.3 Data collection approaches

The review question was:

‘Which standards are used in evaluating undergraduate e-learning programmes in the health professions in LMICs?’

The research question was operationalised by identifying keywords and their synonyms linked through Boolean operators and modifiers to generate a search string. A literature search using the search string was done through the EBSCO Host interface. Here a number of databases were searched with the help of a university information specialist. A total of 610 results were presented as titles and abstracts. A two-step process involving three reviewers guided by inclusion criteria was applied in selecting articles to be included in the review. The candidate, the supervisor, and an expert in health professions education from low- and middle-income countries screened and selected the articles. A total of 305 records were excluded through automatic and physical deduplication. Two hundred and sixty-nine records were eliminated for various reasons, including inappropriate context. The full texts of 24 records were sought, of which 16 were eliminated as they did not meet the inclusion criteria. Six articles that met the criteria were included in this review. The search process was updated in June 2022, and a similar screening and selection process was followed. An additional two articles met the inclusion criteria resulting in a total of eight articles included in the review (see section 2) for the screening process and the PRISMA process diagram). The data from the included articles were extracted using an author-generated custom-made Google form was used to extract data from the included articles. The form was piloted on two articles by both authors and refined to their satisfaction. A total of eight standards emerged from the iterative process, with 109 criteria identified (Addenda 2.6)

5.5 PHASE TWO: Consensus on standards

5.5.1 Purpose:

This paper reports on a consensus study on standards for evaluating the quality of undergraduate nursing e-learning programmes in LMICs.

5.5.2 Design

This study applied a modified Delphi technique used to achieve consensus on standards or quality indicators, especially in areas with no recommended guidelines for a specific problem (Niederberger & Spranger, 2020).

5.5.3 The population and sampling

Experts drawn from various LMICs were selected to participate based on inclusion criteria (see section 3 for the inclusion criteria)

5.5.4 Data collection technique

The data collection process followed the following process:

5.5.4.1 Identifying potential experts for inclusion in the expert panel.

The identified experts were emailed a participation information leaflet and consent form. Those who agreed to participate in the study had to sign the consent form, and a total of 14 experts agreed to participate in the study.

5.5.4.2 Conducting a modified Delphi

The data collection tool for the first round was developed using the RedCap ® application and Survey Monkey ® for consequent rounds. A total of six standards with a total of 109 criteria were used. The modified Delphi had three rounds of rating, review, and reflections by the experts over sixteen weeks. Round 1 of the modified Delphi had an online questionnaire; the experts were presented with all the six standards and 109 criteria and asked to either 'agree, disagree or not sure'. The consensus was set at 80%, with areas of disagreement providing an opportunity for the second phase. Any question reaching the consensus threshold was not drawn back to the second round.

In cases where the experts did not get at least 80% consensus or were unsure about a standard and/or its criterion, the standard and its criterion were reformulated based on the feedback from this round and formed round two questionnaires.

Round 2 The questionnaire for the second round required the experts to review the standards that did not reach the consensus threshold and keep, discard, or provide alternative standards and criteria. At the end of the second round, the standards proposed by the experts were deliberated, the decisions to keep and remove were made in line with expert opinion, and the final standards were developed.

5.5.4.3 Presentation of final standards.

After the iterative process, the experts were presented with the finalised standards and requested to confirm that the standards represented the outcome of the deliberations and to comment on the feasibility, usability, and practicality of LMICs. By the end of this phase, six standards with 105 criteria were developed. (Addenda 4.4)

5.6 Phase three Feasibility study

5.6.1 Purpose

Describe the feasibility of developed standards in evaluating undergraduate nursing e-learning programmes in a middle-income setting at an LMIC.

5.6.2 Design

A multiple-methods design was used for this study, integrating qualitative and quantitative approaches (Creswell, 2013).

5.6.3 Population

A total of 20 learners, three educators and five support staff were eligible to be included in the study. Purposive sampling was used to include participants in the study.

5.6.4 Data collection approach

The data were collected through focus group discussions and individual interviews with participants. A research assistant with experience in e-learning programme design in nursing and quality assurance was selected and trained over three months for the purpose of the study and its data collection process. Based on the standards and criteria, an author-generated data collection tool was used for the data collection process.

5.6.5 Data analysis

The data were analysed through frequencies of descriptive data analysis used to describe the responses received per standard across the various criteria.

5.6.6 Results

After data collection, a panel of three experts with experience in Kenyan higher education e-learning programmes and quality assurance mechanisms were sent the self-evaluation report findings and requested to interpret the report and provide opinions on the feasibility, usability, and practicality of the developed standards. The final standards developed for evaluating the quality of undergraduate e-learning nursing programmes are feasible, usable, and practical in LMICs, according to the experts.

Table 5.1: Factual and conceptual conclusions

Phase	Factual conclusions	Conceptual conclusion
Phase 1	Developed standards Six standards with 109 criteria: curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation.	Fragmented evaluation approaches standards for e-learning and quality in the nurses produced.
Phase 2	Validated standards Six standards with 105 criteria: curriculum planning, proficiency of the educator, learner proficiency and attitude, infrastructure for learning, support, and evaluation.	Holistic approaches to evaluate quality. Policy integration to e-learning
Phase 3	Tested standards Validation of feasibility, usability, and practicality by experts with experience in e-learning in higher education and quality assurance.	Replication to other LMICs The uniqueness of LMICs settings, thus, distinct standards.

5.7 Limitations of the study

The study had the following limitation:

The first phase was limited by the search string and inclusion criteria, which may have excluded some studies. The literature sourced was limited to English-language publications within LMICs attempts to access English translations were futile. Abstracts and full texts in foreign languages were excluded. Only the full articles available to the University of the Free State were accessed, and this might have limited the scope.

The second phase was limited as only a limited number of experts participated despite numerous efforts to recruit more experts. Busy work schedules and unavailability could explain the hesitation to volunteer. The English language proficiency of the experts drawn from different LMICs might have limited the study. Experts from non-English speaking LMICs were excluded and this might have limited the representativeness of LMICs.

The limitation of the third phase was the researcher's involvement in the data collection process, and the compilation of the final survey report could result in bias in the reporting of findings. This limitation was mitigated by including external experts and the supervisor throughout the research process.

5.8 Recommendations of the study

For the study to contribute to standards development in LMICs, the researcher makes the following recommendations:

1. The standards need to be rolled out in various contexts in Kenya and other LMICs to determine their feasibility in non- nursing programmes for e-learning as well.
2. The chairs of nursing departments can strengthen e-learning by developing and supporting the implementation of policies to improve the quality of undergraduate nursing e-learning programmes and by developing curricula specific to e-learning outlined in these standards. The department chairs are at a pivotal point in clearly delineating to management boards the need for improvement and ensuring quality in e-learning.
3. The University management boards should avail the requisite resources for evaluation processes of e-learning using the standards developed to ensure the quality of e-learning.
4. The study's findings be used to evaluate the quality of undergraduate e-learning nursing programmes by the Commission of University Education (CUE) in Kenya.
5. Future research can focus on establishing standards for evaluating clinical teaching to ensure quality in clinical practice.

5.9 The significant contribution to knowledge (SOCK)

The study provides universities with feasible, usable, and practical standards to evaluate the success of undergraduate e-learning programmes. The study presents six standards and 105 criteria that evaluate e-learning holistically, considering all the critical factors. The standards of e-learning will greatly benefit key stakeholders and ensure quality improvement of e-learning in LMICs. The study significantly contributes to nursing education by recommending the use of these standards to evaluate the quality of undergraduate e-learning nursing programmes to ensure that the quality of e-learning is maintained. This will assure regulatory bodies and the public of competent graduates.

The novelty of these standards ensures multidimensional approaches to evaluation by integrating the different components of quality e-learning, namely; curriculum planning, proficiency of educator, learner proficiency and attitude, infrastructure for e-learning, support and evaluation, with the criteria specifically addressing quality measures under each standard. Collectively, these criteria are valid and essential to quality measurement. Secondly, the study went further to check the feasibility of the standards at a leading local university. The findings were presented to experts with expertise in Kenyan higher education e-learning programmes and quality assurance mechanisms. They were requested to provide opinions on the feasibility, usability, and practicality of the developed standards. The study also identified critical factors for the quality evaluation of e-learning, which can be regarded as another contribution. The study makes an overarching contribution to knowledge with an extensive focus on nursing education, practice, and research. In contributing to knowledge, the study revolves around developing standards for evaluating the quality of undergraduate nursing programmes. The standards were developed based on an integrative review, a modified Delphi and a feasibility study.

The study also identified holistic standards in the evaluation of e-learning, enabling the transition from unidimensional evaluation criteria that focus on satisfaction models by educators and learners. To the best of our knowledge, these are the first comprehensive standards that holistically evaluate the quality of e-learning in LMICs. The specificity and continuous focus on foregrounding LMICs in each of the different phases anchored in sound methodological approaches, contribute to e-learning in LMICs. By developing these standards, the researcher contributed to developing local solutions to local

problems in evaluating the quality of e-learning in undergraduate nursing programmes hence the research contribution to the nursing education field.

The theoretical and clinical aspects of training nurses have a bearing on evidence-based practice. The standards developed through an iterative process generated evidence that can be used to strengthen e-learning in low-income countries. The aftermath of the COVID-19 pandemic has had reeling effects on the education sector long after the restrictions have been lifted. The study further contributed to the development of e-learning by ensuring quality at the onset of such programmes as opposed to a haphazard, lacklustre approach to the evaluation of e-learning. This will contribute to ensuring the quality of e-learning in undergraduate nursing programmes in LMICs.

5.10 Personal reflections

The PhD journey has been quite a rollercoaster. Through the years I have grown immensely, and this has shaped my thought processes considerably. My perspective on research and scholarly writing has been transformed through valuable insights from my supervisor, who was instrumental throughout this journey. Working through the COVID-19 pandemic and remaining focused can be attributed to God for his immense grace. Outside the PhD, the regular training sessions provided by the UFS have developed my knowledge and skills in research. The opportunity to visit the UFS was an eye opener, and the face-to-face sessions were invaluable to my growth as a scholar

The desire for e-learning quality was birthed whilst working with upgrading nurses on e-learning platforms. The challenges experienced by these nurses are immense as they seek to advance their qualifications amidst competing interests of family, work and professional development. The desire to offset the burden of e-learning challenges and the provide quality e-learning experiences, shaped by the overarching need for standards spurred me to develop the study. The COVID-19 pandemic highlighted the need for e-learning and increased my impetus to offer local solutions to local problems.

My PhD journey that has not only has been transformative, but life changing as well. My confidence in writing has vastly improved, my articulation of pertinent issues has greatly improved, and I believe the novelty of the standards will assist nurses who are upgrading their qualifications through in their e-learning programmes the much-desired quality.

5.11 Concluding remarks

E-learning demonstrates remarkable promise in LMICs to scale up health workers from diploma to degree programmes, equip these health workers with the requisite knowledge and skills and bolster quality services to improve the health outcomes of patients and communities.

