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Digital Literacy and Academic Performance of University Students: A Quantitative Study

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ABSTRACT

This paper set out to investigate the correlation between digital literacy and academic performance among college students with special emphasis on the main aspects of digital literacy such as digital skills, research skills, communication skills and confidence. The research also evaluated the perceived levels of these competencies among the students in the context of higher education. Quantitative research design was adopted and data was gathered using a structured questionnaire which was given to 219 students of social science disciplines in the Bahauddin Zakariya University and the Institute of Southern Punjab. The data were analyzed using descriptive and inferential statistical methods, such as mean, standard deviation, and Pearson correlation analysis. The results showed that there was a strong positive correlation between digital literacy elements, especially between digital skills and research skills and academic performance of students. There were also significant associations with communication skills and confidence, which suggest that they contribute to the improvement of learning outcomes. The findings indicate that the increased digital literacy levels lead to better academic performance among students in universities. On the basis of these results, it is suggested that higher education establishments should consider incorporating digital literacy programs into their curricula to improve the level of competencies and academic performance of their students. Also, institutional initiatives ought to be directed towards enhancing student and teacher participation in online learning.

Introduction

The modern academic environment requires an advanced concept of digital literacy, which includes the capacity to successfully find, analyze, and synthesize data of various online sources to conduct a rigorous academic investigation (Mr. et al., 2020). This is especially important with

university students who are becoming more and more exposed to a flood of digital information and are supposed to turn this information into practical knowledge by critically analyzing it and engaging in disciplined inquiry (Murray and Lachowsky, 2017, p. 3). Although students are immersed in digital spaces, even in higher education, a large number of them do not have the high-level digital literacy skills needed to conduct effective academic research, including using advanced search operators or critically assessing the credibility of online sources (Farhain et al., 2023, p. 13). As an example, many studies show that the majority of university students are not only sure about their use of the internet but also have a very low level of awareness regarding how to recognize credible web-based information and how to detect misinformation (Mrah, 2022, p. 185; Wada et al., 2023, p. 248).

This gap is not limited to simple search capabilities, as most students do not use appropriate planning or drafting of academic assignments, often falling into the trap of using less academic sources such as Google rather than academic databases (Reyes et al., 2021). These restrictions highlight a significant disparity between perceived digital fluency and actual digital literacy in academic settings, especially in the Global South where universities are grappling with the issue of incorporating digital literacy into their curricula (Nkansah and Oldac, 2024, p. 2). This digital literacy gap among university students, particularly in relation to research skills, indicates that there is an urgent necessity to conduct a thorough analysis of the existing educational strategies (Blankendaal-Tran et al., 2023, p. 3). The purpose of this comparative analysis is to investigate the differences in digital literacy and research skills of university students in different contexts, considering the different conditions and criteria in which the current models and frameworks of digital literacy were created (Muammar et al., 2024, p. 4). In this research, the particular focus was be on the application and adaptation of these frameworks in various educational contexts, taking into account the influence of socio-cultural backgrounds on the acquisition and use of skills (Daire, 2024, p. 8). It was also fill the current digital literacy skills gap among undergraduate students, especially in resource-limited areas, by determining the origins of such differences and suggesting ways to reduce them (Nkansah and Oldac, 2024). Moreover, the study was add to the current academic discussion by shedding light on how socio-cultural differences affect the aspects of digital literacy that are valued and how they are taught or evaluated in higher education (Daire, 2024, p. 8). The study also examines the positive impacts and learning outcomes associated with digital literacy in a higher education context while exploring potential challenges to successful implementation (MOKHTARI, 2023, p. 161). Lastly, the study was suggest specific interventions and pedagogical approaches to develop improved digital literacy and research abilities in university students, thus equipping them with improved academic achievements and professional requirements in the future. These interventions are essential as the lack of digital literacy in students in most areas, especially the Global South, is reported, and the overall work to enhance these abilities is usually insufficient (Nkansah and Oldac, 2024, p. 2). Thus, the patterns of using different digital technologies by higher education students are essential to comprehending the present state of digital literacy integration and how to design interventions (Quraishi et al., 2024, p. 668). Furthermore, the evaluation of existing digital literacy frameworks and theoretical frameworks should be conducted to determine their relevance and effectiveness in various academic environments, especially considering the changing technological environment and pedagogical needs (Muammar et al., 2024, p. 2). This involves a critical analysis of the role of sociocultural factors in the formation and use of digital literacies and the determination of the most important psych educational and learning variables that are necessary to become digitally proficient in higher education (Ángel et al., 2022; Smith and Storrs, 2023, p. 4). This critical analysis was guide the creation of more efficient pedagogical strategies to incorporate digital literacy in higher education programs, thus improving student empowerment and academic

