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Impact of ICT knowledge deficiencies on student engagement and academic success at a university in South Africa: Insights from the BUSSE survey

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Abstract

In an era where digital competence is indispensable for academic achievement, many students still struggle with gaps in Information and Communication Technology (ICT) proficiency, potentially undermining their confidence and performance. This study aimed to assess the extent to which ICT knowledge deficiencies influence first-year students' academic engagement, preparedness, and perceptions of institutional support using data from the Beginning University Survey of Students' Engagement (BUSSE) across two key years: 2021 and 2023. This study employed a quantitative research method informed by a descriptive research design. The pragmatic approach to descriptive research influenced the analysis. Although the findings are presented quantitatively through tables, their interpretation and discussion leaned more towards a qualitative approach. The findings reveal that students with weaker ICT foundations experience diminished engagement in digital classroom activities and greater difficulty adapting to technology-driven tasks. Further, the study underscores the critical interplay between ICT proficiency and student confidence, revealing that deficiencies in digital literacy not only hinder academic performance but also negatively affect learners' engagement and adaptability in technology-driven learning environments. These results underscore the urgency of more targeted interventions, such as structured ICT training programs and curriculum enhancements, to equip students with essential digital skills. The study enriches the broader discourse on digital literacy, emphasizing its pivotal role in ensuring student success within increasingly technology-centric educational landscapes.

Keywords: Digital literacy, Higher education, ICT proficiency, Self-efficacy, Student engagement.

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Contribution of this paper to the literature

The findings of this study contribute to ongoing discussions on educational equity, addressing the digital divide and accessibility, and emphasizing the need for strategic investments in infrastructure and skills to enhance student learning experiences. The study advocates for policy reforms, enhanced digital literacy initiatives, and targeted institutional interventions to promote equitable access to educational resources, strengthen student engagement, and improve student retention and success rates.

1. Introduction

The rapid integration of Information and Communication Technology (ICT) in education has transformed teaching and learning methodologies, making digital literacy a fundamental competency for academic success (Broadband Commission for Sustainable Development, 2018; Selwyn, 2017). Institutions increasingly rely on digital platforms, online resources, and technology-enhanced pedagogies, requiring students to possess adequate ICT skills to engage effectively (Howard, Chan, & Caputi, 2018). However, disparities in ICT proficiency persist, with many students lacking the necessary competencies to navigate digital learning environments confidently (Hatlevik & Christophersen, 2013; Siddiq, Scherer, & Tondeur, 2016).

Longitudinal analysis from a survey study by Fraillon, Ainley, Schulz, Friedman, and Duckworth (2020) across 60 countries paints a concerning picture of persistent digital skill gaps despite technological advancements. The study showed that while institutional ICT infrastructure improved dramatically between 2013 and 2018) - with 89% of surveyed schools now providing 1:1 device access compared to just 52% in 2013 - student performance gaps have narrowed by only 11 percentage points. This disparity suggests that mere access to technology cannot compensate for fundamental skill deficiencies. The survey's competency assessments reveal that nearly 40% of students still lack proficiency in essential digital skills like file management, cloud collaboration, and data security - competencies that directly impact academic performance across all subject areas. Most troubling is the finding that these skill gaps follow socioeconomic lines, with students from disadvantaged backgrounds 2.3 times more likely to score in the lowest ICT proficiency quartile, perpetuating cycles of educational inequality (Fraillon et al., 2020).

The current study was conducted at Walter Sisulu University (WSU), a multi-campus institution in South Africa, serving a diverse student population. WSU is characterized by both urban and rural campuses, which present varying levels of infrastructural development and access to academic resources. As a historically disadvantaged institution, WSU faces persistent challenges related to ICT infrastructure, digital accessibility, and learning resource availability, which directly affect student engagement and academic success (Strydom, Kuh, & Mentz, 2021). Walter Sisulu University comprises four campuses: Buffalo City, Mthatha, Butterworth, and Komani. These campuses differ in their levels of ICT development, with urban campuses having relatively better access to technological resources compared to rural campuses, where students often struggle with poor internet connectivity, limited computer labs, and outdated learning tools (Department of Higher Education and Training, 2017). Research has shown that such disparities in infrastructure contribute to uneven student experiences, with students in resource-limited environments reporting lower academic engagement (Czerniewicz & Brown, 2013).

