REVIEWS

User satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa: A systematic review

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ABSTRACT

Background and objective: Information and communication technologies are often used in universities in sub-Saharan Africa to train nurses and midwives. However, user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa has not been well documented. The objective of this study is to synthesize user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa.
Methods: A systematic review was conducted. Three electronic databases (PubMed, CINAHL, and ERIC) were consulted. Two reviewers independently conducted the selection of eligible publications based on the inclusion and exclusion criteria. Data were extracted and quality assessed by four team members. Qualitative, quantitative, or mixed studies conducted in sub-Saharan African countries published from 2018 to 2021 were included.
Results: The majority of students used smart mobile phones. Access to the internet connection was via their mobile phone or tablet. In terms of their ability to use mobile devices, the majority of students were good users. The rest were divided between experts in mobile use and limited users. The majority of teachers were open to the use of word processing, PowerPoint presentations, and blended learning. Other reasons for satisfaction include the use of information and communication technologies during clinical placements, online assessments, the creation of discussion forums, and live discussions with colleagues.
Conclusions: Students are satisfied with the use of information and communication technologies. The administration must equip itself with the means to use them in teaching by motivating and supporting teachers. To do this, it must take into account the results of regular assessments to provide a better learning environment. Using information and communication technologies could become a quality criterion for a high-performance university.

Key Words: ICT, E-learning, Teachers, Nursing and midwifery students, Sub-Saharan Africa, Systematic review

1. INTRODUCTION

The progress of information and communication technologies (ICT) in teaching and learning in health training institutes is undeniable. Research has been carried out, but systematic reviews have rarely been conducted. This is why user satisfaction with ICT in nursing and midwifery schools

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in sub-Saharan Africa has not been systematically reviewed. However, ICT is used. The use of ICTs in training began with in-service training for healthcare staff and has now spread to learners in schools and universities. Training began with data managers, to improve data exchange and remote communication.[1] Activities have continued to progress through research with other healthcare professionals or around their activities. A study used e-learning to build the capacity of post-Ebola professionals.[2] Nove[3] conducted a study on the quality of midwifery training in six French-speaking African countries. Another study designed an operational plan to develop and implement a digital intervention for maternal and child care by health professionals in Senegal.[4] Ondzingue Mbenga[5] carried out a study on the perception of using information and communication technologies by health professionals in Gabon.

The use of ICTs in the initial training of nurses and midwives has been studied in sub-Saharan Africa. For example, studies have been conducted on student perceptions,[6,7] ICT use,[8] instant messaging,[9] and barriers and facilitators.[10]

The number of studies on satisfaction with the use of ICTs in healthcare training institutions is increasing, making it tedious to access all the information available on the subject, which is why a systematic review is necessary. A systematic review is a rigorous scientific process designed to answer a specific question.[11] Thus, the specific question is: What is user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa? This review will provide evidence for decision-makers working to improve the use of ICTs in health training institutions. Improving the quality of teaching will also increase the quality of care offered to the population.

This study highlights user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa. Satisfaction is an emotional state or primary feeling that users have about their previous use of ICT.

The results of this systematic study will complement existing data on user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa. The existing studies are admittedly few, but we feel that they can be the subject of a systematic review.

2. METHODS

The methodology of this systematic review followed the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines.[12] The systematic review protocol was registered with the International Prospective Register of Systematic Reviews under number [CRD42023423420].

2.1 Eligibility criteria

All original research articles on user satisfaction with ICT that met the following eligibility criteria were included: (1) research with a quantitative, qualitative, or mixed design; (2) studies with nursing, midwifery, and nursing and midwifery faculty as participants; (3) the use of ICTs in the teaching/learning of nursing and midwifery students in sub-Saharan Africa and (4) articles published in English or French journals from 2018 to 2023.

The exclusion criteria were: (1) articles on the use of ICT in learning whose participants are pre-licensure master's or doctoral nursing and midwifery students; (2) ICT use during the COVID-19 epidemic; (3) commentaries, review papers, letters, discussion papers, posters, conference abstracts, conference reports, and dissertations; (4) full text not available.

2.2 Information sources

PubMed/MEDLINE, CINAHL, and ERIC were searched. Literature search strategies were developed using free and controlled vocabulary. Database searches began on 15 September 2023 and the last search date was 20 October 2023. Reference lists of included studies were also reviewed for inclusion and recent citations of included studies.

The search strategy for this study was adapted to each database based on indexing terms, including medical subject headings (MeSH), truncation, and Boolean operations. In addition, a combination of terms for the concepts of nursing and midwifery students, teachers (educators) in nursing faculties, ICT in education was used, (ICT support, Open distance learning, ICT for teaching and learning, ICT for education, Web-based learning, E-learning platform, education, distance, Computerized technological resources, Technology, Online learning, Virtual Reality, Remote education, Internet use for education, Online distance education, E-learning tools, Use of ICT in the classroom, Use of ICT in distance learning, E-learning in nursing education), Access to ICT (Use of ICT, Capacity of use), Perceived usefulness (Confirmation of expectations, personal satisfaction, health knowledge, attitudes, practice, Students' engagement), Advantages, Disadvantages, Limitations, Difficulties, Constraints, Expected and unanticipated changes, Perception on the Utilization, Perception and Attitude to ICT Supports, Students' Experience, Teachers' Experience, Academic Performance, Risk Taking and Africa to the south of the Sahara were used. The complete search strategy, line by line of each database is as follows.

