ORIGINAL RESEARCH

First-year nursing students' digital literacy: A cross-sectional study

Alexis Harerimana*[1,2], Sinegugu Evidence Duma[2], Ntombifikile Gloria Mtshali[2]

[1]Nursing and Midwifery, College of Healthcare Sciences, James Cook University, Townsville, Queensland, Australia
[2]Nursing and Public Health, College of Health Sciences, University of KwaZulu Natal, Durban, KwaZulu Natal, South Africa

ABSTRACT

Background: The digital world is rapidly changing, and so do the required digital skills. As physical devices and software are adapted to meet new possibilities and demands, individuals' skills must adapt to technological advancement. Digital literacy is increasingly used in the public discourse, becoming a core requirement of students, academics, patients and healthcare professionals. Assessing nursing students' digital literacy at the entry-level is vital to ascertain their abilities to use digital technologies. This study aimed to assess basic digital literacy among first-year nursing students at a selected university in South Africa.

Methods: This cross-sectional study was conducted from 1st March 2019 to 31st May 2019 at a university in South Africa. The population consisted of 82 nursing students from the first-year students in the 4-year nursing programme. The convenience sampling technique was used to determine the participants of this study, and 76 respondents completed a structured questionnaire. Data were analysed descriptively using the Statistical Package for Social Sciences (SPSS®) software (version 25) from the International Business Machines Corporation (IBM®). A reliability test of the instrument was conducted, and Cronbach Alpha was 0.85.

Results: The students' digital literacy included: (i) basic computer skills — performing basic computer operations, MS Word and PowerPoint; (ii) internet skills — using e-mail, Moodle®, social media platforms, accessibility to the internet; and internet searches (iii) digital device usage — desktop, laptops, tablets and smartphones. Overall, the mean for internet skills was 3.61 (SD = ±0.62), 3.11 (SD = ±0.85) for computer skills, and 3.00 (SD = ±0.47) for digital device usage. Computer skills was positively correlated with internet skills ($r = 0.278$, $p = .012$) and computer skills corrected with digital device usage ($r = 0.384$, $p < .001$). The overall score for internet skills was higher in the female group than in males, with the mean of 4.00 (SD = ±0.62) and 3.61 (SD = ±0.54), respectively ($t_{74} = -0.405$, $p = .019$). Furthermore, the overall score for digital device usage was higher in the age group of 20 years and above with a mean of 3.19 (SD = ±0.38) than in the age group under 20 with a mean of 2.90 (SD = ±0.48), and those differences were statistically significant ($t_{74} = -2.420$, $p = .018$).

Conclusions: An adequate digital literacy at the entry-level of the nursing programme is a foundation and a critical factor to academic success and future use of technology in nursing education and practice. Having adequate digital literacy among nursing students would positively impact their ability to perform electronic documentation, communicate and collaborate, and search for information to support evidence-based practice.

Key Words: Digital literacy, Digital technologies, First-year, Informatics, Nursing students

---

*Correspondence: Alexis Harerimana; Email: alexis.harerimana@my.jcu.edu.au; Address: Nursing and Midwifery, College of Healthcare Sciences, James Cook University, Townsville, Queensland, Australia.

1. BACKGROUND

The digital world is rapidly changing, and so do the required digital skills.[1, 2] As physical devices and software are adapted to meet new possibilities and demands, individuals' skills must adapt to technological advancement.[1, 2] Nurses play a crucial role in introducing, implementing and using technology in clinical practices, and possessing digital literacy upon completing nursing baccalaureate studies is imperative.[3] Digital literacy is increasingly used in the public discourse,[4] and it is a core requirement of students, academics, patients and healthcare professionals.[5, 6] Due to the importance of technology in nursing education and practice,[7–11] introducing digital technologies at the entry-level plays a vital role in preparing nursing students for their academic success and future career requirements.[7, 9, 12–14]

Digital literacy covers the physical operations of the digital devices and software operations in those devices.[1, 15] Digital literacy includes the ability to use digital technologies — digital tools and digital media.[16] Digital tools are physical and include digital devices such as computers, mobile devices, and software applications, while digital media is divided into the cloud, social media platforms, Wiki technologies and blogs.[16, 17] Digital literacy skills exist on a continuum with varying degrees of competency, depending on the context — personal, community, workplace and employment, education and training within which the skills are applied.[1]

