

ORIGINAL ARTICLE

Nursing students' experiences with simulation-based education as a pedagogic method in low-resource settings: A mixed-method study

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Abstract

Aims and Objectives: This study introduced simulation-based education in nurse education programs in Tanzania and Madagascar and explored nursing students' experiences with this pedagogic method as a mode of learning.

Background: Simulation-based education has barely been introduced to education programs in resource-constrained settings. The study was conducted in two nurse education programs: one in rural Tanzania and the other in the mid-land of Madagascar. Both institutions offer diploma programs in nursing. Simulation-based education has not been included in the teaching methods used in these nursing programs.

Design: A descriptive and convergent mixed method design was employed.

Methods: Ninety-nine nursing students were included in the study. Simulation sessions followed by data collection took place once in 2017 and twice in 2018. Data were collected by means of several questionnaires and six focus groups. The data were analyzed using descriptive statistics and qualitative content analysis. The Standards for Reporting Qualitative Research (SRQR) was used to report the results.

Results: The quantitative data revealed that the students rated all the questions related to the simulation design elements, educational practices, and students' satisfaction and self-confidence in learning with scores of above four on a 5-point Likert scale. The qualitative data from the first theme, building competence and confidence, further emphasized and outlined the quantitative results. Additionally, the qualitative data revealed a second theme, improving through encouragement and corrections. The students clearly expressed that they wanted to be aware of their weaknesses to be able to improve; however, the provision of feedback should be carried out in an encouraging way.

Conclusion: The findings indicated that the nursing students were satisfied with simulation as a pedagogic method, as it improved their competence and prepared them for

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professional practice. Further research is necessary to explore whether the students are able to transfer their knowledge into clinical practice.

Relevance to clinical practice: Simulation as a pedagogic method is valuable for the learning of clinical skills and preparation for clinical practice.

KEYWORDS

low-income countries, mixed methods, nursing education, nursing students, simulation-based education

1 | BACKGROUND: SIMULATION-BASED EDUCATION

1.1 | Simulation as a pedagogic method in education

Simulation-based education is considered a key component in nursing students' learning and preparation for practice and professional life (Cant & Cooper, 2017; Ricketts, 2011). Over the last decades, the use of simulation as a pedagogic method and teaching strategy in nursing education has developed considerably, with the aim of bridging the gap between theory and practice through new and interactive teaching strategies (Bland & Tobbell, 2016). Simulation-based education has been revealed to be useful, beneficial and effective for students during their learning process. Past studies' results have been mainly positive, including benefits like improved decision-making and critical thinking, enhanced performance in clinical skills and improved ability to function in the clinical setting (Al-Ghareeb & Cooper, 2016; Sundler et al., 2015; Warren et al., 2016). Students' knowledge and confidence increased after simulation-based education, and they reported being more satisfied with simulation as a pedagogic method compared to other teaching and learning strategies (Warren et al., 2016).

While simulation-based education has increased in extent and scope in many nurse education programs in Europe and in the United States, the literature reveals a lack of implementation and research linked to simulation as a pedagogic method in low-resource settings (Livingston et al., 2014; Okrainec et al., 2009; Tansley et al., 2016). Although a few studies addressing simulation-based education within nurse education programs in sub-Saharan Africa can be found (Munangatire & Naidoo, 2017; Welman & Spies, 2016), the evidence base remains scarce.

The term 'simulation' has been assigned different definitions. The present study leans towards Jeffries' (2005, p. 97) definition:

[S]imulations are defined as activities that mimic the reality of a clinical environment and are designed to demonstrate procedures, decision making, and critical thinking through techniques such as role playing and the use of devices such as interactive videos or mannequins.

What does this paper contribute to the wider global community

- Simulation-based education as pedagogy is a resource in low-income settings.
- Students in low-income contexts experience increased competence and preparedness for clinical practice through simulation-based education.

Simulation as an interactive experience is founded on how the learning strategy employs scenarios based on specific learning goals. Typical scenarios in nurse education involve a simulated patient imitating clinical nursing care situations. There is no risk for a real patient involved, which also strengthens the immediate focus on patient safety (Cant & Cooper, 2017; Motola et al., 2013).

Simulation, as a pedagogic method, enables students to learn how to reconcile theory with practice through different scenarios. The students work together in a supportive skills training environment (Cant & Cooper, 2017), while the teacher/faculty facilitates the simulation scenarios. The debriefing part following a simulated scenario provides a great opportunity for learning (Dreifuerst & Drecker, 2012). During the debriefing, the teacher/faculty facilitates a discussion among the participants based on the simulated scenario using Gibbs' (1988) reflective learning cycle. This reflective cycle comprises six stages focusing on how to learn from experiences by (1) describing, (2) involving feelings, (3) evaluating, (4) analysing, (5) concluding and (6) planning for new personal acting/role-play. The goal is to enhance the understanding of the targeted subject.

1.2 | Simulation as a pedagogic method in low-resource settings

The implementation of simulation as a pedagogic method in low-resource settings, which aims to enhance healthcare workers' clinical management and interactions, is considered an effective method in diverse healthcare contexts (see e.g. Egenberg et al., 2017; Ersdal et al., 2017; Evans et al., 2014; Mduma et al., 2015; Nelissen et al., 2017; Tache et al., 2009; Vail et al., 2018). However, few studies

have been scaled to report the sustained impact on essential patient outcome measures (Evans & Taubert, 2019; Mduma et al., 2015; Msemo et al., 2013). Thus, there is an ongoing debate related to how simulation-based training can translate into better clinical outcomes and provider retention (Ersdal et al., 2017; Rule et al., 2017). From their study in Kenya, Rule et al. (2017: 402–404) highlighted the challenges arising from the lack of familiarity with simulation and debriefing, cultural differences in giving feedback, and limited time and support for simulation-based training. They recommend strengthening long-term partnerships, staff engagement and educational capacity building, thus bringing awareness to what they define as an existing research gap (Rule et al., 2017).