2.2.1 *Pubmed strategy*

1) "Students, nursing"[MeSH] OR "Midwives students" OR "Student"[MeSH] OR "Nursing and Midwifery learners" OR "Undergraduate Nursing" OR "Nurse educators" OR "Educators"[MeSH] OR "nurse educators for teaching and learning" OR "Midwives educators for teaching and learning" OR "Midwives educators" OR "Health Educators"[MeSH] OR "Nurse Teachers" OR "Nurse Trainers" OR "Midwives Teachers" OR "Midwives Trainers" OR "schools, nursing"[MeSH] OR "School of Nursing and Midwifery" OR "Midwives education institution" OR "Faculty, Nursing"[MeSH] OR "Faculty, Medical"[MeSH]

2) "Information and communication technologies for education" OR "Information and communication technologies support" OR "Computer User Training"[MeSH] OR "Open distance learning" OR "ICT for teaching and learning" OR "Teaching"[MeSH] OR "Learning"[MeSH] OR "ICT for education" OR "Web-based learning" OR "E-learning" OR "E-learning plat form" OR "education, distance"[MeSH] OR "Computerized technological resources" OR "Technology"[MeSH] OR "Online learning" OR "Virtual Reality"[MeSH] OR "Virtual class" OR "Remote education" OR "Remote instruction" OR "Internet use for education" OR "Online distance education" OR "E-learning tools" OR "Use of ICT in the classroom" OR "Use of ICT in distance learning" OR "E-learning in nursing education"

3) "Access to ICT" OR "Capacity of use" OR "ICT Infrastructure" OR "Computer lab" OR "Internet connectivity" OR "Smartphone" [MeSH] OR "Computer" [MeSH] OR "Learning content" OR "Clinical learning situation" OR "Pedagogical use" OR "Learning assessment" OR "Educational Measurement" [MeSH] OR "Course content design" OR "Video presentations" OR "Perceived usefulness" OR "Confirmation of expectations" OR "personal satisfaction"[MeSH] OR "health knowledge, attitudes, practice"[MeSH] OR "Students' engagement" OR "Advantages" OR "Disadvantages" OR "Limitations" OR "Difficulties" OR "Constraints" OR "Expected and unanticipated changes" OR "Perception on the Utilization" OR "Perception and Attitude to ICT Supports" OR "Students' Experience" OR "Teachers' Experience"

4) (Sub-Saharan Africa)

2.2.2 *CINAHL strategy*

1) (MH "students, nursing") OR (TI "Midwives students") OR (MH "Student") OR (AB "Midwives students") OR (MH "Educators") OR (TI "Nursing and Midwifery learners") OR (AB "Nursing and Midwifery learners") OR (TI "Nurse educators") OR (AB "Nurse educators") OR (TI "Midwives educators") OR (AB "Midwives educators") OR (MH "Health Educators") OR (TI "Nurse Teachers") OR (AB "Nurse Teachers") OR (TI "Nurse Trainers") OR (AB "Nurse Trainers") OR (MH "schools, nursing") OR (TI "Midwife Teachers") OR (AB "Midwives Teachers") OR (TI "Midwives Trainers") OR (AB "Midwife Trainers") OR (TI "School of Nursing and Midwifery") OR (AB "School of Nursing and Midwifery") OR (TI "Midwives education institution") OR (AB "Midwives education institution") OR (MH "Faculty, Nursing") OR (MH "Faculty, Medical")

2) (TI "Information and communication technologies for education") OR (AB "Information and communication technologies for education") OR (MH "Teaching") OR (MH "Learning") OR (TI "Information and communication technologies supports") OR (AB "Information and communication technologies supports") OR (MH "Computer User Training") OR (TI "Open distance learning") OR (AB "Open distance learning") OR (TI "ICT for teaching and learning") OR (AB "ICT for teaching and learning") OR (TI "ICT for education") OR (AB "ICT for education") OR (TI "Web-based learning") OR (AB "Web-based learning") OR (TI "E-learning") OR (AB "E-learning") OR (TI "E-learning plat form") OR (AB "E-learning plat form") OR (MH "education, distance") OR (TI "Computerized technological resources") OR (MH "Technology") OR (AB "Computerized technological resources") OR (TI "Online learning") OR (AB "Online learning") OR (MH "Virtual Reality") OR (TI "Virtual class") OR (AB "Virtual class") OR (TI "Remote education") OR (AB "Remote education") OR (TI "Remote instruction") OR (AB "Remote instruction") OR (TI "Internet use for education") OR (AB "Internet use for education") OR (TI "Online distance education") OR (AB "Online distance education") OR (TI "E-learning tools") OR (AB "E-learning tools") OR (TI "Use of ICT in the classroom") OR (AB "Use of ICT in the classroom") OR (TI "Use of ICT in distance learning") OR (AB "Use of ICT in distance learning") OR (TI "E-learning in nursing education") OR (AB "E-learning in nursing education")