Digital literacy sits alongside the core skills of learning, reading, writing, oral communication and numeracy.[1] UNESCO[15] described the competence areas of digital literacy, including information and data literacy, communication and collaboration, digital content creation, safety and problem-solving. Information and data literacy includes the ability to browse, search and filter data, information and digital content. Furthermore, information and data literacy includes evaluating and managing data, information and digital content.[12, 15, 17–20] Communication and collaboration include the ability to manage digital identity, interact, share, collaborate, and engage in citizenship through digital technologies.[15, 19, 20] Digital content creation includes the ability to develop, integrate and re-elaborate digital content. It also included the programming, copyright and licences.[15, 19, 20] The competency area of safety is the ability to protect devices, personal data and privacy, health, well-being and the environment. The competency area of problem-solving is the ability to solve technical problems, identify the needs and technological responses, creatively use technologies and identify digital competencies gaps.[15, 19, 20]

There is a general assumption that students entering universities and colleges have basic Information and Communication Technologies (ICT) skills, with expectations that they will be technology ready.[18, 21] Those assumptions result in the institutions of higher learning, such as universities and nursing colleges, neglecting the need to conduct an ICT skills assessment at the entry-level level, thus leading to inadequate support to address their many and varied requirements.[18]

Digital and future skills are vital components of South Africa's human resources capacity-building path. The 21st-century skills must complement the digital skills to address many digital levels of the digital divide.[22] The South African government has installed Information communication technologies (ICT) and internet connectivities in some schools, but most still lack computing infrastructures, particularly in low-income and rural areas.[23] Matli and Ngoepe[24] argue that most people from rural and townships in South Africa do not have skills in utilising ICT. Many students — who attend high schools from rural areas — may not have computer facilities or people trained to provide adequate ICT instruction.[23] At the tertiary education level, ICT should also not be taught in isolation but integrated into the curriculum to ensure students can apply it for subject-specific purposes.[25–27]

Due to limited access to digital tools at the secondary school level in South Africa,[28, 29] it is essential to assess students' computer skills, access, and use of the internet and digital devices at the beginning of tertiary education to ascertain their abilities to use technology tools and applications for academic purposes. Consequently, design strategies that could uplift their competencies and address challenges.[9, 16]

The emerging technologies pose challenges to nursing education in developing countries due to the lack of basic digital literacy among nursing students,[30] particularly at the entry-level,[12] lack of internet connectivity and digital devices.[25, 31–33] The lack of digital skills among nursing students and nurses negatively impacts nursing documentation, collaboration among the healthcare team, and the provision of evidence-based care.[34, 35] Students in pre-registration nursing programmes are expected to use technology to support their classroom and clinical environment learning.[7, 17, 25, 27] Hence, this study assessed basic digital literacy among first-year nursing students at a selected university in South Africa.

2. METHODOLOGY

This study used a quantitative descriptive design, and it was conducted at a selected university in South Africa from 1st March 2019 to 31st May 2019. The population consisted of 82 nursing students from the first-year students in the 4-year nursing programme. The convenience sampling tech-

nique was used to determine the participants of this study. However, only 76 respondents completed and returned the questionnaires making a response rate of 92.7%. A response rate of approximately 60% for most research should be the researchers' goal.[36] The inclusion criteria included being registered in the 1st year of the undergraduate nursing programme in 2019. Those who were not willing to participate were exempted.

Data were collected using a self-developed, structured questionnaire whose items were adapted from the tools for as-

sessing ICT literacy in schools from the European Commission[37] The self-developed questionnaire consisted of three sections: socio-demographic variables (age, gender, place of residence, area of origin); basic digital literacy — computer and internet skills (eight items) on a five-point Likert scale (1 = strongly disagree and 5 = strongly agree), and use of digital devices (four items) on a four-point Likert scale (1 = never and 4 = always). The reliability of the 12 items ranged from 0.82 to 0.86 (see Table 1). Cronbach Alpha for the instrument was 0.85, indicating excellent reliability of the research instrument.

