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Computer Literacy and Digital Access among College Students in Ahmedabad District: An Empirical Study

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Abstract

This study examines computer literacy and digital access among college students in Ahmedabad District, Gujarat, with particular emphasis on differences associated with demographic characteristics, personal computer/laptop access, and formal computer-training exposure. We adopted a cross-sectional empirical design and collected data through an online structured questionnaire using convenience sampling. After applying the residence-based screening criterion, we retained 163 valid responses for analysis. We assessed computer literacy using an eight-indicator composite measure with a possible score range of 0 to 12, and digital access in terms of smartphone/tablet, personal computer/laptop, and internet access. The findings indicate that digital access was generally high (M = 2.40, SD = 0.49), but demonstrated computer literacy was comparatively limited, with a mean score of 5.74 (SD = 3.49; 47.85%) and 57.06% of respondents classified in the low-literacy category. The computer-literacy scale demonstrated strong internal consistency (Cronbach's α = .871). Mann–Whitney U tests showed significant differences in computer literacy by area of residence, PC/laptop access, and formal computer-training exposure, but not by gender. Kruskal–Wallis tests further indicated significant differences across age, monthly family income, academic status, sub-district, and discipline of study, with discipline showing the largest observed effect (ε^2 = .290). Although 93.25% of respondents reported formal computer training and perceived computer literacy as generally relevant to their academic disciplines, competency levels remained comparatively low. The findings highlight a distinction between technological access and demonstrated computer competency and suggest the need for competency-oriented, practical, and discipline-sensitive computer-literacy development. Given the convenience sampling and cross-sectional design, the findings represent associations within the sample and should not be interpreted causally or generalised without caution.

Keywords: Computer Literacy; Digital Access; College Students; Computer Training; Digital Competency; Ahmedabad District

1. Introduction

Ahmedabad district is located in central Gujarat, with Ahmedabad city as its administrative headquarters. The district covers approximately 8,087 square kilometres. The Census 2011 District Census Handbook records 11 sub-districts in Ahmedabad, including Ranpur. Ranpur subsequently became part of Botad district following the 2013 district reorganisation. Accordingly, Ranpur is not included in the present Ahmedabad study area. The current Ahmedabad District Administration reports 15 talukas/blocks, reflecting subsequent administrative changes and urban subdivision. However, for the present study, 10 talukas have been considered as the geographical and sampling framework to maintain consistency with the defined study area and the population framework adopted for the research. Thus, although Ahmedabad had 11 sub-districts according to the 2011 Census and currently has 15 administrative talukas/blocks, the study considers 10 talukas after excluding Ranpur.

Students of Ahmedabad District and Computer Literacy

Computer literacy has become an increasingly important component of students' educational development because academic learning, communication, information retrieval, digital payments, online examinations, and employment-related activities increasingly require basic digital competencies. In Ahmedabad district, computer literacy should therefore be understood not merely as the ability to operate a computer, but as students' capacity to use digital devices, access and evaluate online information, communicate digitally, and perform routine academic and practical tasks using technology.

Ahmedabad has a substantial, diverse educational ecosystem across urban and rural areas. The Ahmedabad District Administration maintains an official directory of schools across the district, reflecting the extensive institutional base through which students acquire formal and digital education.

Computer literacy is operationalised in this study as a multidimensional competency encompassing conceptual understanding, frequency of computer use, practical experience, hardware awareness, and basic technical knowledge."

2. Review of Relevant Literature

The literature conceptualises computer literacy as a multidimensional competency that extends beyond basic computer operation and application skills. Hoffman and Blake (2003) and Werner (2005) contend that contemporary computer literacy should include technical proficiency, information evaluation, critical thinking, security awareness, and social and ethical understanding. Gupta (2006) highlights the significance of structured, competency-based computer education for undergraduate students. Ibrahim, Majeed, and Jawad (2023) differentiate computer literacy from electronic information-seeking skills, arguing that general computer competence does not necessarily equate to effective information-search proficiency. Collectively, these studies suggest that computer literacy constitutes a broad competency involving knowledge, practical skills, critical awareness, and responsible technology use, rather than mere familiarity with software applications.

Empirical research shows that computer literacy varies by students' prior exposure, demographic characteristics, access, and educational experiences. Link and Marz (2006) found that most medical students had adequate computer skills but noted variations related to prior exposure, frequency of use, and age, supporting the need for differentiated rather than uniform computer-skills training. Tella and Mutula (2008) identified gender differences in computer experience and application use patterns. Bansal and Misra (2021) reported variations in digital literacy based on gender, class, and digital education experience among Indian school students. Afzal et al. (2023) highlighted disparities in technology access associated with age, residence, gender, and income. Kem (2025) identified significant associations between digital literacy and gender, age, location, educational level, and socioeconomic status among marginalised populations in India. Collectively, these findings indicate that researchers must examine computer literacy in relation to the broader conditions under which students access and use technology.