The study involved different groups of e-learning stakeholders (educators, learners, digital campus directors, and quality assurance managers) who enriched the research with a diverse outlook and an improved understanding of the status and challenges facing e-learning. The focus was on the importance of the developed standards in improving the quality of undergraduate e-learning programmes. The standards, developed through evidence and validated by experts within LMICs, bring to the fore the existing need for strengthening of e-learning and offer practical criteria to evaluate quality to achieve the desired results. Each of the standards is supported by robust criteria delineated for ease of use in various settings. Policymakers can use the standards to develop policies on e-learning to improve the quality of e-learning, and to ensure that nurses can deliver services within the context of their different work environments improving the health outcomes of the patients and communities they serve.

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Addenda

Addendum 1:1 Ethical clearance HSREC



Health Sciences Research Ethics Committee

08-Sep-2021

Dear Mr Moses Mulu

Ethics Clearance: Standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya

Principal Investigator: Mr Moses Mulu

Department: School of Nursing Department (Bloemfontein Campus)

[Submission Page](#)

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project. Your ethical clearance number, to be used in all correspondence is:UFS-HSD2021/0370/2809

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

Please submit permission from NACOSTI as a subsequent submission notification in RIMS before the research

conduct phase is started.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise.

This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long-term studies. A final report should be submitted at the completion of the study. Research conducted in any Department of Health facility: Researchers are required to sign and return the HSREC approval letters to the provincial Department of Health where they applied. It is also a requirement for researchers to submit electronic copies of their final research findings, and/or make a presentation of their findings and recommendations at departmental

research days when and where indicated.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; International Council for Harmonisation (ICH) Harmonised Guideline, Integrated Addendum to ICH E6(R1), Guideline for Good Clinical Practice (GCP) E6(R2), 2016, SAHPRA Guidelines as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email

EthicsFHS@ufs.ac.za.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely



Prof. A. Sherriff
Chairperson: Health Sciences Research Ethics Committee



Health Sciences Research Ethics Committee

Office of the Dean: Health Sciences

T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za

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Addendum 1.2: Research authorization (National Commission For Science And Technology)

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Keep abbreviations to a minimum.

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Include a full title and a short title for the manuscript.

Title	Length	Guidelines	Examples
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Short title 100 characters State the topic of the study Cigarette smoke exposure and innate immunity

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Enter author names on the title page of the manuscript and in the online submission system.

On the title page, write author names in the following order:

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The Materials and Methods section should provide enough detail to allow suitably skilled investigators to fully replicate your study. Specific information and/or protocols for new methods should be included in detail. If materials, methods, and protocols are well established, authors may cite articles where those protocols are described in detail, but the submission should include sufficient information to be understood independent of these references.

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Acknowledgments

Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution.

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Figures

Do not include figures in the main manuscript file. Each figure must be prepared and submitted as an individual file.

Cite figures in ascending numeric order at first appearance in the manuscript file.

Figure captions

Figure captions must be inserted in the text of the manuscript, immediately following the paragraph in which the figure is first cited (read order). Do not include captions as part of the figure files themselves or submit them in a separate document.

At a minimum, include the following in your figure captions:

- A figure label with Arabic numerals, and “Figure” abbreviated to “Fig” (e.g. Fig 1, Fig 2, Fig 3, etc). Match the label of your figure with the name of the file uploaded at submission (e.g. a figure citation of “Fig 1” must refer to a figure file named “Fig1.tif”).
- A concise, descriptive title

The caption may also include a legend as needed.

Tables

Cite tables in ascending numeric order upon first appearance in the manuscript file.

Place each table in your manuscript file directly after the paragraph in which it is first cited (read order). Do not submit your tables in separate files.

Tables require a label (e.g., “Table 1”) and brief descriptive title to be placed above the table. Place legends, footnotes, and other text below the table.

Addendum 2.2 Confirmation of manuscript submission

PONE-D-22-18634

Fri, Jul 1, 6:57 AM

UNDERGRADUATE E-LEARNING PROGRAMMES IN THE HEALTH PROFESSIONS:
AN INTEGRATIVE REVIEW OF EVALUATION STANDARDS IN LOW- AND MIDDLE-
INCOME COUNTRIES
PLOS ONE

Dear Dr. Mutua,

Thank you for submitting your manuscript entitled 'UNDERGRADUATE E-LEARNING PROGRAMMES IN THE HEALTH PROFESSIONS: AN INTEGRATIVE REVIEW OF EVALUATION STANDARDS IN LOW- AND MIDDLE-INCOME COUNTRIES' to PLOS ONE. Your assigned manuscript number is PONE-D-22-18634. We will now begin processing your manuscript and may contact you if we require any further information. You will receive an update once your manuscript passes our in-house technical check; you can also check the status of your manuscript by logging into your account at <https://www.editorialmanager.com/pone/>.

If during submission you selected the option for your manuscript to be posted on the bioRxiv preprint server (<http://biorxiv.org>), we will be assessing the manuscript for suitability shortly. If suitable, your preprint will be made publicly available on bioRxiv and you will receive an email confirmation from them when it has posted. Please check your response to this question and email us as soon as possible at plosone@plos.org if it has been answered incorrectly. Further information about our partnership with bioRxiv to facilitate the rapid availability of life sciences research is available at <http://journals.plos.org/plosone/s/preprints>.

If you have any inquiries or other comments regarding this manuscript, please contact plosone@plos.org. Thank you for your support of PLOS ONE.

Kind regards,
PLOS ONE

Addendum 2.3: Peer review comments

PLOS one

Undergraduate e-learning programmes in nursing: an integrative review of evaluation standards in Low- and middle-income Countries

Reviewer feedback

General

1. Important area of research especially for LMICs;
2. Need to double check grammar and language.

Background

1. Good background info, however, please elaborate on the following points:
 - a. Whether the scope of this article is limited to the didactic component of the undergrad health education or clinical and didactic teaching delivered through e-learning programs?
 - b. The aim of the study is vague and does not clearly mention specific outcome or measures authors want to address in terms of quality in undergraduate e-learning programmes. Are the authors trying to elaborate on the best practices in LMICs with regards to health education using e-learning methods pertinent to an entire degree program or general best practices related to any online health education at undergrad level?
 - c. Quality matters and CIPP models provide an assessment of the quality of online teaching and competencies set at the beginning of the courses. This could align or not align with the overall competencies of a given degree program. The subject matter experts and content specialists play a role in determining the relevance of the teaching materials itself in achieving the required competencies especially when patient outcomes have been under consideration and mentioned in one of your citations. Are you focusing on the quality of online teaching or the quality of health care professionals in

online vs. in-person programs? This point is worth elaborating given no specific outcomes of e-learning programs were identified in the introduction and specific aims.

Methods

1. Please clarify for your audience what is an integrative review and how is it different from systematic review or scoping review. This elaboration is necessary because the articles you have included are a mix of methods, practice, experimental etc.
2. Provide a list of inclusion and exclusion criteria? Are you focusing on studies only meant for undergrad level? Is literature limited to only nursing or other health professions were also included?
3. Please provide a list of various reasons in “Of the remaining 295 records, 269 were eliminated for various reasons,151 including inappropriate context and different subjects.”
4. Why are risk of bias methods not applied in the included studies? What was done to assess the quality of included studies?

Results

1. Result well described and presented in table form.
2. Have the authors come across any relevant literature using digital learning technology or it was out of scope for this study? Please note that digital technology and e-learning are not synonymous. There are a wide array of platform to access and use e-learning materials.

Discussion

1. Good discussion points especially regarding proficiency of educators, learning environment, tech / infrastructure needs.
2. What is the role of blended learning in health education?

3. Please describe limitations of your study especially strength and weaknesses of the study design, review process as well as limitation of the evidence included in the review.

Addendum 2.4 Researcher response

COMMENTS	RESPONSE	EVIDENCE
<u>Journal Requirements:</u> Please ensure that your manuscript meets PLOS ONE's style requirements, including those for file naming.	Thank you for your comment. This has been done across the entire document	Areas corrected are tracked and highlighted
Please amend either the title on the online submission form (via Edit Submission) or the title in the manuscript so that they are identical.	Thank you for your comment. This has been done and there is uniformity in the titles	Title in the manuscript amended and on the online submission form.
Please include captions for your Supporting Information files at the end of your manuscript, and update any in-text citations to match accordingly. Please see our Supporting Information guidelines for more information	Thank you for your comment. However, the author does not have supporting information. All the required figures are attached and submitted individually	
EDITORS COMMENTS		
Background The authors have written the aim of this review in the Methods section. I suggest that the authors move the objectives to the Background section.	This is a valid comment the aim of the review has been moved to the background section.	Highlighted in green on page 4.
2. Methods, inclusion, and exclusion criteria Although the authors describe the identification of the problem, there is no clear information regarding the	Thank you for your comment The inclusion and exclusion criteria have been added under the methods section under the sub section selecting the article.	Highlight in green on page 6.

inclusion/exclusion criteria for this review.		
3. Methods, inclusion and exclusion criteria Although the authors describe the identification of the problem, there needs to be more precise information regarding the inclusion/exclusion criteria for this review.	This is a repetition and has been addressed in the above section	
4. The results of selection process The authors describe the study selection process in both the Methods and Results sections. This is confusing for the reader. The flow of the study selection process is generally described in the Results section.	Thank you for your comment The study selection process has been moved to the results section	Highlighted in green on page 9
5. Bias of each study The authors have not assessed the methodological quality of each study included in this review. Therefore, I cannot identify whether the findings of each study are reliable. At least, I suggest that the authors mention in the limitations section that they did not assess the risk of bias in each study. Also, if each study has a substantial bias, I suggest that the authors mention this in the Conclusion section.	Thank you for your comment. However, the integrative review was underpinned by the framework by Whittemore and Knalf (2005), and this framework does not include a step for evaluating methodological quality. Therefore, this could not be considered as a limitation	
REVIEWER COMMENTS		
General		
Need to double check grammar and language.	Thank you for your comment. The review was language edited by a qualified language editor,	Declaration by language editor attached

	and a declaration has been provided.	
Background		
Whether the scope of this article is limited to the didactic component of the undergrad health education or clinical and didactic teaching delivered through e-learning programs?	Thank you for your comment. The initial intention was to identify standards for theoretical and clinical approaches but the results identified throughout the review were skewed towards theoretical approaches hence the authors focus was limited to the didactic component of the undergraduate programme inferences are sometimes made to clinical components but this is only to identify the need to develop standards for e-learning on the clinical space.	The focus has been defined in the document highlighted on green page 2
The aim of the study is vague and does not clearly mention specific outcome or measures authors want to address in terms of quality in undergraduate e-learning programmes. Are the authors trying to elaborate on the best practices in LMICs with regards to health education using e-learning methods pertinent to an entire degree program or general best practices related to any online health education at undergrad level?	Thank you for your comment This has been amended in the manuscript and the specific outcomes reflected in the aims. Thank you for your comment The authors elaborate e-learning methods in health education at undergraduate level. The focus of the review across health professions was to widen the scope of the literature review. However, the overarching research agenda is to	Highlighted in green on page 4

