



Assessing the Digital Literacy Level of LIS Students at the University of Rajshahi

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Abstract

The present study addresses the level of digital literacy among 250 Library and Information Science (LIS) students in University of Rajshahi and the factors affecting digital literacy as well as perception regarding measures to enhance digital literacy. A quantitative cross-sectional survey design was used to collect the data using structured questionnaires, which were sent online and in print across all undergraduate study years. Descriptive statistics, reliability analysis, independent-samples t-test, one-way ANOVA, and correlation analyses were performed by using SPSS. Generally, students reported a high level of digital literacy on all four measures - Communication and Collaboration ($M = 3.81$), Operational Skills ($M = 3.81$), Information Navigation and Evaluation ($M = 3.65$), and Creative Content Creation ($M = 3.62$). Students were found to have high levels of confidence in everyday activities, including email communication and use of basic online tools to create digital content, but lower levels of confidence in identifying misinformation online and creating digital content using more advanced tools. In terms of influencing factors, self-study positively correlated the highest with the digital skills, namely by content creation ($r = .386$), and formal academic courses positively correlated with the lowest value of operational competencies ($r = .314$). Infrastructure constraints were still a major challenge, as 68.0% of participants indicated that they were hindered by infrastructure constraints although 98.4% owned devices. Demographic analyses revealed that there were no significant differences for age or year of study in digital literacy, although male students had marginally higher scores in content creation ($p = .038$). Most crucial improvements were felt to be upgrading of laboratory facilities, inclusion of specific digital literacy courses in the LIS curriculum and better Internet connectivity on campus. The study underscores the need to focus on building higher-order evaluation and creation skills and provision of adequate infrastructure in the context of LIS education from mere literacy.

Keywords: LIS, Digital Literacy, Rajshahi University, Academic Performance, Library Management and Information Science

1. Introduction

In the world where academic learning, information seeking, communication, and knowledge production is increasingly reliant on digital technologies, digital literacy has become a critical competency for university students. It is not just about digital device skills but also the capacity to access, navigate, assess, produce and engage with information effectively in digital environments (Falloon, 2020; UNESCO, 2018). Digital literacy is therefore a multi-faceted set of skills that allow users to be critical, confident and purposeful in exploiting digital technologies in learning and daily life.

Digital literacy plays a vital role in the study of Library and Information Science (LIS), as it is also crucial in identifying information, accessing information, evaluating information, organising information and communicating information both in the academic and professional lives of the LIS students. Modern LIS training involves students using the internet, electronic resources, digital platforms, productivity software and new information technologies. Hence, digital literacy is more than only operational skills; it also includes the skills of navigating and evaluating information, communicating and collaborating in digital environments, and creating and sharing digital content. These skills are more and more applicable to students' academic achievements and readiness for technology-rich work places.

Even though there is an abundance of digital tools in higher education, acquiring digital material does not guarantee that students have sufficient digital literacy abilities. The ability of students to search and evaluate online information, using digital tools to produce academic work, working collaboratively online, and creating digital content can vary. It is especially relevant to the education of LIS students who are expected to become competent in a range of skills that will help them with their learning and coursework as well as in the future as information professionals. However, the evidence of digital literacy level of LIS students of University of Rajshahi is still limited. By evaluating different competencies in various dimensions, a good picture of students' current state of digital literacy and what skills they need can be developed. For this reason, the purpose of this study is to find the level of digital literacy of LIS students in the University of Rajshahi in terms of operational skills, information navigation and evaluation skills, communication and collaboration skills and creative and content creation skills.

2. Literature Review

Digital literacy is no longer about simply using a technology but now is about the effective, critical and responsible use of digital information and technologies. Modern terminology encompasses operational skills, information evaluation skills, digital communication skills, collaboration skills, and content creation skills (Falloon, 2020; Tinmaz et al., 2022). The skills have become particularly relevant in the world of Higher Education in which students are expected to evaluate information critically, to work collaboratively in a digital environment and to create academic material.

2.1. Digital Literacy Among Students

Research indicates variation in students' digital literacy and its educational implications. Soyer (2024) found that the level of digital literacy for the sport sciences students was moderate and this did not differ according to gender or class level, but did predict external academic locus of control. Arsyad and Villia (2022) in their study showed that digital literacy has a positive effect on metacognitive listening strategies, while according to Azzahro et al. (2023), there is no significant relationship between digital literacy and cognitive learning outcomes. These conflicting results point to context-dependency and outcome dependency of the educational potential of digital literacy. In addition, Nahid et al. (2022) have found that there are inconsistencies between self-reported and observed digital skills and Sinha and Ugwulebo (2024) found that the competencies were greater in the lower level than in the higher level. Thus, it is essential to conduct the assessments in a multidimensional manner.