According to the literature, simulation-based education is seldom implemented in education programs in low-resource settings. Thus, to address this research gap, the current study aims to address nursing students' experiences with simulation-based education as a pedagogic method within the topic of emergency nursing.

2 | STUDY CONTEXT

2.1 | Study setting

The study was conducted in two nurse training programs offered in two separate institutions/schools: one in a rural area in northern Tanzania and the other located in the mid-land of Madagascar.

The United Republic of Tanzania, classified within the group of low-income countries, has a population of 58 million people, of whom 66% are living in rural areas. Kiswahili is the official national language, but the medium of instruction at the secondary and higher education levels is English. The youth literacy rate (15–24 years of age) is 85.8%, and 21.4% of the total national expenditure on education is spent on tertiary education/higher education (USAID, 2021b; Worldbank, 2021b).

Madagascar, like Tanzania, is defined as a low-income country. It has a population of 25 million, of whom 62% are living in rural areas. Malagasy is the official national language, but the medium of instruction at the secondary and higher education levels is French, which is also an official language. The youth literacy rate (15–24 years of age) is 81.2%, and 15.3% of the total national expenditure on education is spent on tertiary education/higher education (USAID, 2021a; Worldbank, 2021a).

2.2 | The educational sector

The two current schools offer diploma programs in nursing at the tertiary education level, which are under the control of the Ministry of Education. In Tanzania, nurse education programs are controlled by the Ministry of Health Community Development, Gender, Elderly, and Children (MoHCDGEC). These programs are registered under and regulated by a national curriculum, which is standardised by level and serves as the basis for national examination. The current

curriculum for the nursing and midwifery program was reviewed in 2017 and approved by the National Council for Technical Education (NACTE). In the Tanzanian national curriculum, simulation as a pedagogic method is specifically mentioned as one of the teaching methods to be used. The study program in Madagascar has been established in accordance with the national program instituted by the Ministry of Public Health and the principles of the Lutheran Church. The last review took place in December 2020. Concerning teaching facilities, both schools have newly upgraded skills laboratories with some equipment where skills training takes place. Thus far, simulation-based education has yet to be included in the teaching methods within these nursing training programs.

Based on the current nursing students' experiences with simulation-based education as a pedagogic method, this study aims to generate important knowledge for the development and implementation of simulation-based education within nurse education programs in low-income settings. The knowledge produced from the study will thereafter generate possibilities for further extended research projects connected to simulation-based education in diverse health education sectors and among different health professions in low-resource contexts.

3 | METHODS

3.1 | Study design and participants

The study follows a descriptive and convergent mixed-method design QUAN/QUAL in which quantitative and qualitative data are collected concurrently, but separately, to obtain a more complete understanding of the nursing students' experiences in using simulation as a pedagogic method (Creswell & Plano Clark, 2018).

A total of 99 nursing students participated in the study, of whom 53 were third-year students from Tanzania and 46 were first-year students from Madagascar. All students agreed to participate in the simulation sessions, while 98 nursing students completed the questionnaire, resulting in a response rate of 99%. A purposive sampling strategy was adopted to recruit nursing students to participate in the focus group interviews (FGIs) conducted for the current study (Polit & Beck, 2020).

3.2 | Simulation sessions

The first round of simulation sessions in Tanzania, which involved 53 third-year students, was carried out during one week in October 2017. In each session, 10–11 students participated, of whom five students performed the simulation and the other five to six students observed the session. The scenarios were adapted to the level of the nursing students learning outcome. Three students acted as nurses in the scenario, one student played the role of the patient, and the last student acted as a relative. During the briefing, all students were guided about their respective roles in the scenario. The two students

acting as patient and relative, respectively, were told to play the role as realistically as possible considering the content of the scenario. The students playing the role of nurses were told to relate to the patient and relative as they would do in actual clinical practice in terms of observing and implementing relevant actions. To reduce anxiety and create a relaxed atmosphere, the facilitator started each session with a brief introduction focusing on learning as the goal of the simulation session. In addition, the briefing included a description of the case to be simulated, the learning objectives, the available equipment, and the distribution of roles during the simulation session. Each scenario lasted approximately 10–12 minutes, followed by a debriefing session that lasted for about 30–40 minutes. Each session took approximately two hours to complete, as it included two scenarios, simulated twice, thus allowing all students to participate in the simulation session.

The debriefing included (1) a descriptive and (2) analytic phase as well as (3) a phase in which the students discussed what they had learned during the simulation session and how they could transfer this knowledge into clinical practice. The descriptive phase started with the students describing what happened and what they felt during the scenario. In the analytical phase, the students were asked about what they thought was handled successfully in the scenario and why they felt so. In the last phase of the debriefing, the students were challenged on what they thought could have been improved and followed up on based on their experiences with the scenario.

Based on the students' evaluations from October 2017, the second round of simulation sessions, held in April 2018, was carried out over two days. This round had 26 students participating in one large group each day, comprising 52 third-year students in total. Four to five scenarios were carried out for the larger group within a total of five hours. There were four to five students participating per scenario, while the rest of the group observed the simulations.

In Madagascar, simulation sessions were carried out in April 2018 and included 46 first-year students. Over three days, groups of 9–10 students participated in each session lasting for two and a half hours. A translator who was fluent in French, English and Malagasy participated in the simulation sessions to support students who had difficulties expressing themselves in French.

As the teachers in Tanzania and Madagascar were not familiar with the role of being a facilitator, the last author facilitated the simulation sessions in Tanzania in October 2017 and in Madagascar in April 2018. Thereafter, two local teachers participated as facilitators in Tanzania in April 2018, and one local teacher facilitated another scenario in Madagascar in April 2018, both conducted in close cooperation with the last author.

The simulation sessions in Tanzania in October 2017 covered the following scenarios:

- Management of an acutely deteriorating patient with an abdominal injury in an emergency room and
- Post-operative nursing care for a patient developing severe pneumonia.