	develop standards for evaluating undergraduate e-learning nursing programmes. Similarities can be drawn from various health programmes for example having both theoretical and clinical components as part of training . This informed the need to widen the scope of the review to cover various health professions.	
Quality matters and CIPP models provide an assessment of the quality of online teaching and competencies set at the beginning of the courses. This could align or not align with the overall competencies of a given degree program. The subject matter experts and content specialists play a role in determining the relevance of the teaching materials itself in achieving the required competencies especially when patient outcomes have been under consideration and mentioned in one of your citations. Are you focusing on the quality of online teaching or the quality of health care professionals in online vs. in-person programs? This point is worth elaborating given no specific outcomes of e-learning programs were identified	Thank you for your comment the specific focus was to identify what was being used in LMICs to evaluate the quality of e-learning and not to compare between health care professionals in online vs. in-person program. Identification of the various models used in evaluation was to acknowledge the existence of evaluation models though not contextually developed in LMICs. The main focus is to address the lack of standards for evaluating the quality of undergraduate e-learning programmes in LMICs	

in the introduction and specific aims.		
METHODS		
1. Please clarify for your audience what is an integrative review and how is it different from systematic review or scoping review. This elaboration is necessary because the articles you have included are a mix of methods, practice, experimental etc.	Thank you for your comment The distinction in the reviews have been done as an introduction in the methods section	Highlighted in green on page 5.
2. Provide a list of inclusion and exclusion criteria? Are you focusing on studies only meant for undergrad level? Is literature limited to only nursing or other health professions were also included?	Thank you for your comment The inclusion and exclusion criteria have been added under the methods section	Highlight in green on page 6
3. Please provide a list of various reasons in "Of the remaining 295 records, 269 were eliminated for various reasons, 151 including inappropriate context and different subjects."	Thank you for your comment The reasons for elimination have been included in the manuscript	Highlighted in green on page 9.
4. Why are risk of bias methods not applied in the included studies? What was done to assess the quality of included studies?	Thank you for your comment. However, the integrative review was underpinned by the framework by Whittemore and Knalf (2005), and this framework does not include a step for evaluating methodological quality. Therefore, this could not be considered as a limitation	
RESULTS		
Have the authors come across any relevant	Thank you for your comment. However, the	

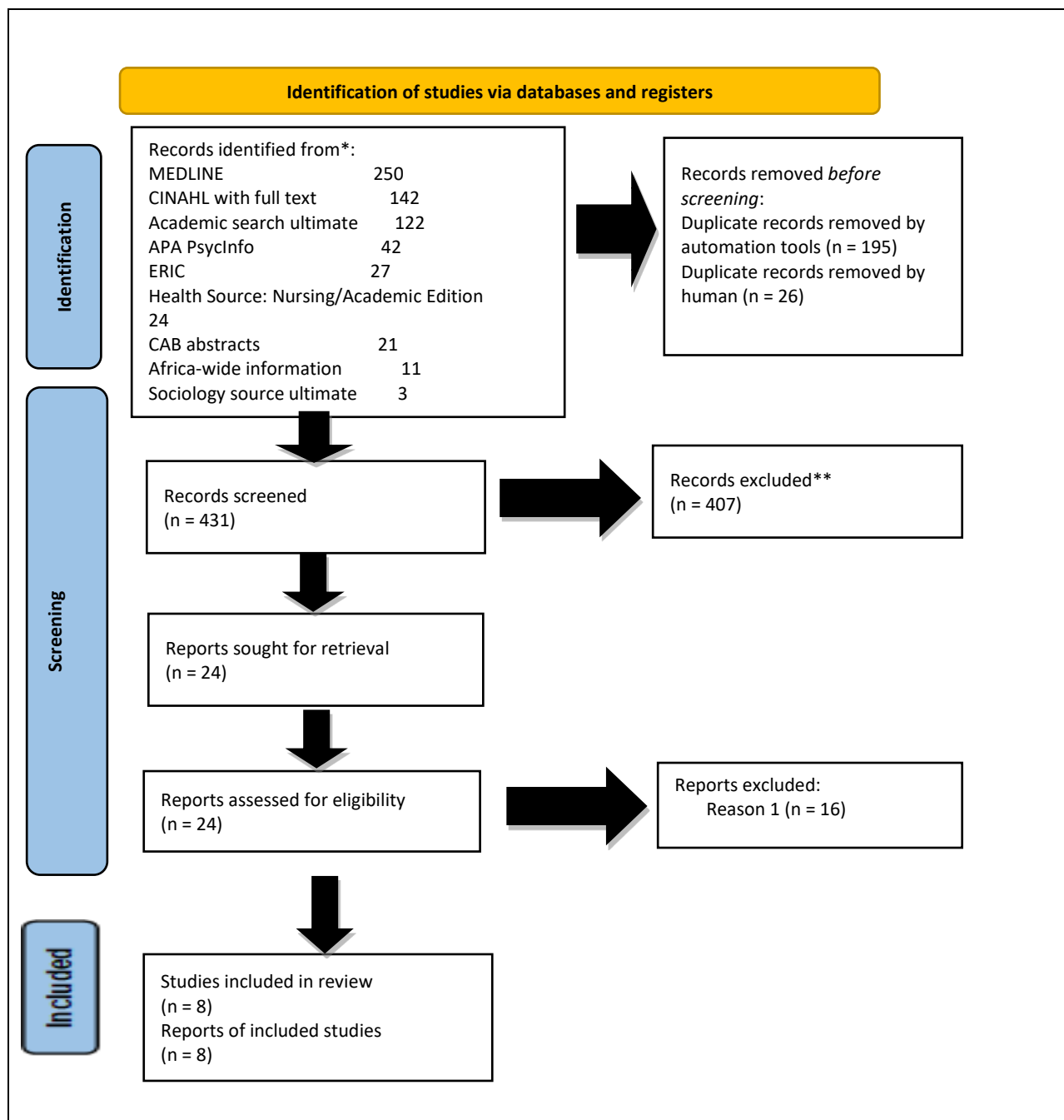
literature using digital learning technology or it was out of scope for this study? Please note that digital technology and e-learning are not synonymous. There are a wide array of platform to access and use e-learning materials.	focus of the review was on e-learning. The aspects of digital learning technology were out of the scope for this review.	
Discussion		
2.What is the role of blended learning in health education?	Thank you for your comment The role of blended learning in the context of the review is situations where teaching is offered through face to face and e-learning sessions. Blended learning was an option taken by most universities in LMICs because of infrastructural challenges at inception of e-learning. COVID-19 pandemic changed the trajectory as most universities were faced with the option to transition offer fully online courses or shut down. Furthermore, a critical look at e-learning programmes in LMICs have mostly adopt blended approaches to the health programme in that e-learning is offered for theoretical units and face to face for clinical components of the programme	
3.Please describe limitations of your study especially strength and weaknesses of the study design, review process as	Thank you for your comment The limitations have been provided in the manuscript	Highlighted in green on page 17

well as limitation of the evidence included in the review.		
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Addendum 2.5 Data extraction form

Number/ Unique identifier	Author	Title	Year	Country	Purpose of study	Populati on	Design	Resu lt/ Outc ome	Evalua tion Model used	Data collection method	Reco mme ndati on	Limitati ons

Addendum 2.6 Prisma flow diagram



**STANDARDS FOR EVALUATING THE
QUALITY OF UNDERGRADUATE
NURSING E-LEARNING PROGRAMMES
IN KENYA**

M. Mulu & Dr. C.N. Nyoni

School of Nursing

University of the Free State

Definition of terms

Educator: An educator is a university appointee to teach, train, or do research (Commission of university education, (2019). When this term is used in the standards, it refers to lecturers, instructors and clinical supervisors who play a role in teaching academic and clinical units.

E-learning: E-learning is defined as an approach to facilitate the application of knowledge information and enhances learning using personal computers, CD-ROMs' and the internet for education (formal and informal) (UNESCO, 2018; Misut & Pribilova, 2014). In the standard, when the concept of e-learning is used, it will refer to learning supported by the use of electronic technology.

Learner: A learner is an individual in the process of receiving instruction research (CUEA, 2019). In these standards, the term learner will refer to students enrolled in the undergraduate nursing programme receiving theoretical and clinical instruction.

Standards: Standards are guidelines or definitions of characteristics to ensure that materials, products, processes, and services fit their purpose with specific parameters to make e-learning courses apt and useful for its user (Abdulla & Ali, 2017; ISO, 2005). When the concept standard is used in these standards, it will refer to guidelines to ensure that processes are fitted to their purpose in an e-learning context.

Requirements: A set of specific minimum conditions that each standard is expected to meet research (CUEA, 2019). When the concept is used in the standards, it will refer to conditions for implementing an e-learning programme.

Undergraduate Nursing: Undergraduate nursing is an academic programme conducted in a university after graduating with a diploma (Stone *et al.*, 2020). In the standards, when the concept of undergraduate nursing is used, it will refer to students pursuing an upgrading degree in nursing.

Introduction

The fundamental development of nurses' knowledge and skills are the pillar of economic prosperity and social wellbeing in the 21st century (Tremblay *et al.*, 2012). According to Urstad *et al.* (2021), higher education is responsible for providing knowledge and skills relevant for nurses to function in the work environment, with e-learning as a positive contribution to learning in nursing education. McCutcheon *et al.* (2015) identified clinical skills delivered through e-learning are crucial in developing nurses for practice in real-life situations; this is in line with Jeppesen *et al.* (2017), who opined that teaching in simulation laboratories provides a positive learning environment and motivates student nurses to develop critical thinking skills and learn. E-learning seeks to equip nurses with the requisite knowledge and skills for better patient outcomes.

Quality in e-learning should be developed at the programme's inception and inculcated in the design, implementation, process and product and not be introduced at the evaluation stage (Ehlers & Pawlowski, 2006). A quality culture within the organisation involves considering quality assurance measures with internal quality systems to ensure that quality is an ongoing process to offer responsibility to the public and the international community (Kazaine & Arhipova, 2018). The quality culture is incorporated into the organisation's strategic plan and operationalised with specific, measurable outcomes. An educational programme is evaluated against a set of standards to determine its quality (Delva *et al.*, 2019; Fishbain *et al.*, 2019; Glanville *et al.*, 2021). These standards prescribe minimum requirements to make the programme a success. Nursing requires a more specific evaluation of competency, and traditional methods of ensuring quality for online education may not be adequate for e-learning (Morcillo *et al.*, 2020).

E-learning can enhance effectiveness and efficiency among learners and educators and produce great educational opportunities (Frehywot *et al.*, 2013). Moreover, e-learning standards provide criteria for the implementation of the e-learning programme; in addition, standards offer a framework for evaluating the quality of undergraduate e-learning nursing programmes (Ehlers & Pawlowski 2006). Standards single handily will not provide quality and success, but the application and adaptability of these standards in e-learning will cause success (Stracke, 2009).

In Kenya, the pathway for nurses is through the direct entry candidates enrol for either the Certificate in nursing, which is a two-and-a-half-year programme that focuses on basic nursing, community health, and basic midwifery but excludes management of complications during childbirth. or the Diploma in Nursing, which is a three-year programme that prepares students for all aspects of general nursing, community health nursing and midwifery. or the Bachelor of Science degree in Nursing, is a five-year programme offered only in universities that focuses on theoretical, clinical, and administrative competency development in Nursing. The upgrading programme for students who have completed a diploma and desire to enrol for the degree programme is offered in a blended mode. students in these programmes struggle to navigate learning systems, some courses are not published on time, and some lecturers do not interact with students adequately. The lack of standards for evaluating the quality of undergraduate nursing programmes hampers the quality of graduates and significantly affects health outcomes.