Table 1. Reliability of the instrument

Variables	Items	Cronbach's Alpha
Computer skills	I can perform basic computer operations	0.82
	I can use Microsoft Word®	0.82
	I can use Microsoft PowerPoint®	0.83
Internet skills	I can use e-mail	0.82
	I can access the internet	0.83
	I can use Moodle®	0.84
	I can use social media platforms	0.84
	I can perform an internet search	0.83
Digital device usage	I use a desktop	0.86
	I use a laptop	0.84
	I use a tablet	0.85
	I use a smartphone	0.86

Data were analysed descriptively using the Statistical Package for Social Sciences (SPSS®) software (version 25) from the International Business Machines Corporation (IBM®). Data were presented using frequencies (n), percentages (%), mean and Standard Deviation (SD). Inferential statistics were performed to establish the statistical association between variables: t-test, One-way ANOVA, and Pearson correlation ($p <$ .05).

Ethical clearance (No: HSS/0028/018PD) was granted on 25th January 2018 from the research ethics committee of the University of KwaZulu-Natal (UKZN). Prior to the enrolment in this study, enough explanation about the study's purpose and methods were provided to the participants; and a written informed consent was taken from them. Furthermore, the registrar's office at a selected university provided the gatekeeper's permission.

3. RESULTS

Table 2 presents the socio-demographics of first-year nursing students. The majority of participants, 57(75%), were females, and 72 (94.70%) were residing off-campus. The

mean age of the respondents was 18.96 (SD = ±1.99).

Table 2. Socio-demographics of first-year nursing students (n = 76)

Socio-demographics	Variables	N	%
Age	Under 20	57	75
	20 years and above	19	25
Gender	Female	57	75
	Male	19	25
Area of residence	On-campus	4	5.30
	Off-campus	72	94.70
Area of origin	Urban	25	32.90
	Semi-urban	18	23.70
	Rural	33	43.40

The students' digital literacy included basic computer skills, internet skills, and digital device usage. The mean for internet skills was 3.61 (SD = ±0.62). Internet literacy covered the use of e-mails, internet accessibility, accessibility to the Modular Object-Oriented Dynamic Learning Environment (Moodle®), social media platforms, and internet searches (see Table 3). The mean for computer skills was 3.11(SD = ±0.85), and those skills covered basic computer operations,

Microsoft Word® and PowerPoint (see Table 3). Nursing students used digital devices, and smartphones were frequently used with a mean of 3.89(SD = ±0.42), followed by laptops at 3.54 (SD = ±0.72), desktops at 2.47 (SD = ±1.00), and tablets at 1.97 (SD = ±0.83).

Table 4 compares students' socio-demographics, computer skills, internet skills, and digital device usage. The Pearson correlation indicated a positive correlation between computer and internet usage skills ($r = 0.278$, $p = .012$). Furthermore, there was a positive correlation between computer skills and digital device usage ($r = 0.384$, $p < .001$). The overall score for internet skills was higher in the female group than in males, with the mean of 4.00 (SD = ±0.62) and 3.61 (SD = ±0.54), respectively. Those differences were statistically significant ($t_{74} = -0.405$, $p = .019$). The overall score for digital devices' usage was higher in the age group of 20 years and above with a mean of 3.19 (SD = ±0.38) than in the age group under 20 with a mean of 2.90 (SD = ±0.48), and those

differences were statistically significant ($t_{74} = -2.420$, $p = .018$).

Table 3. Mean and standard deviation of computer skills, Internet skills and digital device usage (n = 76)

Variables	Items	Mean ± SD
Computer skills	I can perform basic computer operations	3.63 ± 0.81
	I can use Microsoft Word®	3.37 ± 0.87
	I can use Microsoft PowerPoint®	2.32 ± 1.12
	Sub-total	3.11 ± 0.85
Internet skills	I can perform an internet search	3.69 ± 0.82
	I can use E-mail	4.04 ± 0.80
	I can use social media platforms	3.81 ± 0.97
	I can access the internet	4.02 ± 0.71
	I can use Moodle®	3.98 ± 0.74
	Sub-total	3.91 ± 0.62
Digital devices usage	I use a smartphone	3.89 ± 0.42
	I use a laptop	3.54 ± 0.72
	I use a desktop	2.47 ± 1.00
	I use a tablet	1.97 ± 0.83
	Sub-total	2.97 ± 0.47

Table 4. Comparing the socio-demographics with the mean (SD) of basic computer skills, internet skills, and digital devices usage (n = 76)

