Role of Digital Literacy in Improving Students' Learning at University Level

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Abstract

Digital literacy refers to an individual's ability to use digital technologies, communication tools, and networks to access, manage, integrate, analyze, evaluate, and create information in a critical, ethical, and effective manner. The prime objective of the study was to explore the role of digital literacy in improving students' learning at the university level in Pakistan and to determine the understanding and engagement of students in digital practice. The study was quantitative in nature and descriptive research design was approached. A sample of 490 students from the population of 2237 students from four public universities of Southern Punjab was selected with a simple random sampling technique and these universities were selected on the basis of convenient sampling techniques. Moreover, the students from natural and social science departments including male and female gender were selected as population as well as sample for study. The researcher developed a questionnaire for students in order to collect quantitative data. Moreover, the questionnaire was based on the five-point Likert scale including 52 restricted response statements. The collected data was analyzed by SPSS. Descriptive and inferential statistical tools were applied. The mean and standard deviation along with variance and co-relation were found. All factors were tested through an independent t-test for the mean difference of factors. It was concluded from the findings of the study that most of the participants were found agreed with the statements of the survey questionnaire and it was concluded that digital literacy having a significant effects on the learning of the students' at university level in district Multan especially. Moreover, the results of the study indicated that students have a high level of perception of and skills in the use of digital literacy to improve their learning at university level. From the findings and conclusion of the study, it was also recommended from the study that students at university level of education as well as educational policy makers' further need to focus on improving student's perception on the Digital literacy role in improving students' learning at university level as well as at secondary level. Some useful recommendations and solutions have been proposed so that the future challenges can be coped within the presence of new crises. The study was found as a significant path for future research on digital literacy also.

Keywords: Digital literacy, university students, student learning, digital skills, descriptive research, quantitative study, SPSS analysis, educational technology, inferential statistics, perception, digital practice, higher education, Southern Punjab, Pakistan, questionnaire, Likert scale, independent t-test, educational policy

Introduction

In the contemporary digital era, the role of digital literacy has become increasingly crucial in shaping the educational experiences and outcomes of university students. Digital literacy refers to the ability to effectively and ethically use digital technologies, communication tools, and online resources to access, evaluate, create, and communicate information. It encompasses a range of competencies including critical thinking, problem-solving, and information management skills that are essential for academic success and lifelong learning. As higher education institutions integrate more digital tools and platforms into their teaching and learning processes, students are expected to engage with digital content confidently and competently. In this context, enhancing digital literacy among university students not only supports their academic performance but also equips them with the skills necessary to thrive in a technology-driven world. The present study investigates the extent to which digital literacy contributes to improving students' learning at the university level, particularly in the context of Pakistan, where technological advancements and educational reforms are progressively shaping the academic landscape.

Literature Review

Amiri (2009) identified a beneficial effect of digital literacy on learners' academic performance in his study on the effects of computer accessibility and digital literacy on learners' academic performance. Similarly, Brown (2009) conducted research on the association between digital literacy and student accomplishment. The investigation was carried out in primary schools in Texas. According to the study, there is a favourable association between digital literacy and student accomplishment. Fairlie et al. (2010) revealed considerable favourable impacts on school graduation and other educational outcomes in their study on computer and internet usage. It was also revealed that learners' achievements and performance in other academic assignments are influenced by their computer literacy.

Hargittai (2010) performed a study to test undergraduate learners' digital capabilities and discovered that learners with a high degree of internet skills used a wider range of websites. The study, he continued, "does not corroborate evidence indicating that young learners tend to be accurate regarding the website," instead saying "we discover a systematic difference in online expertise amongst a high-wired collection of youthful learners based on user history." Similarly, Kajee and Balfour (2011) conducted a study on digital literacy amongst South African university learners & observed that, while learners' courses required some degree of digital literacy, only a small percentage of learners had access to a computer. Because they possessed limited computer literacy, many learners resorted to pay someone to type their work.

Similarly, Lopez Islas (2013) discovered a beneficial relationship both digital literacy and the academic success of an underrepresented population of high school learners participating in a school-sponsored online learning programme. According to the study, a more positive environment and straightforward access to digital literacy improve academic accomplishment. It was also shown that greater internet usage for social and leisure activities resulted in higher use of different educational platform software and enhanced digital and learning skills. These talents indicated beneficial consequences for student academic progress.

Shopova (2014) investigation titled "Digital literacy among learners and its enhancement at university" found that 76% of learners demonstrated good abilities and the capacity to

operate with machines to gain knowledge availability, 14% showed outstanding skills, and 10% showed excellent skills. 40% of learners displayed competency as well as strong abilities in utilising word processing computer tools, 46% demonstrated outstanding skills, and 14% showed extraordinary capabilities. The vast majority of pupils (76%) could create and prepare documents, tables, pictures, and graphics, with 14% doing quite well and 10% performing exceptionally well. 70% of learners claimed they had adequate presenting skills, 12% said they were very excellent, and 18% said there were extraordinary.

According to the study, 56% of learners were eager to register in classes that would offer them additional opportunities to develop their digital competence. The vast majority of those surveyed said they lacked the requisite skills to access the University's digital library. They had no notion how to make use of the massive information resources available to them. According to 48% of learners, they had issues with imaginative and critical attitudes towards information, as well as its moral and ethical use. The vast majority of those surveyed had no understanding how to interpret a citation to a journal or publication, how to search databases efficiently, or how to evaluate the content of various websites.

Matyjas (2015) conducted study on children's computer use in Europe and discovered that around 85% of children use their computers with no guidance of an instructor or parent. These data suggested that these children had achieved some amount of digital literacy. Ozdamar-Keskin et al. (2015) investigated the digital literacy proficiency of university accessible and distance learners in Turkey using a survey-based study. According to their findings, university open and distance learners feel they had resolving issues and project management skills to meet educational problems. However, it was shown that learners only had basic digital literacy abilities when it came to using technology for communication and information

Problem Statement

Pakistan falls behind in digital literacy globally, there is an urgent need to examine the issue and maximize the benefits of digital literacy because in this era of creativity and technological advancement, digital literacy is viewed as a new word for education. Governments & higher education institutions (HEIs) are working hard to create settings for online education in order to increase the digital literacy of students at university level. As a result, it's critical to examine the significance of digital literacy in students' learning at university level. Less emphasis on digital literacy in university education obstructs students' ability to harness the full potential of technological tools for academic success. This statement of the problem aims to address the challenges and deficiencies in the integration of digital literacy skills in university-level education, thereby exploring ways to optimize digital literacy to improve students' overall learning outcomes.

Study Objectives

The present research objectives were;

1. To evaluate students' perception and engagement of digital literacy at the university level.
2. To explore the role of digital literacy on boosting university students' research skills confidently.
3. To assess the role of digital literacy in improving university students' learning?