In Tanzania and Madagascar, the simulation sessions held in April 2018 covered the above scenarios with the addition of the following topics:

- Management of postpartum bleeding in the labour ward,
- Pre-operative information to a patient going to the operating theatre and
- Nursing care to a patient with signs of sepsis in an emergency room.

To ensure that the scenarios were adapted to the local context, the faculty in the two schools approved the different scenarios prior to the simulation sessions.

3.3 | Instruments

Quantitative data were collected using the following questionnaires: (1) Simulation Design Scale, (2) Educational Practices Questionnaire and (3) Student Satisfaction and Self-Confidence in Learning Scale, which were developed as part of the National League for Nursing 2003/Laerdal simulation research study (NLN, 2021). Permission to use the French version of the instruments was obtained. The reliability of the questionnaires has been tested using Cronbach's alpha, and the instruments are recommended for use when simulation is recently implemented and already established in education programs (NLN, 2021; Simoneau et al., 2011). To the best of our knowledge, this is the first time these questionnaires are used in nurse education programs in sub-Saharan Africa.

The Simulation Design Scale consists of 20 items and measures the students' views on design elements related to simulation and their importance. The 20 items measure *Objectives and Information* (5 items), *Support* (4 items), *Problem-solving* (5 items), *Feedback* (4 items) and *Fidelity* (2 items). There are two response scales: the first surveys the feature elements in the simulation, and the second assesses how important the feature elements are to the students.

The Educational Practices Questionnaire contains 16 items and assesses the students' views of educational practices in simulation and their importance. The 16 items measured *Active Learning* (10 items), *Collaboration* (2 items), *Diverse Ways of Learning* (2 items) and *High Expectations* (2 items). This questionnaire uses two 5-point Likert-type rating scales. The first scale rates the presence (agreement) of educational practice (1 = strongly disagree with the statement, 5 = strongly agree with the statement). The second scale rates the importance of the simulation practice to the participants (1 = not important, 5 = very important).

The Student Satisfaction and Self-Confidence in Learning Scale contains 12 items that measure *Satisfaction with Current Learning* (5 items) and *Self-Confidence in Learning* (7 items). The response scale is a 5-point Likert-type rating scale (1 = strongly disagree with the statement, 5 = strongly agree with the statement).

3.4 | Data collection

The first part of the data collection took place in October 2017 in Tanzania. The second part of the data collection was conducted in April 2018, both in Tanzania and in Madagascar (Figure 1). In Tanzania, the same group of third-year students participated in the simulation sessions and data collection in October 2017 and April 2018.

The students completed all three questionnaires in either English (Tanzania, October 2017) or French (Madagascar, April 2018) by the end of their first simulation sessions, followed by two FGIs the next day. The semi-structured FGIs included questions about the students' general experiences while participating in the simulation sessions, their opinions about this learning approach, what they had learned, and additional topics they would like to underline. In both settings, a translator, fluent in English and in the national and local languages, was present. Although the questionnaires were in English (Tanzania) and French (Madagascar), it could be difficult for the students to understand the details, and some clarifications were required.

In October 2017, the first author carried out the FGIs in Tanzania with the help of a research assistant trained in conducting qualitative interview techniques. Eight students were present in each FGI. The research assistant was a nurse by occupation and had previously worked on several research projects. His main task during the FGI was to translate from English to Kiswahili in cases when the students did not fully understand the questions. In addition, the presence of a translator enabled the students to express themselves in Kiswahili during the FGI as needed.

In April 2018, two FGIs in Tanzania were carried out with the same group of students as in October 2017, excluding two students who did not show up. Based on the experiences from the October 2017 FGIs, the interviews in April were carried out in English only. The first author served as the facilitator. The last author, who was

also present, asked follow-up questions. The semi-structured interviews covered the above-mentioned topics. In addition, the students at this time were asked to outline their experiences in the simulation sessions in larger groups of students ($N = 26$) when they simulated four to five scenarios in one day.

In April 2018, the FGIs in Madagascar were carried out like those in Tanzania in October 2017. This time, however, the proceedings were held using the French language. The last author carried out the FGIs, because she was fluent in French. A translator, who was fluent in English, French and Malagasy and had extensive experience in assisting research projects and providing translations, provided help during the FGIs with the same purpose as that for the FGIs in Tanzania.

3.5 | Data analysis

The quantitative and qualitative data were analysed independently (Creswell & Plano Clark, 2018). The quantitative analyses were carried out using IBM SPSS Statistics version 25. Non-parametric tests were conducted. The quantitative data were presented as median with interquartile range (IQR). Eight questionnaires were excluded, because (\geq) 10 values were missing.

The first and last authors transcribed the qualitative data from the English FGIs verbatim. A translator who fluently spoke French, English and Malagasy transcribed the qualitative data from the French FGIs. The qualitative data were analysed using Graneheim and Lundman's content analyses (2017; 2004). The first and last authors separately read the interviews several times to obtain an overall sense of the data. Further, both authors separately divided the text into meaning units that were condensed and divided into sub-themes. Then, the meaning units, the condensed meaning units and the sub-themes were discussed and agreed upon between the two authors. The analysis resulted in the identification of two themes

