Digital Divide in a New Generation: Assessing ICT Access, Skills, and Attitudes Towards E-Learning Among Pioneer Nursing Students at Abdulrashid Dankoli College of Nursing Sciences Northern Nigeria

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ABSTRACT

For nursing students in Northern Nigeria, access to digital tools and the skills to use them often determine whether e-learning becomes an opportunity or an obstacle. This combination of aspiration and constraint shapes what equitable digital integration requires.

Objective: This study examined ICT access, digital literacy, and e-learning readiness among pioneer nursing students at a newly established college. A descriptive cross-sectional survey was conducted with all 35 pioneer National Diploma nursing students enrolled in the 2025/2026 academic session at Abdulrashid Dankoli College of Nursing Sciences, Kaduna, Nigeria. Data were collected using a structured questionnaire measuring ICT access, digital literacy (8 items, $\alpha = 0.87$), and attitudes based on the Technology Acceptance Model (10 items, $\alpha = 0.91$). Quantitative data were analyzed using descriptive statistics, Mann-Whitney U, Kruskal-Wallis tests, and Spearman's rho. Qualitative open-ended responses were analyzed using reflexive thematic analysis (Braun & Clarke, 2021). Smartphone ownership was near-universal (94.3%), but laptop ownership was critically low (14.3%). Data cost was the primary barrier (57.1%). Digital literacy was highest for evaluating online health information (median = 4.0/5) and lowest for spreadsheet use (median = 2.0/5). A significant digital skills gradient existed by residence type ($H(2) = 6.84$, $p = 0.033$) and prior digital exposure ($U = 52.5$, $p = 0.002$, $r = 0.51$). Laptop owners scored significantly higher than smartphone-only users ($U = 15.5$, $p = 0.004$, $r = 0.49$). Despite skills gaps, students demonstrated high Perceived Usefulness of e-learning (median = 4.2/5). Qualitative analysis generated three themes: precarious connectivity, aspiration amid adversity, and institutional responsibility. Pioneer nursing students exhibit a mobile-first access pattern with significant second-level digital divide challenges. Targeted institutional interventions including campus Wi-Fi, subsidized data, device loan schemes, and foundational digital skills training are urgently needed to ensure inclusive digital transformation from the institution's inception.

Keywords: digital divide, e-learning readiness, digital literacy, nursing education, Nigeria, Technology Acceptance Model

METHODOLOGY

Research Design and Setting

This study employed a descriptive cross-sectional survey design, appropriate for providing a baseline assessment of digital literacy and e-learning readiness at a single time point (Setia, 2016). The study was conducted at Abdulrashid Dankoli College of Nursing Sciences, Kaduna a newly established private college in Chikun Local Government Area, Northern Nigeria where digital infrastructure remains in the developmental phase. At the time

of data collection, the college had a dedicated computer laboratory that was not optimally utilized, and Wi-Fi was limited to the administrative block. Students relied entirely on personal mobile data for internet access.

Participants and Sampling

The study population comprised all pioneer National Diploma I (ND I) nursing students enrolled in the 2025/2026 academic session (N=35). A census sampling approach was adopted to ensure complete representation of this unique cohort (Taherdoost, 2016). Inclusion criteria were age ≥18 years and provision of informed consent. Students absent during data collection or unwilling to participate were excluded.

Data Collection Instrument

Data were collected using a structured, self-administered questionnaire adapted from validated instruments and contextualized for Northern Nigeria's nursing education setting. The instrument comprised five sections:

1. Section A: Socio-demographic profile (7 items)
2. Section B: ICT access and infrastructure (9 items)
3. Section C: Digital literacy skills inventory 8 items measuring self-rated confidence in academic digital tasks on a 5-point Likert scale (1=not confident at all to 5=extremely confident). Internal consistency was acceptable (Cronbach's α=0.87).
4. Section D: Technology Acceptance Model (TAM) items 10 items measuring Perceived Usefulness (4 items), Perceived Ease of Use (2 items), Anxiety (2 items), and Confidence (2 items) on a 5-point Likert scale. Internal consistency was strong (Cronbach's α=0.91).
5. Section E: Perceived barriers and facilitators checklist with an optional open-ended question.

