Journal of Media Horizons
ISSN: 2710-4060 2710-4052 Volume 6, Issue 2, 2025

LIBRARY AND INFORMATION SCIENCES STUDENTS' DIGITAL LITERACY AS A PREDICTOR OF THEIR ACADEMIC PERFORMANCE

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DOI: https://doi.org/10.5281/zenodo.15779977

Keywords
Digital Literacy; Academic Performance; LIS Students; Pakistan

Article History
Received on 23 May 2025
Accepted on 23 June 2025
Published on 30 June 2025

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Abstract
This study investigated the perceived level of digital literacy, academic performance, and the effect of digital literacy on academic performance among the library and information sciences (LIS) students enrolled in the top four LIS schools in Pakistan. A quantitative research approach and a survey questionnaire were used to collect data from 245 LIS students recruited through a convenient sampling technique. The descriptive analysis exhibited low to moderate perceived digital literacy and academic performance among LIS students. Hence, the regression model depicts a positive and significant effect of LIS students' digital literacy on their academic performance. These results provide pragmatic insight to LIS educators on the value of digital literacy in fostering LIS students' academic performance in Pakistan. This research is a substantial contribution to the existing literature as empirical reference was lacking in the literature that examines digital literacy and academic performance among LIS students simultaneously in the Pakistani context.

INTRODUCTION

Technological advancement and its' inception for information production, processing, and dissemination through offline and online means require students to have certain skills to access, evaluate and use information effectively and efficiently. In this regard, Calvani et al. (2009, pp. 60-61) claimed digital literacy as imperative for students that enable them "to explore and face new technological situations in a flexible way, to analyze, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations".

Digital literacy empowers students with essential skills to take advantage of technological trends (Oh et al., 2021). It creates ease for students' online learning (Burton et al., 2013), and facilitates students in the utilization of digital tools for lifelong learning (Ala-Mutka, 2011). It involves students' ability to read, and write in multimedia formats (Spires et al., 2019). It enables students to acquire credible information, identify biased content, and acquire and communicate knowledge with others (Komlayut & Srivatanakul, 2017). Digital literate students can critically evaluate, apply, and understand the information available in digital formats (Hanik, 2020) as they adopt emerging technology tools to reach their desired academic goals (Ng, 2012). Eshet-Alkalai (2004) argued that digital literacy is not merely the ability to use devices rather it includes cognitive, motor, sociological, and emotional abilities required to surf digital context. Abbas et al. (2019) also light on digital literacy to empower individuals to perform optimum in society because these are the fundament

skills related to software (including artificial intelligence), hardware, and operations related to online learning (Abbas et al., 2019). Digital literacy ensures students effective learning and classroom management (Muntu et al., 2023), and it reduces the possible harms associated with technology use and data security (Berson & Berson, 2005). Students lacking digital literacy perceive their information search results as incredible, invalid, and futile (Qoidah et al., 2023). The existing literature illustrates the value of digital literacy among students of diverse academic disciplines, hence the studies assessing digital literacy in students specifically in LIS students are very limited to emphases LIS educators to solidify their efforts to implant digital literacy in their students to produce quality LIS graduates.

Studies in past literature have unearthed several indicators that researchers use to assess students' academic performance. Such indicators include students' study habits, cognitive skills, life skills, academic grades, knowledge acquisition, developed skills, and self-growth (Iqbal et al., 2021). Studies have proved that digital literacy is an important predictor of academic performance among students in different academic settings (Darlis & Sari, 2021; Qoidah et al., 2023; van der Westhuizen & Barlow-Jones, 2011; Wagbara, 2022). Hence, the perceived academic performance and its connection with digital literacy among LIS students is yet to be investigated empirically in the Pakistani context.