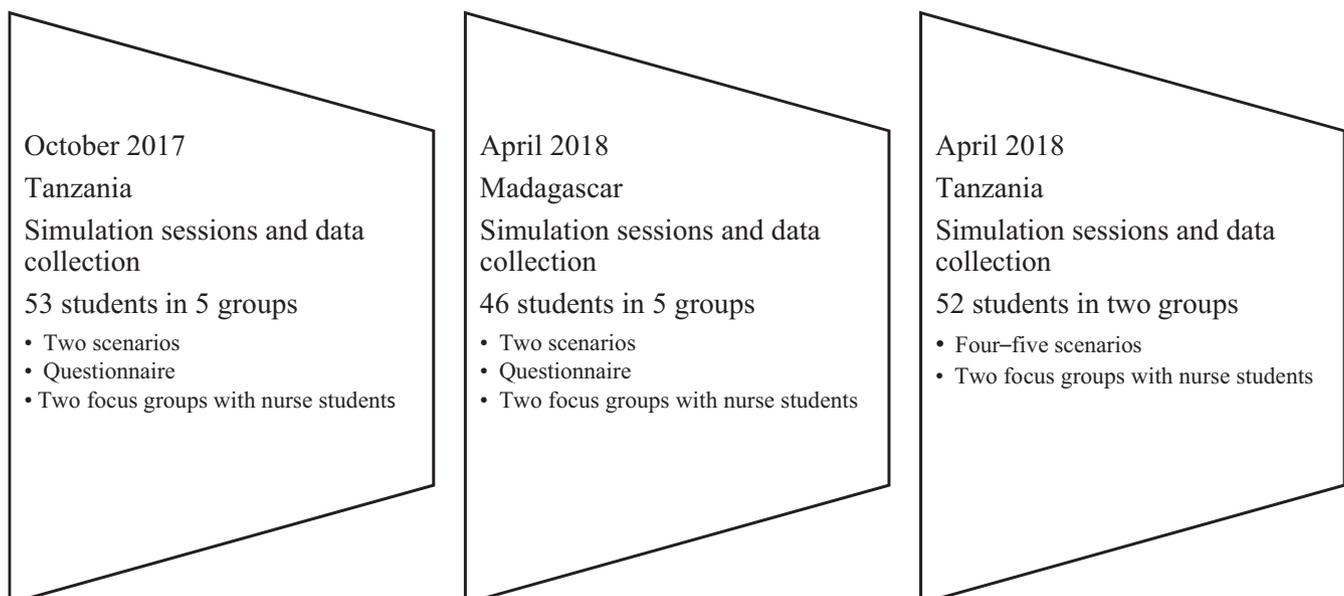


FIGURE 1 Illustration of the different simulation sessions and data collection at the two sites

related to the nursing students' experiences in using simulation as a pedagogic method: (1) becoming confident and competent nurses and (2) expectations and vulnerability in debriefing.

3.6 | Ethical considerations

Permission to conduct the study was obtained from the Nursing School in Tanzania, the National Institute for Medical Research in Tanzania and the Tanzania Commission for Science and Technology. In Madagascar, permission to conduct the study was obtained from the management of the nursing school. No further permission was necessary. Moreover, the study was approved by the Norwegian Centre for Research Data.

All participants were briefed both in writing and verbally concerning anonymity, confidentiality and audiotaping of the FGIs, as well as their right to withdraw from the study at any time without any consequences. In Tanzania, the information was given in English and Kiswahili, while the same was delivered in Madagascar in the French and Malagasy languages to ensure that the information was well understood by the participants. The study did not collect any personal identifiable data from the students. All participants signed letters of consent prior to the data collection.

The Standards for Reporting Qualitative Research (SRQR) was used to report the results (Appendix S1; O'Brien et al., 2014).

4 | RESULTS

The results describe how nursing students in Tanzania and Madagascar experienced simulation as a pedagogic method within their respective education programs. The quantitative and qualitative findings are presented independently, further synthesised, and then compared in the discussion.

4.1 | Quantitative results

The descriptive statistics from the questionnaires from Tanzania and Madagascar are presented in Tables 1–3. The results showed that the medians were four or above on the 1–5 Likert scales in all the questions from both the Tanzania and Madagascar students. Overall, the students rated that the simulation design elements were presented well during the simulation session (Table 1). Related to the importance of practice, the students' median scores were above four on all questions.

The students also agreed that educational practices, such as active learning, collaboration, diverse ways of learning and high expectations, were present during the simulation sessions (Table 2). With regard to the importance of practices, the students reported a median score at the scale level of four or above.

Related to the students' satisfaction and self-confidence in learning, the findings showed that students were very satisfied and had achieved self-confidence in learning during the simulation sessions (Table 3).

Reliability measured by Cronbach's alpha is presented in Table 4.

4.2 | Qualitative results

4.2.1 | 'It builds my capacity'—becoming confident and competent nurses

Students repeatedly expressed how simulation as a teaching method raised their competence within the specific topic of 'emergency nursing' for the simulation sessions. They focused on increased competence raised through the preparation phase, their active participation in the simulated scenarios, and the specific learning outcomes of the simulation training. In addition, they stated that simulation training strengthened their confidence as nursing students, which in turn, encouraged them to enter the 'real' clinical area as competent nursing students.

In the first round of simulation training in Tanzania, the students received no information about the scenarios beforehand—something they expressed as challenging. One student said:

I think it is good if we knew the topics before the simulation sessions so we can prepare ourselves – yes – the conditions and the situations we are expecting – it is good for preparation for testing and performing the procedure.

(Student, Tanzania, FGI-2)

The students addressed the importance of being prepared, because it was challenging knowing and remembering all diverse settings from the theory if they did not have any idea about the content of the scenario presented. One student reflected upon the uncertainty that could arise when they did not know what cases they would meet in the simulated scenario:

When somebody hears that you have gone to the skill lab to do this and this, she will learn to prepare herself. When she comes here, she will find that the situation is another one and this can cause panic.