2.2 Factors Associated with Digital Literacy Development

Digital literacy development is reliant on individual learning experiences, educational support and technological access. Rafi et al., (2019) emphasized association between the technological competence of students, use of digital resources and Library based learning. Opportunities for building digital competencies can be affected by access to devices and reliable Internet, as well as institutional resources. Further, David-West (2022) highlighted the need for infrastructure and regular updating of teachers in technology-integrated teaching. The results showed that digital literacy is not an issue of individual effort, but also a supportive institutional environment.

2.3 Digital Literacy in LIS Education

Digital literacy in Library and Information Science (LIS) education has become a very important skill at the workplace as future LIS professionals have to work with the digital libraries, libraries databases, information-retrieval systems, library-management software and digital archives. These competencies were identified as essential by Okechukwu et al., (2025) as well as the following factors: Practical learning, collaborative projects, faculty expertise, and accreditation standards. However, funding and set curricula can be barriers to competency development. Likewise, Mubofu and Mambo (2023) and Raju (2020) highlighted the new skills and skills of technology in modern LIS education.

2.4 Curriculum, Pedagogy, and Institutional Support

Digital literacy can be incorporated into LIS curricula as a way to provide opportunities for the development and application of digital skills in a structured way. Technical, informational, and communication skills can be enhanced through practical exercises and collaborative projects (Rafi et al., 2019; Okechukwu et al., 2025). But good implementation will require suitable infrastructure, faculty development, and institutional investments (David-West, 2022). Integrating digital skills across areas of information retrieval, digital libraries, research methods and other LIS disciplines could offer more opportunities for discipline specific learning.

2.5 Research Gap

Research on digital literacy among LIS students at public universities in Bangladesh remains limited, particularly regarding operational, information evaluation, communication, collaboration, and content-creation skills. Evidence on factors associated with these competencies and students' perceived improvement priorities also requires further contextual investigation. This study addresses these gaps by assessing four digital-literacy dimensions and exploring related factors and improvement measures among LIS students at the University of Rajshahi.

2.6. Core Objective

To assess the digital literacy level of LIS students at the University of Rajshahi and identify the factors influencing their digital literacy, along with measures for its improvement.

2.7 Research Questions

RQ1. What is the level of digital literacy among LIS students at the University of Rajshahi in terms of operational skills, information navigation and evaluation skills, communication and collaboration skills, and creative and content creation skills?

RQ2. What factors influence the development of digital literacy among LIS students at the University of Rajshahi?

RQ3. What measures do LIS students perceive as important for improving digital literacy at the University of Rajshahi.

Theoretical Framework

This research is based on three complementary perspectives: the Digital Competence Framework for Citizens (DigComp 2.2), Social Cognitive Theory (SCT), and the Technology Acceptance Model (TAM).

DigComp 2.2 is the key conceptual background for digital literacy assessment. It identifies five competence areas: information and data literacy, communication and collaboration, digital content creation, safety and problem solving (Vuorikari et al., 2022). Several of these areas are addressed by the four dimensions of the study; operational skills are considered to be foundational technology use.

Social Cognitive Theory (Bandura, 1986, 2001) provides an explanation for the interaction between personal factors, behaviors, and environmental conditions. It relates to the self-study, academic learning experiences, confidence and access to digital resources of students. These factors can act as enabling or inhibiting factors in gaining digital competency.

Technology Acceptance Model by Davis (1989) puts importance on perceived usefulness and perceived ease of use in technology acceptance. It offers a complementary view of students' interactions with digital tools to support learning and their views on the value of digital literacy.

These perspectives together give support to the research questions of the study: DigComp 2.2 provide a definition of what is measured, SCT discuss the influence of individual and environmental conditions, and TAM provide a context of digital technologies engagement.

3. Methodology

3.1 Research Approach and Design

The methodology of this study was quantitative research and the design adopted was survey type of cross sectional. The present study was conducted to know the digital literacy level of the students of the Department of Information Science and Library Management (ISLM), University of Rajshahi. Data was collected using a structured self-administered questionnaire encompassing digital skills, factors affecting digital literacy and measures to be taken for improving digital literacy, as reported by the students. The quantitative approach allowed analysis of responses to be done in a systematic way through use of descriptive and reliability statistics.

3.2 Study Setting and Population

The study was carried out in Department of Information Science and Library Management, University of Rajshahi, Bangladesh. The target population were the ISLM students from first year, second year, third year and fourth year undergraduate students. This was estimated to be around 300 students but should be confirmed from departmental enrolment records.