3) (TI "Access to ICT") OR (AB "Access to ICT") OR (TI "Capacity of use") OR (AB "Capacity of use") OR (TI "ICT Infrastructure") OR (AB "ICT Infrastructure") OR (TI "Computer lab") OR (AB "Computer lab") OR (TI "Internet connectivity") OR (AB "Internet connectivity") OR (TI "Smartphone") OR (AB "Smartphone") OR (TI "Computer") OR (AB "Computer") OR (TI "Learning content") OR (AB "Learning content") OR (TI "Clinical learning situation") OR (AB "Clinical learning situation") OR (TI "Pedagogical use") OR (AB "Pedagogical use") OR (TI "Learning assessment") OR (AB "Learning assessment") OR (TI "Educational Measurement") OR (AB "Educational Measurement") OR (TI "Course content design") OR (AB "Course content design") OR (TI "Video presentations") OR (AB "Video presenta-

tions") OR (TI "Perceived usefulness") OR (AB "Perceived usefulness") OR (TI "Confirmation of expectations") OR (AB "Confirmation of expectations") OR (TI "personal satisfaction") OR (AB "personal satisfaction") OR (TI "health knowledge, attitudes, practice") OR (AB "health knowledge, attitudes, practice") OR (TI "Students' engagement") OR (AB "Students' engagement") OR (TI "Advantages") OR (AB "Advantages") OR (TI "Disadvantages") OR (AB "Disadvantages") OR (TI "Limitations") OR (AB "Limitations") OR (TI "Difficulties") OR (AB "Difficulties") OR (TI "Constraints") OR (AB "Constraints") OR (TI "Expected and unanticipated changes") OR (AB "Expected and unanticipated changes") OR (TI "Perception on the Utilization") OR (AB "Perception on the Utilization") OR (TI "Perception and Attitude to ICT Supports") OR (AB "Perception and Attitude to ICT Supports") OR (TI "Students' Experience") OR (AB "Students' Experience") OR (TI "Teachers' Experience") OR (AB "Teachers' Experience")

4) (Sub-Saharan Africa)

2.2.3 *ERIC strategy*

1) ("Students, nursing" OR "Midwives students" OR "Student" OR "Nursing and Midwifery learners" OR "Educators" OR "Undergraduate Nursing" OR "Nurse educators" OR "nurse educators for teaching and learning" OR "Midwives educators for teaching and learning" OR "Midwives educators" OR "Health Educators" OR "Nurse Teachers" OR "Nurse Trainers" OR "Midwives Teachers" OR "Midwives Trainers" OR "schools, nursing" OR "School of Nursing and Midwifery" OR "Midwives education institution" OR "Faculty, Nursing" OR "Faculty, Medical")

2) ("Information and communication technologies for education" OR "Information and communication technologies supports" OR "Teaching" OR "Learning" OR "Computer User Training" OR "Open distance learning" OR "ICT for teaching and learning" OR "ICT for education" OR "Web-based learning" OR "E-learning" OR "E-learning plat form" OR "education, distance" OR "Computerized technological resources" OR "Technology" OR "Online learning" OR "Virtual Reality" OR "Virtual class" OR "Remote education" OR "Remote instruction" OR "Internet use for education" OR "Online distance education" OR "E-learning tools" OR "Use of ICT in the classroom" OR "Use of ICT in distance learning" OR "E-learning in nursing education")

3) ("Access to ICT" OR "Capacity of use" OR "ICT Infrastructure" OR "Computer lab" OR "Internet connectivity" OR "Smartphone" OR "Computer" OR "Learning content" OR "Clinical learning situation" OR "Pedagogical use" OR "Learning assessment" OR "Educational Measurement" OR "Course content design" OR "Video presentations" OR "Perceived usefulness" OR "Confirmation of expectations" OR "personal satisfaction" OR "health knowledge, attitudes, practice" OR "Students' engagement" OR "Advantages" OR "Disadvantages" OR "Limitations" OR "Difficulties" OR "Constraints" OR "Expected and unanticipated changes" OR "Perception on the Utilization" OR "Perception and Attitude to ICT Supports" OR "Students' Experience" OR "Teachers' Experience")

4) (Sub-Saharan Africa)

2.3 Selection process

Software Zotero was used to manage the records exported from all the electronic databases. Two independent reviewers selected the articles. A predefined selection form was developed to ensure the reliability of the selection of articles by the two reviewers, and a pilot test was carried out based on the eligibility criteria. Both reviewers described the outcome measures after reviewing the studies to check the relevance of the articles. Each reviewer provided robust justifications for excluding studies. A third reviewer resolved any disagreement between the two reviewers in a consensus meeting. The third reviewer was consulted to decide whether the study met the eligibility criteria for inclusion.