WSU serves as a representative case study of institutions facing ICT infrastructural constraints in South Africa. As part of the national agenda to enhance student success and equity in higher education, understanding the specific challenges faced by WSU students provides insights for policy reforms, strategic investments, and targeted interventions aimed at improving capacity building in ICT infrastructure knowledge and use and student engagement (Council on Higher Education (CHE), 2022).

This study aimed to assess the extent to which ICT knowledge deficiencies influence first-year students' academic engagement, preparedness, and perceptions of institutional support using data from the Beginning University Survey of Student Engagement (BUSSE) collected in 2021 and 2023. The BUSSE Survey provides valuable longitudinal data on students' self-reported ICT knowledge, engagement, and confidence levels. Despite technological advancements over this period, studies suggest that many students continue to struggle with foundational digital skills, negatively impacting their academic performance and adaptability (Fraillon et al., 2020; Scherer, Siddiq, & Tondeur, 2019). This gap raises concerns about equitable access to quality education in increasingly digitized academic settings. By examining trends and correlations between ICT deficiencies and student engagement over the two years, the research sought to provide evidence-based recommendations for improving student capacity building in the use of technology in higher education.

2. Literature Review

Digital literacy is becoming a crucial skill for academic achievement due to the quick integration of information and communication technology (ICT) in education, which has changed teaching and learning approaches (Broadband Commission for Sustainable Development, 2018; Selwyn, 2017). As educational institutions depend more and more on digital platforms, online resources, and technology-enhanced pedagogies, students must be proficient in ICT in order to participate successfully (Howard et al., 2018). ICT competency gaps still exist; nonetheless, many students missing the skills needed to comfortably traverse digital learning settings (Hatlevik & Christophersen, 2013; Siddiq et al., 2016). ICT has actively changed pedagogical paradigms and reorganised learning environments, as Selwyn (2017) persuasively argues, rather than just augmenting traditional education. The most obvious example of this change is the extensive use of digital tools that have completely changed the educational process. The development of AI-driven educational software, such as intelligent tutoring platforms and adaptive learning systems, which offer previously unheard-of levels of individualised instruction, has been perhaps the most revolutionary (Howard et al., 2018).

All student populations do not, however, fully benefit from these technologies' revolutionary potential. Large-scale international studies by Fraillon et al. (2020) show that students' digital literacy levels, which differ greatly among demographic groups, continue to be a major determinant of the efficacy of digital learning tools. This heterogeneity leads to what academics refer to as the "second-level digital divide," in which differences in digital abilities result in different educational outcomes even in cases when access to technology is equal. Low-income

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students, students from rural areas, and members of several ethnic minority groups are among the marginalised student populations that frequently join digital learning environments with less developed ICT competencies, placing them at an initial disadvantage. This situation highlights the necessity of comprehensive digital literacy initiatives and poses important considerations regarding the equity implications of education's digital transition.

2.1. ICT Knowledge Deficiencies and Student Engagement

Student engagement is a critical determinant of academic success in higher education institutions (Kuh, 2009; Mutoni Uwase, 2025). However, knowledge deficiencies, particularly ICT proficiency, pose significant barriers to effective student engagement and learning outcomes (Beetham & Sharpe, 2019). Limited access to modern technology, inadequate digital learning tools, and insufficient institutional support contribute to decreased student preparedness and lower levels of academic confidence (Czerniewicz & Brown, 2013; Makibinyane & Khumalo, 2021). Given the increasing reliance on digital learning environments, it is crucial to examine how these knowledge limitations impact first-year students' engagement and overall university experience. Numerous studies have shown how difficult it is for students with little ICT proficiency to succeed in digital learning environments. According to Hatlevik and Christophersen (2013) groundbreaking study, students who lacked fundamental digital skills often had significant trouble using online learning environments, which frequently led to their disinterest in the course material. This disengagement shows up in a variety of ways, such as a general retreat from technology-mediated learning experiences, a decline in involvement in virtual classroom activities, and a reluctance to use digital resources.

Inadequate ICT skills have serious psychological and academic repercussions in addition to basic technical issues. According to Scherer et al. (2019), students who have trouble using digital tools frequently feel more anxious and frustrated when trying to finish online assignments, which can have a number of detrimental effects. These students turn in assignments late more frequently (42%), participate in online conversations at significantly lower rates (about 37% lower than their peers who are skilled with technology), and drop out of entirely online courses at a rate that is 28% higher. Many students, especially those from non-technical backgrounds, become overwhelmed by the dual-task scenario created by the cognitive burden imposed by concurrently learning course content and struggling with foreign technologies.

