

# DIGITAL DIVIDE AND DIGITAL LITERACY INEQUALITIES AMONG UNIVERSITY STUDENTS IN PAKISTAN: THE ROLE OF SOCIOECONOMIC STATUS, GEOGRAPHIC LOCATION, AND GENDER

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## Abstract

The digital divide the inequality in access to and effective use of digital technologies represents one of the most consequential and under-examined sources of educational inequality in Pakistani higher education. This quantitative, survey-based study examines how three key structural variables socioeconomic status, geographic location (urban versus rural), and gender predict digital literacy skill levels among undergraduate and postgraduate students at multiple public universities across a province in Pakistan. A stratified sample of 200 students was selected using simple random sampling across four public universities. Data were collected using the Digital Literacy Assessment Scale (DLAS), a validated 24-item instrument measuring four dimensions of digital literacy: Basic ICT Skills, Information and Media Literacy, Digital Communication, and Online Safety and Ethics. Descriptive statistical analysis revealed significant and practically meaningful variation in digital literacy scores across all three predictor variables, with students from low socioeconomic backgrounds, rural geographic origins, and female students consistently reporting lower digital literacy across all four dimensions. Basic ICT Skills and Online Safety and Ethics emerged as the most severely underdeveloped dimensions across the sample. These findings constitute evidence of a multi-layered digital divide operating within Pakistani public higher education and offer urgent, evidence-based implications for institutional digital literacy support policy.

## 1. Introduction

Digital literacy the capacity to locate, evaluate, create, and communicate information using digital technologies has emerged as one of the most fundamental competencies for successful participation in contemporary higher education, professional life, and civic society. Universities worldwide have increasingly repositioned digital literacy not as a supplementary technical skill but as a core graduate attribute, integral to students'

capacity to conduct research, engage with digital academic resources, communicate professionally in technology-mediated environments, and navigate the ethical complexities of an increasingly datafied world. In this context, inequalities in digital literacy among university students are not merely a technical inconvenience but a structural source of educational disadvantage with measurable consequences for academic achievement, career readiness, and social mobility.

In Pakistan, where higher education enrollment has expanded rapidly over the past two decades reaching over 1.7 million students by 2022 (Higher Education Commission of Pakistan, 2022) the question of whether this expansion has produced digitally literate graduates is complicated by a deeply entrenched digital divide that operates along three intersecting axes: socioeconomic status, geographic location, and gender. Students from low-income households frequently lack access to personal computing devices, reliable internet connectivity, and the informal digital learning environments such as home computer use and peer technology networks through which digital literacy is typically developed prior to university enrollment. Students from rural areas face compounding disadvantages including infrastructure deficits, limited school-based technology exposure, and reduced access to the digital consumer markets that accelerate informal skill development. Female students, particularly those from conservative rural and semi-urban backgrounds, have historically had more restricted access to digital devices and technology-mediated public spaces, creating gender-specific digital literacy gaps that persist into higher education.

Despite the significance of these intersecting inequalities, empirical research specifically examining the relationship between socioeconomic status, geographic location, gender, and digital literacy skill levels among Pakistani university students remains extremely limited. The available literature consists primarily of small-scale, single-institution studies focused on internet access rather than digital literacy competence, and almost no multi-university provincial studies have been conducted that allow for the kind of cross-institutional, multi-variable comparison necessary to generate policy-relevant insights about the structural determinants of digital literacy inequality in Pakistani higher education.

This study addresses this gap by quantitatively examining how socioeconomic status, geographic location, and gender predict digital literacy levels across four dimensions: Basic ICT Skills, Information and Media Literacy, Digital Communication, and Online Safety and Ethics

among a stratified sample of 200 undergraduate and postgraduate students drawn from multiple public universities across a single province in Pakistan. By generating province-level, multi-institutional empirical evidence on the structural determinants of digital literacy inequality, the study aims to contribute original and policy-relevant findings to the international literature on the digital divide in higher education, and to offer actionable recommendations for university administrators, provincial higher education authorities, and the Higher Education Commission of Pakistan.

### 1.1 Research Objective

The main objective of this study is to examine how socioeconomic status, geographic location, and gender predict digital literacy skill levels across the dimensions of Basic ICT Skills, Information and Media Literacy, Digital Communication, and Online Safety and Ethics among undergraduate and postgraduate students at public universities across a province in Pakistan.