(Student, Tanzania, FGI-1)

Based on evaluations, the students were introduced to the scenarios one or two days prior to the simulation trainings in Tanzania and Madagascar in April 2018. Hence, they could prepare themselves by reading related literature and discussing in groups before the simulation training—something they found to be reassuring. This was exemplified through the following statement:

TABLE 1 Design scale questionnaire

	Tanzania		Madagascar	
	Agreement	Importance	Agreement	Importance
	Median	Median	Median	Median
Objectives and Information				
There was enough information provided at the beginning of the simulation to provide direction and encouragement	5	5	4	4
I clearly understood the purpose and objectives of the simulation.	4	5	5	5
The simulation provided enough information in a clear matter for me to problem-solve the situation.	4	4.5	4	4
There was enough information provided to me during the simulation.	5	5	4	4.5
The cues were appropriate and geared to promote my understanding.	4	4	4	4
Support				
Support was offered in a timely manner.	4	4	4	4
My need for help was recognised.	4	4	4	4
I felt supported by the teacher's assistance during the simulation	5	5	4	5
I was supported in the learning process.	5	5	4	5
Problem-Solving				
Independent problem-solving was facilitated.	4	4	4	4
I was encouraged to explore all possibilities of the simulation.	4	4.5	4	4
The simulation was designed for my specific level of knowledge and skills.	5	5	5	4
The simulation allowed me the opportunity to prioritise nursing assessments and care.	5	5	5	5
The simulation provided me an opportunity to goal set for my patient.	5	5	5	5
Feedback/Guided Reflection				
Feedback provided was constructive.	4	5	4	5
Feedback was provided in a timely manner.	5	5	4	5
The simulation allowed me to analyse my own behaviour and actions.	5	4	5	5
There was an opportunity after the simulation to obtain guidance/feedback from the teacher in order to build knowledge to another level.	5	5	4	5
Fidelity (Realism)				
The scenario resembled a real-life situation.	5	5	5	5
Real-life factors, situations and variables were built into the simulation scenario.	5	5	4	4

So this time, it was somehow easy because the scenarios were given before – one day before, so for me it was somehow good to prepare for the session.

(Student, Tanzania, FGI-3)

Based on experiences with and without preparation, just one student highlighted the positive aspects of not being prepared for the scenarios and being 'thrown into' the scenario like a real setting. Most of them were glad to be able to prepare, as one student expressed:

TABLE 2 Educational practice questionnaire

	Tanzania		Madagascar	
	Agreement	Importance	Agreement	Importance
	Median	Median	Median	Median
Active learning				
I had the opportunity during the simulation activity to discuss the ideas and concepts taught in the course with the teacher and other students.	5	5	4	5
I actively participated in the debriefing session after the simulation.	4	5	4	5
I had the opportunity to put more thought into my comments during the debriefing session.	4	4.5	5	5
There were enough opportunities in the simulation to find out if I clearly understand the material.	5	5	4	4
I learned from the comments made by the teacher before, during, or after the simulation.	5	5	4.5	5
I received cues during the simulation in a timely manner.	5	4	4	4
I had the chance to discuss the simulation objectives with my teacher.	5	4.5	4	4
I had the opportunity to discuss ideas and concepts taught in the simulation with my instructor.	5	5	4	4
The instructor was able to respond to the individual needs of learners during the simulation.	5	5	5	5
Using simulation activities made my learning time more productive	5	5	4.5	4
Collaboration				
I had the chance to work with my peers during the simulation.	5	5	4	4
During the simulation, my peers and I had to work on the clinical situation together.	5	5	4	4
Diverse Ways of Learning				
The simulation offered a variety of ways in which to learn the material.	4	5	4	5
This simulation offered a variety ways of assessing my learning.	5	5	4	5
High Expectations				
The objectives for the simulation experience were clear and easy to understand.	5	5	5	5
My instructor communicated the goals and expectations to accomplish during the simulation.	5	5	4	4

The best is to have the scenario before. You are going to revise the literature, what the literature say and then you are going to practice according to the literature. That makes more competence.

(Student, Tanzania, FGI-4)

Another part of increasing student competence through the simulation was to be an active learner; in other words, the students highlighted the importance of being active participants during the simulation sessions. For each scenario, four to five nursing students were

active participants while the rest observed the sessions. The students clearly expressed the idea that they thought the ones acting in the scenarios learned the most. In their opinion, acting like the nurse in the scenario helped them gain competence. As two students from different rounds of simulations said:

I think that the one acting as nurse learned a lot [...], and when she goes to the clinical area, she will be comfortable because she has already practiced

(Student, Tanzania, FGI-2)

TABLE 3 Student satisfaction and confidence in learning questionnaire.

	Tanzania	Madagascar
	Agreement	Agreement
Satisfaction with Current Learning		
The teaching methods used in this simulation were helpful and effective.	5	5
The simulation provided me with a variety of learning materials and activities to promote my learning the medical-surgical curriculum.	5	4
I enjoyed how my instructor taught the simulation.	5	5
The teaching materials used in this simulation were motivating and helped me to learn.	5	4
The way my instructor(s) taught the simulation was suitable to the way I learn.	5	4
Self-confidence in Learning		
I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	5	4
I am confident that this simulation covered critical content necessary for the mastery of medical-surgical curriculum.	5	5
I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting	5	5
My instructors used helpful resources to teach the simulation.	5	4
It is my responsibility as the student to learn what I need to know from this simulation activity.	4	4.5
I know how to get help when I do not understand the concepts covered in the simulation.	5	4
I know how to use simulation activities to learn critical aspects of these skills.	5	4
It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.	5	4

TABLE 4 Cronbach's alpha values of the questionnaires from Tanzania and Madagascar

Questionnaires	Cronbach's alpha values	
	Tanzania	Madagascar
Design scale, agreement	0.660	0.827
Design scale, importance	0.754	0.871
Educational practice, agreement	0.740	0.796
Educational practice, importance	0.806	0.791
Student satisfaction and confidence in learning	0.742	0.847

So getting the chance to participate and taking the roles will give more knowledge and skills and it will last in their mind rather than only observing.

(Student, Tanzania, FGI-4)

The students communicated a desire to learn from the simulation sessions and were eager to talk about their learning outcomes. As one student said:

Another thing about the improvements is that the simulation helped us to be comfortable and also to know the time management and follow the sequences.

(Student, Tanzania, FGI-4)

Another student shared the following opinion:

This will help us to know our competence before going to the patients. In this procedure, you do not have competence and you will revise more to be competent.

(Student, Tanzania, FGI-4)

The last part of becoming confident and competent nursing students included how the students perceived simulation as a teaching method, which can prepare them for what they called a 'real clinical setting'. The related findings were twofold: (1) realistic simulation scenarios that could be compared to situations in the clinical area, and (2) the importance to conduct simulation sessions to prepare for future clinical practice.