achievement (Quraishi et al., 2024, p. 669; Zakir et al., 2025). The issues related to the implementation of digital literacy in higher education programs was also be taken into account in this inquiry, based on empirical data and the experience of different studies (Quraishi et al., 2024, p. 668).

Research objective

Objectives of the Study

1. To investigate the effect of digital literacy on the academic performance of students at the university level.
2. To find out the perception of communication skills of the students at the university level.
3. To analyze the perception of research skills of the students at the university level.
4. To assess the perception of confidence skills of the students at the university level.
5. To examine the relationships among students' perceptions of digital literacy, communication skills, research skills, confidence, and perceived barriers to digital literacy learning and practice.

Research Methodology

This research aimed to explore the perception of university students about the influence of factors, including Digital Skills Research Skills, Communication Skills, and Confidence, on academic performance. In this study, factors affecting students' academic performance were measured using quantitative research methodology. A self-development questionnaire was distributed to the male and female students in order to collect data. Cross-sectional surveys are effective because they depict attitudes, opinions, behaviors, and characteristics of a large population by asking different questions (Creswell, 2012; Fraenkel et al., 2015).

Population and Sample

Students from both Government Universities in Multan affiliated with the social sciences department, Bahauddin Zakariya University and The Women's University Multan, were included in the study. There is also one private university in Multan, ISP. A stratified sampling technique was used to draw samples from the targeted population. The researcher preferred the BS, MS, and M.Phil. Since they have already spent enough time in the university during their study, they have better understanding of discipline. Due to their experience, they could easily share their opinion about the factors mentioned in the study It was found that 61 students at Bahauddin Zakariya, 85 students at Women University, as well as 73 students at the Institute of Southern Punjab (ISP) studied in the BS discipline within the social sciences departments, including psychology, economics, and education. Thus, 219 university students were included in the study.

Research Instruments

Various studies have examined the effects of digital literacy on student performance, digital skills, research skills, communication skills, and confidence. In order to conduct the research, the researcher developed a closed-ended questionnaire to explore the impact of each factor on students' academic performance. To obtain students' opinions on the different factors, a questionnaire was developed on a Likert scale format ranging from Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. There were two sections to the questionnaire. The demographic information of the research participants is presented in Section A. This section considered 32 statements related to the factors, namely Digital Skill and Student performance, Digital Skill, Research Skill, Communication Skill, and Confidence.

Validity and Reliability of the Tool

After reviewing the relevant literature and discussing the issue with different experts, a questionnaire containing 32 statements was developed for the present study earlier, in order to determine its content validity. A minimum of two experts in the social sciences field were required to review each item of the questionnaire and provide their feedback after reviewing and analyzing it. Moreover, experts identified the weaknesses and strengths of the questionnaire and refined the item statements in terms of their content and format. Based on the feedback provided by the experts, the researcher improved each statement. Ultimately, the research instrument was finalized and consisted of 32 easy-to-understand statements for data collection.

Pilot studies were conducted with 30 students from the department of social sciences in order to assess the reliability of the research tool. The sample selected for the pilot study was not included in the sample. Data from the pilot study were entered into the instrument to determine its reliability. Using this Likert scale, they used strongly agree, agree, undecided, disagree, and strongly disagree. Reliability was measured using Cronbach's alpha.There was a reliability of over 0.7, indicating reliability.

Data Collection

To collect data, 219 questionnaires were distributed to male and female students from WUM, BZU, and ISP, using a mixed method from the departments of social sciences. In almost three weeks, the researcher personally collected data from students from both universities, and the return rate of the questionnaire met the required sample size. Instructions were clearly stated on the questionnaire and were also provided orally by the researcher if necessary. Throughout the research procedure, all information provided by the respondents was kept confidential so that students could provide accurate and authentic data about the factors in this study.

