



Digital Literacy and Associated Factors among Statistics Students at Universitas Sumatera Utara

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ABSTRACT

Digital literacy involves evaluating and using information responsibly as well as operating digital tools. This study describes self-reported digital literacy and its associations with technology access and use, digital skills, information literacy, and a combined measure of digital ethics, security, and attitudes toward artificial intelligence (AI). A cross-sectional online survey was conducted in November 2025 among 155 Statistics Study Program students at the Faculty of Vocational Studies, Universitas Sumatera Utara. Respondents were drawn from three entry cohorts using reported proportional stratified random sampling. Questionnaire scores were analyzed using descriptive statistics and multiple linear regression. The mean digital literacy score was 4.05. Technology access and use ($B = 0.318$, $p < .001$), information literacy ($B = 0.231$, $p = .017$), and the combined ethics, security, and AI-attitude measure ($B = 0.304$, $p < .001$) were positively associated with digital literacy after adjustment for the other predictors. The digital-skills coefficient was not statistically significant ($B = 0.041$, $p = .588$). The model accounted for 54.6% of the observed variance, with an adjusted R^2 of .534. These findings support further assessment of information evaluation and responsible technology use alongside access needs. They do not establish causal effects, objectively measured proficiency, or the separate contribution of attitudes toward AI.

Keywords: digital literacy; information literacy; artificial intelligence; vocational education; university students

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INTRODUCTION

Digital literacy enables students to find, evaluate, create, and communicate information in digital environments. It extends beyond operating software or owning an internet-connected device. Conceptual work distinguishes the cognitive and social demands of digital activity from technical operation (Eshet-Alkalai, 2012), while research on twenty-first-century digital skills situates information management and critical thinking within a broader set of capabilities (van Laar et al., 2017). These distinctions matter when universities assess whether students can use digital resources effectively for academic work.

The description of young people as digital natives can obscure differences in competence. A critical review questions the assumption that an entire generation shares advanced technological skills (Bennett et al., 2008). Research on teaching digital literacy likewise treats competence as something that can be developed through education (W. Ng, 2012). Device ownership and routine technology use are not sufficient evidence of information literacy; a study of Slovenian university students found that attributes of digital nativeness were weak predictors of that capability (Šorgo et al., 2017).

University research documents varied digital-literacy experiences across disciplines and contexts (Gutiérrez-Ángel et al., 2022). In Indonesia, studies of postgraduate learning practices and a multi-university dataset describe information management, communication, and security as relevant aspects of digital participation (Rinekso et al., 2021; Simanjuntak et al., 2025). These studies provide context, but they do not establish the competence profile of vocational statistics students at Universitas Sumatera Utara (USU). A local assessment can help identify areas requiring closer examination within their learning environment.

Artificial intelligence (AI) adds questions about evaluating automated outputs and using digital resources responsibly. AI-literacy measurement studies distinguish awareness, use, evaluation, and ethics, rather than reducing competence to favorable attitudes toward technology (Wang et al., 2023). The present study therefore examines four specified predictors of self-reported digital literacy: technology access and use, digital skills, information literacy, and a combined measure of digital ethics, security, and attitudes toward AI. Its objectives are to describe questionnaire scores and estimate adjusted associations within a sample of USU statistics students.

METHODS

This quantitative, descriptive-analytical study used a cross-sectional survey. The population comprised 254 active students in the Statistics Study Program, Faculty of Vocational Studies, USU. Data were collected through Google Forms at the USU Padang Bulan Campus in Medan in November 2025. The achieved sample contained 155 respondents: 57 from the 2023 entry cohort, 45 from 2024, and 53 from 2025. The sampling procedure was described as proportional stratified random sampling across these cohorts.

The sample-size planning used $n = N/(1 + Ne^2)$, with $N = 254$ and $e = 0.05$, yielding approximately 155.35 respondents. The analysis includes the reported 155 respondents. This planning calculation does not, by itself, establish the precision of regression coefficients. The cohort population totals, random-selection procedure, and numbers invited were not recorded in the available study documentation, so proportional allocation and the response rate cannot be independently assessed.

The dependent variable was the digital literacy score (Y). Four questionnaire-based predictors were included: technology access and use (X_1), digital skills (X_2), information literacy (X_3), and digital ethics, security, and attitudes toward AI (X_4). X_4 was analyzed as a single composite. Consequently, its coefficient does not isolate an association attributable to AI attitudes alone. All variables were measured using Likert-type questionnaire responses. The findings represent self-reports rather than performance on an independent practical test.