3.3 Sample Size and Sampling Technique

A total of 250 students, out of a total population of 300, were studied. Cochran's sample-size formula, with a finite-population correction, was considered to assess the adequacy of the proposed sample size. The initial formula is:

$$n_0 = \frac{Z^2 p (1 - p)}{e^2}$$

Here, Z is 1.96 for a 95% level of confidence, p is the assumed population proportion of 0.50, and e is the desired margin of error of 0.05. The first guess for the sample is about 385. For a finite population, the adjusted sample size is calculated as:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

where $N = 300$. After applying the correction, it is estimated that the number of respondents is at least about 169. Thus, the desired level of responses of 250 is greater than this calculated minimum. The calculation of the 95% confidence level and 5% margin of error assumption used in this calculation, however, assumes probability sampling, and the researchers used convenience sampling, so the 95% confidence level and 5% margin of error cannot be guaranteed. The final sample size was based on the intended sample size and not only the formula (Cochran, 1977) but also practical data-collection issues.

The participants were selected by a non-probability convenience sampling technique, which targeted persons readily accessible to the researcher. Therefore, the results were analyzed and should be interpreted mainly within the context of the students who participated, and not necessarily generalized to the broader population of ISLM students.

3.4 Research Instrument and Questionnaire Design

The questionnaire was designed based on literature review of related works on digital literacy and was modified according to the objectives and context of the study in academia. It was made up of five sections. In section A, demographic data was gathered such as gender, age, year of study, and ownership of digital devices. Section B evaluated the digital literacy skills in terms of operational skills, information navigation and evaluation, communication and collaboration, and production of creative contents. Perceived influences on digital literacy, such as the role of self-directed learning, academic courses, institutional resources, access barriers, and perceived benefits were explored in Section C. A perceived importance rating of 5 improvements measures were identified in Section D. The open-ended question in section E allowed for suggestions beyond the other sections.

For sections B and C, five-point agreement scales were used which scored from 1 (Strongly Disagree) to 5 (Strongly Agree). In Section D, participants indicated how important they felt the questions were on a five-point scale (1 Not Important to 5 Very Important). The questionnaire was self-administered and spread by using Google Forms and paper ones too. All participation was voluntary and the introductory statement provided participants with information regarding the purpose of the study, confidentiality, and voluntary participation.

3.5 Variables and Measurement

The key variable was a self-report of digital-literacy, using items on a Likert scale for the four domains of skills. Gender, age, year of study and possession of a device were considered as demographic factors. Section C contained items which might have been considered as influencing factors, and Section D contained items which measured perceived priorities for improvement. Section E gave qualitative comments for supplementary interpretations. Only after examining item coding, reliability and the appropriateness of the scaling structure, composite scores of digital literacies were to be computed.

3.6 Data Collection Procedure

Data were collected using online and printed questionnaires. The students who were readily met with by the researcher before classes and other students were invited to participate. There was an intent to combine the responses from both formats for analysis. Participation was voluntary and confidentiality was maintained. The responses were screened for duplicate entries, for completeness and for coding inconsistencies or missing data prior to analysis.

3.7 Pilot Study

A preliminary item performance, internal consistency, and factorability were examined through a pilot study of 101 university students. The data were analysed in SPSS. The first 14 items digital literacy scale achieved an acceptable internal consistency level (Cronbach's alpha = .832). DL04, DL06 and DL10 were dropped after

looking at low communalities and low item-total correlations. The resulting 11-item scale demonstrated acceptable reliability ($\alpha = .818$), with KMO = .768 and a significant Bartlett's test, $\chi^2(55) = 363.454$, $p < .001$. In a subsequent factor analysis however, a low factor loading for DL11 (.317) was found and a low corrected item-total correlation for DL12 (.279) as well as communality value (.268). Therefore, the final factor structure should be carefully considered prior to creation of a composite score.

The five items for the influence factors had a KMO = .600, but the reliability of the five items, α , was not satisfactory ($\alpha = .515$ after the elimination of INF18), to warrant the aggregation of these five items into a single scale. So, these items were kept for individual description analysis. Items in the five improvement-measure items demonstrated a high level of internal consistency ($\alpha = .793$), an acceptable KMO, and a significant Bartlett's test ($\chi^2(10) = 151.434$, $p < .001$) with acceptable factor loadings from .555 to .746. However, individual analysis was felt to be appropriate since the recommendations may be different priorities. The pilot results were used to guide the main study analysis, but they do not provide a final validity or reliability for the instrument.

3.9 Data Preparation and Analysis

IBM SPSS Statistics was used for screening the dataset. Distributions, coding errors, missing responses were evaluated using the frequencies and descriptive statistics. Demographic characteristics and categorical responses were summarised using frequencies and percentages. Where appropriate, Likert-scale responses were described using means and standard deviations. Reliability analysis and exploratory factor analysis were used to evaluate the digital literacy items. Where it was not deemed appropriate to combine items for Section C and Section D, then those items were analysed separately. Open ended responses were analysed and summarised into common recommendations. Data were analyzed and presented in the form of tables and interpreted based on the objective of the study.

