

Analysis of University Students' Digital Literacy Based on Five Dimensions of Digital Competence

Auliya Rusmayanti^{1*}, Jun Anas'ash Ritonga², Nezifa Qhayummi Zahra³, Mawaddah Rahmah⁴, Nurdalilah⁵, Desniarti⁶

^{1,2,3,4,5,6} Universitas Muslim Nusantara Al Washliyah, Jl. Garu II No. 93, Medan, 20147, Indonesia
Email: aulyarusmayanti@umnaw.ac.id^{1*}

Abstract

Information in the digital space. Using a quantitative descriptive survey design, 30 active undergraduate students from various Indonesian universities were selected through purposive sampling. Data were collected via a 30-item questionnaire based on five digital literacy dimensions: information access, information management and processing, digital communication and collaboration, digital security and privacy, and critical thinking and digital ethics, measured on a five-point Likert scale. Validity testing using corrected item-total correlation showed all items exceeded the 0.30 threshold, while reliability testing yielded a Cronbach's Alpha of 0.968, indicating excellent internal consistency. Descriptive statistics (mean scores and percentages) revealed that students' digital literacy generally falls into the high to very high category. The highest grand means were found in digital communication and collaboration (4.26) and digital security and privacy (4.26), both very high, followed by critical thinking and digital ethics (4.23). Information access (4.18) and information management and processing (4.15) fell into the high category. These findings indicate that while students are proficient in digital communication, collaboration, and security, further strengthening is needed in evaluating information credibility, using academic reference tools, and understanding copyright and data ethics.

Keywords: Digital competence, Digital literacy, Higher education, Information literacy

INTRODUCTION

The Fourth Industrial Revolution has transformed how individuals access, manage, and evaluate information in the digital space. Digital literacy has become essential, encompassing the ability to identify information needs, access, manage, and critically evaluate the quality of information (Gutiérrez-Ángel et al., 2022). Two key frameworks underpin this construct: the European Commission's DigComp 2.1 (Carretero et al., 2017) and UNESCO's Digital Literacy Global Framework (Law et al., 2018), both of which position access, management, and evaluation as measurable core dimensions, serving as the conceptual foundation of this study. In higher education,

information literacy comprises three main dimensions: efficient access from various digital sources, effective management and organization of information, and critical evaluation of information credibility and relevance (Trixa & Kaspar, 2024).

Despite intensive digital technology use among university students, there is a significant gap between technical access skills and the cognitive capacity needed to meaningfully utilize information. A study using the Kominfo framework found that Indonesian university students actively use digital platforms, yet their ability to select, verify, and critically manage information remains inadequate (Oetomo et al., 2023). Social media has become the primary channel

for students' information access and processing (Karunia H et al., 2021), and students with higher digital literacy have been shown to produce superior academic work, richer references, more critical argumentation, and better avoidance of plagiarism (Salsabila & Abidin, 2024).

Strengthening digital literacy faces obstacles such as limited infrastructure, low independent learning motivation, and insufficient curricular integration (Paturrahman et al., 2024). Information evaluation is the most critical yet weakest dimension: students tend to assess source credibility based solely on visual presentation and popularity, neglecting author authority, content accuracy, and publication purpose (Hahnel et al., 2020), a problem worsened by social media platforms that prioritize engagement over accuracy (Rahardaya & Irwansyah, 2021).

Empirical evidence shows a strong correlation between information literacy and academic achievement. A study of 1,421 students found a significant positive relationship between information literacy and online learning engagement, mediated by self-efficacy (Zhao, 2024), which in turn influences cognitive, social, collaborative, behavioral, and emotional engagement (Getenet et al., 2024). A study of 278 students in Ghana found a strong correlation ($r = 0.776$) between information literacy and both information-seeking behavior and lifelong learning attitudes (Tachie-Donkor & Ezema, 2023). A cross-national study revealed that although students recognize evaluation criteria for online content, consistent application

remains limited, particularly regarding misinformation (Georgopoulou et al., 2025).