### 1.2 Research Question

How do socioeconomic status, geographic location (urban versus rural), and gender predict digital literacy skill levels including Basic ICT Skills, Information and Media Literacy, Digital Communication, and Online Safety and Ethics among undergraduate and postgraduate students at public universities in Pakistan?

## 2. Literature Review

### 2.1 Conceptualizing the Digital Divide and Digital Literacy

The concept of the digital divide was initially framed as a binary distinction between those who had access to computers and the internet and those who did not (Norris, 2001). This first-generation conceptualization has been substantially refined by subsequent scholarship, which identifies at least three levels of digital inequality: access divides (physical access to devices and connectivity), usage divides (differences in the frequency, diversity, and purposiveness of digital technology use), and skills divides (differences in the competencies required

to use digital technologies effectively and critically) (van Dijk, 2006). For the purposes of higher education research, it is the skills divide operationalized as digital literacy that is most directly consequential for student outcomes, as students may have physical access to devices and connectivity while still lacking the competencies to use them productively for academic purposes.

Digital literacy itself is a multi-dimensional construct that has been variously defined and operationalized across the literature. Gilster (1997) originally defined digital literacy as the ability to understand and use information from a variety of digital sources. Subsequent frameworks have elaborated this definition to encompass a broader range of competencies. For the purposes of this study, four dimensions are operationalized: Basic ICT Skills (foundational device and software operation), Information and Media Literacy (locating, evaluating, and using digital information and media), Digital Communication (effective and appropriate communication through digital channels), and Online Safety and Ethics (protecting personal data, recognizing cyber threats, and behaving ethically online).

## 2.2 Socioeconomic Status and Digital Literacy

Socioeconomic status is one of the most consistently documented predictors of digital literacy both internationally and within developing country contexts. Families with higher incomes are more likely to provide children with early access to personal computing devices, high-speed internet connections, and the informal guidance and modeling that facilitate digital skill development before formal schooling (Warschauer, 2004). Hargittai (2010), in a landmark study of college students in the United States, found that socioeconomic background measured through parental education and household income was a significant predictor of internet skills even after controlling for frequency of internet use, demonstrating that access alone does not eliminate skills-based digital inequality. In the Pakistani context, Malik et al. (2021) found that university students from lower socioeconomic backgrounds consistently scored lower on digital literacy assessments than their wealthier peers, and

were significantly more likely to report using shared devices and mobile data rather than personal computers and broadband usage conditions that constrain the development of complex digital skills.

The mechanisms through which socioeconomic status shapes digital literacy are multiple and self-reinforcing. Lower-income students are more likely to attend under-resourced secondary schools with limited computer labs and technology-trained teachers, reducing their pre-university digital skill development. They are also less likely to use digital technology for creative, productive, or academic purposes as opposed to entertainment and social media a distinction that Livingstone and Helsper (2007) identify as central to the reproduction of digital inequality across socioeconomic groups.

## 2.3 Geographic Location and Digital Literacy

Geographic location specifically the urban-rural divide constitutes a second major structural axis of digital inequality in Pakistan. Rural areas across Pakistan suffer from significantly lower rates of broadband internet penetration, fewer computer labs in schools, greater electricity supply instability, and more limited availability of the technology markets, repair services, and peer networks that support informal digital skill development (Pakistan Telecommunication Authority, 2023). Students who complete their secondary education in rural settings are therefore likely to arrive at university with substantially weaker baseline digital literacy than their urban counterparts, and this disadvantage may be further compounded by the concentration of Pakistan's higher-quality public universities in urban centers, creating a geographic selection effect in which rural students who do reach university may be those who have overcome the greatest structural barriers.

Ahmed and Qazi (2011) examined internet access and use patterns among university students in Pakistan and found significant urban-rural differences in both access frequency and the diversity of digital activities engaged in, with rural students more likely to be first-time computer users at the point of university enrollment. More recent research by Rashid and Mustafa (2019)

confirmed persistent urban-rural gaps in digital literacy among Pakistani university students and identified school-level technology infrastructure as the primary mediating variable through which geographic location exerts its effect on digital literacy at the point of university entry.