Data analysis.

Both descriptive and inferential statistics were used to analyze the research data provided by the students. Using the Statistics Package for Social Sciences (SPSS), the researcher analyzed the information received from the students regarding each factor of student academic performance. An analysis of factors-wise data was presented in the form of tables based on Mean, Percentage, and Standard Deviation applied in descriptive statistics. Pearson Correlation was used to analyze the different variables using inferential statistics.

Results of study

Table 1: ***Effect of Digital Literacy on Students' Performance***

S #	Statements	f%	SA	A	UD	DA	SDA	Mean	S.D
1	Academically, I believe that I am performing well.	219	25.155	74.0162	0.92	000	000	4.242	0.450
2	My academic Performance Often causes me to feel Stressed.	219	8.218	46.6102	11.024	34.275	000	3.287	1.029
3	In terms of academic success, I am confident in my abilities.	219	26.558	71.7157	0.92	0.92	000	4.237	0.505
4	In all my subjects, I made myself prepared to learn digitally.	219	20.144	72.659	3.78	1.84	1.84	4.073	0.686
5	With the aid of digital literacy, I	219	19.6	73.1	2.3	2.7	2.3	4.050	0.730

	hope to achieve good grades in every subject.		43	160	5	6	5		
6	When I am working on difficult assignments using digital materials, I exert more effort.	219	21.9 48	68.9 151	5.0 11	1.8 4	2.3 5	4.063	0.739
7	In every discussion, I actively participate.	219	20.1 44	61.6 135	8.7 19	9.6 21	00 0	3.922	0.817

Table 1 show that 74% of respondents agreed and 0% disagreed with the statement that academic performance often causes them to feel stressed. However, the mean score of 4.242 (SD=0.450) represents students' level of agreement towards this statement. Similarly, 46.6% of participants agreed, and 34.2% disagreed with the statement that in terms of academic success, they are confident in their abilities. The men's score of 3.287 (SD= 1.029) shows students a high level of agreement towards these statements. Likewise, 71.7% of respondents agreed, and 0.9% disagreed with the statement that in all my subjects, they made themselves prepared to learn digitally. The mean score of 4.237 (SD=0.505) represents students' greater level of agreement towards this statement. Moreover, 72.6% of respondents agreed, and 1.8% disagreed with the statement that with the aid of digital literacy, they hope to achieve good grades in every subject. The mean score of 4.073 (SD=0.686) represents students' high level of agreement towards this statement. Similarly, 73.1% of respondents agreed, and 2.7% disagreed with the statement that when they work on difficult assignments using digital materials, they exert more effort. The mean score is 4.050 and (SD=0.730) shows students' level of agreement towards this statement. In the same manner, 68.9% of respondents agreed, and only 1.8% disagreed with the statement that in every discussion, they actively participate. The mean score of 4.063 and (SD=0.739) represent students' greater level of agreement towards this statement. Moreover, 61.6% of respondents agreed, and 9.6% disagreed with the statement that with the aid of digital literacy, they hope to achieve good grades in every subject. The mean score of 3.922 (SD=0.817) represents students' high level of agreement towards this statement.

Table 2: ***Effect of Digital Literacy and Digital Skills***

S#	Statements	f%	SA	A	UD	DA	SDA	Mean	S.D
1	When I share personal information online, I am aware of what happens to it.	219	20.5 45	69.9 153	5.0 11	3.7 8	0.9 2	4.054	0.695
2	My digital identity can be presented in a positive light.	219	17.4 38	73.5 161	5.0 11	4.1 9	00	4.041	0.623
3	If I find information online, I know how to check weather I am allow to re-use it legally.	219	11.9 26	74.9 164	7.8 17	3.7 8	1.8 4	3.913	0.708

Table 2 illustrates that 69.9% of participants agreed and 3.7% disagreed with the statement that when they share personal information, they are aware of what happens to it. The mean score of 4.054 (SD=0.695) shows students' level of agreement towards this statement. Similarly, 73.5% of respondents agreed, and 4.1% disagreed towards the statement that their digital identity can be presented in a positive light. The mean score of 4.041 (SD=0.623) represents students' level of agreement towards this statement. Likewise, 74.9% of respondents agreed, and 3.7% disagreed with the statement if they find information online, they know how to check whether they're allowed to re-use it legally. The men's score of 3.913 (SD= 0.708) represents students' high level

of agreement towards this statement. While 81.7% of respondents agreed, and only 2.3% disagreed with this statement that they can use social bookmarking to organize and share information. The mean score of 4.00 (SD= 0.601) represents students' level of agreement toward this statement.