Longitudinal data from a survey study conducted on the relation between 21st-century skills and digital skills from the year 2000 to 2016 by van Laar, van Deursen, van Dijk, and de Haan (2017) provides compelling evidence of the persistent nature of this inadequate ICT proficiency challenge. The survey reveals that while overall ICT access has improved dramatically, self-reported competency gaps continue to correlate strongly with academic engagement metrics. Students rating their digital skills as "below average" were 3.2 times more likely to report low motivation in technology-enhanced courses compared to their more skilled counterparts (van Laar et al., 2017). This motivation gap appears particularly pronounced in courses requiring advanced digital skills such as data analysis, multimedia creation, or collaborative online projects.

2.2. ICT Proficiency and Academic Success

In today's technologically advanced educational environment, a substantial body of research has demonstrated that ICT literacy is a critical factor in determining academic achievement. Students' digital literacy skills and overall academic performance showed a substantial positive association ($r = 0.56$) in the meta-analysis by Siddiq et al. (2016), which covered 78 international studies. The effects were especially noticeable in STEM and business subjects. Technology-dependent tasks, which are already commonplace in the current curriculum, are where this relationship is most evident. As demonstrated by their 23% higher scores when assessing source reliability and synthesising digital information, students with strong digital skills routinely outperform their peers in projects requiring sophisticated online research capabilities (Cabi, 2018). Similarly, these students demonstrate clear benefits in data-analysis tasks, completing statistical exercises 15% more accurately and 37% faster when using digital tools. Their improved capacity to produce polished multimedia presentations that include interactive features, video, and data visualisations leads to assessment scores that are, on average, 1.5 grade points higher than those of their less tech-savvy peers.

The academic penalties for ICT knowledge deficiencies are equally well-documented and multifaceted. Broadband Commission for Sustainable Development (2018) global study revealed that students lacking basic digital skills require 28% more time to locate and access online learning resources, creating cumulative disadvantages throughout a course. These students face challenges with digital assignment submission systems, with error rates 3 times higher than proficient users, often resulting in late penalties or failed submissions. Virtual collaboration presents another significant hurdle, as evidenced by 42% lower participation rates in online group projects among students with poor ICT skills. These compounded difficulties frequently translate into substantial grade differentials, with ICT-deficient students averaging 0.8 GPA points lower in fully online courses compared to traditional classroom settings. These findings collectively underscore that in an era where digital fluency has become as fundamental as traditional literacy, ICT competency operates as both an academic enabler and potential barrier. The research clearly indicates that educational institutions must move beyond simply providing technology access to implementing comprehensive, curriculum-integrated digital skill development programs. Without such intentional interventions, the promise of technology-enhanced education may remain unrealized for significant student populations, potentially exacerbating rather than alleviating existing achievement gaps. To mitigate the impact of ICT deficiencies, researchers recommend targeted interventions such as:

- Mandatory digital literacy programs in early education (Hatlevik & Christophersen, 2013).
- Faculty training to better support students with varying ICT skill levels (Scherer et al., 2019).
- Adaptive learning technologies that personalize instruction based on competency (Howard et al., 2018).

This study is premised on the Technology Acceptance Model (TAM) (Davis, 1989). TAM key concepts are based on Perceived Usefulness (PU) & Perceived Ease of Use (PEOU). In this study, its application is that if students perceive digital tools as difficult to use (low PEOU) or irrelevant (low PU), they are less likely to engage with them. ICT knowledge deficiencies reduce PEOU, leading to avoidance behaviours, and institutional training can enhance PU and PEOU, improving adoption. This framework is supported in a similar study by Venkatesh and Bala (2008)

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who showed that training improves PEOU in educational technology and also Cabi (2018) who found that for students with low digital literacy rate learning management systems (LMSs) platforms are harder to use.

3. Research and Methodology

This study employed a quantitative research approach informed by the descriptive research design to examine the impact of ICT knowledge deficiencies on first-year students' academic engagement, preparedness, and university experience. Descriptive research can be either quantitative or qualitative and when quantitative, it relies primarily on low-inference, low-assumption methods that use no or minimal statistical adjustments with basic frequency analysis presented through figures, tables and charts (Ghanad, 2023; Loeb et al., 2017). The pragmatic approach of descriptive research influenced the analysis, where although the findings are presented quantitatively through tables, the interpretation and discussion of the findings leaned more towards a qualitative approach.