Table 1. Recommended Statistical Thresholds and Interpretive Criteria for Pilot-Study Reliability and Exploratory Factor Analysis

Test or indicator	Recommended criterion	Interpretation	Supporting reference
Cronbach's alpha	$\geq .70$	Generally acceptable internal consistency; values depend on study purpose and scale length.	Nunnally & Bernstein (1994); Hair et al. (2019)
Corrected item-total correlation	$\geq .30$	Items below .30 should be reviewed for consistency and conceptual fit.	Field (2018)
Alpha if item deleted	Compare with overall alpha	A higher alpha after deletion may flag an item for review, but does not automatically justify deletion.	Field (2018)
Kaiser-Meyer-Olkin (KMO)	$\geq .60$ minimally acceptable; $\geq .70$ desirable	Assesses whether the correlation pattern is suitable for factor analysis.	Kaiser (1974); Hair et al. (2019)
Bartlett's test of sphericity	$p < .05$	Indicates that the correlation matrix differs significantly from an identity matrix.	Bartlett (1954); Field (2018)
Communality	$\geq .40$ often preferred	Indicates the proportion of an item's variance accounted for by the extracted factors; lower values require review.	Hair et al. (2019)

Factor loading	$\geq .50$ preferred; .40–.49 may be acceptable	Higher absolute loadings indicate stronger relationships between items and factors.	Hair et al. (2019)
Cross-loading	Review substantial loadings on multiple factors	Items with unclear factor assignment may need revision or theoretical reconsideration.	Hair et al. (2019)
Number of items per factor	Preferably ≥ 3 clear indicators	Supports a more stable and interpretable factor, although exceptions may be justified.	Costello & Osborne (2005)
Explained variance	No universal cut-off	Evaluate the cumulative variance alongside factor interpretability, extraction method, and research context.	Costello & Osborne (2005); Hair et al. (2019)

4. Results

4.1 Demographic profile of the respondents (N = 250)

The results from the main study (N = 250) are shared in relation to the three research questions. Analysis of the responses was made using SPSS with frequencies, means, standard deviations, Cronbach's alpha, independent-samples t-tests, one-way ANOVA and Pearson and Spearman correlations. Likert means were interpreted with equal-interval cut-offs: 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. It was screened and detected as 3 entry errors (DL03 35, INF15 54 and 1 device code 3). The first 2 were fixed prior to the final analyses, and 3.1 has a device error.

Table 2: Demographic profile of the respondents (N = 250)

<i>Demographic characteristics</i>	<i>Category</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Gender</i>	Male	112	44.8
	Female	138	55.2
<i>Age</i>	Below 20 years	19	7.6
	21–23 years	201	80.4
	24–26 years	30	12.0
<i>Year of study</i>	1st Year	97	38.8
	2nd Year	47	18.8
	3rd Year	37	14.8
	4th Year	69	27.6
<i>Device ownership</i>	Yes	246	98.4
	No	3	1.2
	Unidentified category	1	0.4
<i>Total</i>		250	100.0

The table 2. Shows Demographic profile of the respondents. A total of 250 LIS students (55.2% female and 44.8% male) were included in the study. Most respondents (80.4%) were aged 21–23 years. As for the academic year, the largest group was first year students (38.8%) followed by fourth year students (27.6%), second year students (18.8%) and third year students (14.8%). A vast majority (98.4%) of the respondents reported that they had at least one digital device. The data on device ownership, however, have to be verified as one answer (0.4%) was given under an unexpected category.

4.2 Descriptive statistics

4.2.1 Digital Literacy Levels Among LIS Students

Table 3: Digital literacy by dimension

Dimension	Items	Cronbach's α	Mean	SD	Level	Rank
Communication and collaboration	2	.634	3.81	.85	High	1
Operational skills	3	.684	3.79	.76	High	2
Information navigation and evaluation	3	Not reported*	3.65	.72	High	3
Creative and content creation	3	.648	3.62	.78	High	4

*The output reports alpha only for DL07–DL08 (.703), not for the three-item navigation set (DL05, DL07, DL08).

As indicated in **Table 3**, all four dimensions are in the “high” range. Communication and collaboration had the highest mean score ($M = 3.81$, $SD = .85$) followed by operational skills ($M = 3.79$, $SD = .76$). Information navigation and evaluation ($M = 3.65$) and creative and content creation ($M = 3.62$) came next, but were also relatively high. Average for the 4 dimension is 3.71. Alphas are moderate (.634-.684), and all dimension scores should be interpreted with caution particularly the two item communication scale.