Socio-demographic variables		Basic computer skills				Internet skills				Digital devices usage			
		Mean ± SD	Test	d.f	p-value	Mean ± SD	Test	d.f	p-value	Mean ± SD	Test	d.f	p-value
Age Group	< 20	3.06 ± 0.80	-0.832†	74	.408	3.90 ± 0.57	0.138†	74	.890	2.90 ± 0.48	-2.420†	74	.018*
	≥ 20	3.24 ± 1.00				3.92 ± 0.77				3.19 ± 0.38			
Gender	Male	2.80 ± 0.65	1.631†	74	.107	3.61 ± 0.54	-0.405†	74	.019*	2.93 ± 0.37	-0.433†	74	.666
	Female	3.20 ± 0.90				4.00 ± 0.62				2.98 ± 0.51			
Area of origin	Semi-urban	3.12 ± 0.70	0.203‡	2	.817	3.89 ± 0.60	0.549‡	2	.580	3.00 ± 0.48	0.202‡	2	.817
	Urban	3.18 ± 1.05				4.01 ± 0.68				3.00 ± 0.54			
	Rural	3.03 ± 0.76				3.84 ± 060				3.00 ± 0.43			
Place of residence	On-campus	3.00 ± 1.22	0.280†	74	.781	3.75 ± 0.46	0.531†	74	.597	3.06 ± 0.55	0.374†	74	.710
	Off-campus	3.11 ± 0.83				3.91 ± 0.63				2.97 ± 0.47			

†t-test, ‡F-test (One-way Anova); *$p < .05$

4. DISCUSSION

Investigating nursing students' skills in using technology is fundamental to building strategies relevant to acquiring digital literacy.[3] With the digitalisation of the health care system, there is an increasing number of digital competencies required for future nurses.[6] This study revealed that 1st year nursing students had varying levels of digital literacy, including internet skills, computer skills, and digital device usage. Students used digital devices, predominantly smartphones and laptops. Similarly, a study conducted at the Durban University of Technology found that most first-year nursing students used cell phones and laptops, mainly for communication and academic purposes.[38] A similar study by Harerimana and Mtshali[12] found that 89.3% of undergraduate nursing students used smartphones and 78.7% used laptops, and only 22% used desktops. Those results indicate the preferences for portable digital devices.

Nursing students had the skills to operate computers and use applications such as Microsoft Word® and PowerPoint®. Furthermore, students could use e-mails, social media platforms, Moodle®, access the internet and conduct internet searches. Comparatively to the findings from this study, Harerimana and Mtshali[12] found that the majority of respondents had skills to use Ms Word® (86.7%), Ms PowerPoint® (70.7%), e-mails (86%), Moodle® (81.3%) and other basic computer applications. Schlebusch[39] argues that the lack of computer access and skills may cause poor computer self-efficacy and anxiety among undergraduates entering high education.

Training nurses to use digital devices and applications positively impacts their ability to do electronic documentation and search for information to support patient care.[40] According to Kim et al.[41] nurses spend 25% of their time

on documentation, and the documentation quality reflects the quality of care. Lack of the ability to document care and find information on the patients jeopardises the care to those patients.[40] A study conducted by Fetter[42] found that nursing students were confident in their internet, word processing and systems operations skills; however, students rated themselves low on care documentation and planning, valuing informatics knowledge, skills development and data entry competencies.

This study showed a positive correlation between computer skills and digital devices such as laptops and smartphones. A study conducted by Harerimana and Mtshali[12] found that laptops were used frequently to create word documents (92.4%), e-mails (91.5%), and PowerPoint presentations (82.2%). Furthermore, the ownership of smartphones was associated with creating and reading e-mails. Computer and internet skills were reported to have an impact on academic success.[12] In this study, students from urban areas were relatively more skilled in using the Internet and computers than those from rural and semi-urban areas. Those results demonstrated digital inequality in rural and urban areas. Limited access to the Internet and digital devices poses a challenge to students residing off-campus; the majority of the students in this study (94%) were residing off-campus, and 67.1% were from rural and semi-urban areas. A study by Wastiau et al.[43] found that ICT-based activities occur both at home and on campus, and intentional and spontaneous self-directed learning occurs outside schools. Accessibility and use of digital tools are paramount for learning throughout the programme.[12, 27, 44]

The results from this study indicated that students have an average level of basic computer and internet usage skills; however digital skills of nursing should go beyond basic skills to use computers and include how to navigate the digital health systems, use Electronic Health Records (EHR), and other technologies appropriately in a range of clinical settings.[45] Nursing faculty are expected to make changes to their programs to help students acquire the skills needed for the digitalised nursing profession.[46, 47]

The study's limitations include a small sample of the participants who completed the research instrument, and only the first nursing students participated in this study. This might limit the generalisation of the findings. We recommend that a future study be conducted using a larger sample size and target 2nd, 3rd, and 4th-year undergraduate nursing students.