The literature further suggests that access to technology is necessary but not sufficient for developing effective computer competencies. Jenkins et al. (2008) identified a strong positive relationship between computer literacy and technology use (r = .60), compared to a moderate relationship between technology access and technology use (r = .45). These findings indicate that the mere presence of technological resources does not guarantee effective technology utilisation. Werner (2005) similarly observed that regular computer use does not necessarily result in adequate security knowledge. Kem (2025) reported deficiencies in higher-order digital competencies despite disparities in access and training opportunities. Therefore, the literature supports examining computer literacy alongside digital access, educational exposure, and contextual characteristics, rather than equating access alone with competency.

A further theme in the literature is the role of formal training and educational experience. Bansal and Misra (2021) found improved performance across functional, psychological, critical, and ethical dimensions among students with greater digital education experience. Gupta (2006) also emphasised the importance of structured, competency-based education, while Link and Marz (2006) recommended differentiated training because students entering higher education have varying levels of prior computer experience. However, the literature does not establish that training participation alone leads to higher computer literacy, particularly given the prevalence of cross-sectional or descriptive-correlational study designs. This distinction matters for the present research, as training exposure should be treated as a contextual factor associated with computer literacy rather than assumed to be its causal determinant.

3. Research Gap

The existing literature on students' digital competencies has largely focused on the broader concept of digital literacy, with relatively little attention to computer literacy as a distinct area of study. While digital literacy encompasses a wide range of digital skills and competencies, specific aspects of computer literacy, such as understanding computer operating systems, hardware components, computer usage, operating-system installation, and basic computer-related knowledge, have received comparatively less empirical attention.

A further gap concerns the relationship between digital access and computer literacy. Many studies emphasize access to digital technologies or examine digital literacy as a broader competency. At the same time, comparatively less attention has been given to examining whether access to specific computing devices, particularly personal computers and laptops, is associated with differences in students' computer literacy. The distinction between widespread access to smartphones and internet connectivity and actual access to computers therefore requires further empirical investigation.

The literature also provides limited evidence on how to measure computer literacy among college-level students. Much of the available research has focused on school students, general populations, or broader digital-literacy outcomes, leaving relatively limited empirical evidence on the specific level of computer literacy among students in higher education.

In addition, a geographical research gap exists in Ahmedabad District. Compared with the broader literature on digital literacy and digital access, relatively few studies have specifically examined computer literacy and digital access among college students in Ahmedabad. The district-level context matters because students from different geographical areas, socioeconomic backgrounds, academic disciplines, and educational levels may have different opportunities to access and use computing technologies.

Against this background, the present study addresses these gaps by examining computer literacy and digital access among college-level students in Ahmedabad District. The study therefore seeks to contribute empirical evidence to an area that has received comparatively less attention than the broader field of digital literacy.

4. Sampling Design and Data Collection

- **Sampling Design:** Non-probability convenience sampling
- **Data Collection Mode:** Online structured questionnaire through Google Forms
- **Distribution:** Email and direct messages
- **Sample Size:** 163 valid respondents
- **Data Collection Period:** May–June 2026
- **Software and Analytical Tools:** Microsoft Word 2024; Microsoft Excel 2024; IBM SPSS Statistics Version 25; SciSpace Research Agent; and Claude Sonnet 5.
- **Research question:** To what extent do digital access and formal computer-training exposure relate to the computer-literacy competency of students in Ahmedabad District?

Research Objectives

1. To assess the level of digital access among students in Ahmedabad District in terms of smartphone/tablet access, personal computer/laptop access, and internet connectivity.
2. To assess the level of computer literacy among students in Ahmedabad District using indicators of conceptual understanding, computer-use engagement, practical experience, hardware awareness, and basic technical knowledge.
3. To examine whether access to a personal computer or laptop is significantly associated with students' computer-literacy scores.
4. To examine whether formal computer-training exposure is significantly associated with students' computer-literacy scores.
5. To assess students' perceived relevance of computer literacy to their academic disciplines.

5. Limitations of the Study

The study used convenience sampling. The study collected data through an online questionnaire. The sample may not fully represent all students in Ahmedabad District. Respondents were unevenly distributed across sub-districts. Some sub-districts had very few respondents. No respondents were recorded from Detroj-Rampura. Some variables were based on self-reported responses. We developed the computer-literacy measure specifically for this study. Further validation of the computer-literacy measure may be required. The study used a cross-sectional research design. The findings therefore do not establish causal relationships. The formal-training groups were highly unequal in size. The study did not examine the quality or duration of computer training in detail. Other factors influencing computer literacy were not examined comprehensively. Therefore, the findings should be generalised with appropriate caution.

6. Data Analysis and Interpretation

Table 1. Distribution of Respondents by Current Residence in Ahmedabad District

1. Currently Residing in Ahmedabad District?		
	Frequency	Per cent
Yes	163	93.68
No	11	6.32
Total	174	100

Screening of Respondents Based on Place of Residence

A total of 174 responses were initially received for the study. Based on the place-of-residence screening question, 163 respondents (93.68%) reported currently residing in Ahmedabad District, whereas 11 respondents (6.32%) reported residing outside the district. Since the study specifically focuses on students residing in Ahmedabad District, the 11 respondents residing outside the district were excluded from subsequent analysis. Accordingly, 163 eligible responses were retained as the final analytical sample, representing 93.68% of the initially collected responses. All subsequent descriptive and inferential analyses were conducted using this final sample of N = 163.