The questionnaire item wording, response anchors, item counts, reverse-scoring rules, and aggregation procedures were not specified. These details are necessary to distinguish the predictor scales from the overall digital-literacy outcome and to assess possible overlap between their content. Instrument-development research in Indonesian higher education illustrates the need to examine the dimensions represented by questionnaire items (Lukitasari et al., 2022). Studies of digital literacy in the AI era similarly separate critical understanding, technology use, and ethical behavior during scale validation (Hwang et al., 2023); the present questionnaire cannot be assumed to share those validated properties.

The reported instrument-testing procedure used Pearson item–total correlations, comparing each coefficient with a critical value at $\alpha = .05$. Cronbach’s alpha greater than .60 was the stated reliability criterion. Residual normality was assessed using the Kolmogorov–Smirnov test, and multicollinearity was to be examined using tolerance greater than .10 and variance inflation factors below 10. Numerical reliability estimates and diagnostic results were not provided. A nonsignificant normality test would indicate insufficient evidence against the tested distribution, rather than proving that residuals are normal.

Data preparation involved editing, coding, tabulation, and checking in Microsoft Excel, followed by analysis in SPSS. Multiple linear regression estimated the conditional association between each predictor and Y while holding the other predictors constant. The analysis plan included coefficient t-tests, an overall F-test, and R^2 . The available results include coefficient estimates and model-summary statistics, but not the ANOVA/F-test output. Significance was assessed at $\alpha = .05$. Values displayed as .000 in the original output are reported as $p < .001$, and the original t-statistics are retained rather than recalculated from rounded coefficients.

RESULT AND DISCUSSION

Table 1 summarizes the reported mean scores. Digital literacy (Y) had a mean of 4.05. Among the predictors, the highest numerical mean was 4.15 for the combined ethics, security, and AI-attitude measure, and the lowest was 3.95 for digital skills. These are descriptive differences only; no comparison of means or estimates of variability were available. Because response anchors and classification thresholds were not specified, the means are presented without assigning high or moderately high proficiency categories.

Table 1. Mean questionnaire scores for digital literacy and its four predictors.

Code	Variable	Mean
X ₁	Technology access and use	3.98
X ₂	Digital skills	3.95
X ₃	Information literacy	4.06
X ₄	Digital ethics, security, and attitudes toward AI	4.15
Y	Digital literacy	4.05

Note. N = 155. Response anchors, standard deviations, and category thresholds were not reported.

The original analysis reported that all retained questionnaire items met its item–total correlation criterion. However, item-level coefficients, the critical values used, and Cronbach’s alpha estimates were absent. This limits evaluation of the measures,

particularly whether the broad digital-literacy score is sufficiently distinct from its proposed predictors. Positive self-assessment should therefore not be equated with demonstrated competence. University studies have identified differences between confidence in digital activity and the consistent application of information-evaluation practices (Georgopoulou et al., 2025).

Table 2 presents the regression coefficients and their t-statistics. Technology access and use, information literacy, and X_4 had positive coefficients with p-values below .05. Digital skills had a small positive estimate, but its p-value was .588. The fitted relationship, based on the reported unstandardized coefficients, is given in Equation (1).

Table 2. Multiple linear regression coefficients for digital literacy.

Term	B	SE	β	t	p
Constant	0.408	0.275	—	1.481	.141
X_1	0.318	0.073	0.314	4.333	< .001
X_2	0.041	0.076	0.042	0.542	.588
X_3	0.231	0.095	0.223	2.421	.017
X_4	0.304	0.084	0.296	3.610	< .001

Note. B = unstandardized coefficient; SE = standard error; β = standardized coefficient. Outcome: Y. Predictor definitions appear in Table 1. Test statistics are retained from the reported output.

$$\hat{Y} = 0.408 + 0.318X_1 + 0.041X_2 + 0.231X_3 + 0.304X_4 \quad (1)$$

In Equation (1), $\hat{Y}$ is the fitted digital-literacy score. Holding the other three predictor scores constant, a one-unit increase in technology access and use corresponds to an estimated 0.318-unit increase in Y. The corresponding estimates are 0.231 for information literacy and 0.304 for X_4 . These are conditional associations on the questionnaire scales, not estimated effects of changing access, providing training, or altering students' attitudes.