Statement of the Problem

The review of the literature demonstrated a large number of studies assessing students' digital literacy in local and international contexts (Gül, 2022; Jan, 2018; Lazonder et al., 2020; Miranda et al., 2018; Naseer et al., 2022). Similarly, references exist measuring the connection of certain phenomena with students' academic performance (Christensen et al., 2012; Iqbal et al., 2021; Mughari et al., 2023). Likewise, the relationship and effect of digital literacy are also studied (Naz et al., 2022; Qoidah et al., 2023; Rehman et al., 2022). However, these available studies vary in terms of population from different disciplines, research methods, research findings, and scale of evaluation. However, we can infer that there is a dearth of empirical research assessing perceived digital literacy, academic performance, and a connection between the study variables among LIS students in Pakistan. Therefore, the research in hand intended to investigate perceived digital literacy, academic performance, and the effect of digital literacy on academic performance among LIS students of the top four library and information science schools of Pakistan. LIS students are selected because these students will soon become information practitioners and will perform different roles related to information dissemination/activities in different modern organizations. Therefore, an understanding of their digital literacy would assist LIS educators in the design, development, and effective execution of digital literacy programs in Pakistan. This research intended to achieve the following research objectives:

Research Objectives (ROs)

RO1- To determine the perceived level of DL skills of LIS students in Pakistan

RO2- To determine their perceived level of academic performance

RO3- To examine the correlation between LIS students' DL skills and their academic Performance

RO4- To examine the effect of DL skills on LIS students' academic performance

Review of Past Studies and Hypotheses Development

Digital Literacy

The ample literature described the researchers' interest in assessing digital literacy among students of varied disciplines to assist educators in formulating digital literacy policy and practice. For instance, Qoidah et al. (2023) conducted a study and found that Indonesian and Gambian students had high digital literacy. Alex-Nmecha and Ejitagha (2023) revealed that undergraduate LIS students in Nigeria possess adequate digital literacy skills. LIS educators had poor digital literacy in Nigeria. Moreover, the research depicted no significant difference in LIS teachers' digital literacy skills and digital tools and electronic resources utilization (David-West, 2022). Gül (2022) evaluated the digital literacy skills of visually impaired students. Lazonder et al. (2020) depicted that digital literacy assignments resulted in a significant improvement in their actual digital literacy skills. Digital literate students had have understanding of

online information platforms to search health health-related information (Abdulai et al., 2021). Davydov et al. (2020) exhibited massive growth in media and digital literacy in Russia. Despite possessing their own digital devices, the LIS students in Nigeria lack information-searching skills (UDOH et al., 2020). Senior school students had insufficient digital literacy skills and knowledge related to internet searching, hypertext, and content creation (Perdana et al., 2019). Miranda et al. (2018) found a positive attitude among students learning digital literacy skills. Komlayut and Srivatanakul (2017) concluded ill visual/photo literacy and understanding of computer programs in students. Ng (2012) also found sufficient digital literacy skills among digital natives.

Digital Literacy in Pakistani Perspectives

A Plethora of literature exists on addressing information literacy among students in the Pakistani context. Hence, the reference on digital literacy is comparatively limited a few studies include the research of Ameen and Gorman (2009) who revealed that there is ill provision in the academic institutions in Pakistan to impart digital literacy among graduate students. Jan (2018) revealed that school students had high digital literacy such as mobile usage. Hence these students lack technical skills including software installation and computer virus prevention. Moreover, the study depicted equal variance in male and female students regarding digital literacy. Choudhary et al. (2021) contended that secondary school students in Southern Punjab lack understanding of basic computer skills. Anzak and Sultana (2020) working women in Islamabad had high digital literacy. Digital literacy enhanced Pakistani students' autonomous English language learning (Naseer et al., 2022). Hussain (2023) conducted a systematic literature review. The research found adequate digital literacy among students including the use of technology for personal academic activities. Technologies are rapidly advancing, therefore Mughari et al., (2024) and Rafique et al., (2025) the future information professional need digital competencies including artificial intelligence literacy. Based on the arguments, we can infer that the above-cited studies have varied findings related to digital literacy in students. Similarly, these studies include populations other than LIS students. Therefore, the study merits an investigation into the perceived digital literacy among LIS students.