A clear gap remains: Indonesian studies have not examined all three dimensions of digital literacy simultaneously within a single instrument. (Oetomo et al., 2023) used the Kominfo framework (four pillars) rather than the access-management-evaluation trichotomy; other studies examined only a single dimension in isolation—platform-based access (Karunia H et al., 2021) or the academic consequences of literacy such as plagiarism (Salsabila & Abidin, 2024), and focused more on general social media users or school students rather than university students engaged in academic information-seeking. As a result, it remains unclear how these three dimensions interact and which represents the primary bottleneck among Indonesian university students.

This study addresses that gap by examining access, management, and evaluation within a single integrated framework among Indonesian university students is analyzing literacy levels across the three dimensions, identifying the weakest dimension, and examining its relationship with academic achievement, in order to provide an empirical foundation for policy and institutional intervention.

METHOD

This study employed a quantitative approach with a descriptive survey design to systematically describe, measure, and analyze university students' digital literacy based on numerical data. This design was selected because the study aimed to obtain an

objective and measurable description of students' digital literacy, particularly in accessing, managing, and evaluating information in digital environments.

The population consisted of active undergraduate (Bachelor's degree/S1) students from various universities in Indonesia without restriction to specific disciplines, reflecting the cross-disciplinary importance of digital literacy. A total of 30 active undergraduate students were selected using purposive sampling, with active enrollment as the primary inclusion criterion. The sample size was determined based on recommendations for pilot questionnaire studies, which suggest that a minimum of 30 respondents is generally sufficient to evaluate instrument reliability before implementation (Bujang et al., 2024).

Data were collected using a researcher-developed questionnaire entitled Students' Digital Literacy Level, constructed based on the theoretical dimensions of digital literacy identified in the literature. The instrument measured five dimensions: information access, information management, digital communication and collaboration, digital security and privacy, and critical thinking and digital ethics. Prior to the main analysis, the questionnaire was evaluated for validity and reliability using responses from the 30 participants. Item validity was assessed using the corrected item-total correlation method, with all items exceeding the acceptable threshold of 0.30. Reliability testing using Cronbach's Alpha produced a coefficient of 0.968, indicating excellent internal consistency. These results confirmed that the

instrument was valid and reliable for measuring university students' digital literacy.

The questionnaire consisted of 30 statement items measured using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Participation was voluntary, respondents were informed about the purpose of the study before providing their consent, and no personally identifiable information was collected. All responses were kept confidential and used exclusively for academic research purposes.

The collected data were analyzed using descriptive statistics, including mean scores and percentages for each indicator. Mean scores were interpreted using five categories: 1.00–1.80 (very low), 1.81–2.60 (low), 2.61–3.40 (moderate), 3.41–4.20 (high), and 4.21–5.00 (very high). The findings were presented in tables and graphs to facilitate interpretation and provide a clear overview of students' digital literacy levels.

RESULTS AND DISCUSSION

Results are presented through tables, diagrams, and narrative description covering students' digital literacy across five aspects: information access skills, information management and processing skills, digital communication and collaboration skills, digital security and privacy, and critical thinking and digital ethics. Analysis is based on average scores per aspect and indicator, supplemented by comparisons between dimensions and by academic year, to identify overall achievement and relatively stronger versus weaker aspects.

Information Access Skills

Information access skills concern students' ability to search for, find, and select relevant, credible digital information, including use of search engines, advanced search strategies, and source identification.

Table 1. Results of Information Access Skills Analysis

No	Indicator	Mean	Category
1	I am able to use search engines (Google, Bing, etc.) to find relevant information efficiently.	4.47	Very High
2	I know how to use advanced search operators (e.g., quotation marks, site, filetype) to narrow down search results.	4.1	High
3	I am able to access academic databases such as Google Scholar, JSTOR, or university repositories to find scholarly sources.	4.27	Very High
4	I understand the difference between primary and secondary information sources in digital searches.	4.13	High
5	I am able to evaluate the credibility and reliability of a website or digital information source.	4.03	High
6.	I am accustomed to using filter or category features on digital platforms to narrow down and sort information.	4.1	High
Grand Mean		4.18	High

This aspect scored 4.18 (high category), indicating good ability in using digital technology to obtain information. The highest-scoring indicator was efficient use of search engines (4.47, very high), followed by accessing academic databases (4.27, high). These show strong functional ability in using digital technology for both general and academic needs. The lowest indicator was evaluating the credibility and reliability of digital sources (4.03). Though still high, this

gap shows students find it easier to locate information than to assess its quality.