Research Questions

The following research questions were developed in light of the objectives:

1. What are students' perception and engagement of digital literacy at the university level?
2. What is the role of digital literacy on boosting university students' research skills confidently?
3. What is the role of digital literacy in improving university students' learning?

Significance of the Study

The research may be beneficial for university students to identify the areas of digital literacy where they fall short, and it may emphasize the necessity of digital literacy in this technological age. The present research is interesting since digital literacy has been recognized as a crucial instrument in 21st-century daily living. Most professions demand a high level of digital literacy, such as learning how to operate on a computer and use technical tools, how to search the internet for credible information, how to interface with technological equipment, and how to manage data. Students enrolling in higher education institutions, such as universities, are labeled as future leaders; as a result, future leaders must be digitally literate in order to engage actively in society and contribute to the advancement of the country.Furthermore, the study is relevant since it indicates the degree of cognitive, operational, formal, and technical digital literacy of university students in Pakistan. This research may be critical for incorporating digital literacy into students' learning processes. The study's findings may assist students, instructors, and higher education institutions, as well as policymakers and the government, in finding gaps in the introduction of digital literacy into the learning process in the current day.

Research Methodology

The study was quantitative in nature and descriptive research design was approached. The data was collected through survey technique by using a questionnaire. The researcher himself visited the sample of the study and administered the questionnaire in order to collect accurate data for this descriptive study.

Population

As per official list issued by Higher Education Commission, there are total 9 public universities located in South Punjab (hec.gov.pk). Out of total 9 universities, only 4 public universities were selected of District Multan through convenient sampling technique. About 2237 students are enrolled in these four public universities of Multan District which formed the population of the study (List attached in Appendix B-I). Out of total 2237 students of population, 1477 belong to natural sciences department and 760 are from social sciences department (hec.gov.pk).

Sample and Sampling Technique

 About 490 students were targeted as a sample size and simple random sampling technique was adopted to collect data from the above mentioned sample (List attached in Appendix B-II).

Research Instrumentation

To address the issues revealed by the study, the researcher used a quantitative technique. A questionnaire for surveys was employed to perform this study. The researcher adopted the questionnaire from Abbas et al. (2019). The adopted questionnaire was consisted of 75 statements out of which only 52 statements were selected after talking with supervisors, and interacting with other experts in the field.

Data Collection and Data Analysis

The researcher individually visited the study's sample and gathered data from the study's respondents. SPSS (version 26) was used for data analysis. Data analysis methods included both descriptive and inferential statistics. Following thorough data collection, the data was evaluated using SPSS software. The terms employed in descriptive statistics were frequency, percentage, means, and standard deviation. To make inferences, inferential statistics employed the ANOVA, T-test and correlation was used to discover the connection between the scale's sub-factors.

Descriptive Analysis of Demographic Information of Students

Table 1.1:   Demographic Information of Students

Factor	Category	Frequency	Percent
Gender	Male	191	39.0 %
	Female	299	61.0 %
	Total	**490**	**100.0 %**
Department	Natural Science	286	58.4 %
	Social Science	204	41.6 %
	Total	**490**	**100.0 %**
University	BZU Multan	288	58.8 %
	Women University Multan	109	22.2 %
	Emerson Multan	35	7.1 %
	MNSUA Multan	58	11.8 %
	Total	**490**	**100.0 %**

Demographic Information of Students
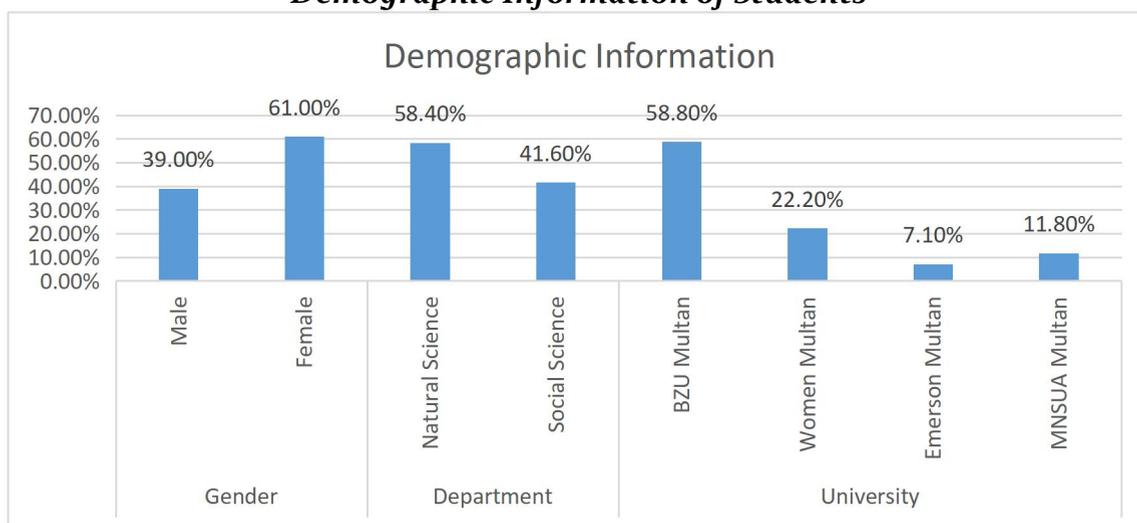
Statements Wise Analysis based on the Digital literacy role in Improving Students' Learning at University Level

The descriptive analysis of Digital literacy role in improving students' learning at university level and its statements are given in this section. All the statements were descriptively analyzed on the basis of Likert Five Scale (SA= Strongly Agree, A= Agree, N=Neutral, DA= Disagree and SDA= Strongly Disagree), mean (N) and Standard Deviation (SD). This section has tabulated data from Table 1.2 to 4.9.