Titles and abstracts were used first to screen out all studies, then full text to screen out studies that did not meet the inclusion criteria. Database searches identified a total of 216 studies. After removing duplicates, 198 potentially relevant titles were retained for title and abstract selection.

After selecting titles and abstracts, 184 articles were excluded. Finally, the full texts of the remaining 14 studies were examined to determine whether they met the inclusion criteria. Finally, 6 studies were selected and used for this review. The PRISMA (Preferred Reporting Items for Systematic Reviews and Metanalyses) diagram was used to capture the study selection process (see Figure 1).

2.4 Data collection process

Both independent reviewers completed a customized data extraction sheet for all included studies. The two reviewers' data extraction tables were compared to ensure that all key results were included in the systematic review. The third reviewer was involved in the event of conflicting information during the data extraction process.

2.5 Data item

We extracted data on the first author, the year of publication of the study, the location of the study, the study design, the participants, and the main results.

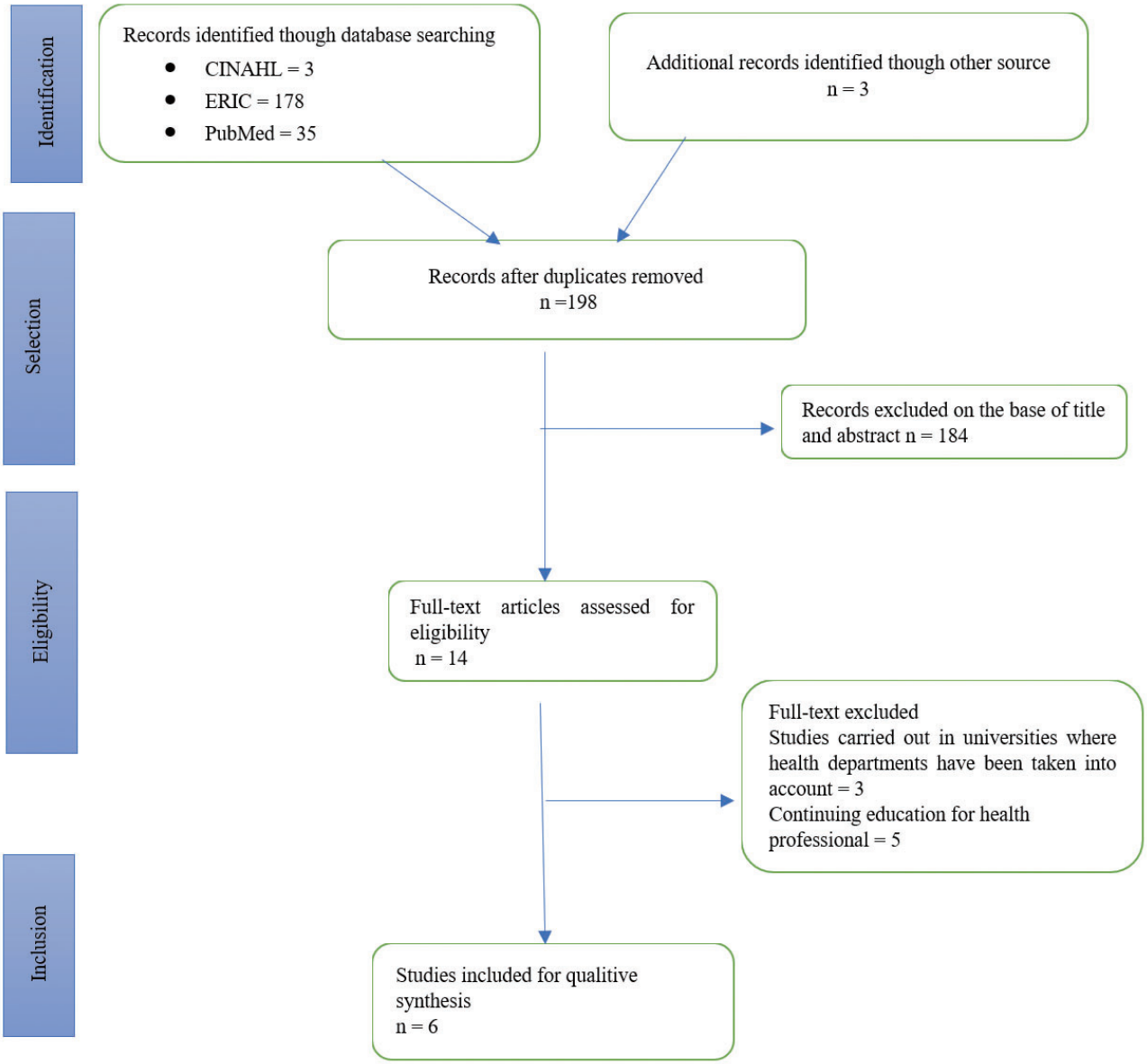

Figure 1. Flow diagram of included studies

2.6 Study risk of bias assessment

The methodological quality of the studies included in this review was assessed using the MMAT (Mixed methods appraisal tool).[13] The MMAT is a critical appraisal tool designed for mixed systematic reviews, including qualitative, quantitative, and mixed methods studies. It assesses the methodological quality of five categories of studies: qualitative research, randomized trials, quantitative descriptive studies, and mixed methods studies. The MMAT Criteria List includes two triage questions and five questions per study category. In addition, the document includes indicators that explain and illustrate certain criteria. For each question, the authors answered by checking "Yes", "I don't know" or "No". One author reviewed six articles, and another reviewed two articles. The authors discussed the evaluation results for all included articles with particular attention to the questions that were checked "don't know" or "no".