Information Management and Processing Skills

This aspect concerns organizing, storing, processing, and presenting information systematically, including avoiding plagiarism and transforming information into new knowledge.

Table 2. Results of Information Management and Processing Skills Analysis

No.	Indicator	Mean	Category
1	I am able to organize digital files and documents systematically using folders or structured naming systems.	4.27	Very High
2	I can use word processing, spreadsheet, and presentation software (Microsoft Office/Google Workspace) effectively.	4.3	Very High
3	I understand how to save and back up important data on both local and cloud storage.	4.13	High
4	I am able to distinguish relevant, accurate, and trustworthy information from false or misleading information (hoaxes).	4.17	High
5	I can create citations, bibliographies, and avoid plagiarism using digital tools (such as Mendeley or Zotero).	3.93	High
6	I am able to summarize and process information from various digital sources into coherent and original content.	4.1	High
Grand Mean		4.15	High

This aspect scored 4.15 (high), showing students generally use digital technology well to support academic information management. Highest indicators was using word processing/spreadsheet/presentation software (4.30) and organizing digital files systematically (4.27), reflecting habitual use of digital devices for academic tasks. The

lowest indicator overall was creating citations, bibliographies, and avoiding plagiarism (3.93), suggesting general technical skill has not fully translated into specific academic-digital ability.

Digital Communication and Collaboration Skills

This aspect covers interacting, collaborating, and networking via digital platforms, including communication ethics and active participation online.

Table 3. Results of Digital Communication and Collaboration Skills Analysis

No	Indicator	Mean	Category
1	I am able to communicate effectively and professionally through email, discussion forums, or digital messaging platforms.	4.23	Very High
2	I am accustomed to using online collaboration platforms (Google Docs, Notion, Miro, etc.) to work on group assignments.	4.17	High
3	I understand digital communication ethics (netiquette), such as using polite language and respecting others' privacy.	4.33	Very High
4	I am able to actively participate in online discussions or academic forums with well-founded arguments.	4.2	High
5	I can create digital content (articles, infographics, short videos) for academic and non-academic purposes.	4.2	High
6	I know how to use social media wisely to build professional and academic networks.	4.4	Very High
Grand Mean		4.26	Very High

Scored 4.26 (very high), indicating excellent ability to interact and collaborate digitally. Highest indicators was wisely using social media for professional networking (4.40) and understanding digital communication ethics (4.33), showing awareness of norms alongside active use. Relatively lower was using online

collaboration platforms (4.17) and participating in online academic discussions/content creation (4.20 each), still high but with room for improvement.

Digital Security and Privacy

This aspect concerns protecting personal data, understanding digital risks, and maintaining account/information security against cyber threats.

Table 4. Results of Digital Security and Privacy Analysis

No	Indicator	Mean	Category
1	I understand the importance of strong passwords and use two-factor authentication (2FA) to secure digital accounts.	4.4	Very High
2	I am aware of the risks posed by phishing, malware, and other cyber threats, as well as how to avoid them.	4.07	High
3	I am careful when sharing personal information on digital platforms and understand privacy settings on social media.	4.33	Very High
4	I understand the basics of network security, such as the differences between public and private Wi-Fi networks and their associated risks.	4.2	High
5	I am aware of my digital rights, including the right to personal data protection in accordance with applicable regulations.	4.37	Very High
6	I am able to recognize and avoid spreading unverified information (hoaxes and misinformation) on digital media.	4.2	High
Grand Mean		4.26	Very High

Scored 4.26 (very high), showing strong awareness of data protection and security. Highest indicators was understanding strong passwords and two-factor authentication (4.40), digital rights and personal data protection (4.37), and caution in sharing personal information (4.33). Relatively lower was understanding cyber threats like phishing

and malware (4.07) and recognizing/avoiding unverified information (4.20), indicating room to grow beyond general awareness into specific threat understanding.

Critical Thinking and Digital Ethics

This aspect covers analyzing, evaluating, and using information responsibly, including verification, copyright understanding, and data ethics.