Table 1.2   *Perception of Students' about Understanding and Engaging in Digital Practice*

Sr.	Statements	SA	A	N	DA	SDA	Mean	SD
1	I can choose the right tool to find, use or create information	321	139	12	10	8	4.54	0.79
		65.51%	28.36 %	2.44%	2.04%	1.63%		
2	I know how to present my digital identity in a positive way	178	269	22	14	7	4.22	0.78
		36.32%	54.89%	4.48%	2.84%	1.42%		
3	I know how to verify the online contact details of a person or organization	142	284	31	10	23	4.04	0.93
		28.97%	57.95%	6.32%	2.04%	4.69%		
4	I know how to verify who owns information and ideas I find online	88	229	95	45	33	3.60	1.09
		17.95%	46.73%	19.38%	9.18%	6.73%		
5	I know how to check whether I can legally re-use information I find online	154	246	41	26	23	3.98	1.02
		31.42%	50.20%	8.36%	5.30%	4.69%		
6	I understand how to keep digital information secure, e.g., creating and managing secure passwords or online accounts	130	235	86	20	19	3.89	0.97
		26.53%	47.95%	17.55%	4.08%	3.87%		
Overall							**4.05**	**0.93**

Figure 1.2:   Perception of Students' about Understanding and Engaging in Digital Practice
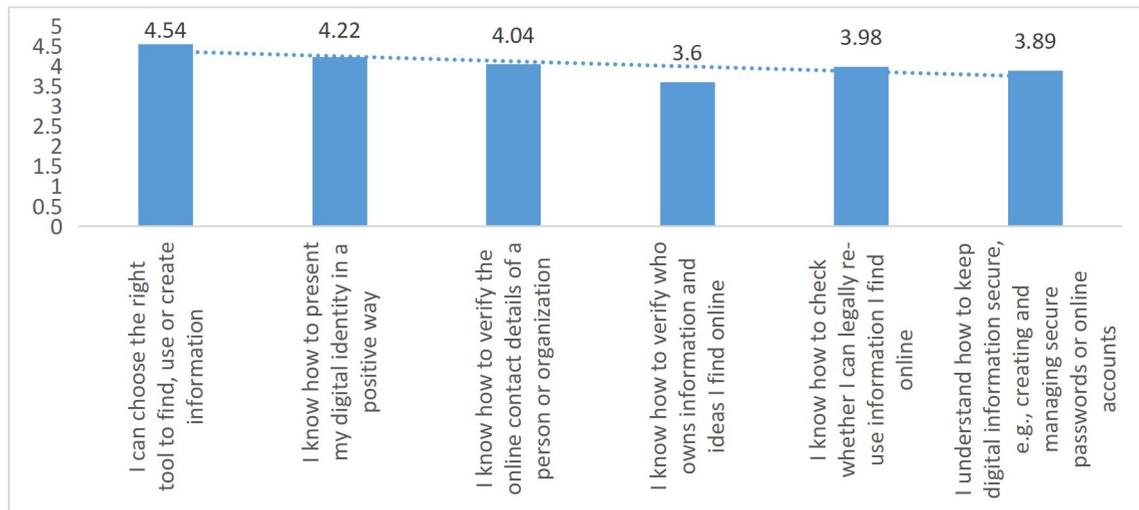

Table 1.2 described the descriptive analysis of perception of students about understanding and engaging in digital practice. The perception of students about understanding and engaging in digital practice was analyzed under six statements. From data analysis, it was found that the statement like I may select the appropriate tool to search, use, or generate information having high mean value (N=4.54) and SD (0.79). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found that I understand how to determine who owns what information and ideas that I discovered online having less value of mean (N=3.60) and SD (1.09). Moreover, it showed that many students were not agreed with this statement.Moreover, it was highlighted from the descriptive analysis of perception of students' about understanding and engaging in digital practice under six statements that overall mean and SD values were 4.05 and 0.93 and most of the statements were found near to average mean value so it was found that most of the participants were found agreed about the perception of students' about understanding and engaging in digital practice and showed positive response about these statements. Same data was also showing in following Figure 1.2.

Table 1.3   Perception of Students' about Finding the Information

Sr. #	Statements	SA	A	N	DA	SDA	Mean	SD
7	I know what kind of information can be found on the web	222 45.30%	219 44.69%	33 6.73%	19 3.87%	9 1.83%	4.27	0.86
8	I know what kind of information can be found in an online library	104 21.22%	260 53.06%	81 16.53%	23 4.69%	22 4.48%	3.82	0.97
9	I can search for information systematically, using advanced search options to limit and refine a search	141 28.77%	251 51.22%	45 9.18%	27 5.51%	26 5.30%	3.93	1.04

10	I can identify and use key words commonly used in my discipline to search for information online	122 24.89%	241 49.18%	57 11.63%	33 6.73%	37 7.55%	3.77	1.12
11	I can use scanning/skimming techniques to quickly access the key relevant information on a web page	124 25.30%	246 50.20%	53 10.81%	25 5.10%	42 8.57%	3.79	1.14
12	I keep up-to-date with information from authoritative people or organizations by subscribing to email alerts	168 34.28%	229 46.73%	51 10.40%	13 2.65%	29 5.91%	4.01	1.04
13	I can use and engage with social networks, e.g., Facebook, Twitter etc.	139 28.36%	268 54.69%	45 9.18%	17 3.46%	21 4.28%	3.99	0.95
Overall							**3.94**	**1.02**

Figure 1.3:   *Perception of Students' about Finding the Information*
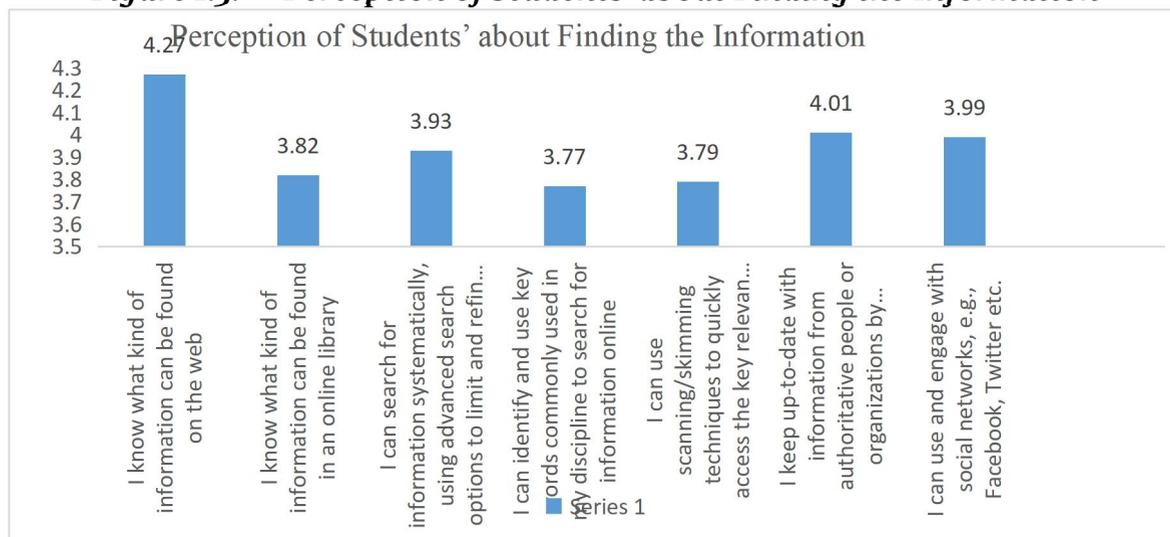

Perception of Students' about Finding the Information

Table 1.3 described the descriptive analysis of perception of students about findings information online using digital tools. The perception of students about findings information was analyzed under seven statements. From data analysis, it was found that the statement like I am aware of the kind of information that may be obtained on the internet having high mean value (N=4.27) and SD (0.86). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found that I

can recognize and utilize key terms often used in my field when searching for information online having less value of mean (N=3.77) and SD (1.12). Moreover, it showed that many students were not agreed with this statement.