Academic Performance

The available research has highlighted a number of factors affecting students' academic performance. These factors include social, psychological economic conditions and various other personal variables like students' attitudes, academic self-efficacy including information literacy, teacher role, teaching styles, motivation, encouragement, students teacher interaction, family and peer relationships, self-management, academic and social motivation, sleep quality, emotional intelligence and so on (Ab Razak et al., 2019; Curcio et al., 2006; Iqbal et al., 2021; Kolo et al., 2017; Li, 2012; Mughari et al., 2023; Pandey & Thapa, 2018; Wentzel & Wigfield, 1998). Although, the reference exists to students' academic performance. However, these studies have either measured students' academic achievement with CGPA or include the relationship and or effect of some other phenomena on students' academic performance. Hence, the current study intended to evaluate students' perceived academic performance with statements that justify an empirical investigation into the perceived academic performance.

Digital Literacy and Academic Performance

The existing research has well explained the connection between digital literacy and academic performance among different populations across different academic settings. Qoidah et al. (2023) revealed that Indonesian and Gambian students' digital literacy appeared to be a positive and significant predictor of their academic outcomes. Widowati et al. (2023) presented that digital literacy has no direct relationship with social sciences humanities and engineering students' academic performance. Indonesian Madrasah students' digital innovation, competencies, and academic performance were positively and significantly correlated (Sopandi et al., 2023). Mughari et al., (2023) also revealed that technological competencies positively influences students' academic performance. Ardhiani et al. (2023) conducted a meta-analysis. The research revealed a positive and significant association between digital literacy and college students' academic performance. Moreover, the research concluded that

better students' digital literacy increases their academic performance. Students' self-control, motivation, and digital literacy predicted their academic achievement (Pala & Başıbüyük, 2023). Wagbara (2022) exhibited that secondary school students' digital literacy impacted their academic performance and development. Students' digital competencies had a significant impact on their academic achievement (Aftab, 2022). Naz et al. (2022) found that university students enrolled in higher educational institutions with adequate technology skills and knowledge had higher academic performance than students lacking such skills. Sari (2022) depicted a positive correlation between students' digital literacy, self-directed learning, and academic performance in the English language department of Sidoarjo. Rehman et al. (2022) depicted significant improvement in young students' digital literacy in Pakistan. Digital literacy development ensures students' better academic success (Ahmed & Roche, 2021). Bidin et al. (2021) reviewed the past literature and conceptualized a relationship between digital literacy and academic performance. Darlis and Sari (2021) Used logistic regression analysis and found that students' digital literacy and their personal variables including gender had no significant effect on their academic performance in higher learning institution in Indonesia. Abbas et al. (2019) found no significant relationship of digital literacy with students CGPA. Digital literacy increased students' overall learning and performance (Ukwoma et al., 2016). van der Westhuizen and Barlow-Jones (2011) found that digital literate students performed significantly better than students lacking computer and allied digital skills. Amiri (2009) reported a positive influence of students' digital literacy on their academic performance. Studies in the available in the past literature on digital literacy and academic performance include population from other discipline, a few reference seen to be evaluating such competencies among LIS students. However, these available studies vary in context such as African countries and other contents. Hence, their results are not generalizable for Pakistani LIS students. Therefore, the arguments justify the need for an empirical research on LIS students of Pakistan. In view to this, the present research postulated following hypothesis.

H1- LIS students' digital literacy has a relationship with their academic performance.

H2- LIS students' digital literacy predicts their academic performance.

Research Procedures

Method

A quantitative survey research method was used to address the study objectives intended to investigate perceived digital literacy, academic performance, relationship, and effect of digital literacy on academic performance among the LIS students in Pakistan. The survey research method is appropriate when research aims to generalize the research findings. The available research undertaking digital literacy-related aspects also utilized survey research methods such as Abbas et al. (2019); Jan, (2018).