Table 4: Item-level results

Dimension	Item	Mean	SD
Operational	DL01 Basic computer operations	3.80	1.00
	DL02 Productivity software	3.74	.97
	DL03 Digital tools for academic tasks	3.81	.95
Navigation	DL05 Searching academic resources	3.73	.95
	DL07 Identifying misinformation	3.55	.93
	DL08 Awareness of ethical issues	3.67	.99
Communication	DL09 Email and messaging	3.89	.97
	DL11 Learning management systems	3.72	1.02
Content creation	DL12 Creating digital content	3.67	.96
	DL13 Confidence with creation tools	3.52	1.09
	DL14 Sharing and publishing	3.67	1.00

Calculated from the DL05 frequency table, as the output does not report them.

Table 4 shows results at Item level which ranged between 3.52 and 3.89, all in the high range. Students had the highest confidence in using email and messaging to communicate with others about school-related issues (DL09, $M = 3.89$). They had the lowest level of confidence in content-creation tools like Canva or video editors (DL13, $M = 3.52$, $SD = 1.09$). The agreement and strong agreement for DL13 was 50.0%, neutral was 33.6% and 16.4% disagreed. Knowledge about misinformation (DL07, $M = 3.55$) was also relatively low.

4.2.2 Factors Associated with Digital Literacy Development

Table 5: Perceived factors influencing digital literacy

ITEM	FACTOR	MEAN	SD	AGREE/STRONGLY AGREE (%)	LEVEL
INF19	Belief that digital literacy improves opportunities	3.98	.93	70.8	High
INF16	Academic courses improved skills	3.91	.94	71.6	High
INF18	Barriers from limited device or internet access	3.82	1.01	68.0	High
INF17	University provides sufficient resources	3.77	1.04	67.2	High
INF15	Learned mostly through self-study	3.68	1.02	60.4	High

Table 5 illustrates **Perceived factors influencing digital literacy**. All five statements were agreed by students. They were strongest in feeling digital literacy would enhance their academic and career prospects ($M = 3.98$) and 71.6% agreed that university courses enhanced their skills ($M = 3.91$). Self-study received the lowest mean score ($M = 3.68$); however, the majority (60.4%) still agreed with it. A significant proportion (68.0%) reported access barriers, which highlights an ongoing infrastructure issue despite most students having access to a device.

Table 6: Pearson correlations between factors and digital literacy dimensions (N = 250)

Factor	Operational	Navigation	Communication	Content creation
INF15 Self-study	.216**	.071	.074	.386**
INF16 Academic courses	.174**	-.093	-.057	.110
INF17 University resources	-.019	-.039	-.026	.057
INF18 Access barriers	.093	.080	-.021	.045
INF19 Career benefit belief	.218**	.063	-.044	.030

Note: ** $p < .01$.

Pearson's correlation values between the Factors and Digital Literacy Dimensions are shown in **Table 6**. The self-study was found to be positively correlated with content creation (moderate relationship, $r = .386$, $p < .001$) and operational skills ($r = .216$, $p = .001$). Weak positive relationships between operational skills and academic courses ($r = .174$, $p = .006$) or belief in career benefits ($r = .218$, $p = .001$) existed. No significant association was found between the dimensions and resource/access barriers. The same four significant pairs

were verified by the Spearman's rho ($\rho = .161$ to $.366$). These are cross-sectional associations and not indicative of the causative factors for higher digital literacy. The four dimensions were also positively intercorrelated ($r = .147$ to $.410$), most strongly navigation with communication ($r = .410$, $p < .001$).

4.2.3 Perceived Priorities for Improving Digital Literacy

Table 7: Ranking of improvement measures

Rank	Measure	Mean	SD	Important/Very important (%)	Level
1	Updated computers and software	4.10	.84	77.6	High
2	Digital literacy courses in the curriculum	3.97	.89	70.4	High
3	Better campus internet	3.94	.97	70.0	High
4	Peer mentoring	3.85	.99	68.0	High
5	Regular workshops	3.84	.99	66.8	High

Table 7. gives Ranking of improvement measures. All five measures were considered to be important. Access to newer computers and software came in first ($M = 4.10$) with 77.6% saying this was important or very important to them. The next two were curriculum courses ($M = 3.97$) and better internet ($M = 3.94$). Peer mentoring ($M = 3.85$) and workshops ($M = 3.84$) were measured as the lowest scores and the scores did not differ to a significant extent. As a consequence, students considered infrastructure and the integration of the curriculum their first choice instead of add-on training activities.

4.3 Group differences

Hypothesis one: There is no significant difference in digital literacy by gender.