The study utilised data from the Beginning University Survey of Student Engagement (BUSSE), a standardised instrument designed to assess first-year students' expectations, academic preparedness, and institutional support, which is part of a broader South African Survey of Student Engagement (SASSE) project (McCormick, Kinzie, & Gonyea, 2013; Tiroyabone & Strydom, 2021). The quantitative data are interpreted and discussed qualitatively.

3.1. Data Collection

Data were collected from first-year students across multiple campuses in 2021 and 2023 through the BUSSE survey. The survey measured students' perceptions of institutional support, knowledge of the use of digital resources, availability of technology, and academic engagement levels. Given the importance of technology in modern higher education, a specific focus was placed on students' ability to use ICT resources and their impact on engagement (Trowler, 2010).

The study adhered to ethical research guidelines, ensuring, anonymity, and confidentiality of all student respondents (Bryman, 2016; Kang & Hwang, 2023). Informed consent was obtained electronically from all participants, who were required to click on a preliminary consent statement confirming their agreement to participate before accessing the survey. Participation in the survey was voluntary, and data were analyzed in aggregate to protect individual identities

3.2. Population and Sample

The study focused on first-year students enrolled at WSU in 2021 and 2023, utilising data from BUSSE. First-year students were selected because they are in a transitional phase, adapting to the university environment, and their engagement is significantly influenced by both abilities to use institutional ICT infrastructure and support systems (Kuh, 2009). The sample included students from across WSU's campuses to ensure comparability and generalisability of findings. Given the institutional challenges associated with resource availability, this study provides empirical evidence on how ICT knowledge disparities impact students' preparedness, confidence, and engagement in their academic journey. A total of 407 graduates participated in the 2021 survey, increasing substantially to 952 participants in 2023, representing more than a twofold increase in sample size and providing a broader representation of the student population. Across both survey periods, female students constituted the majority of respondents.

In 2021, 57% (n=230) of participants identified as female, compared to 42% (n=172) who identified as male, while 0.2% (n=1) identified as another gender identity and 0.5% (n=2) preferred not to disclose their gender. Similarly, in 2023, female participation remained dominant at 59% (n=552), while male participants accounted for 40% (n=376). A very small proportion identified as another gender identity (0.3%, n=3) and preferred not to respond (1%, n= 12), indicating a relatively consistent gender distribution across both cohorts. The overwhelming majority of respondents in both years were first-generation university students. In 2021, 88% (n=359) reported being first-generation students, increasing slightly to 90% (n=848) in 2023. This consistently high proportion of first-generation students highlights the institutional significance of understanding and addressing the unique academic, social, and digital challenges experienced by this student population.

3.3. Data Analysis

For data analysis, descriptive and inferential statistical analyses were conducted through the descriptive research approach, which relies primarily on low-inference, low-assumption methods that use no or minimal statistical adjustments, with basic frequency analysis presented through figures as a particularly useful tool (Loeb et al., 2017; Ndebele & Mbodila, 2025).

Frequency distributions provided an overview of students' experiences in a way that is easy to understand and interpret (Alabi & Bukola, 2023; Ghanad, 2023). The quantitative data were then analysed qualitatively for the purposes of discussion of findings.

4. Findings and Discussion

4.1. Findings

The analysis of BUSSE survey data from first-year students at Walter Sisulu University (WSU) in 2021 and 2023 revealed significant trends regarding the impact of ICT knowledge deficiencies on student engagement and academic success. The findings presented below highlight the knowledge deficiency challenges faced by students in resource-constrained environments and their implications for institutional policy and student support services.

4.2. Capacity to Use the University's Learning Management System (LMS)

The first question sought to establish students' ability to use the university's learning management system and the data for the two groups are presented in Tables 1a and 1b.

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Table 1a. Capacity to use the university's learning management system (LMS) 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	11	6.4	16	7	27	7
I am struggling	27	15.8	27	12	54	13
Not that skilled, but I can manage	112	65.5	157	69	269	68
Very skilled	21	12.3	27	12	48	12.0
Total	171	100	227	100	398	100.0

Table 1b. Capacity to use the university's learning management system, 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	20	5	37	7	57	6
I am struggling	58	16	92	17	150	17
Not that skilled, but I can manage	234	64	347	64	581	64
Very skilled	56	15	64	12	120	13
Total	368	100	540	100	908	100.0

Findings presented in Tables 1a and 1b show that 20% of the 2021 cohort were either not skilled at all or struggling, while 23% of the 2023 cohort also reported being either not skilled or struggling. Meanwhile, 68% of the 2021 cohort, although not adequately skilled, could manage. Regarding the 2023 cohort, 64% could also manage, although they were not highly skilled.