Moreover, it was highlighted from the descriptive analysis of perception of students' about understanding and engaging in digital practice under six statements that overall mean and SD values were 3.94 and 1.02 and most of the statements were found near to average mean value so it was found that most of the participants were found agreed about the perception of students' about finding information and showed positive response about these statements as shown in Figure 1.3.

Table 1.4: *Perception of Students about Information Critical Evaluation, Interacting Online and Using Online Tools*

Sr. #	Statements	SA	A	N	DA	SDA	Mean	SD
14	I use information, for my studies, which comes from different media, e.g., text, podcasts, videos, online discussions	162 33.06%	223 24.51%	34 6.93%	34 6.93%	37 7.55%	3.90	1.16
15	I can tell whether an online resource (e.g., web page, blog, wiki, video, podcast, academic journal article) is credible and trustworthy	165 33.67%	243 49.59%	23 4.69%	30 6.12%	29 5.91%	3.99	1.08
16	I can tell whether a person I interact with online is credible and trustworthy	165 33.67%	210 42.85%	47 9.59%	31 6.32%	37 7.55%	3.89	1.16
17	I can keep a digital record of the relevant information I find online using standard desktop tools	79 1.61%	238 48.57%	73 14.89%	45 9.18%	55 11.22%	3.49	1.20
18	I use social networks to find information to support my university studies	148 30.20%	237 48.36%	36 7.34%	34 6.93%	35 7.14%	3.88	1.13
Overall							3.83	1.15

Figure 1.4:   Perception of Students about Information Critical Evaluation, Interacting Online and Using Online Tools

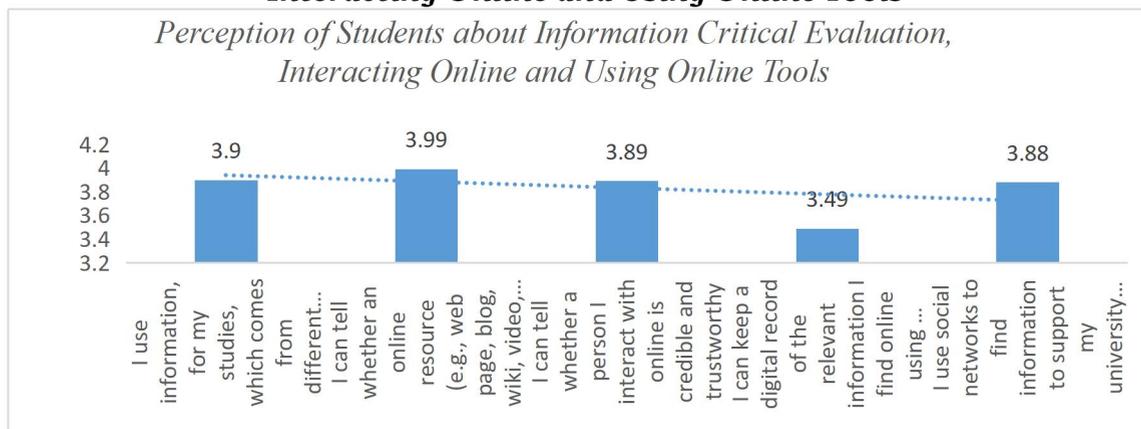Perception of Students about Information Critical Evaluation, Interacting Online and Using Online Tools

Table 1.4 described the descriptive analysis of perception of students about critical evaluation of the information, interacting online and using online tools. The perception of students about students about critical evaluation, interacting online and using online tools was analyzed under five statements. From data analysis, it was found that the statement like I can determine the credibility and trustworthiness of an online resource (e.g., a web page, blog, wiki, video, podcast, or academic journal article) having high mean value (N=3.99) and SD (1.08). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found I can use conventional desktop programs to preserve a digital record of pertinent information I find online having less value of mean (N=3.49) and SD (1.20). Moreover, it showed that many students were not agreed with this statement.

Table 1.5   *Perception of Students' about Managing and Communicating Information*

Sr. #	Statements	SA	S	A	DA	SDA	Mean	SD
19	I regularly add comments to blogs, forums or web pages	106	266	74	20	24	3.84	.973
		21.63%	54.28%	15.10%	4.08%	4.89%		
20	I have updated or corrected information I have found on online reference sources, e.g., Wikipedia	164	272	43	6	5	4.19	0.73
		33.46%	55.51%	8.77%	1.22%	1.02%		
21	I can create content in different media, e.g., video, audio, webpages for people to read online	126	269	66	16	13	3.98	0.87
		25.71%	54.89%	13.46%	3.26%	2.65%		
22	I can cite a reference to an online resource (e.g., in an assignment) using the correct format	89	281	56	25	39	3.73	1.07
		18.16%	57.34%	11.42%	5.10%	7.95%		

Sr. #	Statement						Mean	SD
23	I can use other people's work (found online) without committing plagiarism	316	96	13	33	32	4.29	1.20
		64.48%	19.59%	2.65%	6.73 %	6.53%		
Overall							**4.01**	**0.97**

Figure 1.5: *Perception of Students' about Managing and Communicating Information*

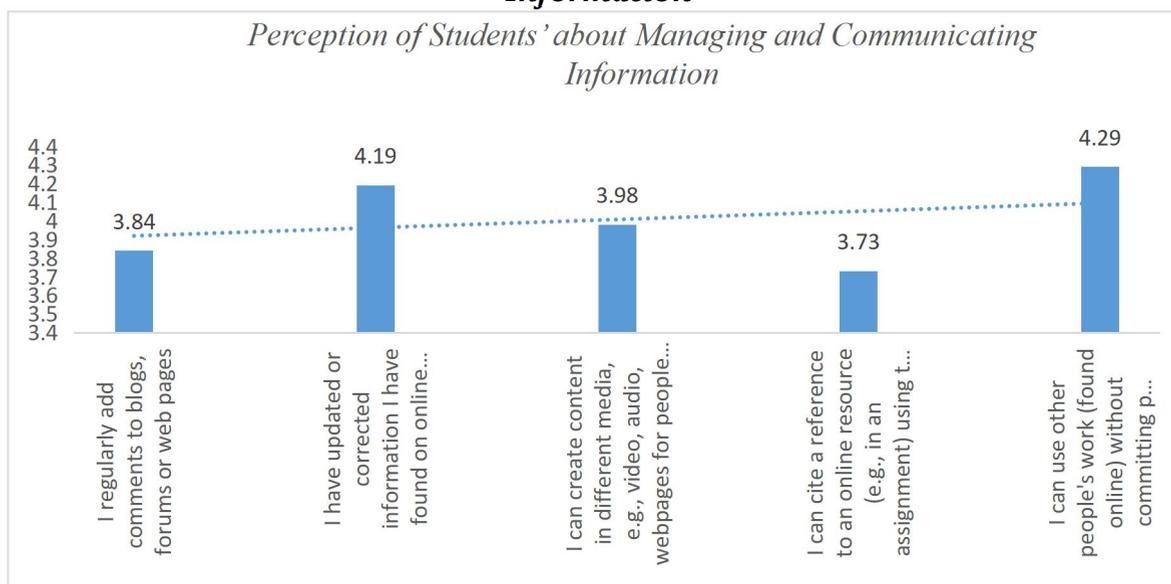*Perception of Students' about Managing and Communicating Information*