Standard Development Process

The standard development process was an iterative process that began with the identification of a broad area used in evaluating the quality of e-learning health sciences programmes and courses in LMICs through an integrative review. The first phase identified six broad themes related to the evaluation of e-learning health science programmes. These identified themes formed the bases of the domains in which the standards presented in the document were formulated. The formulation of these standards was informed by the literature and underpinned by the input, process and outcome model. An iterative process between the candidate and the research promoter results in draft 0 of the standards.

The next phase of the standard development process involved the validation of the developed standards through an expert panel in the form of a modified Delphi technique. The expert panel includes health professions education experts, nursing education experts and electronic, online, and virtual education experts from LMICs. A consensus of 80% on each criterion will be expected.

The final phase of the study will be the piloting of these developed standards at Kenya Methodist university Kenya, a leader in e-learning in the region. The aim of the last phase would be to check the feasibility, usability, and practicability of the developed programme. The study will use a checklist to collect data on the various themes identified below. The samples required will be the chair of the department, lecturers, learners, and support staff of the e-learning programme. Due to the guidelines on data collection for standard development, a research assistant will be used to reduce bias in the process and improve rigour. The result will give us information on the feasibility, usability, and practicability of these developed standards and this is what will be reported. The identified institutions offer an upgrading programme for nurses from diploma to degree. The standard development process can be summarised below:

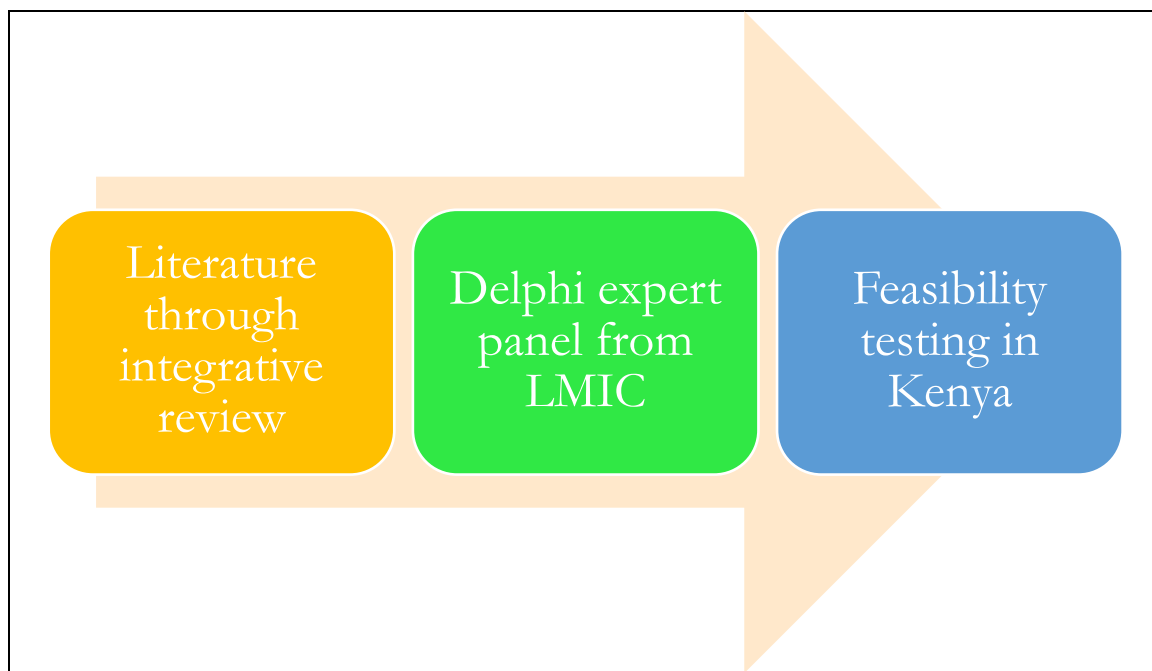


Figure. 1: Standard development process.

The Standard Domains

The six evaluation related domains identified were curriculum planning, educator proficiency, learner proficiency, infrastructure for learning, support, and assessment.



Figure 2: Standard broad domains.

Standard 1: Curriculum planning

Descriptor: Curricula is designed, implemented and evaluated to achieve proficiencies and objectives for the e-learning undergraduate nursing

Criteria

- 1.1 Wider consultation of stakeholders, including potential learners in the curriculum/programme development.
- 1.2 Module content is aligned with national priorities and the clinical environment.
- 1.3 Principles and guidelines for developing the course/curriculum are well known.
- 1.4 Course material developed for the e-learning environment.
- 1.5 Regular review of the programmes.

- 1.6 A policy is available on teaching and learning strategies that employ a variety of
- 1.7 innovative teaching approaches.
- 1.8 The e-learning programme is approved by relevant internal and external structures that have approved programmes in the institution.
- 1.9 Strategies are in place for regular monitoring of course plans and designs.
- 1.10 Course plan and design reflect best e-learning practices.
- 1.11 A comprehensive assessment policy should be integrated in the e-learning programme.
- 1.12 Structures to enhance the security of online assessments.
- 1.13 Assessment methods are aligned with best practices.
- 1.14 Moderation of assessment practices.
- 1.15 Learner satisfaction with the quality of assessments is considered.
- 1.16 A system is available to enhance self-directedness among all learners aligned with the learning outcomes.
- 1.17 Learners have access to course content.
- 1.18 Course content is current, regularly evaluated and updated.
- 1.19 Educators are involved in course content development.
- 1.20 There is evidence of developing problem-solving skills in learning and teaching material.
- 1.21 Learners are facilitated on self-directed learning using electronic resources.
- 1.22 Course material integrates authentic clinical examples.
- 1.23 Various teaching modalities are integrated to support problem-solving.
- 1.24 E-learning programme is socially responsive and accountable.
- 1.25 E-learning programme policy, rules and regulations are available.
- 1.26 E-learning programme policy, rules and regulations are explicit and available to educators and learners.
- 1.27 E-learning programme goals are aligned with national and local statutory requirements.
- 1.28 There is evidence of the integration of educational goals in the design and development of e-learning material.

- 1.29 Educational goals are regularly reviewed and updated.
- 1.30 E-learning programme provides opportunities for student collaboration

Standard 2: Proficiency of educator

Descriptor: The quality of staff recruited in the programme, working conditions in place and the teaching strategy is adequately benchmarked, monitored and evaluated. Professional development approaches in place enable the programme to meet its stated objectives.

Criteria

- 2.1 Educators on-job training on proficiency in the use of technology in education.
- 2.2 Human resource (HR) policy supports the recruitment of educators with appropriate professional expertise for e-learning programmes.
- 2.3 A strategy is available for Continuing Professional Development of technology enhanced education and facilitation of learning.
- 2.4 Class size enables effective learning for each learner, utilising available teaching and learning resources for theoretical and clinical units.
- 2.5 Institutional strategy for orientation and continuous support related to responsibilities, institutional expectations, and computer skills.
- 2.6 Institutional strategy and policies should be in place to determine the e-learning needs of educators.
- 2.7 Strategic plan for the institution/programme reflects the needs of educators related to facilitating e-learning.
- 2.8 A strategy that monitors professionalism during class facilitation is available.
- 2.9 All educators must be registered as professionals by a local professional body.
- 2.10 Institutional policy to provide educators with access to various appropriate teaching resources, including innovative digital tools.
- 2.11 Integrate learners' knowledge of different digital tools in learning.
- 2.12 Institutional policies that support equitable workload distribution allocation/ workload allocation model.

- 2.13 Institutional strategy to provide minimum equipment required by educators.
- 2.14 A strategy is in place for the evaluation of educator competence in facilitation.
- 2.15 Institutional policy on e-learning-specific teaching methods, strategies, and approaches.
- 2.16 Availability of teaching and learning resources, including timely access to information technology (IT) facilities for educators and learners.
- 2.17 A system for monitoring and evaluating the teaching process and a feedback mechanism to improve educator development initiatives.
- 2.18 The variety of teaching strategies are consistent with the profession's current knowledge and fundamental theoretical aspects.
- 2.19 Learner evaluation of educator professionalism.

Standard 3: Learner proficiency and attitude

Descriptor: Learners are provided with a variety of learning opportunities, empowered to develop resilience, reflective and caring attitudes to enable them achieve proficiencies in the e-learning programme and demonstrate professional behaviour.

Criteria:

- 3.1 A policy is available for learners to receive individual academic support based on needs, strength, skills, and interests.
- 3.2 Learners are aware of the obligations and responsibilities of the programme at registration.
- 3.3 Learner orientation on programme and technology requirements on admission.
- 3.4 Learners are provided with course navigation options, an explanation of the purpose of course material, how to navigate through the course, how to use the material and expectations at the end of learning.

- 3.5 Library access to broader electronic resources and literacy skills required to handle these resources appropriately.
- 3.6 Systems are available for learners to meet academic obligations before assessment.
- 3.7 Learners enrolled in the e-learning programme have access to course materials, educators and relevant technology, enabling them to succeed in the programme.
- 3.8 Technology-enhanced approaches integrate various approaches to cater for the different learning styles.
- 3.9 Opportunity for learners to measure their progress and satisfaction with the programme.
- 3.10 Learning activities focus on the learners' needs towards achieving measurable learning outcomes.
- 3.11 Assessments are aligned with the learning outcomes.
- 3.12 Technology, media and course tools support learning outcomes while incorporating learner interests and guiding learners to active learning.
- 3.13 There is a system in place for the learners' evaluation of the use of digital tools.
- 3.14 Learner surveys during and at the course completion stage depict a robust e-learning programme supporting learners' interests.

Standard 4: Infrastructure for learning

Descriptors: Provision of human, financial technological, infrastructure and physical resources used in the delivery of the programme are suitable for the intended purpose and have the potential to enable the programme to achieve its stated objective.

Criteria:

- 5.1 Policies, plans, and structures ensure that the management and maintenance of equipment and resources create an enabling environment for facilitating learning.
- 5.2 Availability of equipment to enable innovative teaching and learning methods.
- 5.3 Systems and sustainable funding are available for the regular maintenance and upgrading of infrastructure.
- 5.4 Accessible internet connectivity on and off campus.
- 5.5 A learning management system (LMS) is accessible on and off-campus.
- 5.6 Periodic updates to upgrade the quality of the LMS to ensure continued teaching and learning.
- 5.7 The curriculum clearly states minimum technology requirements and required technical infrastructure.
- 5.8 Monitoring learner participation in the course to determine whether participation is impeded due to technology and offer solutions.
- 5.9 Technological support is efficiently managed by qualified staff to ensure the operation of technical aspects.
- 5.10 The institution's policy on IT is sufficient to ensure its ability to plan, administer and evaluate the e-learning programme.
- 5.11 Partnerships with relevant organisations to strengthen network infrastructure within the organisation.
- 5.12 Learners have access to libraries' ICT facilities during the day and after-hours supported by competent staff.
- 5.13 A transparent appraisal system to enhance the performance of administrative and support staff.

- 5.14 Provision of adequate space and buildings to accommodate teaching staff, management staff, support staff and process of teaching and learning.
- 5.15 Policy to ensure that learning material developed by educators is protected under intellectual property and educators' terms for authorship and rights are agreed upon and fulfilled.
- 5.16 All resources used in the course are appropriately cited and referenced.
- 5.17 A staff development system is in place for administrative and support staff to align with best practices in e-learning.
- 5.18 The Learning management system and supports a variety of content material.