When these figures are combined, it is alarming to note that 88% of the 2021 student cohort and 87% of the 2023 cohort were either not skilled at all, struggling, or not highly skilled. Only 12% of the 2021 first-entering student cohort and 15% of the 2023 first-entering student cohort were very skilled at using the university's learning management system. This is of critical concern because this occurred during the COVID-19 pandemic, when students had to learn mostly remotely and online.

This likely had a negative impact on student engagement with the LMS and, consequently, student success. Regarding gender variation for this question, more males reported being very skilled (15%) than females (12%) in the 2023 cohort, while the percentage of very skilled participants was equal between males and females in the 2021 cohort, at 12%.

4.3. Student Basic Computer Literacy Skills

A question was posed to assess the extent to which participants possessed basic computer skills such as using a mouse and typing. Tables 2a and 2b illustrate the participants' sentiments on this matter.

Table 2a. Student basic computer skills 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	7	4	12	5	19	5
I am struggling	28	17	27	12	55	14
Not that skilled, but I can manage	81	48	123	54	204	51
Very skilled	53	31	64	28	117	30
Total	169	100	226	100	395	100

Table 2b. Student basic computer skills 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	12	3	32	5.9	44	5
I am struggling	47	13	75	13.8	122	13
Not that skilled, but I can manage	177	48	290	53.6	467	52
Very skilled	132	36	144	26.7	276	30
Total	368	100	541	100	909	100

Findings from Tables 2a and 2b show that 19% and 18% of the two cohorts, respectively, were either not skilled at all or struggling. Furthermore, 51% and 52%, respectively, although not highly skilled, could manage. The combined percentage for those who were not skilled at all, were struggling, or were not skilled but could manage (70% for each cohort) again indicates the extent of knowledge deficiencies in the use of ICT resources among the two cohorts. Thirty percent of the students in both cohorts felt very skilled in computer literacy. Overall, the findings from Tables 2a and 2b indicate that the majority of the students in the two cohorts had deficient knowledge of basic computer literacy.

Gender disparity in knowledge deficiency was apparent in responses to this question, with 31% of males in the 2021 cohort reporting that they were very skilled, compared with 28% of females, and 36% of males in the 2023 cohort reporting that they were very skilled, compared with 27% of females.

4.4. Capacity to Use the Microsoft Office Package

In order for students to be able to take notes and write assignments, they need knowledge of the Microsoft Office packages. Tables 3a and 3b represent participants' responses to a question that sought to establish participants' capacity to use Microsoft Office packages.

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Table 3a. Capacity to use the Microsoft Office package 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	11	6.4	22	10	33	8
I am struggling	35	20.5	37	16	72	18
Not that skilled, but I can manage	87	50.9	116	51	203	51
Very skilled	38	22.2	51	23	89	23
Total	171	100	226	100	397	100

Table 3b. Capacity to use the Microsoft Office package, 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	12	3.3	40	7	52	6
I am struggling	60	16.2	90	17	150	16
Not that skilled, but I can manage	208	56.2	291	54	499	55
Very skilled	90	24.3	120	22	210	23
Total	370	100	541	100	911	100

Results in Tables 3a and 3b show that 26% of the 2021 cohort and 22% of the 2023 cohort were either not skilled at all or struggling to use the Microsoft Office package. Another 51% and 55%, respectively, although not highly skilled, could manage. In both cohorts, 23% indicated that they were very skilled and, by implication, able to use Microsoft Office packages with ease. Overall, the findings indicate a dire need for capacity building among the 77% in each cohort who were either not skilled at all, struggling, or not highly skilled but able to manage. Regarding the use of Microsoft Office packages, for the 2021 cohort, 22% of males were very skilled, compared with 23% of females; for the 2023 cohort, 24% of males were very skilled, compared with 22% of females.

4.5. Ability to Download Content

Looking at the diversity of information sources available to students to access and download content for their studies, there was a need to gauge students' ability to download such content. Table 4a and 4b present the responses of the participants from the 2021 and 2023 cohorts, respectively.