Table 1.5 described the descriptive analysis of perception of students' about managing and communicating information. The perception of students about students' about managing and communicating was analyzed under five statements. From data analysis, it was found that the statement I may utilize other people's work (found online) without plagiarizing it having high mean value (N=4.29) and SD (1.20). It highlighted that most of the students found strongly agreed with this statement and from data analysis, it was also found I know how to properly cite an internet resource (for example, in an assignment) having less value of mean (N=3.73) and SD (1.07). Moreover, it showed that many students were not agreed with this statement.

Table 1.6: *Perception of Students about Digital Literacy & Research Skills*

Sr. #	Statements	SA	A	N	DA	SDA	Mean	SD
24	My research finding and discussion in online journals/articles has increased.	106	266	74	20	24	3.84	0.97
		21.63%	54.28%	15.10%	4.08%	4.89%		
25	My skills for referencing others' online work using APA guideline have been increased.	164	272	43	6	5	4.19	0.73
		33.46%	55.51%	8.77%	1.22%	1.02%		

26	I can manage literature review through digital tools.	126 25.71%	209 42.65%	66 13.46%	16 3.26%	13 2.65%	3.98	0.87
27	I can design scale for quantitative & qualitative research (e.g., Google forms).	89 18.16%	281 57.34%	56 11.42%	25 5.10%	39 7.95%	3.73	1.07
28	My understanding for basic data analysis and interpretation techniques has been developed through digital literacy.	316 64.48%	96 19.59%	13 2.65%	33 6.73%	32 6.53%	4.29	1.20
29	My academic writing skills have been improved.	160 32.65%	304 62.04%	12 2.44%	8 1.63%	6 1.22%	4.23	0.69
Overall							**4.04**	**0.92**

Figure 1.6: *Perception of Students about Digital Literacy & Research Skills*

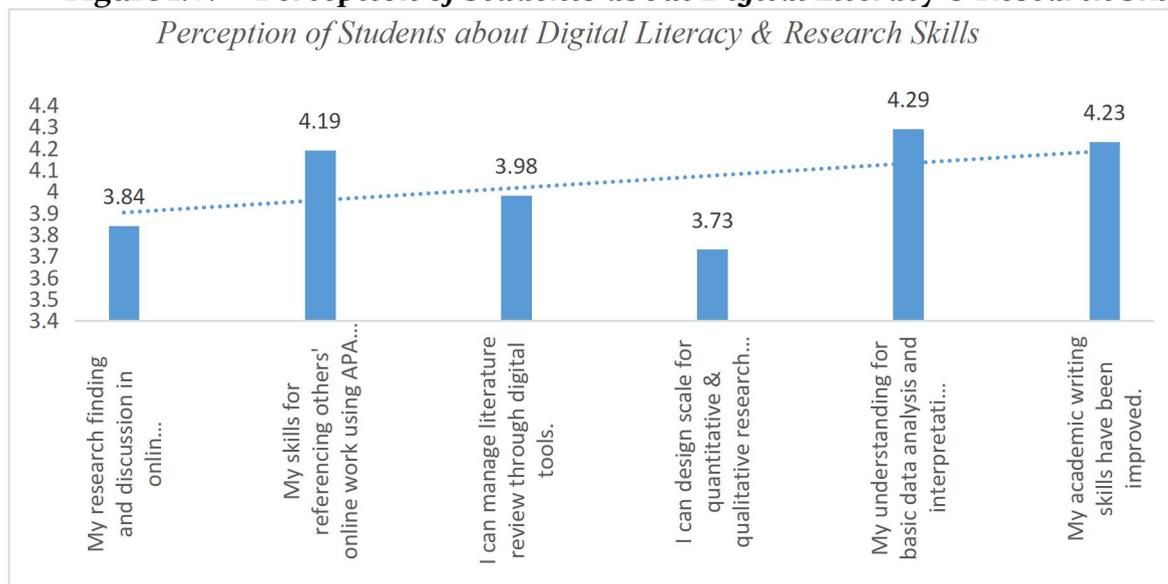*Perception of Students about Digital Literacy & Research Skills*

Table 1.6 described the descriptive analysis of perception of students about digital literacy & research skills. The perception of students about digital literacy & research skills was analyzed under six statements. From data analysis, it was found that the statement Digital literacy has improved my comprehension of fundamental analysis and interpretation of data skills having high mean value (N=4.29) and SD (1.20). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found Digital literacy has improved my comprehension of fundamental analysis and interpretation of data skills having less value of mean (N=3.73) and SD (1.07). Moreover, it showed that many students were not agreed with this statement.

Table 1.7:   *Perception of Students about Digital Literacy & Confidence*

Sr. #	Statements	SA	A	N	DA	SDA	Mean	SD
30	I can work with various software related to my research	149 30.40%	285 58.16%	33 6.73%	12 2.44%	11 2.24%	4.12	0.81
31	Digital technologies have increased my confidence	91 18.57%	259 52.85%	97 19.79%	14 2.85%	29 5.91%	3.75	0.98
32	I can easily present my own work to my fellows/seniors/teachers.	162 33.06%	264 53.87%	42 8.57%	11 2.24%	11 2.24%	4.13	0.83
33	I can produce my research work enriched with required academic skills.	122 24.89%	241 49.18%	81 16.53%	20 4.08%	26 5.30%	3.84	1.01
34	My potential to solve my academic problems has increased.	225 45.91%	220 44.89%	23 4.69 %	13 2.65%	9 1.83%	4.30	0.82
Overall							**4.03**	**0.89**