5. CONCLUSION

This study indicated that first-year nursing students had different digital skill levels using computers and the internet. Students' computer skills correlated positively with the ability to use the internet and digital devices. Availability, accessibility to digital tools and students' adequate skills at entry-level nursing programs are recommended. Having adequate digital literacy among nursing students would positively impact their ability to perform electronic documentation, communicate and collaborate, and search for evidence in favour of patient quality care. Furthermore, there is a need for specialised digital literacy beyond basic digital skills, and nursing education institutions to have a module for digital health or informatics in nursing, which would be an essential step toward ensuring that students are adequately prepared to work in a technology-rich health environment. Nursing faculty are expected to make needed changes to their programs to help students get ready for a digitalised nursing care profession.

CONFLICTS OF INTEREST DISCLOSURE
The authors declare that there is no conflict of interest.

REFERENCES

[1] DESE. Foundation Skills for Your Future Program: DRAFT Digital Literacy Skills Framework. Australia: Australia Government & Department of Education, Skills and Employment [DESE]; 2020.

[2] Jonasen TS, Gram-Hansen SB. Problem Based Learning: A facilitator of Computational Thinking. Proceedings of the 18th European Conference on e-Learning: ECEL 2019 Copenhagen. 2019; 260-7. https://doi.org/10.34190/EEL.19.150

[3] Nes AAG, Steindal SA, Larsen MH, et al. Technological literacy in nursing education: A scoping review. Journal of Professional Nursing. 2021; 37(2): 320-34. PMid:33867086 https://doi.org/10.1016/j.profnurs.2021.01.008

[4] Spante M, Hashemi SS, Lundin M, et al. Digital competence and digital literacy in higher education research: Systematic review of concept use. Cogent Education. 2018; 5(1): 1519143. https://doi.org/10.1080/2331186X.2018.1519143

[5] Kennedy S, Yaldren J. A look at digital literacy in health and social care. British Journal of Cardiac Nursing. 2017; 12(9): 428-32. https://doi.org/10.12968/bjca.2017.12.9.428

[6] Terry J, Davies A, Williams C, et al. Improving the digital liter-

acy competence of nursing and midwifery students: A qualitative study of the experiences of NICE student champions. Nurse Education in Practice. 2019; 34: 192-8. PMid:30579041 https://doi.org/10.1016/j.nepr.2018.11.016

[7] Harerimana A, Mtshali NG. Using Exploratory and Confirmatory Factor Analysis to understand the role of technology in nursing education. Nurse Education Today. 2020; 104490. PMid:32516637 https://doi.org/10.1016/j.nedt.2020.104490

[8] Rushton MA, Drumm IA, Campion SP, et al. The Use of Immersive and Virtual Reality Technologies to Enable Nursing Students to Experience Scenario-Based, Basic Life Support Training—Exploring the Impact on Confidence and Skills. CIN: Computers, Informatics, Nursing. 2020; 38(6): 281-93. PMid:32149741 https://doi.org/10.1097/CIN.0000000000000608

[9] Terkes N, Celik F, Bektas H. Determination of nursing students' attitudes towards the use of technology. Japan Journal of Nursing Science. 2019; 16(1): 17-24. PMid:29527829 https://doi.org/10.1111/jjns.12207

[10] Krick T, Huter K, Domhoff D, et al. Digital technology and nursing care: a scoping review on acceptance, effectiveness and efficiency studies of informal and formal care technologies. BMC health services research. 2019; 19(1): 1-15. PMid:31221133 https://doi.org/10.1186/s12913-019-4238-3

[11] Hack-Polay D, Mahmoud AB, Ikafa I, et al. Steering resilience in nursing practice: Examining the impact of digital innovations and enhanced emotional training on nurse competencies. Technovation. 2022; 102549. https://doi.org/10.1016/j.technovation.2022.102549

[12] Harerimana A, Mtshali NG. Types of ICT applications used and the skills' level of nursing students in higher education: A cross-sectional survey. International Journal of Africa Nursing Sciences. 2019; 11: 1-15. https://doi.org/10.1016/j.ijans.2019.100163