Table 8: Independent-samples t-test by gender (df = 248)

Dimension	Male M (SD)	Female M (SD)	t	p	95% CI of difference
Operational	3.79 (.71)	3.78 (.81)	.174	.862	-.17, .21
Navigation	3.74 (.75)	3.57 (.69)	1.818	.070	-.01, .35
Communication	3.80 (.85)	3.81 (.86)	-.115	.908	-.23, .20
Content creation	3.73 (.76)	3.53 (.79)	2.082	.038	.01, .40

Table 8 shows Independent-samples t-test (by gender). Levene's tests over the four dimensions were not significant (all p -values $> .203$). The mean difference between males and females was .21 on the Content creation dimension, which was significant ($p = .038$); thus, the null hypothesis is rejected for this dimension only. The effect is small (Cohen's $d \sim .26$), and the effect would not withstand the Bonferroni test for the four tests ($\alpha = .0125$). The other three dimensions do not reject the null hypothesis.

Hypotheses two and three: There is no significant difference in digital literacy by age group or year of study.

Table 9: One-way ANOVA by age and year of study

Variable	Dimension	F	df	p	η^2
Age	Operational	.324	2, 247	.724	.003
	Navigation	.474	2, 247	.623	.004
	Communication	1.774	2, 247	.172	.014
	Content creation	2.807	2, 247	.062	.022
Year (Welch)	Operational	1.649	3, 103.88	.183	.020
	Navigation	.423	3, 111.46	.737	.005
	Communication	.928	3, 112.69	.430	.012
	Content creation	.539	3, 106.26	.657	.008

Table 9 is the discovery of a One-way ANOVA based on Age and Year of Study. All age comparisons were not significant in Levene's test. Welch's ANOVA is reported for all dimensions for the year of study, where the results were significant for operational skills ($p = .022$) and content creation ($p = .023$). There was no evidence of any significant differences by age or year so both of the null hypotheses were retained. The difference in age of creating content was close to being significant ($p = .062$), but the effect size was small ($\eta^2 = .022$).

Hypothesis four: There is no difference in digital literacy depending on device ownership. None of the dimensions were significantly different (all $p > .27$). This comparison can't be used to draw any real conclusions because only three students indicated that they did not own a device.

Table 10. Statistical Criteria and Interpretation of Results for the Main Study

Test indicator or	Recommended criterion	Interpretation based on your results	Supporting reference
Frequencies and percentages	Report n and %; totals should be checked	Described gender, age, study year, and device ownership. One device response (0.4%) was unidentified and requires verification.	Field (2018)
Mean and standard deviation	Interpret means using the study's predefined cut-offs	All four digital literacy dimensions were rated high ($M = 3.62-3.81$).	Field (2018)
Cronbach's alpha	$\geq .70$ generally acceptable	Dimension alpha values of .634-.684 were below the conventional threshold, suggesting modest internal consistency. Interpret dimension scores cautiously.	Nunnally & Bernstein (1994); Hair et al. (2019)
Pearson correlation	$p < .05$ for statistical significance; assess linearity and outliers	Significant positive associations were reported between self-study and content creation ($r = .386$), self-study and operational skills ($r = .216$), academic courses and operational skills ($r = .174$), and career-benefit beliefs and operational skills ($r = .218$).	Field (2018)

Spearman's rank correlation	$p < .05$ for statistical significance	The analysis reportedly confirmed the same four significant associations as Pearson's correlation. Report exact rho and p values in the Results if available.	Field (2018)
Independent-samples t-test	$p < .05$; check independence, outliers, and variance assumptions	Gender differences were significant only for content creation ($p = .038$; Cohen's $d \approx 0.26$). This result was not significant after Bonferroni correction ($\alpha = .0125$).	Field (2018)
One-way ANOVA	$p < .05$; check independence, residual normality, and homogeneity of variance	No significant age-group differences were observed across the four dimensions ($p = .062-.724$).	Field (2018)
Welch's ANOVA	$p < .05$; appropriate when group variances are unequal	No significant differences by year of study were found ($p = .183-.737$). Welch's test was appropriate given the reported variance concerns.	Field (2018)
Effect size: eta squared (η^2)	Interpret magnitude in context; .01, .06, and .14 are often used as rough small, medium, and large benchmarks	Age-group effects were small ($\eta^2 = .003-.022$); year-of-study effects were also small ($\eta^2 = .005-.020$).	Cohen (1988)
Device-ownership group comparison	$p < .05$, with adequate group sizes and suitable assumptions	No significant differences were reported ($p > .27$), but only three respondents reported not owning a device. The comparison has limited interpretability.	Field (2018)

Note. The differences were first tested for statistical significance at $p < .05$. The Bonferroni corrected alpha for four gender comparisons was .0125. These criteria are general guidelines and should be used in conjunction with the design of the research, the assumptions made and the substantive importance of the findings.