Table 3: ***Effect of Digital Literacy and Research Skills***

S#	Statements	f%	SA	A	UD	DA	SDA	Mean	S.D
1	Using electronic search engines, I can locate online resources.	219	6.8 15	76.3 167	7.3 16	8.7 19	0.9 2	3.794	0.728
2	My work can be created using a variety of digital tool.	219	4.6 10	83.6 183	3.7 8	8.2 18	00 0	3.844	0.623
3	I can manage literature reviews using digital tools.	219	5.5 12	78.1 171	5.5 12	10.5 23	0.5 1	3.776	0.723
4	I can design scales for quantitative and qualitative research (e.g; Google Forms).	219	7.3 16	75.3 165	5.0 11	11.4 25	0.9 2	3.767	0.781
5	Depending on the nature of the data, I can select appropriate tests.	219	5.0 11	84.0 184	4.1 9	5.9 13	0.9 2	3.683	0.627
6	As a researcher, I have clear understanding of ethical principles.	219	8.7 19	78.1 171	2.3 5	7.3 16	3.7 8	3.808	0.834

Table 3 illustrates that 76.3% of respondents agreed, and 8.7% of respondents disagreed with the statement that by using electronic search engines, they can locate online resources. The mean score of 3.794 (SD= 0.728) represents students' level of agreement towards this statement. Similarly, 83.6% of respondents agreed, and 8.2% of respondents disagreed towards the statement that their work can be created using a variety of digital tools. The mean score of 3.844 (SD=0.623) represents students' level of agreement towards this statement. Likewise, 78.1% of respondents agreed, and 10.5% of respondents disagreed with the statement that they can manage literature reviews using digital tools. The mean score of 3.776 (SD=0.723) shows students' level of agreement with this statement. In the same manner, 75.3% of respondents agreed, and 11.4% of respondents disagreed with the statement that scales can be designed for quantitative and qualitative research (e.g., Google Forms). The mean score of 3.767 (SD=0.781) signifies the student's level of agreement with this statement. While 84.0% of respondents agreed, 0.9% of respondents disagreed with the statement that they, depending on the nature of the data, can select appropriate tests. The mean score of 3.683 (SD=0.627) represents students' level of agreement towards this statement. In addition, 78.1% of respondents agreed, and 7.3% of respondents disagreed with the statement. As researchers, they have a clear understanding of ethical principles. The mean score of 3.808 (SD=0.834) represents students' level of agreement towards this statement.

Table 4: ***Effect of Digital Literacy and Communication Skills***

S#	Statements	f%	SA	A	UD	DA	SDA	Mean	S.D
1	It is clear to me what the purpose of online communication tools is.	21 9	6.4 14	87.2 191	1.8 4	3.2 7	1.4 3	3.940	0.575
2	It is possible for me to work with a variety of	21 9	8 3.7	82.2 180	5.0 11	8.7 19	0.5 1	3.808	0.690

	online tools.								
3	I can communicate through group's emails.	219	4.19	76.3167	5.512	12.828	1.43	3.689	0.798
4	It is easy for me to make voice calls, video calls, and video conferences.	219	5.512	85.8188	0.92	1.54	000	3.890	0.701
5	During online discussion, I am aware of the rules of communication.	219	5.913	85.8188	3.27	4.19	0.92	3.917	0.576
6	Social networking sights have both advantages and disadvantages.	219	4.610	90.0197	0.92	3.78	0.92	3.936	0.529
7	To exchange messages, I can use instant messaging or social media.	219	6.414	81.7179	5.913	3.911	0.92	3.876	0.626
8	I can communicate online (via text, audio, or video calls).	219	7.817	84.5185	0.92	5.913	0.92	3.922	0.634