Table 2 Demographic Profile of Respondents

Demographics	Description	Code	Frequency	Per cent
2. Sub-District or Subdivision of District	Ahmedabad city	1	86	52.76
	Daskroi	2	36	22.09
	Dholka	3	6	3.68
	Sanand	4	9	5.52
	Viramgam	5	11	6.75
	Bavla	6	5	3.07
	Dhandhuka	7	6	3.68
	Detroj-Rampura	8	0	0.00
	Barwala	9	3	1.84
	Mandal	10	1	0.61
3. Age	Below 18	1	7	4.29
	18-20	2	99	60.74
	21-23	3	43	26.38
	24 and above	4	14	8.59
4. Gender	Male	0	112	68.71
	Female	1	51	31.29
5. Monthly Family Income	Below ₹10000	1	8	4.91
	₹10000 - ₹25000	2	48	29.45
	₹25000 - ₹50000	3	72	44.17
	₹50000 - ₹75000	4	16	9.82
	Above ₹75000	5	19	11.66
6. Area of Residence	Urban	0	112	68.71
	Rural	1	51	31.29

7. Discipline of Study	Arts	1	49	30.06
	Commerce	2	69	42.33
	Science	3	18	11.04
	Engineering	4	12	7.36
	Law	5	3	1.84
	Education	6	8	4.91
	Other	7	4	2.45
8. Current Academic Status	Undergraduate (UG)	1	92	56.44
	Postgraduate (PG)	2	57	34.97
	Research Scholar (PhD)	3	14	8.59

The demographic profile indicates that the study comprised 163 respondents drawn from different sub-districts of Ahmedabad district. More than half of the respondents were from Ahmedabad City (52.76%), followed by Daskroi (22.09%). The remaining respondents were distributed across Viramgam (6.75%), Sanand (5.52%), Dhandhuka (3.68%), Dholka (3.68%), Bavla (3.07%), Barwala (1.84%), and Mandal (0.61%); no respondents were recorded from Detroj-Rampura.
In terms of age, the sample was predominantly concentrated in the 18–20 years category (60.74%), followed by 21–23 years (26.38%), while 8.59% were aged 24 years and above and 4.29% were below 18 years. The gender distribution was 68.71% male and 31.29% female. With respect to monthly family income, the largest proportion reported an income of ₹25,000–₹50,000 (44.17%), followed by ₹10,000–₹25,000 (29.45%), above ₹75,000 (11.66%), ₹50,000–₹75,000 (9.82%), and below ₹10,000 (4.91%). Geographically, 68.71% of respondents resided in urban areas, whereas 31.29% were from rural areas. By discipline, Commerce was the largest group (42.33%), followed by Arts (30.06%), Science (11.04%), Engineering (7.36%), Education (4.91%), Law (1.84%), and other disciplines (2.45%).
Finally, 56.44% of the respondents were undergraduate students, 34.97% were postgraduate students, and 8.59% were PhD research scholars. Overall, the sample was predominantly young, urban males, with Commerce and Arts students accounting for a substantial share of the study population.

Table 3 Operationalization, Coding, and Response Distribution of the Study Variables

Questions asked to Respondents.	Construct	Code	Description	Score	Frequency	Percentage
9. Do you have access to a smartphone or Tablet?	Digital Access	ATST	Yes	1	161	98.77
			No	0	2	1.23
10. Do you have access to a personal computer or laptop?	Digital Access	ATPCL	Yes	1	68	41.72
			No	0	95	58.28
11. Do you have internet access?	Digital Access	HIA	Yes	1	162	99.39
			No	0	1	0.61
12. Do you understand the difference between smartphone operating	Computer Literacy	DSOCO	Yes	1	108	66.26
			No	0	55	33.74

systems and computer operating systems?						
13. How often do you use a computer?	Computer Literacy	OUC	Daily	3	57	34.97
			Weekly	2	32	19.63
			Occasionally	1	65	39.88
			Never Used	0	9	5.52
14. Are you aware of lightweight operating systems?	Computer Literacy	ALO	Yes	1	46	28.22
			No	0	117	71.78
15. Have you ever installed an operating system on a PC or laptop?	Computer Literacy	IOS	Yes	1	26	15.95
			No	0	137	84.05
16. Have you completed any formal computer-related course or training programme?	Computer Training Exposure	CCTP	Yes	1	152	93.25
			No	0	11	6.75
17. Do you have knowledge of computer hardware components such as RAM, storage devices, and processor specifications?	Computer Literacy	KCH	Yes, good understanding	3	24	14.72
			Basic understanding	2	16	9.82
			Heard of them but not clear	1	112	68.71
			No knowledge	0	11	6.75
18. Do you think computer literacy is relevant to your academic discipline (Arts/ Commerce/ Science/ Engineering/ Law/ Education etc.)?	Perceived Relevance of Computer Literacy	CLRTD	Highly relevant	4	59	36.20
			Relevant	3	30	18.40
			Moderately relevant	2	31	19.02
			Less relevant	1	32	19.63
			Not relevant	0	11	6.75
19. Which storage device is faster in terms of data transfer speed?	Computer Literacy	SDF	HDD (Hard Disk Drive)	0	42	25.77
			SSD (Solid State Drive)	1	70	42.94
			Both have same speed	0	47	28.83
			Not sure	0	4	2.45
20. Which processor is generally faster in performance?	Computer Literacy	PFP	Intel Core i3	0	25	15.34
			Intel Core i5	0	32	19.63
			Intel Core i7	1	103	63.19
			All are same	0	1	0.61