Figure 1.7:   *Perception of Students about Digital Literacy & Confidence*

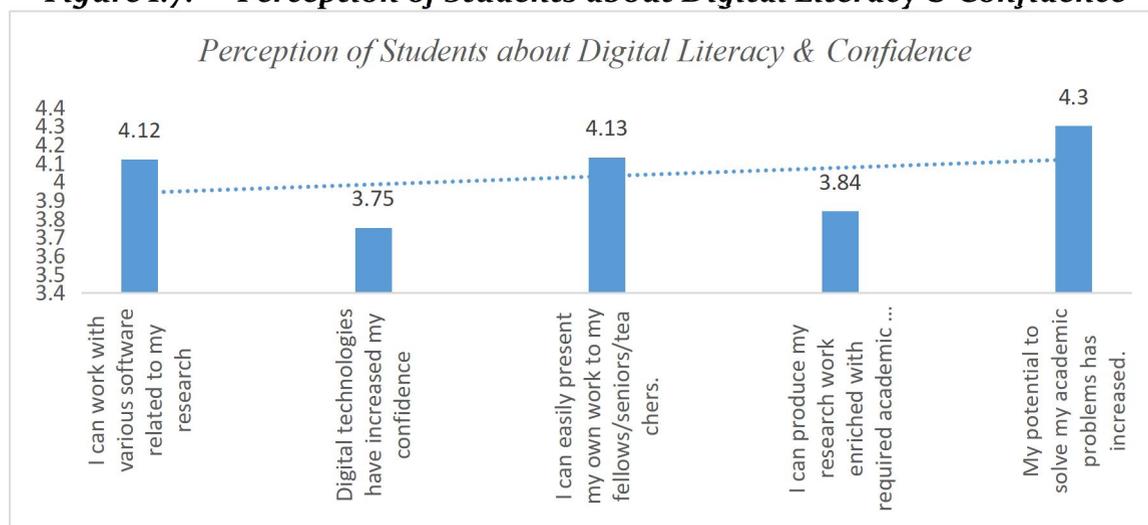Perception of Students about Digital Literacy & Confidence

Table 1.7 described the descriptive analysis of perception of students about digital literacy & confidence. The perception of students about digital literacy & confidence was analyzed under five statements. From data analysis, it was found that the statement My ability to tackle academic issues has grown having high mean value (N=4.30) and SD (0.82). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found I am capable of producing research work that is equipped with the necessary academic abilities having less value of mean (N=3.84) and SD (1.01). Moreover, it showed that many students were not agreed with this statement.

Table 1.8:   *Perception of Students about Learning / Practice Barriers of digital Literacy*

Sr. #	Statements	SA	A	N	DA	SDA	Mean	SD
35	Lack of students' interest	100 20.40%	278 56.73%	79 16.12%	15 3.06%	18 3.67%	3.87	0.90
36	Lack of teachers' interest	159 32.44%	252 51.42%	53 10.81%	9 1.83%	17 3.46%	4.08	0.90
37	Lack of time to learn about digital technologies	120 24.48%	271 55.30%	58 11.83%	15 3.06%	26 5.30%	3.91	0.98
38	Lack of teachers' knowledge about digital technologies	139 28.36%	267 54.48%	46 9.38%	15 3.06%	23 4.69%	3.99	0.96
39	Lack of students' knowledge about digital technologies	156 31.83%	258 52.65%	53 10.81%	11 2.24%	12 2.44%	4.09	0.85
40	Lack of teachers' training about digital technologies	158 32.24%	260 53.06%	40 8.16%	14 2.85%	18 3.67%	4.07	0.92
41	Insufficient internet facilities in university	144 29.38%	269 54.89%	50 10.20%	11 2.24%	16 3.26%	4.05	0.88
42	The cost of internet connection/packages is too high	164 33.46%	260 53.06%	49 10.00%	5 1.02%	12 2.44%	4.14	0.82
43	Low speed Internet issues at University	162 33.06%	247 50.40%	54 11.02%	11 2.24%	16 3.26%	4.08	0.91
44	Lack of availability of digital devices at the University	132 26.93 %	280 57.14 %	56 11.42%	12 2.44%	10 2.04%	4.04	0.82
Overall							**4.03**	**0.89**

Figure 1.8:   Perception of Students about Learning / Practice Barriers of digital Literacy
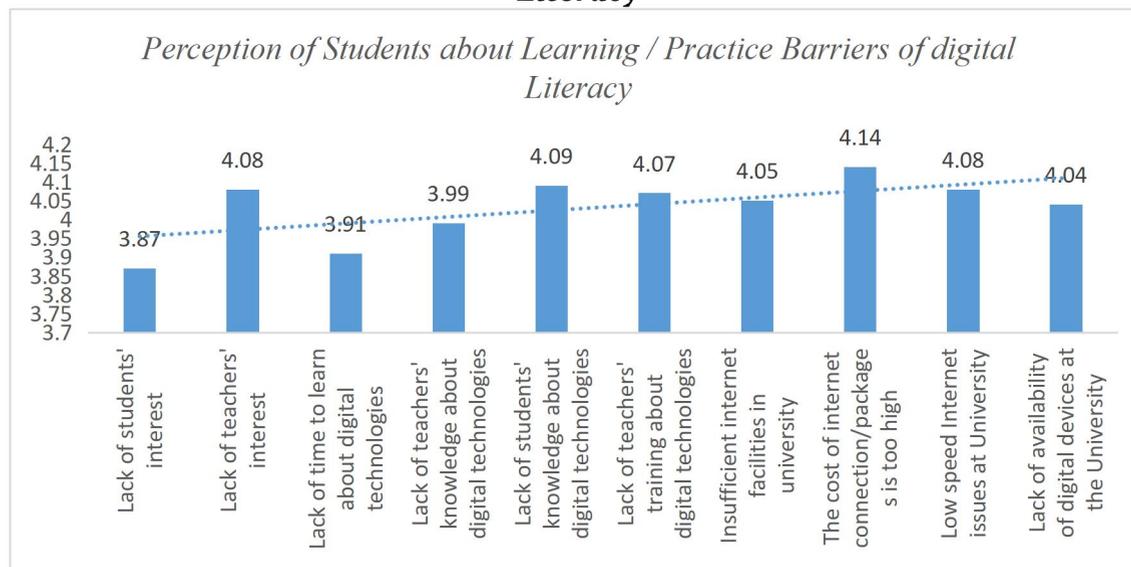

Table 1.8 described the descriptive analysis of perception of students about learning / practice barriers of digital literacy. The perception of students about learning / practice barriers of digital literacy was analyzed under ten statements. From data analysis, it was found that the statement like the cost of internet access/packages is prohibitively expensive having high mean value (N=4.14) and SD (0.82). It highlighted that most of the students found agreed with this statement and from data analysis, it was also found that Lack of students' interest having less value of mean (N=3.87) and SD (0.90). Moreover, it showed that many students were not agreed with this statement.