Concerning the first focus, one student expressed: *'...the person who is acting is like a person whom we meet in the clinical area'* (Student, Tanzania, FGI-2). A second student said: *'So it was a lot easier to learn, because it was practical and it was like an internship'* (Student, Madagascar, FGI-1). Yet another student compared the simulation training with a real situation:

The simulation session is a good teaching method, because when the teacher uses the simulation, it means he tries to transform what is a real situation – so it gives us confidence and more experience. If you meet somebody who is really sick in the registration, you can now know how – or where to start and what to do.

(Student, Tanzania, FGI-1)

The above statement also includes the second focus concerning how the students perceived the importance of simulation sessions to prepare them for the 'real clinical area' heading for clinical practice or entering the clinic after completing nursing school. As one student said:

For myself, I think that this is a good method for learning because it gives us confidence – how to care for a patient before going to the clinical area – it is a good method.

(Student, Tanzania, FGI-1)

Another student expressed, *'So we feel more confident now that we graduate from here, we feel more confident to actually go to work now'* (Student, Madagascar, FGI-1).

The last quotes emphasised how the 'real' scenario setting during simulation could affect how the students handle real clinical situations, as expressed by this student:

I think this kind of teaching method gives the student competence and confidence. If a nurse student faces an emergency condition or other conditions that need help, he/she can be competent enough to perform, because it would not be the first time – is not like theory – he or she has already performed something real, so it gives us confidence. So you find that you yourself are able to act in this situation instead of being fearful of the situation.

(Student, Tanzania, FGI-3)

One student from Madagascar expressed the same thought:

So I may be a little bit scared, but I have to remember that it's something that I have already seen. And when it happens, even if I'm a little bit scared, I just have to tell myself to "just do it" and remember that I've done this before in school and, yeah, go beyond the fear.

(Student, Madagascar, FGI-1)

One quote from FGI-3 summed up the core content of how the nursing students gained competence and confidence. This student talked about how he tried to prepare for the simulation, the importance of being active in the real scenario, and how the continuous practice would allow the knowledge to 'stick in the brain'. In particular, he stated:

You know, theory is quite different from practice. So on that Thursday evening, we tried to pass some modules and some lecture materials, some books also to see what happens in this condition and how to act upon it. But in the real action, in the real situation, somehow it has some challenges. Maybe if we practice more, that 'thing' will stick better in the mind than reading a lot of books or maybe lecture material. So for myself, my experience is that after I read the theory, I have to practice, so that the knowledge will stick in the brain

(Student, Tanzania, FGI-3)

The topic for the simulation was 'emergency care nursing', and many students underlined all the skills they had learned, especially in terms of how to handle a real patient. They particularly mentioned getting drilled in taking vital signs before calling the doctor, performing the assessments themselves, elevating the bed to improve respiration, waiting for the doctor's prescription before administering drugs and so on. Generally, the students also highlighted how the simulation taught them an important lesson on becoming a nurse:

It really teaches us about our role as nurses and where our limits are. So we have to call a doctor beyond our limits. But we need to take care of the first things that we can do.

(Student, Tanzania, FGI-2)

4.2.2 | 'The questions challenge the mind'— expectations and vulnerability in debriefing

The students expressed very clearly that they *'wished to know what they did wrong during the simulation sessions'* to be able to improve. They thought it was essential that corrections were carried out in an encouraging way so they could gain competence. They found the debriefing phase to be particularly important in obtaining feedback

on what they did right and wrong, with the goal of improving themselves. As one student said, 'In the debriefing, you got to know what you did right and what you did wrong so you can correct [your] mistakes'. (Student, Tanzania, FGI-2).

The students expressed that correcting their errors or weaknesses (e.g. in terms of clinical skills) during the debriefing phase was essential so that they could improve and remember their mistakes. This was further expressed by the students who observed the scenarios—they thought that by observing they could learn from and not repeat their mistakes. This is illustrated by the following statements from the students:

The feedback is very important for us to remove our weaknesses and help to improve the knowledge. Then we will not repeat our weaknesses.

(Student, Tanzania, FGI-1)

It is better to know the truth and know your weaknesses so that you can correct yourself. Thus, when you practice, you will remember, you will not repeat the same mistakes, so it is better to know your weaknesses.

(Student, Tanzania, FGI-1)

On the one hand, some students stated that they were anxious in playing the scenario in front of other students and, particularly, the teachers. They reported forgetting things and feeling ashamed and anxious in front of the teachers, as their vision of the teachers was that they held the highest knowledge and would be the best ones to judge the students' performance. As two students explained:

When the simulation is done, she [the student] is thinking about two things: the simulation and how the teacher is thinking about her. That makes the person [the student] become weak somehow.

(Student, Tanzania, FGI-1)

If it is just with your friends, you are not afraid to do something and take action, and you know that if you are wrong you will help each other out. But if it is in front of a teacher or someone else, then you have the "on stage" fright. Even though you really mean to do something good, because you are so afraid, you end up doing something wrong anyway because you are so afraid [of what the teacher thinks].

On the other hand, they described that it was better to be corrected in front of their fellow students rather than in front of actual doctors, patients and relatives in the wards.

Furthermore, although the students wanted to know their weaknesses, it was also vital for them to know what they did correctly so that they could be encouraged by the teachers to learn and gain confidence. As two students expressed:

In the debriefing, the good way is to present the strengths and the points for improvements in a way that is not discouraging. The teachers should encourage us by providing the points for improvements.

(Student, Tanzania, FGI-2)

For it was good to hear that this is right, you have to put more effort into or you have to continue doing the same. That is encouraging and can help you retain "things" in your mind.

(Student, Tanzania, FGI-1)

How the teachers asked questions and pointed out students' strengths and areas of improvement encouraged the latter to build competence. Two students explained the importance of how questions could build capacity:

The questions used are supposed to challenge the mind – it creates something – why are these questions asked, so you think, and then you come up with some answers. The questions put some challenges to the brain to clear some discrepancies.