5. Discussion of results

Overall, the digital literacy of LIS students in the University of Rajshahi was found high in all four dimensions with a mean ranging from 3.62 to 3.81. Students' scores were higher in communication and collaboration ($M = 3.81$) and operational skills ($M = 3.79$) while being lower in information navigation and evaluation ($M = 3.65$) and creative and content creation ($M = 3.62$). This pattern is in line with conceptualizations of digital literacy as a multi-dimensional competency, which is not just about being able to use a device, but includes competencies in evaluating and creating digital information (Falloon, 2020; UNESCO, 2018). Amegashie and Ankamah (2020) established the overall competence of the students in the use of library management systems software in the school which is a fundamental skill and falls within the strong items in the present study ($M = 3.74-3.81$).

On the other hand, Keboh and Baro (2020) and Abubakar (2021) argue that there is scope for improvement in the digital communication skills of LIS students in Nigeria, while Rajshahi students rated their digital media communication skills highest with a mean score of 3.89 for using email and messaging for academic purposes. Despite that, confidence with content-creation tools ($M = 3.52$) and the ability to identify misinformation ($M = 3.55$) were the lowest, with between one-quarter and a third of respondents taking a neutral stance on most items. The overall profile can thus be summarised as being competent at regular tasks, and operational and communication activities, but the need for further development in the area of information evaluating and digital content creation. The drivers of digital literacy indicate that students valued it and credited both formal and

informal learning. Strongest agreement was on the belief that digital literacy enlarged academic and career opportunities ($M = 3.98$), followed by the belief that academic courses enhanced their skills ($M = 3.91$) and self-study received the lowest (but still high) level of agreement ($M = 3.68$). However, correlation results indicate that the self-study clearly correlated with measured skills, especially content creation skills ($r = .386$)

and operational skills ($r = .216$) while the results of the students' academic courses were only related to operational skills ($r = .174$). This aligns with Ranieri et al., (2018) who state that online materials provide opportunities for self-paced learning, thus giving students opportunities to continue practicing their skills outside of class, and Zimmer and Matthews, (2022), who stress how hands-on practice enhances and builds digital competencies. The low correlation between courses and the navigation, communication and content dimensions also aligns with the findings of Radovanović et al. (2015), which states that although the standards of digital literacy are formally included in the curricula of many courses, most graduates feel there is a need to acquire further digital skills for their work or studies.

68.0% of the students reported having access barriers in access to the devices, even while 98.4% had a device. This aligns with the works of Kemp (2013) that suggests that unequal access to technology is one of the sources of unequal learning opportunity for students, and Ying et al. (2019) that the inadequate access funds negatively affect the ability to obtain up-to-date digital resources. However, there was no significant relationship between the barrier and the digital literacy scores as well as between the university resources and the digital literacy scores. Ownership of the device was not shown to be a measure of the quality, speed or reliability of access, and while students may make up for these in their own study, this was not tested, and the cross-sectional design of the study only allows for association rather than cause and effect.

All five improvement measures were important to students ($M = 3.84$ – 4.10). The most important were updated computers and software ($M = 4.10$), digital literacy courses in curriculum ($M = 3.97$) and improved campus Internet ($M = 3.94$). Equipment and connectivity take priority, reflecting the funding limitations stated by Ying et al. (2019) and the access issue discussed by Kemp (2013). The hierarchy of curriculum courses aligns with Rafi et al. (2019) and Fallon (2020) who place emphasis on the need for digital literacy to be taught in all of the LIS courses; and with the findings of Mathias et al. (2023) that due to the rigidity of the curriculum and the overcrowding of the syllabus there is little scope for this to happen. Workshops ($M = 3.84$) and peer mentoring ($M = 3.85$) were ranked lower, although Purcell (2019) highlights that specialised workshops provide targeted training in crucial areas, which suits the weak skills found here.

For group differences, the tests indicated that there were few differences in digital literacy by demographics. There was no significant difference by age or year of study and thus those null hypotheses were not rejected. In all other areas, the only statistically significant difference occurred in content creation with males scoring higher than females ($p = .038$), but the effect was small ($d \approx .26$) and not sustained by Bonferroni correction and is therefore interpreted with caution. Since there were only three students who did not own a device, the device-ownership comparison could not be interpreted. It is unclear whether there is a change in self-reported digital literacy following progression through the programme, but this could indicate that progression alone does not significantly enhance self-reported digital literacy; however, this cannot be confirmed in a cross-sectional study.