Standard 5: Support

Descriptors: Technical support for all actors to enable a conducive learning environment and attainment of the stated objectives of the programme.

Criteria:

- 5.1 Technical support is provided for learners.
- 5.2 The course clearly articulates how to access help features for the course.
- 5.3 There is a system in place for regular training and support for learners on the use of the learning management system.
- 5.4 The learners have access to learning, counselling and career services.
- 5.5 Support offered online provides learners with information on who to contact and the best time to contact.
- 5.6 Support for educators to facilitate the learner-learner interactions by various modalities.
- 5.7 Remedial systems are in place to support learners who are not progressing as expected.
- 5.8 Monitoring students on e-learning platforms to ensure continuity and challenges identified are resolved.

- 5.9 A complaint handling procedure exists and is well known to the learners and staff.
- 5.10 Continuous professional development for educators on navigation challenges whilst accessing, interacting and preparing assessments on the LMS.
- 5.11 Institutional policy to offer support to administrative staff in infrastructure development to support the e-learning programme.
- 5.12 A system is in place to support learning for students during work-integrated learning.
- 5.13 Institutional partnership with technological companies to ensure administrative staff have skill development relevant to support e-learning.

Standard 6: Evaluation

Descriptors: Programme evaluation is a sound, well-articulated procedure to ensure quality assurance, program effectiveness and compliance with regulation authorities to enhance programme delivery.

Criteria

- 6.1 Institutional procedures to monitor the use of learning infrastructure for computer and internet usage within the institution is for learning purposes.
- 6.2 The Evaluation criteria of the e-learning programme implementation and strategic plan are implemented.
- 6.3 The quality of the internet should support efficient and effective learning within online media.
- 6.4 Learners fulfil all academic and clinical obligations before final summative assessments.
- 6.5 Ensure that learners evaluate learning, assessment techniques and technology required for success in the e-learning programme.
- 6.6 Systems are available for regular review of programmes in consultation with stakeholders and professional associations.

- 6.7 Institution to continuously improve e-learning programmes in terms of sufficient investment in the course and material development, staff development and infrastructure development.
- 6.8 Evaluation Information from all stakeholders in the e-learning programme provides information for strengthening e-learning.
- 6.9 Demonstrate various evaluation methods that integrate information communication technology (ICT) to enable learners to meet the programme learning outcomes.
- 6.10 Feedback solicited from students and gathered information is analysed for use in systematic educator, learner, and administrative support staff development initiatives.

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Addendum 3.1: Author Guidelines BMC Nursing

Aims and scope

Aims and scope

BMC Nursing is an open access, peer-reviewed journal that considers articles on all aspects of nursing research, training, education and practice.

Research article

Criteria

Research articles should report on original primary research, but may report on systematic reviews of published research provided they adhere to the appropriate reporting guidelines which are detailed in our editorial policies. Please note that non-commissioned pooled analyses of selected published research will not be considered. Studies reporting descriptive results from a single institution or region will only be considered if analogous data have not been previously published in a peer reviewed journal and the conclusions provide distinct insights that are of relevance to a regional or international audience.

BMC Nursing strongly encourages that all datasets on which the conclusions of the paper rely should be available to readers. We encourage authors to ensure that their datasets are either deposited in publicly available repositories (where available and appropriate) or presented in the main manuscript or additional supporting files whenever possible. Please see Springer Nature's information on recommended repositories. Where a widely established research community expectation for data archiving in public repositories exists, submission to a community-endorsed, public repository is mandatory. A list of data where deposition is required, with the appropriate repositories, can be found on the Editorial Policies Page.

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Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should:

- present a title that includes, if appropriate, the study design e.g.:
 - "A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"
 - or for non-clinical or non-research studies a description of what the article reports
- list the full names and institutional addresses for all authors
 - if a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below
- indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the CONSORT extension for abstracts. The abstract must include the following separate sections:

- **Background:** the context and purpose of the study
- **Methods:** how the study was performed and statistical tests used
- **Results:** the main findings
- **Conclusions:** brief summary and potential implications
- **Trial registration:** If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be stated in this section. If it was not registered prospectively (before enrollment of the first participant), you should include the words 'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

Background

The Background section should explain the background to the study, its aims, a summary of the existing literature and why this study was necessary or its contribution to the field.

Methods

The methods section should include:

- the aim, design and setting of the study
- the characteristics of participants or description of materials

- a clear description of all processes, interventions and comparisons. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses
- the type of statistical analysis used, including a power calculation if appropriate

Results

This should include the findings of the study including, if appropriate, results of statistical analysis which must be included either in the text or as tables and figures.

Discussion

This section should discuss the implications of the findings in context of existing research and highlight limitations of the study.

Conclusions

This should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations should be provided.

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- Ethics approval and consent to participate
- Consent for publication
- Availability of data and materials
- Competing interests
- Funding

- Authors' contributions
- Acknowledgements
- Authors' information (optional)

Please see below for details on the information to be included in these sections.

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Ethics approval and consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must:

- include a statement on ethics approval and consent (even where the need for approval was waived)
- include the name of the ethics committee that approved the study and the committee's reference number if appropriate

Studies involving animals must include a statement on ethics approval and for experimental studies involving client-owned animals, authors must also include a statement on informed consent from the client or owner.

See our editorial policies for more information.

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Consent for publication

If your manuscript contains any individual person's data in any form (including any individual details, images or videos), consent for publication must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent for publication.

You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).

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If your manuscript does not contain data from any individual person, please state “Not applicable” in this section.

Availability of data and materials

All manuscripts must include an ‘Availability of data and materials’ statement. Data availability statements should include information on where data supporting the results reported in the article can be found including, where applicable, hyperlinks to publicly archived datasets analysed or generated during the study. By data we mean the minimal dataset that would be necessary to interpret, replicate and build upon the findings reported in the article. We recognise it is not always possible to share research data publicly, for instance when individual privacy could be compromised, and in such instances data availability should still be stated in the manuscript along with any conditions for access.

Authors are also encouraged to preserve search strings on searchRxiv <https://searchrxiv.org/>, an archive to support researchers to report, store and share their searches consistently and to enable them to review and re-use existing searches. searchRxiv enables researchers to obtain a digital object identifier (DOI) for their search, allowing it to be cited.

Data availability statements can take one of the following forms (or a combination of more than one if required for multiple datasets):

- The datasets generated and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]

- The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
- All data generated or analysed during this study are included in this published article [and its supplementary information files].
- The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.
- Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.
- The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name].
- Not applicable. If your manuscript does not contain any data, please state 'Not applicable' in this section.

More examples of template data availability statements, which include examples of openly available and restricted access datasets, are available [here](#).

BioMed Central also requires that authors cite any publicly available data on which the conclusions of the paper rely in the manuscript. Data citations should include a persistent identifier (such as a DOI) and should ideally be included in the reference list. Citations of datasets, when they appear in the reference list, should include the minimum information recommended by DataCite and follow journal style. Dataset identifiers including DOIs should be expressed as full URLs. For example:

Hao Z, AghaKouchak A, Nakhjiri N, Farahmand A. Global integrated drought monitoring and prediction system (GIDMaPS) data sets. figshare. 2014. <http://dx.doi.org/10.6084/m9.figshare.853801>

With the corresponding text in the Availability of data and materials statement:

The datasets generated during and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]^[Reference number]

If you wish to co-submit a data note describing your data to be published in *BMC Research Notes*, you can do so by visiting our submission portal. Data notes support open data and help authors to comply with funder policies on data sharing. Co-published data notes will be linked to the research article the data support (example).

Competing interests

All financial and non-financial competing interests must be declared in this section.

See our editorial policies for a full explanation of competing interests. If you are unsure whether you or any of your co-authors have a competing interest please contact the editorial office.

Please use the authors initials to refer to each authors' competing interests in this section.

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Funding

All sources of funding for the research reported should be declared. The role of the funding body in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript should be declared.

Authors' contributions

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Please use initials to refer to each author's contribution in this section, for example: "FC analyzed and interpreted the patient data regarding the hematological disease and the transplant. RH performed the histological examination of the kidney, and was a major contributor in writing the manuscript. All authors read and approved the final manuscript."

Acknowledgements

Please acknowledge anyone who contributed towards the article who does not meet the criteria for authorship including anyone who provided professional writing services or materials.

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Always use footnotes instead of endnotes.

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Examples of the Vancouver reference style are shown below.

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Web links and URLs

All web links and URLs, including links to the authors' own websites, should be given a reference number and included in the reference list rather than within the text of the

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Article within a journal (no page numbers)

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Article within a journal by DOI

Slifka MK, Whitton JL. Clinical implications of dysregulated cytokine production. Dig J Mol Med. 2000; doi:10.1007/s801090000086.

Article within a journal supplement

Frumin AM, Nussbaum J, Esposito M. Functional asplenia: demonstration of splenic activity by bone marrow scan. Blood 1979;59 Suppl 1:26-32.

Book chapter, or an article within a book

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. p. 251-306.

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doi:10.1007/128_2006_108.

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Online document

Doe J. Title of subordinate document. In: The dictionary of substances and their effects. Royal Society of Chemistry. 1999. [http://www.rsc.org/dose/title of subordinate document](http://www.rsc.org/dose/title%20of%20subordinate%20document). Accessed 15 Jan 1999.

Online database

Healthwise Knowledgebase. US Pharmacopeia, Rockville. 1998.
<http://www.healthwise.org>. Accessed 21 Sept 1998.

Supplementary material/private homepage

Doe J. Title of supplementary material. 2000. <http://www.privatehomepage.com>.
Accessed 22 Feb 2000.

University site

Doe, J: Title of preprint. <http://www.uni-heidelberg.de/mydata.html> (1999). Accessed 25 Dec 1999.

FTP site

Doe, J: Trivial HTTP, RFC2169. <ftp://ftp.isi.edu/in-notes/rfc2169.txt> (1999). Accessed 12 Nov 1999.

Organization site

ISSN International Centre: The ISSN register. <http://www.issn.org> (2006). Accessed 20 Feb 2007.

Dataset with persistent identifier

Zheng L-Y, Guo X-S, He B, Sun L-J, Peng Y, Dong S-S, *et al.* Genome data from sweet and grain sorghum (*Sorghum bicolor*). GigaScience Database. 2011.
<http://dx.doi.org/10.5524/100012>.

Figures, tables and additional files

See General formatting guidelines for information on how to format figures, tables and additional files.

Addendum 3.2 Confirmation of manuscript submission

Ref: Submission ID 0eddcebd-1692-4c52-bf45-7ffa37a0060c Wed, Oct 19, 3:20 PM

Dear Dr Mutua,

Thank you for submitting your manuscript to BMC Nursing.

Your manuscript is now at our initial Quality Check stage, where we look for adherence to the journal's submission guidelines, including any relevant editorial and publishing policies. If there are any points that need to be addressed prior to progressing we will send you a detailed email. Otherwise, your manuscript will proceed into peer review.

You can check on the status of your submission at any time by using the link below and logging in with the account you created for this submission:

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Kind regards,

Peer Review Advisors
BMC Nursing

Addendum 3.3: Participant information leaflet (modified Delphi)



TITLE OF THE RESEARCH PROJECT: Standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

PURPOSE: The purpose of the research project is to develop standards for evaluating the quality of undergraduate nursing in e-learning programmes in Kenya.