The questionnaire was reviewed for face and content validity by three experts in nursing education and educational technology.

Data Collection Procedure

Participants were recruited during a scheduled lecture session. Following written informed consent, data were collected anonymously using a Google Form questionnaire, which participants completed on their mobile devices in a classroom setting over a single day in February 2026. Participants received a debriefing sheet containing counseling contact information.

Data Analysis

Quantitative Analysis: Data were analyzed using SPSS (version 29) and Microsoft Excel. Descriptive statistics (frequencies, percentages, medians, interquartile ranges) were computed for all variables. Given the small sample size and ordinal nature of Likert-scale data, non-parametric inferential tests were employed:

i. Mann-Whitney U test for two-group comparisons (e.g., gender, prior digital exposure)
ii. Kruskal-Wallis H test for multi-group comparisons (e.g., residence type, school type)
iii. Spearman's rank-order correlation (rho) for associations between continuous variables

Effect sizes (r) were calculated for significant Mann-Whitney U tests, with r=0.1 considered small, 0.3 medium, and 0.5 large (Cohen, 1988). Statistical significance was set at $p < 0.05$.

Qualitative Analysis: Open-ended responses were analyzed using reflexive thematic analysis (Braun & Clarke, 2021). The analysis followed six phases: familiarization with data, systematic coding, generating initial themes,

reviewing themes, defining themes, and writing. Coding was conducted inductively by two independent researchers, with discrepancies resolved through discussion. A reflexive journal was maintained to enhance transparency. Member checking was conducted with three participants to validate theme interpretations.

Ethical Considerations

Ethical approval was obtained from the Institutional Research Ethics Committee of Abdulrashid Dankoli College of Nursing Sciences (approval number: ADCONS/ERC/2026/002). All participants provided written informed consent. Anonymity and confidentiality were maintained throughout.

RESULTS

Digital Literacy Skills Assessment

Table 1 presents students' self-reported digital literacy skills. Internal consistency for the 8-item scale was acceptable (Cronbach's α=0.87). Students demonstrated highest competency in evaluating credibility of health information online (median=4.0, IQR=3.0–4.0) and searching online academic databases (median=3.0, IQR=2.0–4.0). The lowest competencies were in using spreadsheet software (median=2.0, IQR=1.0–3.0) and navigating Learning Management Systems (median=2.0, IQR=2.0–3.5).

Table 1: Digital Literacy Skills (N=35)

Skill	Median	IQR	Interpretation
Using email (sending, receiving, attaching files)	3.0	2.0–4.0	Intermediate
Using word processing (Word, Google Docs)	3.0	2.0–4.0	Intermediate
Using presentation software (PowerPoint, Slides)	3.0	1.5–4.0	Intermediate
Navigating Learning Management System (LMS)	2.0	2.0–3.5	Beginner
Searching online academic databases (Google Scholar)	3.0	2.0–4.0	Intermediate
Evaluating credibility of health information online	4.0	3.0–4.0	High
Participating in live online/video classes	3.0	1.5–4.0	Intermediate
Using spreadsheet software (Excel) for data/charts	2.0	1.0–3.0	Beginner

Note: IQR = Interquartile range; Likert scale: 1=not confident, 5=extremely confident. Source: *Authors' fieldwork (2026)*

Inferential Analysis: Factors Associated with Digital Literacy

Digital Skills by Residence Type: A Kruskal-Wallis H test revealed a statistically significant difference in digital literacy scores across residence types, H(2)=6.84, p=0.033. Post-hoc pairwise comparisons with Dunn's test (Bonferroni-adjusted) indicated that students from urban areas (median=25.0, IQR=22.0–28.0) scored significantly higher than those from rural areas (median=16.0, IQR=14.5–18.5, p=0.028). Semi-urban students (median=22.0, IQR=19.5–24.0) did not differ significantly from either group.