Table 4 shows that 87.2% of respondents agreed and 3.2% of respondents disagreed towards the statement that the purpose of online communication tools is. The mean score of 3.940 (SD=0.575) represents students' level of agreement towards this statement. Similarly, 82.2% of respondents agreed, and only 8.7% of respondents disagreed with the statement that communication skills make it possible for students to work on their academic performance by using a variety of online tools. The mean score of 3.808 (SD=0.690) represents students' high level of agreement towards this statement. Likewise, 76.3% of respondents agreed, and only 12.8% disagreed with the statement that students can communicate through group emails to interact with their classmates. The mean score of 3.689 (SD=0.798) represents students' level of agreement towards this statement. 85.8% of respondents agreed, and 1.5% of respondents disagreed with the statement that communication skills make it easy for their students to make voice calls, video calls and video conferences. The mean score of 3.890 (SD=0.701) represents students' level of agreement with this statement. Moreover, 85.8% of respondents agreed, and 4.1% of respondents disagreed with the statement that during online discussions, students are aware of their rules of communication. The mean score of 3.917 (SD0.576) represents students' level of agreement towards this statement. In the same way, 90.0% of respondents agreed, and 3.7% of respondents disagreed with the statement social networking sites have both advantages and disadvantages. The mean score of 3.936 (SD=0.529) represented the students' level of agreement with this statement. In addition, 81.7% of respondents agreed, and only 3.9% disagreed with the statement that to exchange messages, they can use instant messaging or social media. The mean score of 3.876 (SD=0.626) represents students' levels of agreement towards this statement. Moreover, 84.5% of respondents agreed, and only 5.9% disagreed with the statement that they can communicate online (via text, audio, or video calls) through platforms. The mean score of 3.922 (SD=0.634) represents students' level of agreement towards this statement.

Table 5: ***The effect of digital literacy and Confidence*****.**

S#	Statements	f%	SA	A	UD	DA	SDA	Mean	S.D
1	It is possible for me to work	219	5.9	85.4	1.4	7.3	00	3.899	0.597

	with a variety of software related to my research.		13	187	3	16	0		
2	My confidence has increased because of digital technologies.	219	11.4 25	81.3 178	1.8 4	5.0 11	0.5 1	3.981	0.613
3	As a result, I am more capable of solving my academic problems.	219	9.1 20	76.3 167	9.1 20	5.0 11	0.5 1	3.885	0.643
4	I am confidence in my ability to participate in online discussion, blogs, and social networking sites.	219	7.8 17	73.5 161	8.7 19	7.8 17	2.3 5	3.767	0.793
5	Depending on my needs, I can direct/ manage the search for data, information, and content in digital media.	219	11.9 26	76.7 168	3.7 8	5.5 12	2.3 5	3.904	0.757
6	Using digital media, I can save and store data, information and content.	219	5.5 12	85.5 188	1.8 4	3.7 8	3.2 7	3.867	0.701
7	It is possible for me to upload, download, save, and open file.	219	10.5 23	83.1 182	1.4 3	4.1 9	0.9 2	3.981	0.605

Table 5 shows that 85.4% of respondents agreed, and 7.3% of respondents disagreed towards the statement that it is possible for their students to work with a variety of software related to my research. The mean score of 3.899 (SD=0.597) represents students in agreement with this statement. Similarly, 81.3%respondents agreed, and 5.0% disagreed with the statement that their confidence has increased because of the use of digital technologies. The mean score of 3.981 (SD= 0.613) reprints students' level of agreement. Likewise, 76.3%respondents agreed, and 5.0% disagreed with the statement that, as a result, they are more capable of solving their academic problems. The mean score of 3.885 (SD=0.643) represents students' level of agreement towards this statement. While 73.5% of respondents agreed and 7.8% disagreed with the statement they are confident in their ability to participate in online discussions, blogs, and social networking sites. The mean score of 3.767 (SD= 0.793) represents students' level of agreement. In the same way, 76.7%respondents agreed and 5.5%disagreed with the statement the statement depending on their needs, they can direct/manage the search for data, information, and content in digital media. The mean score of 3.904 (SD=0.757) reprints students' level of agreement towards this statement. Moreover, 85.5%respondents agreed and only.3.7% disagreed with this statement that by using digital media, they can save and store data, information, and content. The mean score of 3.867 (SD= 0.701) reprints students' level of agreement towards this statement. In addition, 83.1% of respondents agreed, and 4.1% of respondents disagreed with the statement that it is possible for their students to upload, download, save, and open files. The mean score of 3.981 (SD=0.605) represents students' level of agreement towards this statement.