[13] Harerimana A, Mtshali NG. Using mobile technologies among undergraduate nursing students for academic purposes in tertiary education: A quantitative survey. CIN: Computers, Informatics, Nursing. 2020; Publish Ahead of Print: 1-8. PMid:33259348 https://doi.org/10.1097/cin.0000000000000694

[14] Holt KA, Overgaard D, Engel LV, et al. Health literacy, digital literacy and eHealth literacy in Danish nursing students at entry and graduate level: a cross sectional study. BMC Nursing. 2020; 19: 1-12. PMid:32308559 https://doi.org/10.1186/s12912-020-00418-w

[15] UNESCO. A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2. Montreal, Quebec: UNESCO Institute for Statistics; 2018.

[16] Røsvik K, Haukedal TA. Wikis as digital learning resources in nursing education. Nordic Journal of Digital Literacy. 2017; 12(01-02): 31-46. https://doi.org/10.18261/issn.1891-943x-2017-01-02-04

[17] Brown J, Morgan A, Mason J, et al. Student nurses' digital literacy levels: Lessons for curricula. CIN: Computers, Informatics, Nursing. 2020; 38(9): 451-8. PMid:33955370 https://doi.org/10.1097/CIN.0000000000000615

[18] Hough JW. Assessment and support for basic computer skills at community college hispanic serving institutions in California [Thesis]. Fayetteville: University of Arkansas; 2019.

[19] Oh SS, Kim KA, Kim M, et al. Measurement of digital literacy among older adults: systematic review. Journal of medical Internet research. 2021; 23(2): e26145. PMid:33533727 https://doi.org/10.2196/26145

[20] Ferrari A, Punie Y, Brečko BN. A framework for developing and understanding digital competence in Europe. Luxembourg: European Commission; 2013.

[21] Jenkins PD, Lahr HE, Fink J, et al. What We are Learning about Guided Pathways. New York: Columbia University Community College Research Center; 2018.

[22] Republic of South Africa. Implementation Programme Guide: For the National Digital and Future Skills Strategy of South Africa 2021-2025: Department of Communication and Digital Technologies; 2021. Available from: https://www.gov.za/sites/default/files/gcis_document/202203/digital-and-future-skillsimplementation-programmefinal.pdf

[23] Fares K, Fowler B, Vegas E. How South Africa implemented its computer science education program: Center for Universal Education at Brookings; 2021. Available from: https://www.brookings.edu/wp-content/uploads/2021/10/How-South-Africa-implemented-its-CS-education-program_FINAL.pdf

[24] Matli W, Ngoepe M. Capitalizing on digital literacy skills for capacity development of people who are not in education, employment or training in South Africa. African Journal of Science, Technology, Innovation and Development. 2020; 12(2): 129-39. https://doi.org/10.1080/20421338.2019.1624008

[25] Harerimana A, Wicking K, Biedermann N, et al. Integrating nursing informatics into undergraduate nursing education in Africa: A scoping review. International Nursing Review. 2020; 69(3): 420-33. PMid:32893345 https://doi.org/10.1111/inr.12618

[26] Singh F, Masango T. Information Technology in Nursing Education: Perspectives of Student Nurses. The Open Nursing Journal. 2020; 14(1): 18-28. https://doi.org/10.2174/1874434602014010018

[27] Harerimana A, Wicking K, Biedermann N, et al. Nursing informatics in undergraduate nursing education in Australia prior to COVID-19: A scoping review. Collegian. 2021; PMid:34867065 https://doi.org/10.1016/j.colegn.2021.11.004

[28] Padayachee K. A snapshot survey of ICT integration in South African schools. South African Computer Journal. 2017; 29(2): 36-65. https://doi.org/10.18489/sacj.v29i2.463

[29] Chisango G, Marongwe N. The digital divide at three disadvantaged secondary schools in Gauteng, South Africa. Journal of Education. 2021(82). https://doi.org/10.17159/2520-9868/i82a09

[30] Bello UL, Hassan L, Yunusa U, et al. Challenges of information and communication technology utilisation among undergraduate community health nursing students in Tanta University, Egypt. American Journal of Nursing. 2017; 6(3): 274-9. https://doi.org/10.11648/j.ajns.20170603.26

[31] Rudhumbu N, Dziva D, Plessis E. Level of Integration of Mobile Device Technology in Teaching and Learning in Universities in Botswana. International Journal of Education and Development using Information and Communication Technology. 2021; 17(1): 21-33. https://files.eric.ed.gov/fulltext/EJ1285504.pdf