Digital Skills by Prior Digital Exposure: Students who had previously used computers or tablets for academic purposes (n=16) demonstrated significantly higher digital literacy scores (median=27.0, IQR=24.3–29.0) than those without prior experience (n=19, median=19.0, IQR=16.0–22.0). A Mann-Whitney U test confirmed this difference was statistically significant, U=52.5, p=0.002, with a large effect size, r=0.51.

Digital Skills by Device Ownership: Laptop owners (n=5) had significantly higher digital literacy scores (median=28.0, IQR=27.0–30.0) compared to students who relied solely on smartphones for internet access (n=29, median=22.0, IQR=18.0–25.0). Mann-Whitney U=15.5, p=0.004, r=0.49 (medium-large effect).

Association with Prior Device Age: A Spearman's rank-order correlation revealed a moderate positive association between device age (recently of device) and digital literacy, though this did not reach statistical significance (ρ=0.29, p=0.093).

Qualitative Findings: Thematic Analysis

Reflexive thematic analysis (Braun & Clarke, 2021) of open-ended responses (n=28, 80% of sample) generated three overarching themes with associated sub-themes. Table 2 presents the thematic structure with illustrative quotes.

Table 2: Thematic Structure of Qualitative Findings

Theme	Sub-themes	Representative Quote
1. Precarious Connectivity	Data cost anxiety; Network instability; Device inadequacy	*"Sometimes I have data, sometimes I don't. When I don't, I miss important announcements and feel left behind."* (P12, female, rural origin)
2. Aspiration Amid Adversity	Recognition of e-learning value; Self-efficacy despite barriers; Future career orientation	*"I know e-learning is the future of nursing. I want to learn, but I need the college to help us with computers and training."* (P24, female, urban origin)
3. Institutional Responsibility	Demand for infrastructure; Request for structured training; Desire for dedicated support	*"We need someone we can go to when we have problems with the computer or internet. Sometimes we don't even know what questions to ask."* (P7, female, semi-urban origin)

Source: Authors' qualitative data (2026*)*

Theme 1: Precarious Connectivity

Participants consistently described the fragility of their digital access. The cost of mobile data was a persistent source of anxiety, with several students describing a cycle of connectivity followed by disconnection once data was depleted. This precarity was palpable even during the research process: students were observed stepping outside the classroom to find network signal to submit their survey responses, and one student hesitated before clicking submit, asking, "Will this use my data?" a stark reminder that even academic participation carries a tangible cost. Network instability compounded this precarity, particularly for students from rural and semi-urban areas. As one participant explained, "The network in my area is not good. Even when I buy data, sometimes I cannot attend live classes because the network will fail me" (P18, female, rural origin). Device inadequacy further exacerbated these challenges; smartphone-only users described the limitations of working on small screens, with one noting, "Using my phone for assignments is hard. The screen is small and typing long documents takes forever" (P31, female, urban origin).

Theme 2: Aspiration Amid Adversity

Despite material barriers, participants expressed strong motivation to engage with e-learning. This aspiration was grounded in recognition of e-learning's value for nursing education and future careers. One participant articulated: *"I chose nursing because I want to help people. If technology can make me a better nurse, I want to learn it. But I cannot learn if I don't have the tools"* (P5, female, semi-urban origin). Another noted the contrast between aspiration and current reality: *"In secondary school, we only used phones for social media. Now I need to use them for learning. I am trying but I need guidance"* (P14, female, urban origin). This sub-theme of *navigating the transition* highlighted the gap between students' recreational digital use and academic digital demands.