Table 1.9:   Perception of Students about Improvement through Digital Literacy

Sr. #	Statements	Yes	No	Mean	SD
45	Digital literacy is important for learning	490 100%	0 0.0%	1.00	0.00
46	Digital literacy improves the learning during education journey at university.	472 96.32%	18 3.68%	1.04	0.18
47	Digital literacy helps in developing research more effectively.	460 93.87%	30 6.13%	1.06	0.24
48	Digital literacy helps in writing up a thesis better.	486 99.18%	4 0.9%	1.01	0.09
49	Digital literacy helps in improving communication skills	472 96.32%	18 3.67%	1.04	0.18
50	Digital literacy helps in evaluating research information more efficiently.	481 98.16%	9 1.83%	1.02	0.13
51	Digital literacy improves problem-solving skills	487 99.38%	3 0.62%	1.01	.07
52	Digital literacy improves operating skills (ability to use tools and the exchange, interaction, or execution of tasks)	470 95.91%	20 4.09%	1.04	0.19

| Overall | | | | | 1.03 | 0.14 |

Figure 1.9:   Perception of Students about Improvement through Digital Literacy
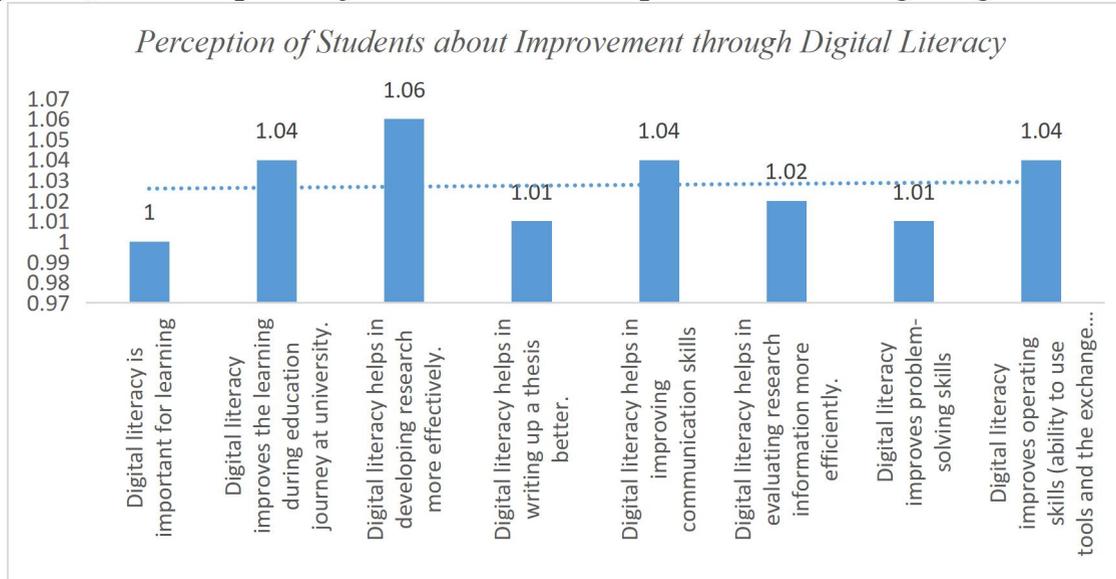

Table 1.9 described the descriptive analysis of perception of students about Improvement through Digital Literacy. The perception of students' Digital literacy help in developing research more effectively was analyzed under eight statements. From data analysis, it was found that the statement like Digital literacy help in developing research more effectively having high mean value (N=1.06) and SD (0.24). It highlighted that most of the students found agreed and having option "yes" with this statement and from data analysis, it was also found that Digital literacy is important for learning having less value of mean and all having option "yes" (N=1.00) and SD (0.00). Moreover, it showed that all students were agreed with this statement.

Inferential Analysis of Statements of Questionnaire based on the Digital literacy role in Improving Students' Learning at University Level

Inferential statistics was applied to find out the effect of demographic information on the Digital literacy role to improve students' learning at higher education level.

Inferential Analysis of Statements of Questionnaire based on understanding and Engaging in Digital Practice

Table 1.10:   Independent t-test for the Perception of Students about Overall Understanding and Engaging in Digital Practice based on classification of gender

Factor	Gender	N	Mean	SD	t	df	Sig.
Overall understanding and engaging in digital practice	Male	191	24.50	2.205	1.68	488	0.17
	Female	299	24.14	2.438	1.72	433.92	

Table 1.10 showed the independent t-test analysis of perception of students about overall understanding and engaging in digital practice based on classification of gender. It was found that Male (N=191) were less in frequency as compared to female students (N=299). The mean value for male and female participants were found as 24.50 and 24.14. It was found that there was found a difference of 0.233 in SD values for male and female students.

Table 1.11: *Independent t-test for the Perception of Students about Overall Understanding and Engaging in Digital Practice based on Department*

Factor	Department	N	Mean	SD	t	df	Sig.
Overall understanding and engaging in digital practice	Natural Science	286	24.23	2.296	-.54	488	0.90
	Social Science	204	24.35	2.438	-.54	421.13	

Table 1.11 showed the independent t-test analysis of perception of students about overall understanding and engaging in digital practice based on department. It was found that participants from natural science (N=286) were more in frequency as compared to social science students (N=204). The mean value for natural science and social science participants were found as 24.23 and 24.35. It was found that there was found a difference of 0.142 in SD values for natural science and social science students.

Table 1.12: *ANOVA t-test for the Perception of Students about Overall Understanding and Engaging in Digital Practice based on university*

Overall understanding and engaging in digital practice	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	56.130	3	18.710	3.425	
Within Groups	2654.566	486	5.462		0.01
Total	**2710.696**	**489**			

Table 1.12 showed the results of ANOVA t-test for analysis of perception of students about overall understanding and engaging in digital practice based on university of participants. It was found that overall value of sum of square was 2710.96, and mean square value between the groups was 18.710 and within the groups was 5.462. It was found that between the groups of university variable of students most of the participants having positive perception about the understanding and engaging in digital practice.

4.3.2 Inferential Analysis of Statements of Questionnaire based on Finding Information

Table 1.13: *Independent t-test for the Perception of Students about Overall finding Information Based on classification of gender*

Factor	Gender	N	Mean	SD	T	df	Sig.
Overall Finding information	Male	191	28.06	2.845	2.49	488	0.00
	Female	299	27.27	3.726	2.64	472.64	

Table 1.13 showed the independent t-test analysis of perception of students about overall finding information based on classification of gender. It was found that Male (N=191) were less in frequency as compared to female students (N=299). The mean value for male and female participants were found as 28.06 and 27.27. It was found that there was found a difference of 0.881 in SD values for male and female students.