Technology access and use had the largest standardized coefficient ($\beta = .314$), followed by X_4 ($\beta = .296$), information literacy ($\beta = .223$), and digital skills ($\beta = .042$). This ordering describes the fitted model; it is not a test that one coefficient is larger than another. The absence of a statistically significant digital-skills coefficient does not demonstrate that technical skills are unimportant or homogeneous across students. Those explanations would require further evidence, including score distributions, correlations, and diagnostic results.

Table 3 summarizes model fit. $R^2 = .546$ indicates that the four predictors jointly account for 54.6% of the observed variation in Y within this sample. The adjusted value, .534, accounts for the number of predictors relative to sample size. The reported $R = .739$ is the multiple correlation between observed and fitted outcome values, not a signed correlation between Y and each independent variable.

Table 3. Summary of the four-predictor regression model.

Model	R	R^2	Adjusted R^2	Residual SE
1	.739	.546	.534	0.37898

Note. N = 155. Predictors: X_1 – X_4 and an intercept. Outcome: digital literacy (Y).

The remaining 45.4% is unexplained variation under this model; it cannot be attributed solely to unmeasured factors, because measurement error and model misspecification may also contribute. The residual standard error of 0.37898 is expressed in outcome-score units. Its magnitude cannot establish good predictive accuracy without a meaningful scale interpretation and external or out-of-sample evaluation. Neither R^2 nor adjusted R^2 demonstrates robustness, unbiased estimation, or causal validity.

The positive association with technology access and use is compatible with the view that opportunities to engage with digital resources are relevant to learning. Studies of students' everyday and academic digital participation describe connections between these contexts (Martzoukou et al., 2020; Martzoukou et al., 2022), while research in higher education identifies variation associated with personal background and prior training (Zhao et al., 2021). The present results do not identify which particular device, platform, or access condition matters most, because item-level findings were not reported.

Information literacy also remained positively associated with Y after adjustment. This finding is consistent with treating source evaluation as a distinct educational concern. A survey of higher education students reported comparatively weak proficiency in evaluating information quality and bias (Morgan et al., 2022), while a discipline-specific study of nursing students identified self-perceived gaps in information literacy and digital research (Martzoukou et al., 2024). These different populations offer context for the USU findings, but their score levels should not be compared directly because the instruments and sampling designs differ.

The association for X_4 requires particular care. Its combination of ethics, security, and AI attitudes prevents conclusions about any one component. Research on AI-literacy questionnaires separates affective, behavioral, cognitive, and ethical dimensions (D. T. K. Ng et al., 2024), and another scale distinguishes ethical considerations from perceived threats and user efficacy (Yuan et al., 2024). A Greek student survey also found different relationships between digital literacy, media literacy, and AI attitudes (Saklaki & Gardikiotis, 2024). These findings support disaggregating the components in future work, provided that the revised measures are validated.

The results suggest practical areas for a needs assessment in vocational statistics education. Students could be asked to evaluate the provenance of online datasets, check claims produced by AI tools, and explain decisions about sharing potentially sensitive information. Access barriers should be assessed alongside these tasks. Such activities are proposed applications of the findings, not interventions evaluated in this study. Technical-skills support should remain available, because a nonsignificant adjusted coefficient is not evidence that this form of support has no value.

This study is limited by its cross-sectional design and reliance on self-reported questionnaire scores. Collecting predictors and the outcome through the same instrument may introduce shared-method variation, and overlapping item content may partly explain their associations. The absence of questionnaire details, score dispersions, and numerical diagnostic outputs prevents a fuller assessment of measurement quality and model assumptions. Linearity, constant residual variance, influential observations, and possible cohort differences also require examination. The findings should therefore be confined to the surveyed students rather than generalized to all vocational students or digital natives.

Future research should document the sampling process and complete measurement instrument, report reliability and regression diagnostics, and distinguish AI attitudes from ethical and security competencies. Practical assessments could complement self-reports, while repeated measurements or an evaluated training program could address questions about change. The present survey provides a starting point for that work; it does not establish educational improvement or community-service outcomes.

CONCLUSION

Among 155 USU statistics students, the mean self-reported digital-literacy score was 4.05. Technology access and use, information literacy, and the combined ethics, security, and AI-attitude measure were positively associated with digital literacy after adjustment for the other predictors. Digital skills did not show a statistically significant adjusted association. Together, the four predictors accounted for 54.6% of the observed variance in the outcome.

The findings justify closer assessment of information evaluation and responsible technology use alongside access and technical-support needs. They do not establish causal effects or independently measured proficiency. Clearer measurement definitions, complete diagnostic reporting, and validation through practical tasks are needed before the results support targeted policy or claims about the benefits of a training program.

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