Theme 3: Institutional Responsibility

Students framed the college as having a duty to address digital inequities. This theme encompassed demands for infrastructure (campus Wi-Fi, subsidized data), structured training, and dedicated support personnel. One participant emphasized the need for foundational skills: *"Please the school should teach us how to use computers properly. Some of us never touched a laptop before coming here"* (P22, female, rural origin). Another highlighted the sustainability of support: *"It is not enough to give us training once. We need someone always there to help*

when we have problems" (P9, female, urban origin). The demand for *accountability and equity* was implicit: students recognized that without institutional intervention, those from disadvantaged backgrounds would be left behind.

DISCUSSION

This study provides the first empirical baseline assessment of digital literacy and e-learning readiness among pioneer nursing students in a newly established college in Northern Nigeria. The findings reveal a complex digital landscape characterized by mobile-first access, significant skill disparities, and high psychological readiness a configuration that both enables and constrains equitable e-learning implementation.

The Mobile-First Access Pattern and First-Level Digital Divide

The near-universal smartphone ownership (94.3%) aligns with global trends in Sub-Saharan Africa, where mobile phones have become the primary internet access point (GSMA, 2023). However, the critically low laptop ownership (14.3%) and overwhelming reliance on mobile data (82.9%) represent a first-level digital divide (van Dijk, 2020) that constrains the types of academic activities students can effectively engage in. Smartphone-only access has been shown to limit participation in complex academic tasks such as long-form writing, data analysis, and synchronous video-based learning (Kemp & Henderson, 2024). This finding challenges the assumption that smartphone ownership equates to e-learning readiness a distinction increasingly recognized in the digital divide literature (Helsper & Smirnova, 2023).

The financial precarity described in qualitative findings the cycle of connectivity and disconnection tied to data affordability echoes Asare's (2022) multi-country study, which identified data cost as the most significant barrier to consistent e-learning participation in West Africa. Unlike students in high-income contexts with campus Wi-Fi infrastructure, these students' educational participation is contingent on family resources that may be unpredictable.

Second-Level Digital Divide: Skills Disparities and Their Determinants

The finding that students demonstrate higher competency in *information consumption* skills (evaluating online health information, online searching) but lower competency in *technical/production* skills (spreadsheet use, LMS navigation) is consistent with international nursing education research. Hughes et al. (2019) reported similar patterns among Australian nursing students, noting that self-perceived digital competence often exceeds actual performance on production tasks. This gap is more pronounced in resource-constrained settings where students have limited exposure to productivity software (Mpungose & Khoza, 2022).

The significant digital skills gradient by residence type (urban vs. rural) and prior digital exposure provides evidence of how geographic and socioeconomic factors stratify digital readiness. Rural-origin students in this study scored 36% lower on digital literacy than their urban counterparts a disparity consistent with Mwangi's (2020) Kenyan findings. This gradient suggests that the digital divide is not merely a matter of individual aptitude but reflects accumulated differences in educational infrastructure, home resources, and exposure to technology during formative years (van Deursen & van Dijk, 2019).

Notably, laptop ownership was associated with a 25% higher digital literacy score compared to smartphone-only access. This finding is significant because it suggests that device type shapes skill development, not merely reflects socioeconomic status. Laptops enable engagement with more complex software and multitasking, potentially fostering higher-order digital competencies (Hargittai & Hinnant, 2022). For students entering with smartphones only, the transition to academic digital work may represent not only an access barrier but also a skills barrier that institutional support must address.

Psychological Readiness: High Perceived Usefulness Despite Skills Gaps

The high Perceived Usefulness scores (median >4.0/5 across all TAM items) demonstrate that students strongly value e-learning a critical prerequisite for technology acceptance (Davis, 1989). This finding diverges from some

studies in similar contexts where skepticism about technology's educational value has been reported (Adarkwah, 2021). The difference may reflect the post-COVID normalization of digital learning or the aspirational mindset of pioneer students entering a newly established institution.

The moderate Perceived Ease of Use scores (median range 3.5–4.0) and moderate anxiety about technical problems and online exams (median=3.5) suggest that while students feel capable, they recognize their vulnerability. This pattern aligns with the TAM framework, which posits that PEOU influences behavioral intention through its effect on PU, but also directly affects anxiety and confidence (Venkatesh et al., 2003). The moderate anxiety levels are not inherently problematic some anxiety can motivate preparation but without institutional support, they may undermine engagement (Button et al., 2021).