[32] Harerimana A, Mtshali NG, Ewing H, et al. E-Learning in Nursing Education in Rwanda: Benefits and Challenges. An Exploration of Participants' Perceptives. Iosr Journal Of Nursing And Health Science. 2016; 5(2): 64-92. https://doi.org/10.9790/1959-0502036492

[33] Hockenberry M, Mulemba T, Nedege A, et al. Distance-Based Education for Nurses Caring for Children With Cancer in Sub-Saharan Africa. Journal of Pediatric Oncology Nursing. 2020; 37(5): 321-9. PMid:32659198 https://doi.org/10.1177%2F1043454220938355

[34] Ranjbar K, Sabetsarvestani R, Oghlaee H, et al. Using electronic software for nursing documentation in nursing students. Florence Nightin-

gale Journal of Nursing. 2021; 29(2): 128-36. PMid:34263231 https://doi.org/10.5152/FNJN.2021.20077

[35] Akhu-Zaheya L, Al-Maaitah R, Bany Hani S. Quality of nursing documentation: Paper-based health records versus electronic-based health records. Journal of Clinical Ursing. 2018; 27(3-4): e578-e89. https://doi.org/10.1016/j.jal.2003.08.005

[36] Mansouri M, Sharifi F, Varmaghani M, et al. Iranian university students lifestyle and health status survey: study profile. Journal of Diabetes & Metabolic Disorders. 2017; 16(1): 1-10. PMid:29270393 https://doi.org/10.1186/s40200-017-0329-z

[37] European Commission. Survey of Schools: ICT in Education. Final report, country fiches and background material [Online]. Belgium: European Commission 2017 [cited 2017 18th July]. Available from:http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=1814

[38] Coopasami M, Knight S, Pete M. e-Learning readiness amongst nursing students at the Durban University of Technology. Health Sa Gesondheid. 2017; 22(1): 300-6. https://doi.org/10.1016/j.hsag.2017.04.003

[39] Schlebusch CL. Computer anxiety, computer self-efficacy and attitudes towards the internet of first year students at a South African University of Technology. Africa Education Review. 2018; 15(3): 72-90. https://doi.org/10.1080/18146627.2017.1341291

[40] Zaman N, Goldberg DM, Kelly S, et al. The relationship between nurses' training and perceptions of electronic documentation systems. Nursing Reports. 2021; 11(1): 12-27. PMid:34968308 https://doi.org/10.3390%2Fnursrep11010002

[41] Kim H, Dykes PC, Thomas D, et al. A closer look at nursing documentation on paper forms: Preparation for computerising a nursing documentation system. Computers in Biology and Medicine. 2011; 41(4): 182-9. PMid:20846646 https://doi.org/10.1016/j.compbiomed.2010.08.006

[42] Fetter MS. Graduating nurses' self-evaluation of information technology competencies. Journal of Nursing Education. 2009; 48(2): 86-90. PMid:19260400 https://doi.org/10.3928/01484834-20090201-05

[43] Wastiau P, Blamire R, Kearney C, et al. The Use of ICT in Education: a survey of schools in Europe. European Journal of Education. 2013; 48(1): 11-27. https://doi.org/10.1111/ejed.12020

[44] Silva AMA, Mascarenhas VHA, Araújo SNM, Machado RS, Santos AMR, Andrade EMLR. Mobile technologies in the Nursing area. Revista brasileira de enfermagem. 2018; 71(5): 2570-8. PMid:30304191 https://doi.org/10.1590/0034-7167-2017-0513

[45] O'Connor S, LaRue E. Integrating informatics into undergraduate nursing education: A case study using a spiral learning approach. Nurse Education in Practice. 2021; 50: 102934. PMid:33278702 https://doi.org/10.1016/j.nepr.2020.102934

[46] Nsouli R, Vlachopoulos D. Attitudes of nursing faculty members toward technology and e-learning in Lebanon. BMC Nursing. 2021; 20(1): 1-15. PMid:34193112 https://doi.org/10.1186/s12912-021-00638-8

[47] Meum TT, Koch TB, Briseid HS, et al. Perceptions of digital technology in nursing education: A qualitative study. Nurse Education in Practice. 2021; 54: 103136. PMid:34246884 https://doi.org/10.1016/j.nepr.2021.103136