REFERENCE NUMBER: UFS-HSD2021/0370/2809

PRINCIPAL INVESTIGATOR: Moses Mutua Mulu

ADDRESS: School of Nursing, University of the Free State

CONTACT NUMBER: +254 720 763 753; mmmutua254@gmail.com

Dear Colleague,

My name is Moses Mutua Mulu and I am a Ph.D. in Nursing candidate at the School of Nursing of the University of the Free State (UFS) in South Africa. I would like to invite you to participate in a research project that aims to develop standards for evaluating the quality of undergraduate nursing in e-learning programmes in Kenya.

Please take some time to read the information presented here, which will explain the details of this project and contact me if you require further explanation or clarification of any aspect of the study. You are invited to participate in a Delphi panel. The first phase of the overall study developed a set of standards informed by the literature. The developed standards will be sent to you as a survey link on the first week of March 2022. A provision of two (2) weeks will be provided for you complete the survey. As a member of the panel, you will be required to respond to each of the standards and associated criteria with a 'agree' or 'unsure' and 'disagree'. You will be sent a reminder a week to the deadline. Data from this round will be collated and analysed for agreement with other members of the Delphi panel.

A second round of this process will be sent to you in the month of April 2022. In this second round, statements/standards where agreement/ consensus was not reached by the panel will be included for similar process. The panellists will be emailed the final standards.

Your participation is **entirely voluntary** and you may decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are free to withdraw from the study at any point, even if you do agree to take part. In addition, you may nominate another expert who might be available to participate in this study. The information provided is confidential and will not be shared with third parties.

This study has been approved by the **Health Sciences Research Ethics Committee (HSREC) at the University of the Free State** approval number UFS-HSD2021/0370/2809 and will be conducted according to accepted and applicable national and international ethical guidelines and principles, including those of the international Declaration of Helsinki.

The information provided will be confidential and the privacy of respondents will be maintained. The results from the study may be published and or presented at a conference.

If you are willing to participate in this study please sign below. Once you sign, please return the form to me. Please note that the form is a Fillable PDF, so you are not required to print it to complete it.

Signature..... Date.....

Yours sincerely

Moses Mutua Mulu

Principal Investigator

HSREC Information Leaflet and Consent. Alternative template. V1. May 2018

In case you require more information, please feel free to contact:

Dr. Champion Nyoni
University of the Free State
Supervisor

Email: nyonic@ufs.ac.za

Health Sciences Research Ethics Committee (HSREC)

Office of the Dean: Health Sciences

T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za

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Addendum 4.1 Author guidelines IJANS



INTERNATIONAL JOURNAL OF AFRICA NURSING SCIENCES

AUTHOR INFORMATION

ISSN: 2214-1391

Description

International Journal of Africa Nursing Sciences (IJANS) is an international scientific open access journal published by Elsevier. The broad-based journal was founded on two key tenets, i.e. to publish the most exciting research with respect to the subjects of **Nursing** and **Midwifery** in **Africa**, and secondly, to advance the international understanding and development of **nursing** and **midwifery** in **Africa**, both as a profession and as an academic discipline.

The fully refereed journal provides a forum for all aspects of **nursing** and **midwifery sciences**, especially new trends and advances. The journal call for original research papers, systematic and scholarly review articles, and critical papers which will stimulate debate on research, policy, theory or philosophy of **nursing** as related to **nursing** and **midwifery** in **Africa**, technical reports, and short communications, and which will meet the journal's high academic and ethical standards. Manuscripts of **nursing practice**, education, management, and research are encouraged. The journal values critical scholarly debate on issues that have strategic significance for educators, practitioners, leaders and policy-makers of **nursing** and **midwifery** in **Africa**. The journal publishes the highest quality scholarly contributions reflecting the diversity of **nursing**, and is also inviting international scholars who are engaged with **nursing** and **midwifery** in **Africa** to contribute to the journal. We will only publish work that demonstrates the use of rigorous

methodology as well as by publishing papers that highlight the theoretical underpinnings of **nursing** and **midwifery** as it relates to the **Africa** context. The journal employs a double blind peer review process for all submissions and is working towards inclusion of the journal on the Thomson Reuters Journal Citation Reports.

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Guide for authors

Introduction

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Submission checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:

- E-mail address
- Full postal address

All necessary files have been uploaded:

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- Include keywords
- All figures (include relevant captions)
- All tables (including titles, description, footnotes)
- Ensure all figure and table citations in the text match the files provided
- Indicate clearly if color should be used for any figures in print

Graphical Abstracts / Highlights files (where applicable)

Supplemental files (where applicable)

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- All references mentioned in the Reference List are cited in the text, and vice versa
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The IJANS is a signatory journal to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, issued by the International Committee for Medical Journal Editors (ICMJE), and to the Committee on Publication Ethics (COPE) code of conduct for editors. Our guidelines should be read in conjunction with this broader guidance. The ICMJE requirements can be found at <http://www.icmje.org/> and the COPE's guidelines at http://publicationethics.org/files/u2/New_Code.pdf.

Studies in humans and animals

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Your request seeking authorization to collect data for your research titled, *"Standards for Evaluating the Quality of Undergraduate Nursing E-Learning Programmes in Kenya."* at Kenya Methodist University has been approved.

Please note that only approved data forms are to be used in the enrollment of participants with their individual consent. All consent forms signed by subjects and/or witnesses should be retained on file. Further, any substantial changes in the scope of your research from what is presently provided will require an approval from the University.

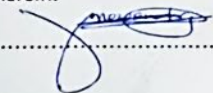
Please proceed as you have outlined in your proposal and share your findings with the University by sending a copy to the Director, Research and Innovation.

If the terms are acceptable to you please sign a copy of this letter and return it to the office of Postgraduate Studies as soon as possible.

Yours sincerely,


PROF. DAVID GICHOYA, PhD
VICE CHANCELLOR

I, the undersigned hereby confirm acceptance of this offer and the conditions stated herein.

Signed.......... Date.....19/7/22.....

Addendum 4.4: Participant information leaflet (interview)



TITLE OF THE RESEARCH PROJECT: Standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Moses Mutua Mulu

ADDRESS: *(Nursing department)*

CONTACT NUMBER: +254720763753

Dear Colleague *(fellow student, etc)*

My name is Moses Mutua Mulu and I am a Ph.D. candidate in Nursing at the School of Nursing of the UFS. I would like to invite you to participate in a research project that aims to develop standards for evaluating the quality of undergraduate nursing in e-learning programs in Kenya.

Please take some time to read the information presented here, which will explain the details of this project, and contact me if you require further explanation or clarification of any aspect of the study. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Sciences Research Ethics Committee (HSREC) at the University of the Free State** and will be conducted according to accepted and applicable national and international ethical guidelines and principles, including those of the international Declaration of Helsinki.

The research data will be collected from students, faculty, and digital campus personnel. There will be no costs payable by the participant. The information provided will be confidential and the privacy of respondents will be maintained. The results from the study may be published and or presented at a conference.

You are invited to participate in an interview. The interview will take 45 minutes after which a token of appreciation will be offered. If interested in getting a copy of the results kindly notify the principal investigator through the contact provided. If you are willing to participate in this study please sign below (hand it to the investigator, place it in the box available, etc as is appropriate to your project).

Signature..... Date.....

Yours sincerely

Moses Mutua Mulu

Principal Investigator

HSREC Information Leaflet and Consent. Alternative template. V1.May 2018

Addendum 4.5: Participant information leaflet (Focus Group Discussion)



TITLE OF THE RESEARCH PROJECT: Standards for evaluating the quality of undergraduate nursing e-learning programmes in Kenya.

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Moses Mutua Mulu

ADDRESS: *(Nursing department)*

CONTACT NUMBER: +254720763753 **Email:** mssmt979@gmail.com

Dear Colleague *(fellow student, etc)*

My name is Moses Mutua Mulu and I am a Ph.D. candidate in Nursing at the School of Nursing of the UFS. I would like to invite you to participate in a research project that aims to develop standards for evaluating the quality of undergraduate nursing in e-learning programs in Kenya.

Please take some time to read the information presented here, which will explain the details of this project, and contact me if you require further explanation or clarification of any aspect of the study. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Sciences Research Ethics Committee (HSREC) at the University of the Free State** and will be conducted according to accepted and applicable national and international ethical guidelines and principles, including those of the international Declaration of Helsinki.

The research data will be collected from students, faculty, and digital campus personnel. There will be no costs payable by the participant. The information provided will be confidential and the privacy of respondents will be maintained. The results from the study may be published and or presented at a conference.

You are invited to participate in a Focus group discussion. The Focus group discussion will take 45 minutes after which a token of appreciation will be offered. If interested in getting a copy of the results kindly notify the principal investigator through the contact provided. If you are willing to participate in this study please sign below (hand it to the investigator, place it in the box available, etc as is appropriate to your project).

Signature..... Date.....

Yours sincerely

Moses Mutua Mulu

Principal Investigator

HSREC Information Leaflet and Consent. Alternative template. V1.May 2018

**STANDARDS FOR EVALUATING THE
QUALITY OF UNDERGRADUATE
NURSING E-LEARNING PROGRAMMES
IN KENYA**

**M. Mulu & Dr C.N. Nyoni
School of Nursing
University of the Free State**

Standard 1: Curriculum planning

Descriptor: Curricula is designed, implemented and evaluated to achieve proficiencies and objectives for the e-learning undergraduate nursing programme.

Criteria

	Yes	No	Not clear
1.31 Wider consultation of stakeholders, including potential learners in the curriculum/programme development.			
Narrative:			
Supporting Evidence			
1.32 Module content is aligned with national priorities and the clinical environment.			
Narrative:			
Supporting Evidence			
1.33 Principles and guidelines for developing the course/curriculum are well known.			
Narrative:			
Supporting Evidence			
1.34 Course material developed for the e-learning environment.			
Narrative:			

Supporting Evidence			
1.35 Regular review of the programmes.			
Narrative:			
Supporting Evidence			
1.36 A policy is available on teaching and learning strategies that employ a variety of innovative teaching approaches.			
Narrative:			
Supporting Evidence			
1.37 The e-learning programme is approved by relevant internal and external structures that have approved programmes in the institution.			
Narrative:			
Supporting Evidence			
1.38 Strategies are in place for regular monitoring of course plans and designs.			
Narrative:			
Supporting Evidence			
1.39 Course plan and design reflect best e-learning practices.			
Narrative:			
Supporting Evidence			
1.40 A comprehensive assessment policy should be integrated in the e-learning programme.			