2.7 Synthesis methods

The main results of the studies were analyzed and summarized in narrative form. Information was collected on the first author, study setting, participants, study method, study design, and main results. A systematic narrative synthesis was performed using the information presented in the text and table to summarize and explain the characteristics and results of the included studies. The results of the review were synthesized in narrative form. First, we performed a descriptive analysis of all final included studies to record

their main characteristics. A narrative synthesis was then produced in which the final studies were grouped according to key attitudes.

3. RESULTS

3.1 Studies selection

A total of 198 articles were retrieved through various searches. After the removal of duplicates and exclusions based on title and abstract, there were 14 articles, 6 of which met the inclusion and exclusion criteria.

3.2 Study characteristics

All six (6) included studies were cross-sectional studies. The studies were carried out in Nigeria (= 1), Ghana (n = 2), South Africa (n = 2) et Tanzania (n = 1). Study populations included nursing students (n = 5) and nurse educators (n = 1). In addition, all used quantitative.

3.3 Risk of bias

In terms of methodological quality, four studies were of good quality, one of moderate quality, and one of poor quality. Concerning the study whose quality is considered poor, the authors conducted a quantitative study with voluntary sampling. Then, they reported some (socio-demographic) results in the "recruitment, data collection, and ethics committee approval" sub-section of the approach and method section. Descriptive statistics are presented in the results section (see Table 1).

3.4 Results of individual studies

A total of six eligible studies were included in the systematic review. Two of these were conducted in 2018, two in 2019, one in 2020 and one in 2021. Table 2 gives a brief overview of the main features of the included studies.

3.5 Results of synthesis

The results are summarized in terms of access to information and communication technologies, use of information and communication technologies, information and communication technology teaching content, and teacher and student satisfaction. Details are given in Table 3.

Table 1. Participants, methods, instrument, and validity

N°	Participants	Methods	Instrument	Validity
1	Students in five Schools of Nursing	Not specified	Questionnaire	Poor
2	Undergraduate nursing students	Not specified	Open-Ende question	Moderate
3	Nurse educators	Sampling method	Questionnaire	Quality
4	Public health nursing students, Midwifery students, Radiology students	Survey	Structured questionnaire	Quality
5	Undergraduate students	Not specified	Structured questionnaire	Quality
6	Student nursing	Quantitative	Questionnaire	Quality

Table 2. Characteristics of included articles

N⁰	1st author	Year of publication	Localization	Setting
1	Christoph Pimmer	2018	Nigéria	Oyo State,
2	Juliana J. Willemse	2019	Afrique du sud	Faculty of Community and Health Sciences
3	Ngozi Mbah	2019	Afrique du sud	Eastern Cape
4	Robert Kaba Alhassan	2021	Ghana	Région de Volta
5	Robert Kaba Alhassan	2020	Ghana	Région de Volta
6	Simwanza, Nturu C	2018	Tanzanie	Dodoma

3.5.1 *Access to information and communication technologies*

Studies have focused on students using smartphones[14, 17, 18] and only one study has looked at teachers.[10] The majority of students used smartphones[14, 17, 18] and sometimes tablets.[14] Nearly a third of the students surveyed said they also used their personal computers.[14]

An article discussing the use of devices to access the e-learning facility highlighted that the most reliable were computer lab desktops, personal mobile phones, personal laptops, and personal tablets.[15] However, it was found that the most common means used by students to access the internet was their smartphone or tablet.[14, 16–18] It also appears that half the students belonged to average households.[14] Students spent between €1.80 to more than €9 per month to connect to the internet. They connected from one to several times a day.[14]