			Not sure	0	2	1.23
21. Which of the following can be considered a Lightweight Operating System?	Computer Literacy	CLOS	Lubuntu	1	67	41.10
			Microsoft Windows	0	43	26.38
			Mac OS	0	21	12.88
			Ubuntu	0	30	18.40
			Not Sure	0	2	1.23

The descriptive analysis of the responses of 163 students reveals a substantial level of basic digital access, but comparatively lower levels of demonstrated computer-literacy competency. 161 respondents (98.77%) reported access to smartphones or tablets, while 162 respondents (99.39%) reported internet access. In contrast, only 68 respondents (41.72%) reported access to a personal computer or laptop, indicating a notable device-level disparity between general digital connectivity and access to computer-specific resources. Regarding computer literacy, 108 respondents (66.26%) reported understanding the difference between smartphone and computer operating systems. At the same time, computer-use frequency showed that 57 respondents (34.97%) used computers daily, 32 (19.63%) weekly, 65 (39.88%) occasionally, and 9 (5.52%) never used a computer. Awareness of lightweight operating systems was comparatively limited: only 46 respondents (28.22%) reported awareness, and only 26 respondents (15.95%) reported practical experience installing an operating system. Hardware-related knowledge was also largely basic, as only 24 respondents (14.72%) reported a good understanding of components such as RAM, storage devices and processor specifications. In comparison, 112 respondents (68.71%) had merely heard of these components without clear understanding. Among the objective computer-literacy knowledge Indicators, 70 respondents (42.94%) correctly identified SSD as the faster storage device in terms of data-transfer speed, 103 respondents (63.19%) identified Intel Core i7 as the generally faster processor, and 67 respondents (41.10%) correctly identified Lubuntu as a lightweight operating system. In addition, formal computer-training exposure was very high, with 152 respondents (93.25%) reporting completion of a formal computer-related course or training programme. Perceptions regarding the relevance of computer literacy were also generally favourable: 59 respondents (36.20%) considered it highly relevant and 30 (18.40%) considered it relevant to their academic discipline.

Table 4 Operationalization and Measurement of Study Constructs

Construct	**Question Nos.**	**Minimum Score**	**Maximum Score**	**What it measures**
Digital Access	Q-9, Q-10, Q-11	0	3	Whether students have access to digital devices and the internet
Computer Literacy	Q-12, Q-13, Q-14, Q-15, Q-17, Q-19, Q-20, Q-21	0	12	Actual knowledge, understanding, use and practical awareness of computers
Computer Training Exposure	Q-16	0	1	Whether the respondent has received formal computer-

				related training
Perceived Relevance of Computer Literacy	Q-18	0	4	How relevant the respondent believes computer literacy is to their discipline

6.1 Assessment of Digital Access among Students

Score construction of Digital Access = Q9 + Q10 + Q11

Table 5 Distribution of Respondents by Digital Access Score

Score	**Frequency**	**Percentage**
0	0	0.00%
1	0	0.00%
2	98	60.12%
3	65	39.88%
Total	163	100%

Table 6. Descriptive Statistics of Digital Access

N	Minimum	Maximum	Mean	Median	Standard Deviation
163	2	3	2.40	2.00	0.49

The Digital Access Score, constructed from Q9–Q11, ranged from **2 to 3** among all 163 respondents. Most respondents (60.12%) scored 2, while 39.88% scored the maximum of 3. The mean score was **2.40** (SD = 0.49), with a median of **2.00**, indicating generally high digital access within the sample. Overall, the distribution suggests that respondents had access to at least two of the three assessed digital-access components.