Narrative:			
Supporting Evidence			
1.41 Structures to enhance the security of online assessments.			
Narrative:			
Supporting Evidence			
1.42 Assessment methods are aligned with best practices.			
Narrative:			
Supporting Evidence			
1.43 Moderation of assessment practices.			
Narrative:			
Supporting Evidence			
1.44 Learner satisfaction with the quality of assessments is considered.			
Narrative:			
Supporting Evidence			
1.45 A system is available to enhance self-directness among all learners aligned with the learning outcomes.			
Narrative:			
Supporting Evidence			
1.46 Learners have access to course content.			
Narrative:			

Supporting Evidence			
1.47 Course content is current, regularly evaluated and updated.			
Narrative:			
Supporting Evidence			
1.48 Educators are involved in course content development.			
Narrative:			
Supporting Evidence			
1.49 There is evidence of developing problem-solving skills in learning and teaching material.			
Narrative:			
Supporting Evidence			
1.50 Learners are facilitated on self-directed learning using electronic resources.			
Narrative:			
Supporting Evidence			
1.51 Course material integrates authentic clinical examples.			
Narrative:			
Supporting Evidence			
1.52 Various teaching modalities are integrated to support problem-solving.			
Narrative:			
Supporting Evidence			
1.53 E-learning programme is socially responsive and accountable.			

Narrative:			
Supporting Evidence			
1.54 E-learning programme policy, rules and regulations are available.			
Narrative:			
Supporting Evidence			
1.55 E-learning programme policy, rules and regulations are explicit and available to educators and learners.			
Narrative:			
Supporting Evidence			
1.56 E-learning programme goals are aligned with national and local statutory requirements.			
Narrative:			
Supporting Evidence			
1.57 There is evidence of the integration of educational goals in the design and development of e-learning material.			
Narrative:			
Supporting Evidence			
1.58 Educational goals are regularly reviewed and updated.			
Narrative:			
Supporting Evidence			
1.59 E-learning programme provides opportunities for student collaboration			
Narrative:			

Supporting Evidence			
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Standard 2: Proficiency of educator

Descriptor: The quality of staff recruited in the programme, working conditions in place and the teaching strategy is adequately benchmarked, monitored and evaluated. Professional development approaches in place enable the programme to meet its stated objectives.

Criteria

	Yes	No	Not clear
2.20 Educators on-job training on proficiency in the use of technology in education.			
Narrative:			
Supporting Evidence			
2.21 Human resource (HR) policy supports the recruitment of educators with appropriate professional expertise for e-learning programmes.			
Narrative:			
Supporting Evidence			
2.22 A strategy is available for Continuing Professional Development of technology enhanced education and facilitation of learning.			
Narrative:			
Supporting Evidence			
2.23 Class size enables effective learning for each learner, utilising available teaching and learning resources for theoretical and clinical units.			
Narrative:			

Supporting Evidence			
2.24 Institutional strategy for orientation and continuous support related to responsibilities, institutional expectations, and computer skills.			
Narrative:			
Supporting Evidence			
2.25 Institutional strategy and policies should be in place to determine the e-learning needs of educators.			
Narrative:			
Supporting Evidence			
2.26 Strategic plan for the institution/programme reflects the needs of educators related to facilitating e-learning.			
Narrative:			
Supporting Evidence			
2.27 A strategy that monitors professionalism during class facilitation is available.			
Narrative:			
Supporting Evidence			
2.28 All educators must be registered as professionals by a local professional body.			
Narrative:			
Supporting Evidence			
2.29 Institutional policy to provide educators with access to various appropriate teaching resources, including innovative digital tools.			
Narrative:			

Supporting Evidence			
2.30 Integrate learners' knowledge of different digital tools in learning.			
Narrative:			
Supporting Evidence			
2.31 Institutional policies that support equitable workload distribution allocation/ workload allocation model.			
Narrative:			
Supporting Evidence			
2.32 Institutional strategy to provide minimum equipment required by educators.			
Narrative:			
Supporting Evidence			
2.33 A strategy is in place for the evaluation of educator competence in facilitation.			
Narrative:			
Supporting Evidence			
2.34 Institutional policy on e-learning-specific teaching methods, strategies, and approaches.			
Narrative:			
Supporting Evidence			
2.35 Availability of teaching and learning resources, including timely access to information technology (IT) facilities for educators and learners			
Narrative:			
Supporting Evidence			

2.36 A system for monitoring and evaluating the teaching process and a feedback mechanism to improve educator development initiatives.			
Narrative:			
Supporting Evidence			
2.37 The variety of teaching strategies are consistent with the profession's current knowledge and fundamental theoretical aspects.			
Narrative:			
Supporting Evidence			
2.38 Learner evaluation of educator professionalism.			
Narrative:			
Supporting Evidence			

Standard 3: Learner proficiency and attitude

Descriptor: Learners are provided with a variety of learning opportunities, empowered to develop resilience, reflective and caring attitudes to enable them achieve proficiencies in the e-learning programme and demonstrate professional behaviour.

Criteria:

	Yes	No	Not clear
3.15 A policy is available for learners to receive individual academic support based on needs, strength, skills, and interests.			
Narrative:			
Supporting Evidence			
3.16 Learners are aware of the obligations and responsibilities of the programme at registration.			
Narrative:			
Supporting Evidence			
3.17 Learner orientation on programme and technology requirements on admission.			
Narrative:			
Supporting Evidence			
3.18 Learners are provided with course navigation options, an explanation of the purpose of course material, how to navigate through the course, how to use the material and expectations at the end of learning.			
Narrative:			

Supporting Evidence			
3.19 Library access to broader electronic resources and literacy skills required to handle these resources appropriately.			
Narrative:			
Supporting Evidence			
3.20 Systems are available for learners to meet academic obligations before assessment.			
Narrative:			
Supporting Evidence			
3.21 Learners enrolled in the e-learning programme have access to course materials, educators and relevant technology, enabling them to succeed in the programme			
Narrative:			
Supporting Evidence			
3.22 Technology-enhanced approaches integrate various approaches to cater for the different learning styles.			
Narrative:			
Supporting Evidence			
3.23 Opportunity for learners to measure their progress and satisfaction with the programme.			
Narrative:			
Supporting Evidence			
3.24 Learning activities focus on the learners' needs towards achieving measurable learning outcomes.			
Narrative:			

Supporting Evidence			
3.25 Assessments are aligned with the learning outcomes.			
Narrative:			
Supporting Evidence			
3.26 Technology, media and course tools support learning outcomes while incorporating learner interests and guiding learners to active learning.			
Narrative:			
Supporting Evidence			
3.27 There is a system in place for the learners' evaluation of the use of digital tools.			
Narrative:			
Supporting Evidence			
3.28 Learner surveys during and at the course completion stage depict a robust e-learning programme supporting learners' interests.			
Narrative:			
Supporting Evidence			

Standard 4: Infrastructure for learning

Descriptors: Provision of human, financial technological, infrastructure and physical resources used in the delivery of the programme are suitable for the intended purpose and have the potential to enable the programme to achieve its stated objective.

Criteria:

	Yes	No	Not clear
4.1 Policies, plans, and structures ensure that the management and maintenance of equipment and resources create an enabling environment for facilitating learning.			
Narrative:			
Supporting Evidence			
4.2 Availability of equipment to enable innovative teaching and learning methods.			
Narrative:			
Supporting Evidence			
4.3 Systems and sustainable funding are available for the regular maintenance and upgrading of infrastructure.			
Narrative:			
Supporting Evidence			
4.4 Accessible internet connectivity on and off campus.			
Narrative:			
Supporting Evidence			

4.5 A learning management system (LMS) is accessible on and off-campus.			
Narrative:			
Supporting Evidence			
4.6 Periodic updates to upgrade the quality of the LMS to ensure continued teaching and learning.			
Narrative:			
Supporting Evidence			
4.7 The curriculum clearly states minimum technology requirements and required technical infrastructure.			
Narrative:			
Supporting Evidence			
4.8 Monitoring learner participation in the course to determine whether participation is impeded due to technology and offer solutions.			
Narrative:			
Supporting Evidence			
4.9 Technological support is efficiently managed by qualified staff to ensure the operation of technical aspects.			
Narrative:			
Supporting Evidence			
4.10 The institution's policy on IT is sufficient to ensure its ability to plan, administer and evaluate the e-learning programme.			
Narrative:			
Supporting Evidence			

4.11 Partnerships with relevant organisations to strengthen network infrastructure within the organisation.			
Narrative:			
Supporting Evidence			
4.12 Learners have access to libraries' ICT facilities during the day and after-hours supported by competent staff.			
Narrative:			
Supporting Evidence			
4.13 A transparent appraisal system to enhance the performance of administrative and support staff.			
Narrative:			
Supporting Evidence			
4.14 Provision of adequate space and buildings to accommodate teaching staff, management staff, support staff and process of teaching and learning.			
Narrative:			
Supporting Evidence			
4.15 Policy to ensure that learning material developed by educators is protected under intellectual property and educators' terms for authorship and rights are agreed upon and fulfilled.			
Narrative:			
Supporting Evidence			
4.16 All resources used in the course are appropriately cited and referenced.			
Narrative:			

Supporting Evidence			
4.17 A staff development system is in place for administrative and support staff to align with best practices in e-learning.			
Narrative:			
Supporting Evidence			
4.18 The Learning management system and supports a variety of content material			
Narrative:			
Supporting Evidence			

Standard 5: Support

Descriptors: Technical support for all actors to enable a conducive learning environment and attainment of the stated objectives of the programme.

Criteria

	Yes	No	Not clear
5.1 Technical support is provided for learners.			
Narrative:			
Supporting Evidence			
5.2 The course clearly articulates how to access help features for the course.			
Narrative:			
Supporting Evidence			
5.3 There is a system in place for regular training and support for learners on the use of the learning management system.			
Narrative:			
Supporting Evidence			
5.4 The learners have access to learning, counselling and career services.			
Narrative:			
Supporting Evidence			
5.5 Support offered online provides learners with information on who to contact and the best time to contact.			
Narrative:			

Supporting Evidence			
5.6 Support for educators to facilitate the learner-learner interactions by various modalities.			
Narrative:			
Supporting Evidence			
5.7 Remedial systems are in place to support learners who are not progressing as expected.			
Narrative:			
Supporting Evidence			
5.8 Monitoring students on e-learning platforms to ensure continuity and challenges identified are resolved.			
Narrative:			
Supporting Evidence			
5.9 A complaint handling procedure exists and is well known to the learners and staff.			
Narrative:			
Supporting Evidence			
5.10 Continuous professional development for educators on navigation challenges whilst accessing, interacting and preparing assessments on the LMS.			
Narrative:			
Supporting Evidence			
5.11 Institutional policy to offer support to administrative staff in infrastructure development to support the e-learning programme.			
Narrative:			

Supporting Evidence			
5.12 A system is in place to support learning for students during work-integrated learning			
Narrative:			
Supporting Evidence			
5.13 Institutional partnership with technological companies to ensure administrative staff have skill development relevant to support e-learning.			
Narrative:			
Supporting Evidence			

Standard 6: Evaluation

Descriptors: Programme evaluation is a sound, well-articulated procedure to ensure quality assurance, program effectiveness and compliance with regulation authorities to enhance programme delivery.

Criteria:

	Yes	No	Not clear
6.1 Institutional procedures to monitor the use of learning infrastructure for computer and internet usage within the institution is for learning purposes.			
Narrative:			
Supporting Evidence			
6.2 The Evaluation criteria of the e-learning programme implementation and strategic plan are implemented.			
Narrative:			
Supporting Evidence			
6.3 The quality of the internet should support efficient and effective learning within online media.			
Narrative:			
Supporting Evidence			
6.4 Learners fulfil all academic and clinical obligations before final summative assessments.			