Table 3. Participants and results of included studies

Nº	Auteur	Setting	Study design	Participants	Outcomes
1	Christoph Pimmer, 2018, Nigéria	Oyo State,	Not specified	Students in five Schools of Nursing	−Uses WhatsApp and writes several messages while traveling − Maintain connection with friends and colleagues −Elderly nurses found WhatsApp but were using −Students use the WhatsApp platform because it greatly improves their communication with other students and nurses. −The use of WhatsApp during internships to maintain students' social capital with their peers, to develop a professional identity, to increase satisfaction with the internship and to reduce the feeling of isolation from professional communities.
2	Juliana J. Willemse, 2019, Afrique du sud	Faculty of Community and Health Sciences	Qualitative contextual design	Undergraduate nursing students	−Mobile devices afforded a learning platform −Mobile learning enactment enhanced engagement −Challenges experienced with data/airtime/Wi-Fi −Use of mobile devices in practice perceived as unprofessional
3	Ngozi Mbah, 2019, Afrique du sud	Eastern Cape	Quantitative research approach that used a descriptive survey	Nurse educators	−Facilitators: training and retraining; availability, accessibility of the internet; provision of adequate internet −Computer laboratory used by teachers −The audiovisual technology used −Interactive educational CDRom not used −Teachers do not have skills; a large number were confident about using PowerPoint −Blended learning is a better measure for online teaching −Lectures must be recorded to facilitate online teaching −Online teaching is beneficial −Lack of connectivity −Lack of training
4	Robert Kaba Alhassan; 2020 Ghana	Volta region	Cross-sectional descriptive	Public health nursing students, Midwifery students. Radiology students.	−All students had a smartphone; −WhatsApp was the most frequently used function. −At least five applications per day and daily use −E-learning school content, existing search for information on the Internet followed by reading −Obtain additional learning materials such as YouTube videos from the Internet −The quality of online material was not assessed and verified in advance by teachers. −The absence of structures dedicated to these digital innovation tools −Recording of lectures or for documentation purposes −Effectiveness of smartphones rated good and very good for learning, networking, communicating with teachers, and working offline −Students spend around €1.80 per month or more than €9. −Access to the Internet several times a day or at least once a day. Internet access via smartphone or tablet −Nearly a third of respondents said they use their personal computer. −Even though the university is equipped with a computer laboratory, only 9% used school-owned computers to access the Internet. They were from middle-income households. −Mobile data transfer has been hampered by low bandwidth availability and poor internet connectivity. −The e-learning program was beneficial. Exam score and e-learning assessment score, followed by live discussions with colleagues (10%), access to learning materials (9%), and Live discussions with teachers (5%) were beneficial. −Suggestion to train teachers and ICT staff, improve the speed of the internet and intranet, the relevance of learning content −Students who downloaded and had discussions with teachers were less satisfied with security and reliability. −Mobile devices afforded a learning platform −Mobile learning enablement enhanced engagement −Challenges experienced with data/airtime/Wi-Fi −Use of mobile devices in practice perceived as unprofessionalmoins satisfaits de la sécurité et de la fiabilité.
5	Robert Kaba Alhassan 2021 Ghana	Volta region	Mixed methods	Undergraduate students	−Provide educational content; communication between lecturers and students; −Online/offline assessments and creation of discussion forums for students and teachers. Almost all students owned a mobile phone −Mobile phone functions were: playing/listening to music, making calls, connecting on social networks, and for academic purposes −The online learning functions through their mobile phones were writing midterm assessments, uploading learning materials, uploading class assignments, live chats with teachers, and live chats with students. fellow students. −The devices used to access the e-learning facility were computer lab desktops (63%), personal mobile phones (20%), personal laptops (7%) and personal tablets. −Worst rated computer lab, consistency and internet reliability −Ease of access to e-learning content via desktops highest while usability was rated lowest
6	Simwanza, Nturu C, 2018, Tanzanie	Dodoma	Quantitative	Student nursing	−Use of smartphone, tablets −Device usage: mobile usage experts, good users and limited users. Appropriate User Behavior of Mobile Learning Technology −Inappropriate behavior of MLT users −Self-directed learning −Obtained superior results over 3 years

In a university with a computer laboratory, some respondents used computers belonging to the school to access the Internet (63%).[15] In some studies, there was no structure dedicated to digital innovation tools,[15] and in many regions, the Internet was not widely available or accessible.[10]

Mbah, whose study focused on nursing educators, found that teachers had laptops. He pointed out that having a computer did not mean that it was used for online teaching.[10]

3.5.2 *Use of information and communication technologies*

WhatsApp was the most frequently used program[14] and mobile devices were a learning platform.[16] The use of smartphones for learning, networking, communication with teachers, and offline work was rated as very good or good. Their use to record lectures or for documentation purposes was not widespread.[14]

In terms of the ability to use mobile devices, the majority of students declared themselves to be good users. The remaining students were divided between experts in mobile use and limited users.[14] The most commonly used cell phone functions are playing/listening to music, making calls, connecting to social networks, and studying.[15] In addition, many of those surveyed used at least five apps a day and WhatsApp daily.[14] Reading e-books, using mobile apps for learning, collaborating online for learning, taking notes during audio/video lessons, checking/sending emails, accessing educational content, and searching for educational resources are appropriate behaviors of mobile learning technology users.[18] However, inappropriate behaviors on the part of mobile learning technology users, such as using the device during lessons, using the device during group discussions, and using social networks such as Instagram, Skype, Twitter, WhatsApp, and YouTube have also been recounted.[18]

ICT also encourages students to learn independently. Indeed, the items concerning autonomy obtained responses ranging from agreement to total agreement.[18] In addition, during an internship, the use of mobile devices in practice was perceived as unprofessional.[16]

About teachers, Mbah found that the computer lab and audiovisual technology were exploited. However, the intelligent electronic blackboard and interactive educational CD-ROM were not used.[10]