Integration with Digital Divide Framework

van Dijk's (2020) multi-level digital divide framework provides a useful lens for interpreting these findings:

1. First-level divide (access): Evident in the disparity between smartphone and laptop ownership, the absence of campus Wi-Fi, and the 8.6% of students with no regular internet access.

2. Second-level divide (skills): Starkly illustrated by the variation in digital literacy by residence type ($p=0.033$) and prior exposure ($p=0.002$). The mobile-first access pattern may actually *amplify* second-level divides, as smartphones afford fewer opportunities for developing production-oriented skills.

3. Third-level divide (outcomes): While not directly measured in this cross-sectional study, the skills and access gaps identified strongly suggest that without intervention, academic outcome disparities will emerge. Research in higher education contexts shows that digital skills predict academic performance more strongly than access alone (Helsper & Eynon, 2023).

Critical Engagement with Contradictory Evidence

While this study's findings align with research on digital divides in Sub-Saharan Africa, several factors may explain its specific results. First, the nursing-specific context may require more sophisticated academic digital tasks such as using spreadsheets for clinical data or navigating learning management systems than those in general undergraduate settings. Second, as a pioneer cohort, students may lack the informal peer networks typically developed over time in established institutions.

Similarly, although this study found high perceived usefulness of e-learning, Adarkwah (2021) reported significant resistance among Ghanaian nursing students, citing cultural preferences for face-to-face interaction and skepticism about online assessment fairness. This divergence may be due to temporal effects, such as post-pandemic normalization, or other contextual differences.institutional culture of a newly established college where students are motivated to embrace innovation.

Strengths and Limitations

The small sample size (N=35), while appropriate for a census study of this unique pioneer cohort, limits statistical generalizability. However, the study offers analytical generalizability through its detailed contextual description a newly established college in Northern Nigeria with nascent digital infrastructure. The observed patterns (mobile-first access, a rural-urban skills gradient, and high perceived usefulness despite material constraints) are highly transferable to similar resource-limited nursing and health sciences programs across Northern Nigeria and West Africa.

A key limitation is the use of self-reported skills, which may overestimate actual competencies a known issue in digital literacy research (Mahmood, 2024). This has critical implications for intervention design, as such overestimation could lead to advanced training that assumes foundational skills students lack. Therefore, institutional interventions including the foundational training this study recommends should be based on objective, task-based assessments to ensure they address students' actual needs.

CONCLUSION

For these 35 pioneer nursing students, digital access is defined less by ownership than by inconsistency. Nearly all had smartphones, but laptops were rare. Most relied on mobile data that could run out mid-semester. Their skills mirrored this uneven landscape: they could evaluate health information online but struggled with spreadsheets or learning management systems. Where they came from mattered rural-origin students scored significantly lower on digital literacy than their urban peers and prior exposure to computers shaped what they could do on arrival.

Yet despite these gaps, students saw e-learning as essential. Perceived Usefulness scores were high across the board. They wanted to learn, but they also recognized what stood in their way. In their own words, they asked for infrastructure, training, and someone to turn to when things went wrong.

What does this mean for the college? If digital learning is to be more than an aspiration, institutional investment will be necessary. Campus Wi-Fi, subsidized data, device loan schemes, and foundational skills training are not incidental additions they are prerequisites for equitable participation. The college has a choice: address these gaps now, as it builds its programs from the ground up, or watch them widen over time.

This study is a snapshot, not a verdict, but it provides a crucial baseline. The findings offer a replicable framework for assessing digital readiness in similar contexts. Future research might track these students longitudinally, assess their skills objectively, and evaluate what kinds of support actually make a difference. For now, the message from this cohort is clear: they are ready to learn. What remains to be seen is whether the institution is ready to meet them there.

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