Table 6: ***Correlation of different Factors Digital Literacy and Students Performance.***

Correlations

		Devices	Students Performance	Digital Skills	Research Skills	Communication Skills	Confidence
Devices	Pearson Correlation	1	.800	.846**	.966*	.884**	.905
	Sig. (2-tailed)		.159	.000	.019	.009	.141
	N	219	219	219	219	219	219
Students Performance	Pearson Correlation	.800	1	.703**	.952*	.832**	.952
.	Sig. (2-tailed)	.159		.004	.032	.001	.467
	N	219	219	219	219	219	219
Digital Skills	Pearson Correlation	.846**	.73**	1	.717**	.640**	.820**
	Sig. (2-tailed)	.000	.004		.000	.000	.000
	N	219	219	219	219	219	219
Research Skills	Pearson Correlation	.966*	.852*	.717**	1	.768**	.967**
	Sig. (2-tailed)	.019	.032	.000		.000	.000
	N	219	219	219	219	219	219
Communications kills	Pearson Correlation	.984**	.832**	.840**	.768**	1	.730**
	Sig. (2-tailed)	.009	.001	.000	.000		.000
	N	219	219	219	219	219	219
Confidence	Pearson Correlation	.805	.852	.720**	.767**	.730**	1
	Sig. (2-tailed)	.141	.467	.000	.000	.000	
	N	219	219	219	219	219	219

Table 6 describe the value of coefficient of correlation between students' academic performance and (CGPA)(.800), students' academic performance and digital skills(.846), students' academic performance and research skills(.966), students' academic performance and communication skills(.984), students' academic performance and confidence(.805).Table indicate that there is a significant correlation among all the influencing factors, students' performance, Digital skills, Research skills, Communication skills and confidence.

Discussion and conclusion

The finding that desktop computers are the most commonly used device among participants, with laptops being the second, is consistent with global trends in educational technology use. Desktops offer stability and power for extensive academic tasks, whereas laptops provide mobility and

flexibility, essential for students' multitasking between home and university environments (Smith & Caruso, 2020). Given the rapid increase in e-learning adoption, future studies could explore whether mobile devices and tablets are gaining popularity over time (Johnson et al., 2018).

The majority of participants lacked internet access at the university, which reflects a significant challenge in academic environments, especially in regions with limited ICT infrastructure. This aligns with studies indicating that internet accessibility is a determinant factor in digital divide issues, which can further exacerbate educational inequality (Ragnedda et al., 2016). Universities must address this gap by enhancing campus-wide Wi-Fi networks or offering alternative solutions, as research suggests the lack of internet access negatively affects academic performance and student engagement (Koltay, 2017).

The high percentage of participants with certifications and degrees in ICT is noteworthy, as it suggests a high level of engagement with digital tools among students. These findings align with literature emphasizing that formal ICT training improves digital literacy, internet searching skills, and software proficiency, all critical components of academic success in the digital age (Al-Samarraie & Saeed, 2018). It's also crucial to note the importance of informal learning via platforms like social media and Google Scholar, which is increasingly being acknowledged as a valuable complement to formal ICT training (Greenhow & Lewin, 2016).

Most participants learned through online resources such as social networking sites and Google Scholar. This aligns with the concept of connectivism, which posits that knowledge is distributed across a network of connections, and learning happens by navigating these networks (Siemens, 2005). The use of social networking platforms for academic learning reinforces previous findings that students benefit from the collaborative and communal aspects of these platforms, enhancing engagement and resource sharing (Tess, 2013).

The fact that most participants expressed confidence in their academic success after receiving ICT training emphasizes the role of digital skills in promoting academic self-efficacy. This supports previous research, which shows that ICT competence is a strong predictor of academic success, as it equips students with the tools needed for efficient research, collaboration, and communication (JISC, 2019). However, the simultaneous stress over academic performance suggests a need for support mechanisms, such as digital wellness programs and academic counseling, to help students manage the pressures associated with technology-driven academic environments (Lepp et al., 2015).