6.2 Assessment of Computer Literacy among Respondents

Score construction of Computer Literacy = Q12 + Q13 + Q14 + Q15 + Q17 + Q19 + Q20 + Q21

Table 7. Frequency and Percentage Distribution of Computer Literacy Scores

Score	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Frequency	4	4	17	35	21	12	7	14	5	12	7	9	16
Percentage (%)	2.45	2.45	10.43	21.47	12.88	7.36	4.29	8.59	3.07	7.36	4.29	5.52	9.82

Table 8. Distribution of Respondents by Computer Literacy Level Based on Composite Scores

Computer Literacy Level	**Score**	**Frequency**	**Percentage**
Low	0–5	93	57.06%
Moderate	6–9	38	23.31%
High	10–12	32	19.63%
Total		163	100%

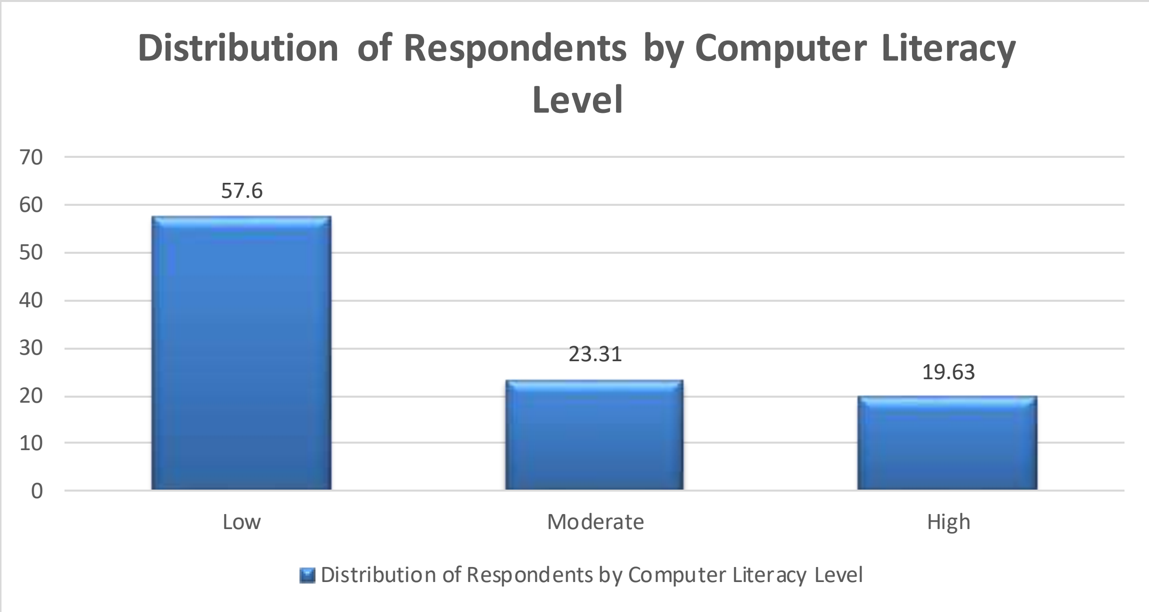

Table 9: Descriptive Statistics of the Computer Literacy Composite Score

Statistic	N	Minimum	Maximum	Mean	Median	Standard Deviation	Variance	Mean Percentage
Result	163	0	12	5.74	5.00	3.49	12.17	47.85%

Interpretation

The Computer Literacy Score, constructed from eight items (Q12, Q13, Q14, Q15, Q17, Q19, Q20, and Q21), ranged from 0 to 12 among the 163 respondents. The mean score was 5.74 (SD = 3.49), with a median of 5.00, and the mean percentage score was 47.85%, indicating a moderate overall level of computer literacy performance in the sample. Based on the defined categories, 57.06% of respondents were classified as having low computer literacy, 23.31% as moderate, and 19.63% as high. Overall, more than half of respondents fell into the low computer-literacy category, while fewer than one-fifth reached the high-literacy category.

Table 10 Descriptive Characteristics and Internal Consistency of Computer Literacy Indicators
N=163

Question	**Question Code**	$\sum x_i$	**Mean** $= \frac{\Sigma x_i}{N}$	**SD** $= \sqrt{\frac{\sum(x_i-\bar{x})^2}{N-1}}$	**Correct/Positive Response Rate (%)** $= \frac{\textit{Number of correct Responses}}{N} * 100$	**Corrected Indicator–Total Correlation**
Q-12	DSOCO	108	0.663	0.474	66.26%	0.48022813
Q-13	OUC	**300**	1.840	0.975	94.48%*(34.97+19.63+39.88)	0.71480736
Q-14	ALO	46	0.282	0.451	28.22%	0.76825768
Q-15	IOS	26	0.160	0.367	15.95%	0.58694426
Q-17	KCH	**216**	1.325	0.808	93.25%*(14.72+9.82+68.71)	0.68257642

Q-19	SDF	70	0.429	0.497	42.94%	0.7413068
Q-20	PFP	103	0.632	0.484	63.19%	0.58801217
Q-21	CLOS	67	0.411	0.494	41.10%	0.79884081

**Q-13 and Q-17 are multi-level scored Indicators*

Cronbach's Alpha =

$$= \frac{k}{k-1}\left(1 - \frac{\sum indicator\ variance}{variance\ of\ total\ score}\right)$$

$$= \frac{8}{8-1}\left(1 - \frac{2.896143498}{12.1677649}\right) \quad = 0.87085$$

Table 11. Variance Analysis of Computer Literacy Indicators and Total Score

Question	**Value**
Q-12	0.224948875
Q-13	0.955448202
Q-14	0.203817314
Q-15	0.134893585
Q-17	0.652881921
Q-19	0.246534878
Q-20	0.234037719
Q-21	0.243581004
∑ Indicator Variance	2.896143498
Variance of Total Score	12.1677649
Method	VAR.S

The variance of each question and the total score was calculated in Microsoft Excel using the VAR.S function. The sum of indicator variances and the total-score variance were then obtained from these Excel calculations for further analysis.