Population Sample and Sampling

The population of the current research consisted of 684 students enrolled in undergraduate and graduate Library and information sciences programs in 4 universities in Punjab, Pakistan. The sample of 245 students was determined using Krejcie and Morgan (1970) sampling table. However, the researchers recruited 62 LIS students from each LIS school. The participants were recruited through a convenient simple sampling approach. The institution-wise participation, sample distribution, and received rate of responses are presented in Table 1.

Table 1. Participating Institutions, Sample Distribution, and Received Responses

S#	University Name	Frequency	Percentage
1	University of Sargodha, Sargodha	61	24.89%
2	The University of the Punjab, Lahore	59	24.08%
3	The Islamia University of Bahawalpur, Bahawalpur	57	23.26%
4	University of Sindh, Jamshoro	59	24.08%

Total Received responses	236	97.03%

Instrument and Instrumentations

This research used a survey questionnaire to achieve the study objective. The questionnaire was composed of 31 items divided into two sections. The section one consisted of 17 items related to digital literacy and 10 items of academic performance. Whereas, the section two consisted of 4 items related to research participants' demographic information such as gender, age, study program, and CGPA. Initially, the compiled draft of the questionnaire was sent to a panel of experts for face and content validation. The experts identified minor statement alignment issues that were addressed. After the revision of the questionnaire, the researchers went through the data collection process. A detailed description of research instruments and examples of items is presented in the below-given headings:

Digital Literacy

The 17 items related to digital literacy were adopted from the study titled "Can we teach digital native digital literacy? By Ng (2012). An example of the items include "I, like using ICT for learning", "I, can learn new technologies easily" and "I am confident with my search and evaluate skills in regards to obtaining information from the Web". All the items of digital literacy were measured using a five-point Likert scale i.e., 1 = strongly disagree and 5 = strongly agree. The motive for adopting this particular instrument was the coherence among the statements, conciseness, and comprehensiveness. The assessed reliability of the measure was a = 8.79.

Academic Performance

Research in the available literature described several indicators that researchers use to determine students' academic performance. Such indicators include students' CGPA, study habits, cognitive skills, etc. However, the previous studies criticized CGPA as a standard to measure academic performance rather they noted CGPA as a predictor of academic achievement (Iqbal et al., 2021). Therefore, the researchers in this study adopted 10 items related to academic performance from the research titled "Developing a Scale to Measure Students' Social Media Attitude and Their Academic Performance" by Bhooma Mani et al. (2019). The adoption of this scale was inspired by Mughari et al. (2023) who also conducted a study using a similar scale among business students in Pakistan and reported its high reliability and validity among students in the Pakistani settings. The instance of items include "I regularly ask for feedback on my performance from the faculty members", "I enjoy uncertain situations in college where I can find out how capable I am" and "I always put the necessary effort to reach my goals". All the items of academic performance were measured through a five-point Likert scale such as 1 = strongly disagree to 5 = strongly agree. The determined reliability of items is a = 798. Some similar reliability of the scale was also determined by Mughari et al. (2023).

Data Collection and Analyses

As an ethical condition, the researchers acquired formal permission from university administrations for the data collection. Afterwards, the researchers personally visited each of the selected research sites for data collection. The recruited research participants were assured of their anonymity and confidentiality and then requested to respond to the questionnaire voluntarily. The data collection process was completed in 5 months from January 2023 to May 2023. Of 245 distributed questionnaires, the researchers received 236 (97.03%) usable responses. The collected data was screened out and entered into SPSS v.21 datasheets for analysis. The statistical analysis includes descriptive statistics such as frequency and percentage for participants' demographic profile, mean and standard deviation for perceived digital literacy and academic performance, Pearson's product-moment and t-test for correlation between digital literacy and academic performance, and simple linear regression was employed to assess the effect of digital literacy on academic performance.

Results

Demographics

Research participants' demographic information is presented in frequency and percentage in Table 2.