Table 5. Results of Critical Thinking and Digital Ethics Analysis

No	Indicator	Mean	Category
1	I always verify the accuracy of information before believing it or sharing it with others.	4.43	Very High
2	I understand the concepts of copyright, Creative Commons licenses, and the importance of respecting other people's intellectual property in the digital realm.	4.03	High
3	I am able to analyze the positive and negative impacts of digital technology on social, academic, and cultural life.	4.33	Very High
4	I am able to think critically about content generated by artificial intelligence (AI), including understanding its limitations.	4.27	Very High
5	I understand the ethical implications of the use of personal data by digital platforms and large technology companies.	4.13	High
6	I am aware of digital addiction and strive to manage device usage time in a healthy and productive manner.	4.17	High
Grand Mean		4.23	Very High

Scored 4.23 (very high), showing good critical and responsible technology use. Highest indicators was verifying information before believing/sharing it (4.43), analyzing positive/negative impacts of technology (4.33), and critically evaluating AI-generated content (4.30). Relatively lower was

understanding digital copyright/licensing (4.03) and ethical implications of personal data use (4.13), still high but needing further strengthening.

Comparison of Digital Literacy Levels Across Dimensions

To obtain a picture of the differences in achievement across dimensions, a comparison was made of the average scores of the five digital literacy aspects studied,

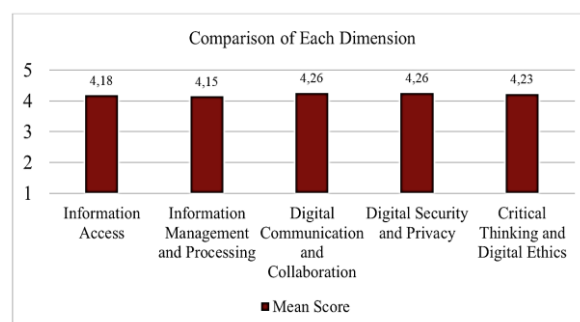


Diagram 1. Comparison of Five Digital Literacy Dimensions

Digital communication/collaboration and digital security/privacy scored highest (4.26 each, very high), followed by critical thinking/digital ethics (4.23), information access (4.18), and information management/processing (4.15, lowest). All dimensions fall in the high to very high range, with relatively small differences between them.

Comparison of Digital Literacy Levels Based on Academic Year

In addition to comparisons across dimensions, analysis was also conducted to examine students' digital literacy achievement based on academic year.

Table 6. Comparison of Digital Literacy Based on Academic Year

Academic Year	Information Access	Information Management and Processing	Digital Communication and Collaboration	Digital Security and Privacy	Critical Thinking and Digital Ethics	Mean
First-year	3.87	3.93	4.04	4.15	4.04	4.00
Second-year	4.21	4.06	4.21	4.08	4.11	4.14
Third-year	4.63	4.75	4.67	5.00	4.92	4.79
Fourth-year	4.39	4.44	4.56	4.44	4.44	4.46

Third-year students scored highest (4.79), followed by fourth-year (4.46), second-year (4.14), and first-year (4.00). Third-years also led in every dimension. Scores tend to rise from first to third year but decline in fourth year, a non-linear pattern. Because respondent numbers varied by year, these differences should be read as descriptive of the sample rather than generalizable.

Discussion

Overall, students' digital literacy is high to very high, showing a solid foundation for academic and daily use of technology. However, the five dimensions did not develop evenly: students are stronger in frequently-used operational skills, while evaluation, academic information management, and specific ethical understanding show more room for growth.

Patterns of Achievement Across Digital Literacy Dimensions

High digital communication/collaboration scores likely stem from frequent daily use of messaging apps, social media, and forums, which naturally builds communication skill.

However, collaboration-specific skills (using platforms, discussing academically, creating content) scored lower than networking and ethics awareness. This suggests communication experience hasn't fully translated into more complex collaboration and production skills, which require coordination, task division, document management, and feedback, beyond simple message exchange. Project-based learning using digital collaboration platforms could help address this.

The high digital security/privacy score reflects awareness built from routine use of services requiring passwords and authentication. Yet the gap between general awareness and specific threat knowledge (lower phishing/malware scores) suggests security literacy needs to move from general knowledge toward practical threat-recognition skills.

In information access, strong search/database skills contrast with weaker source-evaluation skills, a gap that matters academically, since abundant information isn't always credible. Evaluation skills need deliberate development in higher education.