(Student, Tanzania, FGI-1)

Even for that question – is that vital sign normal? The student will think, why is she [the facilitator] asking that question? It makes me think more and discover what she [the facilitator] is thinking about so I can... maybe know that... wow yeah that is not normal or it is normal and why it is normal ... so... yes, I have to think.

(Student, Tanzania, FGI-1)

In addition to being asked questions during the debriefing, one student stressed the importance of holding on to and following the principles of simulation as a pedagogic method. That student expressed that the teachers should not mix pedagogic principles from other sources (e.g. lectures) but focus more on reflecting than on teaching to avoid confusion among the students during the simulation sessions.

In summary, the students expressed that the simulation training raised their competence in the specific topic (i.e. emergency nursing) covered during the simulation. In addition, they felt better prepared for practical studies in the hospital through their strengthened confidence as nursing students. The debriefing phase was emphasised as instrumental in receiving constructive feedback and corrections from the teachers, and the students showed a clear desire to learn from their mistakes.

5 | DISCUSSION

This study aimed to describe how students in two nurse education programs in sub-Saharan Africa experienced simulation as a

pedagogic method, more specifically through scenarios within the topic of 'emergency nursing'. In this section, we will merge and compare the quantitative and qualitative findings in order to obtain a more complete understanding of the students' experiences with simulation. As the findings from the two different countries reveal the same results, they will not be discussed separately.

First, we discuss the convergent findings related to what the students in both countries found to be of importance. In particular, we will reflect on how simulation, as a pedagogic method, prepared students to deal with 'real' clinical practice. The second part of the discussion will relate to both convergent and divergent findings through a focus on the students' immense wish to learn from what they define as 'mistakes' and their reflections on the feedback given to them during the debriefing phase. We will briefly draw upon Jordan's (1997) work on authoritative knowledge in health care and Jeffries' (2012) work on simulation in nurse education.

5.1 | Building competence and confidence

The merged findings from the qualitative and quantitative data underline two central aspects in relation to increased competence and confidence as nursing students. The first aspect is connected to the importance of increased knowledge and competence as a result of simulation-based education in general. The second aspect deals with the students' experience of being better prepared and confident to meet real patients in clinical settings. In the succeeding paragraphs, we will draw some reflections on these aspects.

The overall aspect focusing on increased confidence and competence among nursing students, which is central in working with simulation-based education in general, has been reported in previous research in high-income settings (Warren et al., 2016). Thus, it is interesting to reflect on how students, who experience simulation-based education for the first time, based in a low-resource setting, expect interactive learning methods that prepare them for real-world patient care experiences. Jeffries (2012) highlighted the importance of using simulation-based education based on learning theory and evidence of its effectiveness. The current study did not aim to test whether the students' knowledge and competence led to changed behaviours in real clinical settings. However, both qualitative and quantitative data give a clear picture of how the students themselves perceived their increased competence and confidence. From the qualitative data, the students linked the scenarios in the simulation-based education to actual clinical settings and emphasised the importance of being able to perform care and observation in a simulated setting before meeting what they referred to as 'real' patients in the hospital. One student expressed that when they would meet similar situations in the clinical setting, it would not be the first time for him/her to experience it, and (s)he would be more confident in knowing how to handle a situation, '*because it [would] not be the first time – is not like theory*'. From the quantitative data (Table 3), the statement, '*I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform*

necessary tasks in a clinical setting', has a median of 5, the highest attainable score on the scale.

Reflections on how students experience simulation-based education to increase their competence and confidence are not new and evidence show how it is found to be an effective pedagogical approach for nursing students in high-income countries (Al-Ghareeb & Cooper, 2016; Sundler et al., 2015; Warren et al., 2016). However, emphasising and reflecting on it from a low-resource setting is highly relevant. Raising the confidence, quality and competence of future nurses worldwide is vital. However, we argue that this is particularly important in low- and middle-income countries (LMIC) where nurses are few, and the issues they need to handle during their clinical practice are generally more complex and varied and the barriers to evidence-based practice are several (Shayan et al., 2019).

Research carried out in the same area as the present study highlights that nurses themselves perceive their roles as nurses with professional pride and that their motivation to become nurses is driven by the opportunity to provide high-quality care to the patients (Tjoflåt et al., 2018). In contrast, a recent report published in the *Lancet* evaluated the quality of care available to people in LMICs. One of the main conclusions of the report is that 'the care that people receive is often inadequate, and poor-quality care is common across conditions and countries' (Kruk et al., 2018, p. e1196). The authors pointed out that pre-service education is inadequate and that poor knowledge and competence among healthcare providers lead to poor-quality care (Kruk et al., 2018). Furthermore, the report stated that the 'education of health professionals should focus on achieving competence through active learning, early clinical exposure and problem-based learning' (Kruk et al., 2018, p. e1236). The report also highlighted the importance of good pre-service education and the lack of focus on the educational setting in the healthcare quality improvement discourse (Kruk et al., 2018).

The findings of the present study, which highlight the students' experiences in gaining increased competence and confidence through simulation-based education to some degree, answer the call for increased focus on the educational setting in LMICs. How students learn to provide high-quality care must be given priority, and new and innovative teaching methods, such as simulation-based education, might be one of the methods to be tested to achieve this goal.

5.2 | Improving through encouragement and corrections

The students reflected upon the debriefing phase as the arena that stimulated learning, as this was the point at which they expected to be given feedback by the teachers. They expressed the sincere wish to learn from what they defined as 'mistakes' and wanted to be corrected by the teachers regarding their failures during the simulated scenarios. At the same time, they expressed that acting out the scenarios in front of the teachers filled them with anxiety and shame. The students were afraid that their actions during the scenario

would affect how the teachers would view them as students and judge their performance during the debriefing phase. The students thought that the teachers possessed the highest level of knowledge; thus, whatever the teachers communicated would be correct.