Reliability and Indicator Analysis

An Indicator-level analysis assessed the descriptive characteristics and internal consistency of the eight-indicator Computer Literacy scale comprising Q-12, Q-13, Q-14, Q-15, Q-17, Q-19, Q-20, and Q-21. The Indicator means varied according to the respective scoring ranges, with Q12 recording a mean of 0.663 (SD = 0.474), Q13 1.840 (SD = 0.975), Q14 0.282 (SD = 0.451), Q15 0.160 (SD = 0.367), Q17 1.325 (SD = 0.808), Q19 0.429 (SD = 0.497), Q20 0.632 (SD = 0.484) and Q21 0.411 (SD = 0.494). The response pattern indicates considerable variation across the dimensions assessed. The internal consistency of the scale was assessed using corrected Indicator–total correlations and Cronbach's alpha. The corrected Indicator–total correlations ranged from 0.480 to 0.799, with all eight Indicators showing positive associations with the overall Computer Literacy construct. Q-21 recorded the highest corrected Indicator–total correlation (r = 0.799), followed by Q-14 (r = 0.768), Q-19 (r = 0.741) and Q-13 (r = 0.715). Q-17 (r = 0.683), Q-20 (r = 0.588), Q-15 (r = 0.587) and Q-12 (r = 0.480) also demonstrated positive Indicator–total relationships. These results indicate that each Indicator contributes meaningfully to the overall scale, and no Indicator exhibited a weak or adverse association requiring exclusion. Accordingly, all eight Indicators were retained to construct the Computer Literacy Composite Score.

The reliability analysis produced a Cronbach's alpha coefficient of **0.871** for the eight-Indicator scale across the 163 respondents, indicating strong internal consistency. The reliability coefficient, together with the positive corrected Indicator–total correlations observed across all Indicators, provides empirical support for aggregating the eight indicators into a composite measure of computer literacy. Consequently, the eight Indicators were retained without deletion, and their summed scores were used to derive the Computer Literacy Composite Score, with a possible range from 0 to 12.

Table 12 Tests of Normality for the Computer Literacy Composite Score

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Computer_Literacy_Score	.188	163	.000	.907	163	.000
a. Lilliefors Significance Correction						

Normality Assessment

The distribution of the Computer Literacy Composite Score was examined before inferential analysis. The composite score was based on eight indicators of computer literacy and was calculated for 163 respondents. Both normality tests indicated a statistically significant departure from normality. The Kolmogorov–Smirnov test produced a statistic of 0.188 ($p < 0.001$), while the Shapiro–Wilk test produced a statistic of 0.907 ($p < 0.001$). Since the Shapiro–Wilk p-value was below the 0.05 significance level, the null hypothesis of normality was rejected. Thus, the Computer Literacy Composite Score was treated as non-normally distributed for subsequent analysis. This finding informed the selection of appropriate non-parametric procedures for bivariate group comparisons and association testing.

Mann-Whitney Test

The Mann–Whitney U test was applied to gender, area of residence, PC/laptop access, and formal computer-training exposure because these variables comprised two independent categorical groups, making them appropriate binary grouping variables for non-parametric between-group comparison. These variables were theoretically selected as key demographic, contextual, access-related, and human-capital factors that could plausibly differentiate computer-literacy outcomes, rather than treating every questionnaire item as an independent grouping variable. This specification also avoided indiscriminate item-wise testing and associated Type-I error inflation, while maintaining alignment between the research objectives, measurement structure, and statistical procedure.

Table 13. Mann–Whitney U Test Results for Differences in Computer Literacy by Selected Binary Grouping Variables

Grouping variable	**Category**	***n***	**Mean rank**	**Mann–Whitney U**	**Z**	***p*-value**	**Rank-biserial *r***
Gender	Male	112	85.87	2422.50	−1.564	.118	0.152
	Female	51	73.50				
Area of residence	Urban	112	87.48	2242.00	−2.215	.027	0.215
	Rural	51	69.96				
PC/laptop access	No	95	60.98	1233.00	−6.775	<.001	−0.618
	Yes	68	111.37				
Formal computer training (CCTP)	No	11	31.27	278.00	−3.721	<.001	−0.667
	Yes	152	85.67				

Note. n = number of observations; U = Mann–Whitney U statistic. $p < .05$ indicates statistical significance. Rank-biserial r is reported as the effect-size measure. Group categories correspond to the coding used in the dataset: Gender (0 = Male, 1 = Female); Area of residence (0 = Urban, 1 = Rural); PC/laptop access (0 = No, 1 = Yes); Formal computer training (0 = No, 1 = Yes).