#### 2.4 Gender and Digital Literacy

Gender-based digital literacy disparities in Pakistan are rooted in structural inequalities in access to technology, educational opportunity, and social permission to engage with digital public spaces. Female students particularly those from rural and conservative social contexts are more likely to have had restricted access to personal devices, to have attended schools with limited technology infrastructure, and to have experienced social norms discouraging independent and exploratory digital engagement (Hafkin & Huyer, 2007). The World Economic Forum's Global Gender Gap Report (2023) consistently ranks Pakistan among the countries with the largest gender gaps in technology access and participation, reflecting deep structural barriers that do not disappear upon entry to higher education.

Within higher education specifically, Choudhury (2009) found significant gender differences in digital literacy across multiple dimensions, with female students reporting lower confidence and competence in Basic ICT Skills and information search strategies than male students. However, the picture is not uniformly disadvantageous for female students: several studies have found that female students may demonstrate equivalent or superior digital communication skills including email etiquette, online collaboration, and digital writing reflecting differential patterns of technology socialization rather than a simple competence hierarchy (Hargittai & Shafer, 2006). This nuanced pattern underscores the importance of examining gender differences across multiple digital literacy dimensions rather than treating digital literacy as a single undifferentiated construct.

#### 2.5 Digital Literacy Inequalities in Pakistani Higher Education

The intersection of socioeconomic, geographic, and gender-based digital inequalities within Pakistani public universities creates a complex and layered digital divide that has significant implications for academic equity and graduate employability. Iqbal et al. (2020) conducted one of the few multi-university studies of digital literacy in Pakistani higher education and found that first-generation university students who disproportionately come from low-income rural backgrounds scored significantly lower on digital literacy assessments than continuing-generation students, even when enrolled in the same programs at the same institutions. This finding suggests that university enrollment does not automatically neutralize pre-existing digital literacy inequalities and that without deliberate institutional intervention, the digital divide is likely to be reproduced and potentially amplified within the university experience itself.

### 3. Research Methodology

#### 3.1 Research Design

This study employs a quantitative, survey-based research design. A quantitative approach was selected to enable systematic measurement of digital literacy levels across a large, multi-institutional sample and to examine how structural predictor variables socioeconomic status, geographic location, and gender relate to those levels descriptively.

#### 3.2 Population and Sample

The target population comprised all currently enrolled undergraduate and postgraduate students at the four selected public universities. A stratified sample of 200 students 50 from each university was selected using simple random sampling within each institution. The sample was designed to include both undergraduate and postgraduate students, and to capture variation in gender (approximately equal male and female representation), socioeconomic background, and geographic origin.

### 3.3 Research Instrument

Data were collected using a two-section structured questionnaire. Section One gathered demographic information. Section Two comprised the Digital Literacy Assessment Scale (DLAS), a researcher-developed 24-item instrument organized into four six-item subscales measuring Basic ICT Skills, Information and Media Literacy, Digital Communication, and Online Safety and Ethics, rated on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Items were developed by adapting validated scales from Carretero et al. (2017) and Hargittai (2010) to the Pakistani university context, with content validity confirmed by a panel of three digital education experts.

### 3.4 Data Analysis

Data were analyzed using IBM SPSS Statistics (Version 28.0). Descriptive statistics including means, standard deviations, minimum and

maximum values, frequency distributions, and item-level analysis were computed for all four DLAS subscales and the overall scale score. Digital literacy proficiency was categorized as Low (mean 1.00–2.33), Moderate (2.34–3.66), and High (3.67–5.00). Mean subscale scores were compared descriptively across socioeconomic status categories (Low, Middle, High), geographic origin (Urban, Rural), gender (Male, Female), and student level (Undergraduate, Postgraduate) to examine the relationship between each structural variable and digital literacy outcomes.

### 4. Results

Results are organized across three tables. Table 1 presents the demographic characteristics of the sample. Table 2 presents item-level descriptive statistics for all 24 DLAS items. Table 3 presents subscale-level descriptive statistics, proficiency category distributions, and mean scores by key demographic subgroups.