The quantitative and qualitative findings concerning the importance of gaining feedback were found to be convergent. Looking at the quantitative findings related to feedback and guided reflection (Table 4), the students reported a median of four or five (indicating agreement and importance) regarding the statement, '*There was an opportunity after the simulation to obtain guidance/feedback from the teacher in order to build knowledge to another level*'. Nevertheless, the statement, '*Feedback provided was constructive*', ranged at a median of four, which was lower than the above-mentioned statement concerning feedback from the teacher. The importance of receiving feedback in a constructive and encouraging manner is further expressed and underlined as decisive in the qualitative data. By merging the quantitative and qualitative findings, we may reflect on the students' expectations to learn from encouragement and corrections given by the teachers during the debriefing phase.

The debriefing phase of simulation-based education is said to be 'an opportunity for learners to reflect on and interpret their performance' (Dreifuerst & Drecker, 2012, p. 106). There are, indeed, variations of how to debrief simulated scenarios; however, it is common to reflect on what went right, what went wrong and how one should act differently the next time (Dreifuerst & Drecker, 2012). Thus, the present students' clear message to expect feedback from their teachers on what they did right and not the least wrong is interesting. Particularly from the qualitative findings, the students expressed that the debriefing phase was a setting where they should receive direct and clear feedback on their mistakes from the teacher and not so much as a setting to reflect on their own performance. This may be connected to the students' view of the teachers as the ones who hold the highest and most correct knowledge, thus guiding their expectations concerning the debriefing phase. Jordan (1997) reflects on 'authoritative knowledge', which is a concept directed towards settings wherein several knowledge systems co-exist, with one or more of them usually associated with a stronger power base than the others. The concept has previously been addressed in similar discussions from the same area related to the hierarchy of scientific knowledge, and the expectations that those holding such knowledge possess the knowledge that counts (Våga et al., 2014). As Jordan (1997, p. 154) stated:

It is important to realize that to identify a body of knowledge as authoritative speaks, for us as analysts, in no way to the correctness of that knowledge. Rather, the label "authoritative" is intended to draw attention to its status within a particular social group and to the work it does in maintaining the group's definition of morality and rationality. The power of authoritative knowledge is not that it is correct but that it counts.

In the present study, this might lead nursing students, who do not yet possess this knowledge, to expect the teachers to give them clear feedback, particularly on their failures and mistakes. As the teachers possess authoritative knowledge, they act as expected by both parties in the debriefing phase when they clearly inform the students what scenarios the latter handled incorrectly and how. The students expressed fear and shame in simulating scenarios in front of the teachers as they were afraid of being judged on their performance. Hence, the nursing students communicated that they respected their teachers' knowledge base and expected them to possess authoritative knowledge in a particular situation.

At the same time, the students expressed interest when teachers did ask questions during the debriefing phase, thus inducing reflections from the students themselves and leading them to find solutions and new ways to handle the simulated scenario in a different way next time. This is also emphasised by Jeffries (2012), who advocated for the inclusion of critical thinking, simple analysis and basic reflections in teaching with an intention to change behaviour or clinical practice (Dreifuerst & Drecker, 2012). Related to the settings where teachers asked questions for reflections, one student clearly linked such questions to raising their capacity, as '*it makes me to think more and to discover*'. Hence, the students found corrections, encouragement and opportunities for reflection as relevant for their learning.

Overall, as highlighted in the first part of the discussion, the students expressed a clear wish to learn and be better prepared for real clinical practice. Hence, they found simulation-based education to be a pedagogic method that helped them create new knowledge, built their competence and stimulated their confidence through corrections and encouragement.

6 | STUDY LIMITATIONS

The questionnaire is developed based on simulation-based education in high-income settings. The present study is, as far as we know, the first time to use this questionnaire in a low-resource setting. The results from the questionnaire show limited variation and hence the results may be questioned. However, the quantitative findings are supported by the qualitative data which strengthening the validity of the findings. Data from focus group discussions in Madagascar gave less in-depth information, likely because informants were 1st year students, hence less experienced students and they appeared less expressive. Fewer quotes are therefore elaborated from the focus group discussions in Madagascar.

The first and last author, who carried out the data collection did not speak local language Kiswahili or Malagasy and some participants have problem expressing themselves in English or French. To minimise these weaknesses local assistants participated as translators in the data collection, allowing the students to speak in their local language and also clarifying and repeating questions and answers in English and French. Another possible influence of the trustworthiness of the data is the first and last authors Western

background, the students may have answered in a manner that they thought was expected of them as they want to present themselves in a positive light. The first and last author carried out the main analysis. There could have been a better consensus on the analysis, concerning meaning units and themes with a stronger participation by the authors from Tanzania and Madagascar. Another limitation to this study is the generalisability of the findings might be limited as this a small study only conducted in the two nursing schools in Sub-Saharan Africa.

7 | CONCLUSION

This study provides knowledge and insight into nursing students' experience with simulation-based education as a pedagogic method during their pre-service education. Overall, the students expressed to be satisfied with simulation as a pedagogic method, as it improved their competence and prepared them for professional practice. As such, we would like to emphasise the importance of implementing new and innovative teaching methods to ensure high-quality pre-service education to future nurses in low-resource settings. Further research is necessary to explore whether the students are able to transfer their knowledge into clinical practice.

ETHICAL APPROVAL STATEMENT

The research and ethical permits were granted by the National Institute of Medical Research (NIMR) (No: NIMR/HQ/R.8c/Vol. 11/996), Tanzania, and by the Tanzania Commission for Science and Technology (COSTECH) (No: 2019-77-NA-2017-206), Tanzania. This study was also approved by the Norwegian Center for Research Data (No: 55230). In Madagascar, the management of the nursing schools approved the study, and no further permission was required.

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

Project plan: BB and IT; data collection carried out: BB, IT, BPM and HR; Performance of the analyses and manuscript draft: BB and IT; Critical revisions to the paper for important intellectual content: BPM, HR and HE; All the authors meet the criteria for authorship and have approved the final article.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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