Table 4a. Ability to download content, 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	6	3.5	12	5	18	4
I am struggling	27	15.8	48	21	75	19
Not that skilled but I can manage	78	45.6	104	46	182	46
Very skilled	60	35.1	63	28	123	31
Total	171	100	227	100	398	100

Table 4b. Ability to download content, 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	9	2.4	35	6	44	5
I am struggling	61	16.5	119	22	180	20
Not that skilled, but I can manage	174	46.9	240	45	414	45
Very skilled	127	34.2	145	27	272	30
Total	371	100	539	100	910	100

Regarding the question of whether students were able to download content, 23% of the 2021 cohort and 25% of the 2023 cohort, respectively, were either not skilled at all or struggled to download content. Forty-six percent of the 2021 cohort and 45% of the 2023 cohort, respectively, although not highly skilled, were able to download content. Thirty-one percent of the 2021 cohort and 30% of the 2023 cohort reported being very skilled and, by implication, able to download content with ease. An analysis of the total number of participants who needed some form of training to download content (69% of the 2021 cohort and 70% of the 2023 cohort) demonstrates the significance of capacity building in the use of ICT resources, which translates into easier use of these resources. When the analysis is disaggregated by gender, more males again reported being very skilled than females (35% of males compared with 28% of females in the 2021 cohort, and 34% of males compared with 27% of females in the 2023 cohort).

4.6. Competency in Using the Internet for Academic Purposes

To pursue their studies, acquire relevant disciplinary knowledge, and submit assignments, students need to use online resources accessed through various search engines on the World Wide Web. A survey question sought to determine the extent to which students could use the internet for academic purposes, and the results are presented in Tables 5a and 5b.

Table 5a. Competency in using the internet for academic purposes, 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	2	1.2	4	2	6	2
I am struggling	23	13.4	16	7	39	10
Not that skilled, but I can manage	77	45.1	100	44	177	44
Very skilled	69	40.3	107	47	176	44
Total	171	100	227	100	398	100

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Table 5b. Competency in using the internet for academic purposes, 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	4	1.1	10	2	14	2
I am struggling	26	7.1	39	7	65	7
Not that skilled but I can manage	167	45.4	226	42	393	43
Very skilled	171	46.4	264	49	435	48
Total	368	100	539	100	907	100

The findings presented in Tables 5a and 5b show that 10% of the 2021 cohort were either not skilled at all or were struggling, while 9% of the 2023 cohort were also reported as being either not skilled or struggling. Meanwhile, 44% of the 2021 cohort, although not adequately skilled, could use the internet for academic purposes. Regarding the 2023 cohort, 43% could also use the internet for academic purposes, although they were not highly skilled. When these figures are combined, a total of 56% of the 2021 cohort and 52% of the 2023 cohort were either not skilled at all, struggling, or not highly skilled. Forty-four percent of the 2021 first-entering students and 48% of the 2023 first-entering students were very skilled in using the internet for academic purposes. Regarding gender differences for this question, more females reported being very skilled: 47% compared with 40% of males in the 2021 cohort, and 49% compared with 46% of males in the 2023 cohort.

4.7. Using the Library's Digital Resources

Related to the question on competency in using the internet for academic purposes was a question on students' ability to use library digital resources. The university houses several digital resources and subscribes to several databases to enable easy access to information for students. Results are presented in Tables 6a and 6b.

Table 6a. Using the library's digital resources 2021 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	9	5	18	7.9	27	7
I am struggling	30	18	28	12.3	58	15
Not that skilled, but I can manage	91	53	121	53.3	212	53
Very skilled	41	24	60	26.5	101	25
Total	171	100	227	100	398	100

Table 6b. Using the library's digital resources 2023 cohort.

Response categories	Males		Females		Total	
	Number	%	Number	%	Number	%
I am not skilled in this at all	8	2	30	5.5	38	4
I am struggling	62	17	75	13.8	137	15
Not that skilled, but I can manage	184	50	271	50	455	50
Very skilled	116	31	166	30.7	282	31
Total	370	100	542	100	912	100

Regarding the question of whether students were able to use the library's digital resources, 22% of the 2021 cohort and 19% of the 2023 cohort, respectively, were either not skilled at all or struggled to use the library's digital resources. Fifty-three percent of the 2021 cohort and 50% of the 2023 cohort were not highly skilled but could nevertheless use the library's digital resources. Twenty-five percent of the 2021 cohort and 31% of the 2023 cohort reported that they were very skilled and, by implication, able to use the library's digital resources with ease. An analysis of the total number of participants who were either not skilled at all, struggling, or not highly skilled in using the library's digital resources revealed that 75% of the 2021 cohort and 69% of the 2023 cohort fell into these categories. Gender disaggregation of the data shows that more females (26%) than males (24%) were able to use the library's digital resources in the 2021 cohort, while an equal proportion of both genders (31%) reported this ability in the 2023 cohort.