Table 1

*Demographic Characteristics of the Sample (N = 200)*

| Variable             | Category                    | n   | %    |
|----------------------|-----------------------------|-----|------|
| Gender               | Male                        | 101 | 50.5 |
|                      | Female                      | 99  | 49.5 |
| Student Level        | Undergraduate               | 118 | 59.0 |
|                      | Postgraduate                | 82  | 41.0 |
| Geographic Origin    | Urban                       | 108 | 54.0 |
|                      | Rural                       | 92  | 46.0 |
| Socioeconomic Status | Low SES                     | 72  | 36.0 |
|                      | Middle SES                  | 88  | 44.0 |
|                      | High SES                    | 40  | 20.0 |
| Device Ownership     | Personal laptop/desktop     | 94  | 47.0 |
|                      | Shared device               | 61  | 30.5 |
|                      | Mobile only                 | 45  | 22.5 |
| Internet Access      | Home broadband              | 82  | 41.0 |
|                      | Mobile data only            | 79  | 39.5 |
|                      | University/public WiFi only | 39  | 19.5 |

SES = Socioeconomic Status, determined using a composite index of household income, parental education, and device ownership. 22.5% of students rely exclusively on mobile devices for digital access, indicating significant hardware inequality within the sample. Percentages may not sum to 100 due to rounding.

Table 2

*Item-Level Descriptive Statistics: Digital Literacy Assessment Scale (N = 200)*

| Item                                                                 | Item Statement                                                                                                                            | M    | SD   |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------|
| <b>1: BASIC ICT SKILLS   <math>\alpha = .86</math></b>               |                                                                                                                                           |      |      |
| 1                                                                    | I can independently operate a computer or laptop to complete academic tasks such as word processing and spreadsheet use.                  | 3.12 | 1.08 |
| 2                                                                    | I am able to install, update, and troubleshoot commonly used software applications without external assistance.                           | 2.74 | 1.14 |
| 3                                                                    | I can organize and manage files, folders, and digital documents effectively on a computer or cloud storage platform.                      | 3.04 | 1.09 |
| 4                                                                    | I am comfortable using a range of digital tools – including presentation software, data tools, and productivity apps – for academic work. | 2.88 | 1.12 |
| 5                                                                    | I can connect to and configure internet and network settings on a device independently.                                                   | 2.61 | 1.17 |
| 6                                                                    | I am able to use digital tools to create, edit, and share academic content in various formats (text, audio, video).                       | 2.79 | 1.13 |
| <b>2: INFORMATION AND MEDIA LITERACY   <math>\alpha = .84</math></b> |                                                                                                                                           |      |      |
| 7                                                                    | I can effectively search academic databases and digital libraries to find relevant and credible information for my studies.               | 3.28 | 1.04 |
| 8                                                                    | I am able to critically evaluate the reliability, accuracy, and bias of information found online.                                         | 3.41 | 1.01 |
| 9                                                                    | I understand how to correctly cite and reference digital sources in academic work.                                                        | 3.54 | 0.97 |
| 10                                                                   | I can distinguish between peer-reviewed academic sources and non-scholarly digital content.                                               | 3.31 | 1.03 |
| 11                                                                   | I am able to recognize misleading, biased, or fabricated digital content including fake news and misinformation.                          | 3.18 | 1.06 |
| 12                                                                   | I can synthesize information from multiple digital sources to construct a coherent and well-supported academic argument.                  | 3.24 | 1.04 |
| <b>3: DIGITAL COMMUNICATION   <math>\alpha = .83</math></b>          |                                                                                                                                           |      |      |
| 13                                                                   | I can compose professional and academically appropriate emails to instructors and institutional contacts.                                 | 3.61 | 0.94 |
| 14                                                                   | I am comfortable participating in online academic discussions, forums, and collaborative digital platforms.                               | 3.44 | 0.98 |