Results interpretation

The Mann–Whitney U tests indicate that computer literacy did not differ significantly by gender, with males showing a higher mean rank than females (85.87 vs. 73.50). Still, the difference was not statistically significant (U = 2422.50, Z = −1.564, p = .118). In contrast, a statistically significant difference was observed by area of residence, with urban students having a higher mean rank than rural students (87.48 vs. 69.96), $U = 2242.00$, $Z = -2.215$, $p = .027$.

The biggest differences were associated with PC/laptop access and formal computer training. Students with PC/laptop access had substantially higher mean ranks than those without access (111.37 vs. 60.98), $U = 1233.00$, $Z = -6.775$, $p < .001$. Similarly, students who had completed formal computer training had a higher mean rank than those who had not (85.67 vs. 31.27), $U = 278.00$, $Z = -3.721$, $p < .001$.

Kruskal–Wallis Test

Table 14 Kruskal–Wallis Test Results for Differences in Computer Literacy

Grouping Variable	**No. of Groups**	**Valid N**	**Kruskal–Wallis H**	**df**	**p-value**	**Effect Size (ε²)**	**Interpretation**
Age	4	163	21.418	3	< .001	.116	Moderate
Monthly Family Income	5	163	21.127	4	< .001	.105	Moderate
Current Academic Status	3	163	12.758	2	.002	.067	Small–moderate
Sub-District/Subdivision	9	163	17.175	8	.028	.060	Small–moderate
Discipline of Study	7	163	51.228	6	< .001	.290	Large

Dependent variable: Computer Literacy Score
Test: Kruskal–Wallis H test
Significance level: $\alpha = .05$

Interpretation

To examine whether computer literacy scores differed across demographic, socioeconomic, educational, and geographical categories, we conducted Kruskal–Wallis H tests. The results indicated statistically significant differences in computer literacy scores across all five grouping variables examined. Significant differences were observed across age categories, $H(3) = 21.418$, $p < .001$, with an effect size of $\varepsilon^2 = .116$, indicating a moderate effect. Similarly, computer literacy scores differed significantly across monthly family-income categories, $H(4) = 21.127$, $p < .001$, $\varepsilon^2 = .105$, also representing a moderate effect. Current academic status was significantly associated with differences in computer literacy scores, $H(2) = 12.758$, $p = .002$, $\varepsilon^2 = .067$, indicating a small-to-moderate effect. A statistically significant difference was also observed across sub-district/subdivision categories, $H(8) = 17.175$, $p = .028$, $\varepsilon^2 = .060$, although the effect size was relatively small. The largest effect was observed for discipline of study, $H(6) = 51.228$, $p < .001$, $\varepsilon^2 = .290$, indicating a comparatively large effect. Overall, the findings suggest that computer literacy scores vary significantly across the examined demographic, socioeconomic, educational, and geographical categories, with discipline of study showing the strongest association among the variables considered.

6.3 Assessment of Computer Training Exposure among Respondents

Table 15 Distribution of Respondents According to Formal Computer Training Exposure

Training Exposure	Respondents	Percentage
Yes	152	93.25%
No	11	6.75%
Total	163	100%

Interpretation of Construct 3: Computer Training Exposure

The findings show that 152 respondents (93.25%) received formal computer training, whereas only 11 respondents (6.75%) had not. Despite the very high prevalence of formal training, the overall mean computer-literacy score was 47.85%, with 57.06% of respondents classified as having low computer literacy. This pattern is noteworthy because it indicates that formal training exposure alone does not necessarily correspond to high computer literacy in the current sample. However, this descriptive pattern does not establish that training is ineffective or causes lower/higher literacy; therefore, the relationship between training exposure and computer literacy should be examined statistically using the Mann–Whitney U test.

6.4 Perceived Academic Relevance of Computer Literacy

Table 16 Distribution of Respondents by Perceived Academic Relevance of Computer Literacy

Perceived Relevance	Respondents
0 — Not relevant	11
1 — Less relevant	32
2 — Moderately relevant	31

3 — Relevant	30
4 — Highly relevant	**59**
Total	**163**

Table 18 Descriptive Statistics of Perceived Relevance of Computer Literacy to Academic Discipline

N	Minimum	Maximum	Mean	Median	SD
163	0	4	2.58	3.00	1.33

Interpretation

The perceived relevance of computer literacy to respondents' academic disciplines was assessed using a five-point ordered scale ranging from 0 (Not relevant) to 4 (Highly relevant). Among the 163 respondents, 59 (36.20%) considered computer literacy highly relevant, while 30 (18.40%) considered it relevant. A further 31 (19.02%) regarded it as moderately relevant, whereas 32 (19.63%) considered it less relevant and 11 (6.75%) considered it not relevant. The variable recorded a mean of 2.58, median of 3.00, and standard deviation of 1.333, with scores ranging from 0 to 4. Overall, 54.60% of respondents rated computer literacy as either relevant or highly relevant to their academic discipline. The results therefore indicate that a majority of respondents recognise the academic relevance of computer literacy, although a substantial proportion perceive its relevance as moderate or lower.