5. Discussion

5.1. Proficiency in Using the University's Learning Management System (LMS)

The University's learning management system is the official platform for blended learning at the university, and it is critical that all students be able to navigate and use it. The fact that 88% of the 2021 student cohort and 87% of the 2023 cohort were either not skilled at all, struggling, or not very skilled highlights the need for capacity building on the LMS. This lack of proficiency likely had a negative impact on students' engagement with the LMS and, consequently, on their academic success. As the literature shows, students' comfort and proficiency with the use of digital tools, such as online learning systems, can have a negative impact on their ability to learn effectively in an online environment (Dimo et al., 2024; She, Ma, Jan, Sharif Nia, & Rahmatpour, 2021) One of the key components of the Technology Acceptance Model is perceived ease of use which posits that if people perceive technology as easy to use, they will be keen and motivated to use it (Barz, Benick, Dörrenbächer-Ulrich, & Perels, 2024; Toros, Asiksoy, & Sürücü, 2024). Thus, if students found the LMS easy to use because they had been adequately trained on its use, they would engage and collaborate with ease on the system.

5.2. Student Basic Computer Literacy Skills Including Use of the Microsoft Office Package

For students to be able to leverage technology to take notes and write assignments, they need basic computer literacy skills like using the mouse, typing and knowledge of the Microsoft Office packages such as Word, Excel, and PowerPoint. As Yang and Lou (2026) argue. If users believe that a technology is easy to learn and use, they are more

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likely to accept it. The combined percentage finding for those who were not skilled at all, struggling and not skilled in terms of basic computer literacy, such as typing and knowledge of Microsoft Office, of over 70% for each cohort indicates the extent of knowledge deficiencies in the use of ICT resources by the two cohorts. Such poor sense of self-efficacy in computer literacy among students has a negative impact on their ability to use such digital tools. Self-efficacy, which refers to the degree to which students believe in their abilities to use technology-related tools for learning (He, Chen, & Kitkuakul, 2018; Liwanag & Galicia, 2023; Pan, 2020), is strongly aligned with the Technology Acceptance Model tenet of perceived ease of use. Training of students in basic computer literacy and the Microsoft Office package will help improve their self-efficacy, resulting in motivation to use digital tools for learning.

5.3. Competency in Using the Internet for Academic Purposes Including Downloading Content

For students to go about their studies, access relevant disciplinary knowledge and submit assignments, they need to access online resources through various search engines on the World Wide Web and download such online content for offline use. Looking at the diversity of information sources available to students to access and download content for their studies on the internet, appropriate training needs to be provided for them to perform these tasks with ease. An analysis of the total number of participants who needed some form of training to use the internet for academic purposes in general and to download content in particular (56% & 69% for the 2021 cohort and 52% and 70% for the 2023 cohort, respectively) demonstrates the significance of capacity building in the use of ICT resources, which will translate to ease of use of the resources. Without sufficient digital literacy skills and knowledge, students find it challenging to use online databases and other digital tools, which by implication limits their access to knowledge that is crucial for academic performance (Agina-Obu & Okwu, 2023; Carretero, Vuorikari, & Punie, 2017). In this regard, Agina-Obu and Okwu (2023) advise institutions of higher learning to train their students in digital literacy and the skills to efficiently explore and use internet resources.

5.4. Ability to Use the Library's Digital Resources

Related to the issue of competency in using the internet for academic purposes, the university houses several digital resources and subscribes to several databases to enable easy access to information by students. Digital libraries provide new opportunities for students to instantly access the most pertinent informational sources using digital library items (Meeramani, Lakshmi, Swapna, Duragannavar, & Sharmila, 2023). As Francis (2023) shows, through search features and indexing capabilities, e-resources make it easier to retrieve information quickly and effectively, saving them time and effort. An analysis of the total number of participants who were either not skilled at all, struggling and not that skilled in using library digital resources revealed 75% for the 2021 cohort and 69% for the 2023 cohort, signalling the need for orientation and training on the use of library digital resources. Recent studies also confirm a lack of student digital skills to use digital library resources. Meeramani et al. (2023) argue that many students are unfamiliar with how to obtain and borrow digital resources like those from an electronic database or a digital library because they are used to the traditional reading mode and borrowing format. A study by Ruzegea and Msonde (2021) regarding Information Literacy (IL) and Information Technology (IT) revealed that students had limited IL and IT competencies, and this hindered them in carrying out effective literature searches and retrieval of e-resources. To overcome these digital literacy challenges and make good use of electronic resources, Francis (2023) calls for academic libraries to invest in staff professional development and ongoing training of both staff and students.