The gender-wise distribution exhibited that 180 (73.4%) a large number of male students and 56 (22.8%) female students participated in the study. They described their age as 228 (93.0%) students were in the age bracket of 20 to 25 years old and only 8 (3.2%) students were 25 to 30 years old. LIS students' representation in the study was as follows: 198 (80.8%) students were enrolled in BS LIS and 38 (15.5%) students were pursuing their MLIS studies. These students reported their CGPA as 64 (26.1%) students' CGPA had up to 2.0, 165 (67.3%) had between 2.0 to 3.0 CGPA and only 7 (2.8%) students had 3.1 to 4.0 CGPA.

Table 2. Demographic Statistics of Respondents N = 236

S#	Category	Sub-Category	Frequency	Percentage
1	**Gender**	Male	180	73.4%
		Female	56	22.8%
2	Age	20 to 25 years	228	93.0%
		25 to 30 years	8	3.2%
3	**Degree**	BS-LIS	198	80.8%
		MA/MLIS	38	15.5%
4	**CGPA**	Up to 2 CGPA	64	26.1%
		2.0 to 3.0CGPA	165	67.3%
		3.1 to 4.0 CGPA	7	2.8%

Perceived Digital Literacy

The participants were asked to rate their perceived digital literacy on a five-point Likert scale ranging from 1 strongly disagree to strongly agree. The mean and standard deviation for self-perceived digital literacy are presented in descending order in Table 3. The observed mean and standard deviation depicted that the LIS students' self-perceived digital literacy was low in the majority of statements as they perceived little knowledge about different technologies (M = 3.19; SD. = 1.337), issues related to cyber safety, search issues, plagiarism (M = 3.21, SD. = 1.307), own technical problems solving (M = 3.25, SD. = 1.280). However, these students perceive the importance of digital literacy as they opened that ICT makes their learning interesting (M = 3.60, SD. = 1.332), they emphasized that teachers should use more ICT in their teaching of my classes (M = 3.62, SD. = 1.492), and ICT enables them to be a self-directed and independent learner (M = 3.62, SD. = 1.392).

Table 3. Perceived Digital Literacy of LIS Students

S#	Statements	Mean	Std. Deviation
1	I know about a lot of different technologies	3.19	1.337
2	I am familiar with issues related to web-based activities e.g. cyber safety, search issues, plagiarism	3.21	1.307
3	I know how to solve my own technical problems	3.25	1.280
4	I keep up with important new technologies	3.30	1.320
5	I have the technical skills I need to use ICT for learning and to create artefacts (e.g. presentations, digital stories, wikis, blogs) that demonstrate my understanding of what I have learnt	3.31	1.351
6	I have good ICT skills	3.33	1.372
7	I can learn new technologies easily	3.36	1.331
8	I frequently obtain help with my university work from my friends over the Internet e.g. through Skype, Facebook, Blogs	3.37	1.264

9	I am confident with my search and evaluate skills in regards to obtaining information from the Web	3.38	1.300
10	I learn better with ICT	3.46	1.246
11	There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, smartphones etc.) for learning	3.47	1.269
12	I am more motivated to learn with ICT	3.49	1.322
13	ICT enables me to collaborate better with my peers on project work and other learning activities	3.58	1.399
14	I like using ICT for learning	3.59	1.319
15	ICT makes learning more interesting	3.60	1.332
16	Teachers/lecturers should use more ICT in their teaching of my classes	3.62	1.492
17	ICT enables me to be a self-directed and independent learner	3.62	1.392
	Digital Literacy (overall)	3.75	.467

Note: Items derived from Ng (2012), Scale: 1= Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

Perceived Academic Performance

LIS students' perceived academic performance was acquired on 10 statements using a five-point Likert scale starting from 1 = strongly disagree and ending at 5 = strongly agree in Table 4. The descriptive statistics such as mean and standard deviation revealed a low to moderate perceived academic performance among the LIS students as opined neutral with the majority of statements related to academic performance including asking for feedback on their performance from their faculty members (M = 2.44, SD. = 1.072), they were afraid of failing in exams (M = 2.52, SD. = .934), and their capability to enjoy uncertain situations in the college (M = 2.91, SD. = .833).