6. Recommendations

Based on the findings, some recommendations are suggested for enhancing digital literacy of LIS students of the University of Rajshahi. First, to improve the computers, software and laboratory facilities, which is the highest priority that needs to be improved ($M = 4.10$; 77.6%), and the university should be auditing its facilities on a regular basis (Ying et al., 2019). Second, on the other hand, there is a need to consider integrating digital literacy activities into the LIS courses, to be assessed through practical in-class activities such as searching for

information, evaluating information and creating digital content (Rafi et al., 2019; Falloon, 2020), without imposing any additional burden on the LIS curriculum (Mathias et al., 2023).

Thirdly, we need to enhance the campus Internet access, especially in the library and department laboratories, since 68.0% of students indicated hindering to Internet access (Kemp, 2013). Fourthly, practical workshops should focus on students' weaker skills: content creation, which has a mean score of 3.52 and misinformation detection, which has a mean score of 3.55, and should teach them through hands-on activities and fact-check training (Purcell, 2019; Zimmer & Matthews, 2022).

Fifth, independent skills development should be encouraged at least within the framework of curated self-learning resources, peer mentoring and flipped classroom activities (Ranieri et al., 2018; Etemi et al., 2024). Continuous technical support (Hoanca & Craig, 2019) could be offered by collaboration between the department and the University IT team.

Finally, the support should start from the first year and throughout the programme. Going forward, it would be useful to incorporate practical tasks as well as self-reported surveys to assess students' actual digital competencies.

7. Conclusion

This study examined the digital literacy level of 250 LIS students at University of Rajshahi and explored its related factors and what measures do the students think is important for enhancing their digital literacy. Research questions with findings are summarised below.

Digital literacy (LODL). Digital literacy means were high for all four dimensions, from 3.62 to 3.81, as students reported a high level of digital literacy. The highest were communication and collaboration ($M = 3.81$) and operational skills ($M = 3.79$), followed by information navigation and evaluation ($M = 3.65$) and creative and content creation ($M = 3.62$). Many students opted for the neutral choice, and there was a relative lack of confidence with content-creation tools and in identifying misinformation – the generally high scores must not mask areas which still require development.

Influencing factors. Students all identified that self-study, academic courses, university resources and access barriers were all a part of their experience and they felt that digital literacy enhances academic and career prospects strongly. The strongest association was found for self-study in terms of the measured skills, especially content creation. Operational skills were slightly related to courses and to the career-benefit belief, but there were no significant relationships between operational skills and resources or between operational skills and barriers to access. These are associations in cross sectional data and not causal.

Improvement measures. All of the five measures of improvement were rated important. Updated computers and software ($M = 4.10$), curriculum courses ($M = 3.97$), better campus Internet access ($M = 3.94$) were first priority areas, while peer mentoring and workshops were less priority.

Concerning the hypotheses, no significant difference was found between digital literacy according to age or year of study. The significant difference was only in the content creation by gender, favouring males, but in a small and tentative sense. The device comparison was inconclusive because not many students did not own a device.

The study provides an evidence base for LIS educators and managers of Higher Education which was restricted so far in this context. It indicates that the department's students do not lack fundamental digital skills; the issue is to build up their digital skills, particularly the creation of digital content and evaluation skills, and to strengthen the equipment and connectivity facilities that support it. As students place priority on infrastructure and programme curriculum over workshop and mentoring, it may be appropriate for planning to include a mix of infrastructure and structured teaching within the programme. The findings also suggest the student general confidence and the LIS professionals' specific tasks to be there is a gap to be addressed in future curricula.

There are a couple of limitations to take into consideration. Data is based on self-report and may not be indicative of actual performance. The study has a cross-sectional and its scope is limited to one department of one university which also limits generalisation. Reliability of the dimension scales was modest, especially the two item communication scale and pilot analysis suggested that the factor structure requires further exploration. The five factor items were not analysed as a validated scale and no regression model was estimated; therefore, the relative contribution of each factor is not known. Three people, who did not own a device, were used for the comparison of the device ownership. The results should then be viewed as a descriptive snapshot of students' perceptions at a specific moment in time.

It is suggested that more research should be conducted involving a larger number of students from various institutions and disciplines and validate the instrument based on their performance. Longitudinal designs may be used for the purpose to demonstrate the progression of skills as students work through the programme. Answers to the open-ended questions could be subject to qualitative analysis to understand why infrastructure and curricular measures are so important to students, and the relations between the various variables and digital literacy could be better understood using regression or structural models.

In general, LIS students at University of Rajshahi feel that they are relatively digitally literate, though they are feeling less confident about the skills of information evaluation and content creation and consider that better equipment, curriculum integration and internet access are the biggest ways to improve.

8. References

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