5.5. Gender and Knowledge Deficiencies

The issue of gender disparity in knowledge deficiency was apparent in this study. In six of the seven questions regarding ICT knowledge deficiencies among the 2021 cohort, more males than females were skilled in using ICT tools. Similarly, although there was a slight improvement in the 2023 cohort, more males were still skilled in ICT use in three questions; there was an equal distribution in two questions, and more females than males were skilled in two questions. The issue of gender highlights the need to encourage gender discussions to remove gender stereotypes at the university. These findings are consistent with those of another related study.

A systematic review of studies conducted on gender and ICT by Campos and Scherer (2024) showed that boys were more likely than girls to have access to a computer at home from their primary school years onwards and that this persisted in secondary schools across educational systems. Another longitudinal study reported in the literature was conducted with a sample of 15-year-old students to investigate the effects of gender on ICT literacy and its evolution over time. At the beginning of the study, there were no significant gender differences, but boys had a higher ICT literacy than girls after three years (Campos & Scherer, 2024; Gnambs, 2021). Similarly, Tondeur, Van de Velde, Vermeersch, and Van Houtte (2016) conducted a large-scale survey involving 1138 university students in Flanders, Belgium, to examine the relationship between gender, computer access, attitudes, and uses in both learning and everyday activities of university students. The results showed that women had a less positive attitude towards computers in general.

6. Conclusion and Recommendations

The findings of this study contribute to ongoing discussions on educational equity and digital accessibility, emphasising the need for strategic investments in infrastructure to enhance student learning experiences. The study advocates for policy reforms, increased digital literacy initiatives, and targeted institutional interventions to ensure equitable access to educational resources and improve student retention and success rates (Selwyn, 2017; Tinto, 2017). Furthermore, the study underscores the critical interplay between ICT proficiency and student confidence, revealing that deficiencies in digital literacy not only hinder academic performance but also diminish learners' engagement and adaptability in technology-driven environments. Using data from the BUSSE Survey (2021 and 2023), we have identified persistent gaps in foundational ICT skills that directly impact students' self-assurance and learning efficiency. These findings highlight an urgent need for educational institutions to implement targeted interventions to bridge these competency gaps. Empowering students with robust digital literacy is no longer optional but essential for their success in an increasingly technology-centric academic and professional world.

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Based on our analysis, we propose the following recommendations.

Implementation of Mandatory, Tiered ICT Foundation Programs:

- Institutions must develop a diagnostic tool based on the BUSSE Survey to assess incoming students' ICT competency levels.
- Offer mandatory foundational digital literacy modules for students identified as needing support, while providing advanced, optional modules for proficient students seeking to enhance their skills.

Integration of Digital Literacy into the Curriculum:

- Move beyond standalone ICT courses by embedding digital skills development directly into disciplinary coursework (e.g., using data analysis software in social sciences or simulation tools in engineering).
- This "digital literacy across the curriculum" approach reinforces skills in a relevant, contextualized manner.

Enhancing Faculty Capacity and Support:

- Provide professional development workshops for academics to design assignments and teaching methods that seamlessly integrate and develop essential digital competencies.
- Establish a centralised support hub with digital guides, video tutorials, and peer-to-peer mentoring programmes to provide just-in-time assistance for both students and staff.

Promotion of a Culture of Continuous Digital Upskilling:

- Institutions should regularly update their digital literacy frameworks to align with evolving technological trends and workforce demands.
- Encourage student participation by offering digital badges or micro-credentials for completing advanced ICT modules, adding tangible value to their qualifications.

By implementing these targeted strategies, universities can transform from merely using technology to actively cultivating a confident, digitally fluent student body, ultimately ensuring equitable participation and success in the digital age. This research contributes to the ongoing discourse on educational equity and digital inclusion, advocating for systemic changes that foster resilient and future-ready learners.

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