Table 4. Perceived Academic Performance of LIS Students (n = 236)

S#	Statements	Mean	Std. Deviation
1	I regularly ask for feedback on my performance from the faculty members	2.44	1.072
2	I am afraid of failing in exams	2.52	.934
3	I enjoy uncertain situations in college where I can find out how capable I am	2.91	.833
4	I always want to be regarded as the best student in my class	2.92	.915
5	I always desire to perform better in class than others	2.97	.910
6	I often love to work in groups as it helps to learn many things from others	3.08	.789
7	I always put necessary effort to reach my goals	3.19	.791
8	I actively and enthusiastically participate in most of the classroom activities (i.e. presentations, discussions)	3.29	.735
9	For me, faculty members are more supportive for my academic betterment	3.30	.656
10	I am willing to work hard to succeed for my exams	3.33	.732
	Academic Performance (overall)	3.83	.615

Note: items adopted from Bhooma Mani et al. (2019), Scale: 1= Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

Relationship of Students' Personal Variables with Digital Literacy and Academic Performance

This research performed various statistical tests to identify whether there is a connection between LIS students' personal variables with digital literacy and academic performance in Table 5. The results revealed a negative and insignificant relationship between gender, age, study program, and CGPA with digital literacy and academic performance as all the statistical values were above the significant range of $p > 0.05$.

However, the LIS students' gender appeared to be negatively but significantly correlated with their academic performance.

Table 5. Relationship of students' personal variables with Digital Literacy and Academic Performance

S#	Personal Variables	Statistics	Digital Literacy		Academic Performance	
			R-vale	Sig-value	R-value	Sig-value
1	Gender	t-test	-.251	.802	-3.532	.000
2	Age	Pearson correlation	-.052	.211	-.028	.495
3	Study Program	t-test	-1.901	.058	-1.285	.199
4	CGPA	Pearson correlation	0.76	0.68	0.53	.233

Hypotheses Testing

LIS Students' Digital Literacy has a Relationship with their Academic Performance (H1)

Pearson Product Moment (Pearson r) was employed to assess the relationship between digital literacy and academic performance. The tests demonstrated a positive and significant relationship between the variables with observed r = 0.503**. Moreover, the strength of the correlation was determined with Cohen (1988) criterion. Which propose r > .10, r > .30, and r >.50 denoted as a weak, moderate, and strong relationship between the variables. Here, the observed r value was greater than r > .50. This means that digital literacy has a strong association with academic performance in Table 6.

Table 6. Relationship between Digital Literacy and Academic Performance

Hypothesis	Variables	DL	AP	Hypothesis
H1	Digital Literacy	1		Supported
	Academic Performance	0.503**	1	

Note: **Correlation significant at the level of 0.01, LIS Students' Digital Literacy Predicts Their Academic Performance (H2)

A simple linear regression was performed to evaluate the effect of digital literacy on academic performance in Table 7. The academic performance as a response variable was regressed on digital literacy as a predicting variable which results in an F = 196.621 < .001 with beta 0.503. It means that digital literacy has a positive and significant effect on academic performance. Moreover, the R^2 scored as .253 which depicts that digital literacy caused a 25.3% change in the response variable in academic performance.

Table 7. Effect of Digital Literacy on Academic Performance (Regression Analysis)

Hypothesis	Regression Weights		Beta Coefficient	R^2	F	p-value	Hypothesis Support
H2	DL	AP	503	0.253	196.621	.000	Supported

Discussion

The analysis showed that LIS students' perceived digital literacy was low to moderate. These students possess inadequate ICT and technical skills related to digital tools. They were deficient in the cognitive and social-emotional dimensions of digital literacy. These findings are not surprising as the majority of studies concerning students' information/digital literacy found ill or provision to impart such skills in academic institutions across Pakistan (Ameen & Gorman, 2009; Mugahri et al., (2024); Naveed & Mahmood, 2022; Naveed & Saadia, 2023; Naveed & Shah, 2022). However, these results are consistent with the results of Choudhary et al. (2021) who exhibited poor digital literacy skills among school students in Pakistan. These results disagreed with the