3.5.3 *Teaching content using information and communication technologies*

The provision of educational content (e-books, links to database articles, distribution of course updates)[15] and searching for information on the Internet followed by reading[14] have been identified as e-learning content. In addition, the most frequently used e-learning functions are writing interim assessments, downloading learning materials, downloading class assignments, chatting live with lecturers, and chatting live with other students.[15] ICT also enabled students to establish communication with teachers (sharing of teaching materials and resources, academic announcements). During their placement, students wrote and read many messages on WhatsApp.[16]

Teachers often ask students to obtain additional learning material such as YouTube videos from the Internet. No specific website has been created to help find adequate and relevant sources of information on the subjects covered. In addition, the use of mobile data transfer was hampered by low bandwidth availability and poor internet connectivity.[14]

As for the teachers, the majority were open to the use of word processing, PowerPoint presentations, and blended learning, which is necessary for online teaching. In addition, courses should be recorded to facilitate online teaching.[10]

3.5.4 *Teacher and student satisfaction*

Among the perceived benefits of the e-learning program, more than half of students said it was beneficial.[14] The implementation of mobile learning increases engagement.[18] Using WhatsApp during placements brings satisfaction.[18] They found that it was positively associated with maintaining students' social capital with peers, developing a professional identity, satisfaction with the placement, and limiting feelings of isolation from professional communities.[16] Connections also helped students maintain links with friends and colleagues at school.[18] The results suggest that students used WhatsApp frequently and considered that this platform significantly improved their communication with other students and nurses.[16] However, older nursing students found WhatsApp slightly more difficult to use, but this did not appear to affect their actual usage.[18]

A point of satisfaction was also the online/offline assessments (Quizzes, assignments, case scenarios, case studies, self-test, grading component) and the creation of discussion forums (students can communicate with lecturers and peers, and interact in class or groups) for students and teachers.[15] They were also satisfied with the live discussions with peers, access to learning materials, and live discussions with teachers.[14] In addition, the exam and e-learning assessment scores were seen as the most beneficial element of the program.[14] Many students obtained higher results over the 3 years.[18]

However, there is some dissatisfaction. Students who had discussions with teachers were less satisfied with safety and reliability.[14] Also, the quality of the online material was not evaluated and checked beforehand by the teachers.[14]

In terms of evaluation results, the lowest ratings were for consistency of content and reliability of the Internet.[15] In this connection, the students suggested improving the speed of the Internet and intranet, improving the relevance of e-learning content, improving the training of teachers and ICT staff,[14] and providing reliable Internet, appropriate ICT tools, and adequate ICT equipment to support use.[16] Concerning teachers, they highlighted the lack of skills, lack of connectivity, and insufficient equipment as challenges to be overcome for effective online teaching.[10]

4. DISCUSSION

This study aims to assess user satisfaction with ICT in nursing and midwifery schools in sub-Saharan Africa. In terms of access to ICTs, students have access to smartphones, they spend between €1.80 and over €9, and they go online more than once a day. Teachers also have computers. In terms of use, pupils make appropriate and inappropriate use of ICT. Providing educational content and searching for information on the Internet followed by reading were identified as e-learning content. Overall, students found the use of ICT beneficial and were satisfied. In addition, measures to improve e-learning were identified. These include skills development, ICT equipment, and the provision of reliable internet access.

Most of the studies included have focused on mobile phones in education.[14,16–18] Students are increasingly using smartphones for school activities. Research shows that mobile technologies are a lever for learning.[19] Mobile applications have become numerous, accessible, and easy to use.[20] What's more, ICTs are seeing an unprecedented increase in the number of mobile phone and Internet users, as well as a fall in the price of devices and services.[21] The ease with which mobile phones can be obtained and transported, and above all the applications available, mean that students can learn anywhere and at any time. This means that owning a smartphone will soon be a requirement for access to some schools. However, it would be useful to rule out the inappropriate use of mobile phones during lessons. Pupils, teachers, school administration, and ICT staff need to be brought together to find solutions to curb it. Many teachers use their smartphones even for teaching purposes. However, they do have laptops, but that doesn't mean they use them. Their use certainly requires specific training for teachers to enable them to design, deliver, and evaluate their lessons, collect, process, and disseminate information, and carry out administrative and research activities.

WhatsApp, the instant messaging application, was the most widely used feature[14] and mobile devices are a platform for learning.[16] It is a mobile phone messaging application that uses the internet to send messages and documents to individuals or groups and to make voice notes or video calls.[22] In the world of education, WhatsApp offers many advantages, such as easier access to teaching resources and instant messaging between teachers and students, openness to collaborative learning, and the possibility of creating virtual communities for learning, sharing, and co-constructing knowledge.[23] In addition, it is easy to share links to subject content and obtain immediate feedback from teaching staff, the possibility of tutoring and helping students online, and openness to blended learning integrating formal and informal practices.[23] It is all these features that have attracted students to adopt it. WhatsApp is also a tool that encourages the emergence of virtual learning communities and can be used to acquire skills such as collaboration, communication, and problem-solving.[24,25] For this reason, nowadays almost all students have the WhatsApp application since almost all Android phone manufacturers have already integrated it into their design. This means that the WhatsApp application has become indispensable in education and that teachers, students, and the administration should organize themselves to harmonize its use.