|                                                                |                                                                                                                                 |      |      |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------|------|
| 15                                                             | I can use video conferencing tools effectively for academic meetings, seminars, and group work.                                 | 3.38 | 1.01 |
| 16                                                             | I am able to collaborate on shared digital documents and projects with peers using cloud-based tools.                           | 3.29 | 1.04 |
| 17                                                             | I understand the norms of professional digital communication and apply them consistently in academic contexts.                  | 3.48 | 0.97 |
| 18                                                             | I can adapt my digital communication style appropriately for different audiences and platforms.                                 | 3.32 | 1.02 |
| <b>4: ONLINE SAFETY AND ETHICS   <math>\alpha = .87</math></b> |                                                                                                                                 |      |      |
| 19                                                             | I understand how to protect my personal data and privacy when using online platforms and services.                              | 2.94 | 1.11 |
| 20                                                             | I am aware of common cyber threats – including phishing, malware, and identity theft – and know how to protect myself.          | 2.81 | 1.14 |
| 21                                                             | I understand and respect intellectual property rights and copyright regulations when using digital content.                     | 2.88 | 1.12 |
| 22                                                             | I behave ethically online, including avoiding plagiarism, respecting others' digital privacy, and citing sources appropriately. | 3.04 | 1.08 |
| 23                                                             | I am aware of the legal and ethical responsibilities associated with creating and sharing digital content.                      | 2.78 | 1.16 |
| 24                                                             | I can recognize and respond appropriately to online harassment, cyberbullying, and digital misconduct.                          | 2.91 | 1.13 |

Items rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Higher scores indicate greater self-assessed digital literacy proficiency. M = Mean; SD = Standard Deviation. Item 9 (M = 3.54) recorded the highest mean across the entire scale. Item 5 (network configuration, M = 2.61) recorded the lowest mean, indicating this as the most critically underdeveloped specific skill in the sample.

Table 3

*DLAS Subscale Descriptive Statistics, Proficiency Distributions, and Mean Scores by Demographic Subgroups (N = 200)*

| Dimension              | M    | SD   | Min  | Max  | Low % | Mod. % | High % | Low SES | Mid SES | High SES | Urban | Rural | Male | Female | $\alpha$ |
|------------------------|------|------|------|------|-------|--------|--------|---------|---------|----------|-------|-------|------|--------|----------|
| Basic ICT Skills       | 2.86 | 0.94 | 1.00 | 5.00 | 38.0  | 47.0   | 15.0   | 2.31    | 2.88    | 3.74     | 3.24  | 2.41  | 3.11 | 2.61   | .86      |
| Info. & Media Literacy | 3.33 | 0.88 | 1.17 | 5.00 | 14.0  | 58.0   | 28.0   | 2.84    | 3.38    | 3.97     | 3.61  | 3.02  | 3.48 | 3.17   | .84      |
| Digital Communication  | 3.42 | 0.84 | 1.33 | 5.00 | 11.0  | 61.0   | 28.0   | 2.96    | 3.47    | 3.98     | 3.64  | 3.17  | 3.54 | 3.30   | .83      |
| Online Safety & Ethics | 2.89 | 0.91 | 1.00 | 5.00 | 36.0  | 49.0   | 15.0   | 2.38    | 2.91    | 3.66     | 3.14  | 2.59  | 3.02 | 2.76   | .87      |

|                    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |     |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| Overall DLAS Score | 3.13 | 0.82 | 1.08 | 4.92 | 18.0 | 58.0 | 24.0 | 2.62 | 3.16 | 3.84 | 3.41 | 2.80 | 3.29 | 2.96 | .93 |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|

*Proficiency categories: Low = mean 1.00–2.33; Moderate = 2.34–3.66; High = 3.67–5.00. SES = Socioeconomic Status. Low SES n = 72, Middle SES n = 88, High SES n = 40. Urban n = 108, Rural n = 92. Male n = 101, Female n = 99. A consistent positive gradient is visible across SES categories for all four dimensions (Low SES < Middle SES < High SES). Rural students score consistently lower than urban students across all dimensions, with the largest gap in Basic ICT Skills (Urban M = 3.24 vs. Rural M = 2.41). Female students score lower than male students across all dimensions, with the smallest gap in Information and Media Literacy and the largest in Basic ICT Skills.  $\alpha$  = Cronbach's alpha; M = Mean; SD = Standard Deviation; Info. = Information; Mod. = Moderate.*

## 5. Discussion

This study was guided by one central research question: How do socioeconomic status, geographic location, and gender predict digital literacy skill levels among undergraduate and postgraduate students at public universities in Pakistan? The descriptive findings provide a comprehensive, multi-dimensional answer: all three structural variables are associated with meaningful and practically significant variation in digital literacy across all four measured dimensions, with the patterns forming a coherent and theoretically interpretable picture of a multi-layered digital divide operating within Pakistani public higher education.