results of Ali and Mughari, (2024); Hussain (2023); Jan (2018) who found adequate digital literacy among students with varied populations. However, these results were found to be disagreed with the results of Anjum et al, (2022) who depicted high perceived literacy competencies among LIS students in Punjab. Likewise, LIS students' perceived academic performance also appeared to be disappointing. These students avoid regularly asking for feedback on their performance from their faculty members, they are afraid of failing in exams, do not enjoy uncertain situations in their college where they can find out how capable they are, and so on. Definitely, digital literacy causes variability in students' academic performance. It facilitates students in digital tool utilization for academic learning (Ala-Mutka, 2011) and it includes the cognitive, motor, sociological, and emotional abilities of students (Eshet-Alkalai, 2004). These findings are also supported by the study of van der Westhuizen and Barlow-Jones (2011) who found that digital literacy students had better academic performance. So we can infer that LIS students lack digital literacy, therefore their academic performance was unsatisfactory.

The results also demonstrated digital literacy as a positive correlative predictor of LIS students' academic performance (H1 and H2). These findings are corroborated by some other studies depicting a statistically positive and significant relationship between digital literacy and academic performance (Amiri, 2009; Sopandi et al., 2023). Similarly, Ukwoma et al. (2016) asserted that digital literacy fosters and increases students' academic learning and overall academic performance. The positive effect of digital literacy on academic performance among students of diverse disciplines was also reported by studies such as Wagbara (2022) who depicted that school students' digital literacy significantly impacted their academic performance. Ahmed and Roche (2021) found that digital literacy improved students' academic success. Aftab (2022) also revealed that young students' digital competencies had a significant effect on their academic performance.

Conclusions

This study concludes that LIS students possess inadequate digital literacy and academic performance. However, the empirical analysis provided evidence of a positive and significant relationship and effect of digital literacy on academic performance. It means that digital literacy can foster academic performance and it can create sustainable overall academic success among students. These findings provided a pragmatic insight to LIS educators, policymakers, universities, and other potential beneficiaries of how digital literacy ensures students' academic performance and sustainability.

Implication

This research has some definite theoretical and practical implications. From the theoretical point of view, this research adds a substantial contribution to the existing literature in the field of LIS as no study appeared to assess the perceived level of digital literacy, academic performance, and connection between the variables among LIS students of the top four LIS schools of Pakistan. Practically, this research provided empirical evidence of how digital literacy affects academic performance among LIS students. Therefore, LIS educators, policy makers, and university librarians in Pakistan and in the South Asian region should consider the revision of existing digital literacy courses if available otherwise, they need to design, develop, and integrate a need-based digital literacy into the LIS curriculum. Moreover, the LIS educator should assign digital literacy-related tasks to their students to enhance their interest in learning digital skills and ensure its practical applications in their academics. Furthermore, these stakeholders should also carry a time to time digital literacy training for LIS students regardless of their undergraduate, graduate, and postgraduate programs.

Limitations and Future Research Directions

There are some limitations associated with this study. This research used a survey research method and incorporated self-reported data related to digital literacy and academic performance. However, researchers consider this approach biased as the research participants may underestimate, overestimate or provide inaccurate information. Therefore, this may be deemed as a potential limitation of this study. Moreover, this research included participants from four LIS schools. However, it ignored other LIS institutions in the country. This may also be deemed as another limitation of this study. With regard to

statistical application, this research analyzed the relationship and effect of digital literacy on academic performance as whole variables. Whereas, the statistical use at the minute level which includes the relationship and effect of attitude, technical, cognitive, and social-emotional dimensions of digital literacy on academic performance was not performed. This may be recognized as a limitation also.

Future research studies may increase the scope of the research by studying perceived digital literacy and academic performance among all LIS students enrolled in LIS schools in Pakistan. The forthcoming research may study digital literacy among students of diverse disciplines such as students of natural sciences, engineering students, lawyers, and or medical students. Moreover, future inquiries may also increase the scope of the study adding other LIS variables such as Marketing, knowledge sharing, engagement, etc.

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