Narrative:			
Supporting Evidence			
6.5 Ensure that learners evaluate learning, assessment techniques and technology required for success in the e-learning programme.			
Narrative:			
Supporting Evidence			
6.6 Systems are available for regular review of programmes in consultation with stakeholders and professional associations.			
Narrative:			
Supporting Evidence			
6.7 Institution to continuously improve e-learning programmes in terms of sufficient investment in the course and material development, staff development and infrastructure development.			
Narrative:			
Supporting Evidence			
6.8 Evaluation Information from all stakeholders in the e-learning programme provides information for strengthening e-learning.			
Narrative:			
Supporting Evidence			
6.9 Demonstrate various evaluation methods that integrate information communication technology (ICT) to enable learners to meet the programme learning outcomes.			
Narrative:			

Supporting Evidence			
6.10 Feedback solicited from students and gathered information is analysed for use in systematic educator, learner, and administrative support staff development initiatives.			
Narrative:			
Supporting Evidence			

Addendum 5.1: Final standards

Final standards

**STANDARDS FOR EVALUATING THE QUALITY OF
UNDERGRADUATE NURSING E-LEARNING
PROGRAMMES IN KENYA**

M. Mulu & Dr. C.N. Nyoni

School of Nursing

University of the Free State

Standard 1: Curriculum planning

Descriptor: Curricula is designed, implemented and evaluated to achieve proficiencies and objectives for the e-learning undergraduate nursing programme.

Criteria:

- 1.1. Wider consultation of stakeholders, including potential learners in the curriculum/programme development.
- 1.2. Module content is aligned with national priorities and the clinical environment
- 1.3. Principles and guidelines for developing the course/curriculum are well known
- 1.4. Course material developed for the e-learning environment.
- 1.5. Regular review of the programmes.
- 1.6. A policy is available on teaching and learning strategies that employ a variety of innovative teaching approaches.
- 1.7. The e-learning programme is approved by relevant internal and external structures that have approved programmes in the institution.
- 1.8. Strategies are in place for regular monitoring of course plans and designs
- 1.9. Course plan and design reflect best e-learning practices.
- 1.10. A comprehensive assessment policy should be integrated in the e-learning programme.
- 1.11. Structures to enhance the security of online assessments.
- 1.12. Assessment methods are aligned with best practices.
- 1.13. Moderation of assessment practices.
- 1.14. Learner satisfaction with the quality of assessments is considered.
- 1.15. A system is available to enhance self-directedness among all learners aligned with the learning outcomes.
- 1.16. Learners have access to course content.

- 1.17. Course content is current, regularly evaluated and updated.
- 1.18. Educators are involved in course content development.
- 1.19. There is evidence of developing problem-solving skills in learning and teaching material.
- 1.20. Learners are facilitated on self-directed learning using electronic resources.
- 1.21. Course material integrates authentic clinical examples.
- 1.22. Various teaching modalities are integrated to support problem-solving.
- 1.23. E-learning programme is socially responsive and accountable.
- 1.24. E-learning programme policy, rules and regulations are available.
- 1.25. E-learning programme policy, rules and regulations are explicit and available to educators and learners.
- 1.26. E-learning programme goals are aligned with national and local statutory requirements.
- 1.27. There is evidence of the integration of educational goals in the design and development of e-learning material.
- 1.28. Educational goals are regularly reviewed and updated.
- 1.29. E-learning programme provides opportunities for student collaboration

Standard 2: Proficiency of educator

Descriptor: The quality of staff recruited in the programme, working conditions in place and the teaching strategy is adequately benchmarked, monitored and evaluated. Professional development approaches in place enable the programme to meet its stated objectives.

Criteria:

- 2.1 Educators on-job training on proficiency in the use of technology in education.
- 2.2 Human resource (HR) policy supports the recruitment of educators with appropriate professional expertise for e-learning programmes.
- 2.3 A strategy is available for Continuing Professional Development of technology enhanced education and facilitation of learning.
- 2.4 Class size enables effective learning for each learner, utilising available teaching and learning resources for theoretical and clinical units.
- 2.5 Institutional strategy for orientation and continuous support related to responsibilities, institutional expectations, and computer skills.
- 2.6 Institutional strategy and policies should be in place to determine the e-learning needs of educators.
- 2.7 Strategic plan for the institution/programme reflects the needs of educators related to facilitating e-learning.
- 2.8 A strategy that monitors professionalism during class facilitation is available.
- 2.9 All educators must be registered as professionals by a local professional body.
- 2.10 Institutional policy to provide educators with access to various appropriate teaching resources, including innovative digital tools

- 2.11 Integrate learners' knowledge of different digital tools in learning.
- 2.12 Institutional policies that support equitable workload distribution allocation/ workload allocation model.
- 2.13 Institutional strategy to provide minimum equipment required by educators.
- 2.14 A strategy is in place for the evaluation of educator competence in facilitation.
- 2.15 Institutional policy on e-learning-specific teaching methods, strategies, and approaches.
- 2.16 Availability of teaching and learning resources, including timely access to information technology (IT) facilities for educators and learners
- 2.17 A system for monitoring and evaluating the teaching process and a feedback mechanism to improve educator development initiatives.
- 2.18 The variety of teaching strategies are consistent with the profession's current knowledge and fundamental theoretical aspects.
- 2.19 Learner evaluation of educator professionalism.

Standard 3: Learner proficiency and attitude

Descriptor: Learners are provided with a variety of learning opportunities, empowered to develop resilience, reflective and caring attitudes to enable them achieve proficiencies in the e-learning programme and demonstrate professional behaviour.

Criteria:

- 3.1 A policy is available for learners to receive individual academic support based on needs, strength, skills, and interests.
- 3.2 Learners are aware of the obligations and responsibilities of the programme at registration.
- 3.3 Learner orientation on programme and technology requirements on admission.
- 3.4 Learners are provided with course navigation options, an explanation of the purpose of course material, how to navigate through the course, how to use the material and expectations at the end of learning.
- 3.5 Library access to broader electronic resources and literacy skills required to handle these resources appropriately.
- 3.6 Systems are available for learners to meet academic obligations before assessment.
- 3.7 Learners enrolled in the e-learning programme have access to course materials, educators and relevant technology, enabling them to succeed in the programme
- 3.8 Technology-enhanced approaches integrate various approaches to cater for the different learning styles.
- 3.9 Opportunity for learners to measure their progress and satisfaction with the programme.
- 3.10 Learning activities focus on the learners' needs towards achieving measurable learning outcomes.
- 3.11 Assessments are aligned with the learning outcomes.
- 3.12 Technology, media and course tools support learning outcomes while incorporating learner interests and guiding learners to active learning.

- 3.13 There is a system in place for the learners' evaluation of the use of digital tools.
- 3.14 Learner surveys during and at the course completion stage depict a robust e-learning programme supporting learners' interests.

Standard 4: Infrastructure for e-learning

Descriptors: Provision of human, financial technological, infrastructure and physical resources used in the delivery of the programme are suitable for the intended purpose and have the potential to enable the programme to achieve its stated objective.

Criteria:

- 4.1 Policies, plans, and structures ensure that the management and maintenance of equipment and resources create an enabling environment for facilitating learning.
- 4.2 Availability of equipment to enable innovative teaching and learning methods.
- 4.3 Systems and sustainable funding are available for the regular maintenance and upgrading of infrastructure.
- 4.4 Accessible internet connectivity on and off campus.
- 4.5 A learning management system (LMS) is accessible on and off-campus.
- 4.6 Periodic updates to upgrade the quality of the LMS to ensure continued teaching and learning.
- 4.7 The curriculum clearly states minimum technology requirements and required technical infrastructure.
- 4.8 Monitoring learner participation in the course to determine whether participation is impeded due to technology and offer solutions.
- 4.9 Technological support is efficiently managed by qualified staff to ensure the operation of technical aspects.
- 4.10 The institution's policy on IT is sufficient to ensure its ability to plan, administer and evaluate the e-learning programme.
- 4.11 Partnerships with relevant organisations to strengthen network infrastructure within the organisation.
- 4.12 Learners have access to libraries' ICT facilities during the day and after-hours supported by competent staff.
- 4.13 A transparent appraisal system to enhance the performance of administrative and support staff.

- 4.14 Provision of adequate space and buildings to accommodate teaching staff, management staff, support staff and process of teaching and learning.
- 4.15 Policy to ensure that learning material developed by educators is protected under intellectual property and educators' terms for authorship and rights are agreed upon and fulfilled.
- 4.16 All resources used in the course are appropriately cited and referenced.
- 4.17 A staff development system is in place for administrative and support staff to align with best practices in e-learning.
- 4.18 The Learning management system and supports a variety of content material.

Standard 5: Support

Descriptors: Technical support for all actors to enable a conducive learning environment and attainment of the stated objectives of the programme.

Criteria:

- 5.1 Technical support is provided for learners.
- 5.2 The course clearly articulates how to access help features for the course.
- 5.3 There is a system in place for regular training and support for learners on the use of the learning management system.
- 5.4 The learners have access to learning, counselling and career services.
- 5.5 Support offered online provides learners with information on who to contact and the best time to contact.
- 5.6 Support for educators to facilitate the learner-learner interactions by various modalities.
- 5.7 Remedial systems are in place to support learners who are not progressing as expected.
- 5.8 Monitoring students on e-learning platforms to ensure continuity and challenges identified are resolved.
- 5.9 A complaint handling procedure exists and is well known to the learners and staff.
- 5.10 Continuous professional development for educators on navigation challenges whilst accessing, interacting and preparing assessments on the LMS.
- 5.11 Institutional policy to offer support to administrative staff in infrastructure development to support the e-learning programme.
- 5.12 A system is in place to support learning for students during work-integrated learning.
- 5.13 Institutional partnership with technological companies to ensure administrative staff have skill development relevant to support e-learning.

Standard 6: Evaluation

Descriptors: Programme evaluation is a sound, well-articulated procedure to ensure quality assurance, program effectiveness and compliance with regulation authorities to enhance programme delivery.

Criteria:

- 6.1 Institutional procedures to monitor the use of learning infrastructure for computer and internet usage within the institution is for learning purposes.
- 6.2 The Evaluation criteria of the e-learning programme implementation and strategic plan are implemented.
- 6.3 The quality of the internet should support efficient and effective learning within online media.
- 6.4 Learners fulfil all academic and clinical obligations before final summative assessments.
- 6.5 Ensure that learners evaluate learning, assessment techniques and technology
- 6.6 Systems are available for regular review of programmes in consultation with stakeholders and professional associations.
- 6.7 Institution to continuously improve e-learning programmes in terms of sufficient investment in the course and material development, staff development and infrastructure development.
- 6.8 Evaluation Information from all stakeholders in the e-learning programme provides information for strengthening e-learning.
- 6.9 Demonstrate various evaluation methods that integrate information communication technology (ICT) to enable learners to meet the programme learning outcomes.
- 6.10 Feedback solicited from students and gathered information is analysed for use in systematic educator, learner, and administrative support staff development initiatives.

Addendum 5.2 Turn it in report

Dr
Champion
N. Nyoni

Digitally signed by
Dr Champion N.
Nyoni
Date: 2022.11.23
10:31:46 +02'00'

STANDARDS FOR EVALUATING THE QUALITY OF UNDERGRADUATE E-LEARNING NURSING PROGRAMMES IN KENYA W.docx

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