7. Conclusion

The present study examined computer literacy among students, considering digital access, demographic and educational characteristics, exposure to formal computer training, and the perceived relevance of computer literacy to students' academic disciplines. The findings indicate that although access to digital resources was generally high, demonstrated computer literacy remained comparatively limited. The mean Computer Literacy Score was 5.74 out of 12 (47.85%), with 57.06% of respondents classified as having low computer literacy, compared with 23.31% at the moderate level and 19.63% at the high level. This finding highlights an important distinction between having access to digital resources and possessing the competencies required to use computers effectively.

The study also found that 93.25% of respondents had received formal computer training, indicating widespread exposure to computer-related training. However, the relatively low overall computer-literacy performance, despite this high level of training exposure, suggests that training participation alone should not be assumed to guarantee higher competency. The Mann–Whitney U analysis provides an appropriate basis for examining whether computer-literacy scores differed between respondents with and without formal training. Similarly, respondents generally perceived computer literacy as relevant to their academic discipline, with a mean perceived-relevance score of 2.58 out of 4. The coexistence of relatively positive perceptions of relevance and comparatively low measured competency suggests a potential perception–competency gap, although the present descriptive findings do not establish causality.

The non-parametric group comparisons further demonstrated statistically significant differences in computer-literacy scores across age, monthly family income, current academic status, sub-district/subdivision, and discipline of study. The Kruskal–Wallis results were significant for age, $H(3) = 21.418$, $p < .001$; monthly family income, $H(4) = 21.127$, $p < .001$; current academic status, $H(2) = 12.758$, $p = .002$; sub-district/subdivision, $H(8) = 17.175$, $p = .028$; and discipline of study, $H(6) =$

51.228, $p < .001$. These findings indicate that computer-literacy scores are not uniformly distributed across the examined categories. In particular, discipline of study showed the strongest omnibus difference among the variables examined. However, because the categorical codes represent nominal group identifiers rather than numerical rankings, these findings should not be interpreted as evidence of a linear progression from one coded category to another.

Overall, the study demonstrates that computer literacy cannot be understood solely in terms of technology access or exposure to formal training. The findings underscore the importance of considering students' demographic, socioeconomic, educational, geographical, and disciplinary contexts when examining differences in computer-literacy competency. At the same time, the cross-sectional, non-experimental design limits causal interpretation. The significant associations identified in this study therefore provide a basis for further investigation rather than evidence that any particular demographic characteristic, training exposure, or contextual factor directly causes higher or lower computer literacy.

From an educational perspective, the findings suggest a need to move beyond simply providing access to computers or offering formal training and towards competency-oriented, context-sensitive digital-skills development. Training programmes may need to focus more explicitly on practical application, repeated practice, and discipline-relevant computer competencies. Future research could extend the present study by using larger, more diverse samples, validated computer-literacy measurement instruments, longitudinal designs, and multivariate analysis to determine the relative contribution of access, training, perceived relevance, and student characteristics to computer-literacy outcomes.

8. Suggestions

1. **Shift from access-oriented to competency-oriented digital education:** Since digital access appears relatively high while the mean computer-literacy score remains comparatively low, institutions should focus not only on providing access to computers and digital resources but also on developing students' practical computer competencies.
2. **Strengthen practical and application-based computer training:** The high proportion of students reporting formal computer training suggests that participation alone may not be sufficient. Training programmes should incorporate hands-on activities, repeated practice, problem-solving exercises, and practical tasks that students can apply in academic settings.
3. **Develop discipline-sensitive computer-literacy programmes:** The significant difference in computer-literacy scores across disciplines indicates the value of considering disciplinary context when designing training. Computer-skills programmes could incorporate examples, software, and tasks relevant to students' respective academic fields.
4. **Provide targeted support for students with lower computer-literacy levels:** As **57.06%** of respondents fall within the low computer-literacy category, institutions should identify specific competency gaps and provide additional remedial or foundational training rather than assuming that all students have comparable skill levels.
5. **Consider demographic and socioeconomic differences in programme design:** Significant differences were observed across age, monthly family income, academic status, and geographical categories. Institutions should therefore consider differences in students' backgrounds when planning digital-skills interventions and support mechanisms.
6. **Address the gap between perceived relevance and demonstrated competency:** Although respondents generally recognised the relevance of computer literacy, their measured competency was

comparatively low. Institutions should connect the perceived importance of computer literacy with opportunities for students to practise and demonstrate these skills in their academic work.

7. **Regularly assess computer literacy rather than relying solely on training participation:** Institutions should consider competency-based assessments before and after training programmes to determine whether students have actually developed the required skills.
8. **Undertake further research using stronger research designs:** Future studies should use larger, more diverse samples and, where feasible, longitudinal or quasi-experimental designs to examine whether specific training interventions improve computer-literacy outcomes. This would provide stronger evidence than cross-sectional associations alone.

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