The study highlights the critical importance of integrating ICT training into university curricula. With digital literacy being an essential skill in the 21st century, universities must invest in structured ICT programs that go beyond basic training, focusing on critical internet searching skills, advanced software use, and cybersecurity. Research supports the idea that embedding ICT into coursework not only enhances academic performance but also prepares students for the digital workforce (Oliver, 2008).

The study reveals that the majority of participants use a desktop computer, with laptops being the most common device. The results of the internet accessibility at home showed that the majority of participants had no internet access at the university. This study discovered that most of the participants had computer certificates, diplomas, degrees, and other computer education. The majority of participants had good internet searching skills, digital literacy skills, and good software skills. The majority of participants learned through social networking sites, Google Scholar, and online resources. The study highlights the importance of ICT training in enhancing students' skills

and promoting academic success. The majority of respondents feel stressed about academic performance, while most participants are confident in their academic success.

The majority of participants prepared themselves for digital learning in all subjects; in the current study, the majority of respondents hope to achieve good grades with digital literacy, with most of the respondents believing they exert more effort when working on difficult assignments using digital materials while the mostly of participants agreed that they are aware of the consequences of sharing personal information online, while to conduct the present study the mostly participants agreed that their digital identity could be presented positively. To conduct this research, the majority of participants agreed that they know how to check if information is allowed to be re-used legally, and most participants agreed that they can use social bookmarking to organize and share information.

With the conduct of this research, most of the respondents agreed that electronic search engines could help locate online resources, while the majority of respondents agreed that their work could be created using various digital tools. In this study, most of the participants agreed that they could manage literature reviews using digital tools, and the majority of respondents agreed that the statement could be used as a design scale for quantitative and qualitative research. In the results of the present research, the majority of respondents agreed that appropriate tests can be selected based on the nature of the data, and in the current study, most of the respondents agreed that they have a clear understanding of ethical principles as researchers. The results of this research are that the majority of respondents agreed that online communication tools serve a purpose, and the majority of respondents agreed that communication skills enable students to improve their academic performance using these tools.

The majority of respondents believe it is possible for students to use various software related to their research, and the results of the current study show that most of the respondents believe their confidence has increased due to digital technologies. This present research shows the results mostly of respondents, who show a correlation between students' academic performance and various factors such as CGPA, digital skills, research skills, communication skills, and confidence. A significant correlation was found among these factors, but the standard deviation was 0.

Recommendations

Taking into account the conclusions of the existing research study, the following recommendations are made:-

1. According to this study, students demonstrated moderate levels of digital literacy in managing and communicating information factors, so the management of general category universities should plan to conduct various types of trainings/workshops/seminars geared toward improving students' digital literacy skills in managing and communicating information.

2. The results of this study indicated that students had a moderate level of digital literacy in collaboration and shared a digital content factor. To improve this factor, the concerned authorities should plan a variety of courses and training sessions.

3. According to the current research, students' opinions regarding the barriers to learning digital literacy were positive; therefore, university management belonging to the general category should adopt necessary measures in order to decrease various barriers to learning digital literacy within the university.

4. As a result of the study, it was found that the majority of participants did not receive any information and communication technology training as part of their coursework, which suggests that university authorities should provide information and communication technology training as part of the curriculum.

5. It is also recommended that government agencies as well as public and private universities belonging to the general category should develop a plan to ensure that students and teachers are as interested in learning digital literacy skills as possible.

7. Based on the suggestions of the participants of the study, it is recommended that the universities belonging to the general category introduce a comprehensive course on digital literacy for increasing the level of digital literacy among the students.

8. In this era of information and communication technology, our future generation will be unable to compete in a world that is increasingly moving online. Government agencies and policymakers should start mandatory training on digital literacy for students in all educational institutions around the world. A compulsory online course should also be designed by each university to increase the students' skills in digital literacy at the university level.

9. The research was conducted at public and private universities in the province of Punjab, Pakistan. In Pakistan, it is recommended that the same type of studies be conducted at another category of universities.

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