The overall DLAS Mean of 3.13 (SD = 0.82) places the sample's aggregate digital literacy within the Moderate range, with 18.0% of students classified in the Low proficiency category and only 24.0% reaching the High threshold. Basic ICT Skills (M = 2.86) and Online Safety and Ethics (M = 2.89) were the two dimensions closest to the Low-Moderate boundary, indicating that foundational device operation and digital citizenship competencies are the most critically underdeveloped aspects of digital literacy across the sample as a whole. This finding is consistent with the broader South Asian higher education literature, which consistently identifies basic computer operation and cyber safety awareness as the digital literacy dimensions most severely compromised by pre-university technology deprivation (Iqbal et al., 2020; Rashid & Mustafa, 2019).

With respect to socioeconomic status the first predictor variable addressed by the research

question the descriptive data reveal a clear and consistent positive gradient: Low SES students score substantially below Middle SES students, who in turn score below High SES students, across all four digital literacy dimensions and in the overall DLAS score (Low SES M = 2.62, Middle SES M = 3.16, High SES M = 3.84). The largest SES gap is observed in Basic ICT Skills, where Low SES students (M = 2.31) fall below the Low-Moderate threshold while High SES students (M = 3.74) exceed the Moderate-High threshold a difference of 1.43 scale points representing a practically substantial disparity. This pattern directly answers the research question with respect to SES and is consistent with van Dijk's (2006) Resources and Appropriation Theory, which predicts that material resource inequalities in terms of device ownership and connectivity translate into skills inequalities through differential patterns of digital engagement and practice.

Geographic location emerged as the second major predictor, with rural students consistently scoring lower than urban students across all four dimensions (Overall DLAS: Urban M = 3.41 vs. Rural M = 2.80). The largest urban-rural gap was observed in Basic ICT Skills (Urban M = 3.24 vs. Rural M = 2.41), where rural students fall solidly within the Low proficiency range a finding directly consistent with Ahmed and Qazi's (2011) documentation of first-time computer use at university enrollment among rural Pakistani students and with PTA (2023) data on infrastructure deficits in rural areas. The relatively smaller urban-rural gap in Information and Media Literacy (Urban M = 3.61 vs. Rural M = 3.02) may

reflect the mobile internet-mediated information access that has partially bridged the geographic information divide even in areas with limited broadband infrastructure, though the quality of information engagement enabled by mobile-only access remains substantially below that supported by computer and broadband connectivity.

Gender differences in digital literacy, the third predictor examined by the research question, are present across all four dimensions, with male students consistently outscoring female students (Overall DLAS: Male  $M = 3.29$  vs. Female  $M = 2.96$ ). The largest gender gap appears in Basic ICT Skills (Male  $M = 3.11$  vs. Female  $M = 2.61$ ), consistent with the literature on gendered technology socialization in Pakistan (Hafkin & Huyer, 2007) and reflecting the documented restriction of female students' access to computers and independent digital exploration in conservative social contexts. Notably, the gender gap was smallest in Information and Media Literacy (Male  $M = 3.48$  vs. Female  $M = 3.17$ ), suggesting that mobile internet-mediated information access and social media use platforms on which female students in Pakistan are increasingly active may be partially narrowing the gender information literacy gap even as hardware and skills gaps persist in other dimensions.

## 6. Conclusion

This study examined how socioeconomic status, geographic location, and gender predict digital literacy levels across four dimensions among 200 undergraduate and postgraduate students at public universities across a province in Pakistan. The findings demonstrate that all three structural variables are associated with practically significant and consistent digital literacy inequalities, with the most severe deficits concentrated in Basic ICT Skills and Online Safety and Ethics. Low SES, rural origin, and female gender each independently predict lower digital literacy across all four dimensions, and the intersection of multiple disadvantaged statuses low SES, rural, female is likely to be associated with the most severe digital literacy deficits, though the

descriptive design of this study does not permit formal testing of interaction effects.

This study is delimited to undergraduate and postgraduate students at four public universities within a single province of Pakistan and relies on self-reported digital literacy assessments, which may be subject to social desirability bias and Dunning-Kruger effects whereby students with the lowest actual digital literacy may overestimate their competence. The cross-sectional, descriptive design does not permit causal conclusions. Future research should supplement self-report data with objective digital literacy assessments and extend the sampling frame to multiple provinces to enable nationwide generalization.

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