Table 1.14: *Independent t-test for the Perception of Students about Overall Finding Information Based on Department*

Factor	Department	N	Mean	SD	t	df	Sig.
Overall Finding information	Natural Science	286	27.46	3.343	-.91	488	0.50
	Social Science	204	27.75	3.546	-.90	421.34	

Table 1.14 showed the independent t-test analysis of perception of students about overall finding information based on department. It was found that participants from natural

science (N=286) were more in frequency as compared to social science students (N=204). The mean value for natural science and social science participants were found as 27.46 and 27.75. It was found that there was found a difference of 0.203 in SD values for natural science and social science students.

Table 1.15: *ANOVA t-test for the Perception of Students about Overall Finding Information Based on University*

Overall Finding information	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	307.853	3	102.618	9.168	0.00
Within Groups	5439.701	486	11.193		
Total	**5747.553**	**489**			

Table 1.15 showed the results of ANOVA t-test for analysis of perception of students about overall finding information based on university of participants. It was found that overall value of sum of square was 5747.533, and mean square value between the groups was 102.618 and within the groups was 11.193. It was found that between the groups of university variable of students most of the participants having positive perception about the finding information.

Inferential Analysis of Statements of Questionnaire based on Information critical evaluation, interacting online and using online tools

Table 1.16: *Independent t-test for the Perception of Students about Overall Information critical evaluation, interacting online and using online tools Based on classification of gender*

Factor	Gender	N	Mean	SD	t	df	Sig.
Overall, information critical evaluation, interacting online and using online tools	Male	191	20.32	2.554	2.40	488	0.53
	Female	299	19.74	2.677	2.42	418.78	

Table 1.16 showed the independent t-test analysis of perception of students about overall information critically evaluation, interacting online and using online tools based on classification of gender. It was found that Male (N=191) were less in frequency as compared to female students (N=299). The mean value for male and female participants were found as 20.32 and 19.74. It was found that there was found a difference of 0.123 in SD values for male and female students. .

Table 1.17: *Independent t-test for the Perception of Students about Overall Information critical evaluation, interacting online and using online tools Based on Department*

Factor	Department	N	Mean	SD	t	df	Sig.
Overall, information critical evaluation, interacting online and using online tools	Natural Science	286	20.01	2.56	.50	488	0.52
	Social Science	204	19.89	2.76	.50	416.54	

Table 1.17 showed the independent t-test analysis of perception of students about overall information critically evaluation, interacting online and using online tools based on department. It was found that participants from natural science (N=286) were more in frequency as compared to social science students (N=204). The mean value for natural science and social science participants were found as 20.01 and 19.89. It was found that

there was found a difference of 0.2 in SD values for natural science and social science students.

Table 1.18:   *ANOVA t-test for the Perception of Students about Overall Information critical evaluation, interacting online and using online tools Based on University*

Overall, critically evaluating information, online interaction and online too	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.393	3	10.798		
Within Groups	3382.946	486	6.961	1.551	0.20
Total	**3415.339**	**489**			

Table 1.18 showed the results of ANOVA t-test for analysis of perception of students about overall information critically evaluation, interacting online and using online tools based on university of participants. It was found that overall value of sum of square was 3415.339 and mean square value between the groups was 10.798 and within the groups was 6.961. It was found that between the groups of university variable of students most of the participants having positive perception about the information critically evaluation, interacting online and using online tools.

Results and Discussion

The findings of the study reveal a comprehensive understanding of students' perceptions regarding the role of digital literacy in enhancing learning at the university level. Descriptive analysis indicated a gender disparity with more female (61%) than male (39%) participants. The students were also fairly distributed across departments—58.4% from natural sciences and 41.6% from social sciences—and came from four major universities in Multan. Most participants reported confidence in using digital tools to search, manage, and evaluate information, particularly in statements like selecting appropriate tools for information retrieval and identifying credible sources online. However, lower mean scores were reported on tasks such as citing sources correctly or designing research tools like Google Forms. Barriers such as high internet costs and lack of interest also emerged as significant.

Inferential statistics (t-tests and ANOVA) explored perceptions by gender, department, and university. While differences in mean scores between male and female students were generally minor, females often scored slightly higher on digital literacy perceptions. Students from natural science departments displayed marginally stronger perceptions in some areas, but these differences were not statistically large. ANOVA results across universities showed variation in perceptions, suggesting institutional differences in digital literacy exposure and resources. Nonetheless, the majority of students across demographic groups expressed generally positive views about the impact of digital literacy on their academic capabilities, research skills, and confidence in digital environments. The study reinforces the critical role of digital literacy in higher education and highlights the influence of demographic factors on students' digital competencies. The findings suggest that while students recognize the importance of digital tools in learning, gaps remain in applying these tools effectively—particularly in academic writing and research methodology. Given the limitations of surveying only students, future research should expand to include teachers' perspectives, subject-specific analysis, and postgraduate students. These insights can help tailor digital literacy programs more effectively and

address specific learning challenges faced by students at the university level (Shopova, 2014).

Conclusion

The descriptive analysis of the questionnaire responses revealed that students generally held a positive perception regarding various dimensions of digital literacy. Most participants agreed that they effectively engage with digital practices, manage and communicate information, and utilize digital tools for research and learning. This was evident from the average or above-average mean values across statements in Tables 4.2 to 4.7. Similarly, students reported high confidence in their digital literacy skills, particularly in areas related to digital research and information management. Although some variation existed in specific items, the overall trend reflected a strong consensus on the beneficial role of digital literacy in supporting university-level education.

Additionally, the analysis highlighted student acknowledgment of certain challenges, such as learning and practice barriers to digital literacy (Tables 4.8 and 4.9). Despite these barriers, most respondents affirmed that digital literacy contributes significantly to academic improvement. Inferential analysis further supported these findings, particularly regarding statistically significant differences based on university affiliation. For instance, ANOVA results indicated that students' perceptions of digital literacy and research skills varied significantly across institutions (Tables 4.12, 4.24, and 4.27), with p-values below the 0.05 threshold. These outcomes underline the importance of institutional context in shaping students' digital competencies and suggest that targeted strategies at the university level can enhance digital literacy outcomes.

Recommendations for Future Research

Following were the recommendations for future research.

1. This study was delimited to seeking perception of students at university level of District Multan only. The future researcher may conduct research on other levels of schooling.

2. This study focused on investigating views of students only. Future research can be extended to examining teachers' perception about the Digital literacy role in improving students' learning at university level.

3. This study cannot analyze overall students' views regarding their views about the Digital literacy role in improving students' learning at university level. Future researchers may focus on analyzing views of teachers based on their specific subject of teaching or area/discipline at any level.

4. The study was limited to district Multan only, in future it should also be conducted at other's districts also.

5. Moreover, this study is delimited to the Digital literacy role in improving students' learning at university level, it should be conducted for other's subjects like Biology and Mathematics etc. also.

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