The provision of educational content[15] and the search for information on the Internet followed by reading[14] have been identified as services provided by ICT. It is these same services that Vaillant and Bouix have described in detail. They mentioned the provision of pedagogical content and reading, the facilitation of interactivity between learners, support for learning in a collaborative process, the design of e-learning, support for digital literacy, and the accompaniment of experts and resources.[26] Except for research, which is probably of interest at another level, all the elements have been listed. The challenge lies in organizing these courses and placements, where teachers need constant refresher courses and reliable ICT connections and equipment. Without this, teachers will continue to teach face-to-face or teach online with many shortcomings. Failure to adapt to change will lead students to enroll in universities or schools that use ICT, or they will turn it into a point of contention. Blended learning or online distribution of lectures can facilitate the development of distance learning. For this to happen, teachers need to be motivated and supported to adopt ICT, because the time has come to fully develop digital tools in education.

More than half the students found teaching using ICT beneficial.[14] Indeed, the simple and effective presentation of courses, the promotion of interactive learning, the improvement of motivation, the optimization of performance, and the interaction between teacher and learner are among the benefits of ICT.[26] Teaching using ICT has a set of intrinsic characteristics that enable it to meet students' requirements.

To achieve this, those in charge of training institutions must develop the equipment, infrastructure, and human resources needed to use ICT in teaching. Without the use of ICTs, students will continue to struggle to learn, memorize, and assess.

The use of WhatsApp during the course brings satisfaction.[18] This is in line with what Psyché and Payen had found about satisfaction with the use of the WhatsApp application in teaching. They say that using WhatsApp facilitates access to teaching resources and instant communication between teachers and students. They also add that there is the possibility of creating virtual communities for learning, sharing and co-constructing knowledge.[23] WhatsApp is increasingly attracting the interest of teaching staff as a platform for facilitating distance teaching-learning situations and pedagogical continuity.[23] This means that midwifery nurse training institutions must promote the use of WhatsApp during certain courses and find a formula to facilitate access to WhatsApp for those who do not have it. Beyond that, the use of WhatsApp will have to be regulated, as it is being used inappropriately.

Online and offline assessment for students and teachers was also deemed satisfactory.[15] Digital assessment tools have user-friendly interfaces. In addition, marking is automatic, analysis is done in real-time, and security features are in place to ensure that online assessment is fairer, safer, and more effective.[27] Students complain in particular about the length of time it takes to mark papers and the awarding of marks of convenience. Teachers, for their part, complain above all about the lack of time and the number of papers to be corrected. Training institutions, teachers, and students need to be given the training they need to use online assessment wisely. Above all, teachers need to know how to design an online assessment and how to mark them. Students, at the very least, need to know how to compose online.

Students who spoke to teachers were less satisfied with security and reliability.[15] Difficulties in accessing data, airtime, low bandwidth availability, and poor internet connectivity are consistently described in evaluations of ICT use in sub-Saharan Africa. Heads of institutions need to work on strengthening the digital infrastructure before starting to teach using ICTs and to have a maintenance and renewal plan that can be financed. The lack of equipment could demotivate students and teachers.

Teachers stressed the lack of skills, the lack of connectivity, and the lack of equipment.[10] Two types of skills seem to be needed by future teachers: technological or techno-instrumental skills on the one hand, and techno-pedagogical skills on the other.[28] Training is important for all players, especially teachers, because pedagogical skills alone are not enough. Teachers are obliged to start using ICT in their teaching without any training. However, those in charge of training institutions need to train them and provide for their ongoing training so that they can contribute to teaching with ICT, which is another style of teaching.

Limitation of study

This study aimed to assess user satisfaction with information and communication technologies in nursing and midwifery schools in sub-Saharan Africa. The included studies all involved nurses. This limits the applicability of the findings to midwives. In addition, we limited the studies to the last five years, as the field of technology is evolving very rapidly. Finally, we are not certain that we have exhausted all the unpublished documents.

5. Conclusion

The use of ICTs in nursing and midwifery schools is satisfactory in most sub-Saharan African countries. The evaluations that have been carried out have shown progress. They show that students are increasingly using smartphones. Teachers have laptops, but this does not mean that they are using them for online teaching. ICT developments in the field of mobile telephony appear to be accelerating. Of the six studies included, five dealt with online teaching incorporating mobile telephony used by students. Only one study of teachers mentions the use of a computer. Although students say they are satisfied with the use of ICT, the authorities must take account of the suggestions made by students and teachers, as this is the tool of the future for our education.

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Authors contributions

All authors made substantial intellectual contributions to the development of this manuscript. PAH and EG contributed to the conception and design of the study and conceptualized the review approach. DS, KS, and BN contributed to screening, study selection, data classification, and data extraction. KN led the drafting of the manuscript. All authors contributed to the writing of the article and approved the submitted version.

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