A similar pattern appears in information management: strong productivity-software skills versus weak citation/plagiarism-avoidance skills, since the latter requires specific academic knowledge not built through general tech use, and needs targeted training.

In critical thinking/digital ethics, strong information-verification skills contrast with weaker understanding of copyright, licensing, and data ethics likely because students encounter verification needs more often than ethical/regulatory issues in daily use.

Comparison Based on Academic Year

Third-year students' higher scores may reflect greater academic experience with digital sources, technology-based assignments, and collaboration. However, the drop in fourth-year scores shows the relationship isn't purely linear, other factors like learning experience, assignment type, and individual differences likely matter too.

Given unequal group sizes (larger first/second-year samples), the higher upper-year scores should be read descriptively, not generalized. Statistical significance testing would be needed to confirm real between-group differences.

The Gap Between Operational and Reflective Skills

Together, findings reveal a gap between operational and reflective digital literacy. Students are strong in using technology, communicating, accessing information, and applying basic security but weaker in deep evaluation, academic information management, copyright understanding, plagiarism prevention, and specific threat awareness.

This shows that heavy technology use doesn't guarantee balanced development across all literacy dimensions; digital literacy must include evaluating information, managing knowledge responsibly, understanding risk, considering ethics, and making sound decisions, not just using devices.

Relation to Previous Research

These findings align with (Trixa & Kaspar, 2024), who found high technology use alongside a need for stronger critical evaluation strategies, and with (Georgopoulou et al., 2025) in Computers, who found a gap between awareness of digital literacy's importance and consistent application in evaluating credibility and using information ethically. This convergence supports viewing digital literacy development as multidimensional, technical skill and frequent use are necessary but not sufficient for critical, safe, and ethical technology use.

Theoretical Implications

This study reinforces digital literacy as a multidimensional construct (technical, informational, communicative, security, critical-thinking, and ethical). High scores on some dimensions don't guarantee balanced development across all. The operational-reflective gap suggests technology-use ability is foundational, while evaluation and responsible use represent a more advanced competence level, so measurement should go beyond overall averages to dimension- and indicator-level analysis.

Practical Implications

Institutions should develop targeted digital literacy programs addressing not just basic tech skills but also source evaluation, academic database use, reference management, plagiarism avoidance, copyright/licensing understanding, phishing/malware recognition, and ethics around personal data and AI use.

This can be integrated via project-based assignments, academic training, case studies, security simulations, and student orientation with project-based learning boosting collaboration/content skills and information literacy training targeting credibility evaluation and academic referencing.

Overall, students have a strong digital literacy foundation, but further development should target evaluative, reflective, academic, and ethical skills helping students become not just active technology users, but critical, safe, ethical, and responsible digital citizens ready for academic and professional demands.

CONCLUSION

Overall, students' digital literacy falls into the high to very high category across all five dimensions, with digital communication and collaboration and digital security and privacy scoring highest (4.26 each, very high), followed by critical thinking and digital ethics (4.23), information access (4.18), and information management and processing (4.15). More importantly, this study's main contribution is identifying a gap between operational and reflective digital skills: students excel in frequently practiced technical activities, such as using search engines, productivity software, and social media, but perform relatively lower in dimensions requiring evaluation and judgment, including assessing source credibility, creating citations, recognizing cyber threats, and understanding copyright and data ethics. This indicates that intensive technology use does not automatically ensure balanced development across all dimensions, supporting the view that digital literacy should be understood as a multidimensional construct rather than a single aggregate score. Additionally, digital literacy scores tended to increase from first to third year before declining among fourth year students, suggesting a relationship with academic experience that is not strictly linear.

Several limitations should be noted: the small sample size ($n = 30$) and purposive sampling limit generalizability respondent numbers were unevenly distributed across academic years, so year based comparisons should be read descriptively data relied solely on a self-administered questionnaire, which

may involve social desirability bias and the descriptive design does not allow for inferential testing of the observed differences.

Future research should therefore use larger, more balanced samples with probability sampling, apply inferential tests (e.g., ANOVA or regression) to examine dimensional and academic year differences, incorporate mixed methods to explore the reasons behind weaker performance in information evaluation and digital ethics, and conduct comparative studies across disciplines or institutions to better inform targeted digital literacy interventions.

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