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Digital literacy in relation to competency and attitude towards online education among postgraduate students

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Abstract

Digital literacy has emerged as a crucial behavioural competence influencing students' engagement, adaptability, and effectiveness within online education systems. In higher education, particularly in agriculture and allied disciplines, postgraduate students are expected to utilize ICT tools not only for learning but also for research, communication, and professional development. The present study assessed the digital literacy level of postgraduate students as a key behavioural variable shaping online learning readiness. The investigation was conducted at Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, using a proportionate random sample of 120 postgraduate students selected from the I.C. College of Home Sciences and the College of Agriculture. Digital literacy was operationalized through eight skill components, including typing, writing, reading and comprehensibility, web searching, information processing, computer literacy, internet literacy, and e-safety and security. Data were collected using a structured scale and analyzed using mean scores, weighted mean scores, frequencies, and percentages. The results revealed that reading and comprehensibility skills and web searching skills were at a good level, while most other digital skills were at a fair level. Overall, the majority of respondents (57.50%) exhibited a medium level of digital literacy, followed by 40.00% with high digital literacy. The findings underscore the need for systematic strengthening of advanced digital competencies to enhance the effectiveness of online education and future professional readiness.

Keywords: Digital literacy, ICTs, online education, behavioural sciences and postgraduate students

1. Introduction

The rapid integration of digital technologies into higher education has transformed teaching-learning processes, making online and technology-mediated education an integral component of academic systems. In this context, students' ability to effectively engage with digital platforms has emerged as a critical determinant of learning outcomes. Among various factors influencing online education, digital literacy plays a central role as it shapes students' competency in using ICT tools, their attitude toward technology-enabled learning, and their overall engagement with digital academic environments.

Digital literacy refers to an individual's ability to use digital technologies purposefully for accessing, processing, evaluating, and communicating information. It encompasses functional skills such as typing, internet use, and software operation, as well as higher-order abilities related to information processing, online safety, and responsible digital behaviour. In online education systems, these skills are essential for navigating learning platforms, accessing academic resources, participating in virtual interactions, and independently managing learning tasks. At the postgraduate level, digital literacy assumes greater significance due to increased reliance on digital databases, research tools, and online scholarly communication. Students with higher digital literacy are more confident, adaptable, and efficient in technology-based learning environments, whereas limited digital skills may act as barriers to competency development and positive learning attitudes. Therefore, digital literacy was selected as a key independent variable in the present study to examine its influence on students' competency in handling ICT tools, their attitude toward online education, and the identification of conducive and limiting factors affecting online learning systems. Understanding the digital literacy status of postgraduate students provides a

meaningful basis for strengthening capacity-building initiatives and enhancing the effectiveness of online education in higher education institutions.

2. Review of Literature

Digital literacy has been widely recognized as a critical determinant of students' competency, attitude, and engagement in online education systems. Kaur, Choudhary, and Verma (2019) ^[7] reported that agricultural university students possessed high familiarity with basic computer operations and internet browsing, whereas proficiency in advanced applications such as data processing and specialized software was moderate. Similarly, Gupta, Singh, and Sharma (2020) ^[3] found that postgraduate home science students exhibited strong reading and comprehension skills but comparatively weaker technical and digital safety skills. In a study conducted by Bansal and Aggarwal (2021) ^[2], digital literacy was found to significantly influence students' effectiveness and satisfaction with online learning. The authors observed that skills related to web searching and information retrieval were more developed than information processing and e-safety competencies. Sharma and Kumar (2021) ^[14] also reported that a majority of Indian university students belonged to the medium category of digital literacy, emphasizing the need for systematic digital skill enhancement. Likewise, Singh and Chawla (2018) ^[15] highlighted discipline-wise variations in digital competence among higher education students in India. Studies focusing on technology-mediated learning environments revealed that students with higher digital literacy demonstrated better engagement and more positive attitudes toward online education. Mishra and Singh (2020) ^[8] observed that ICT competency played a decisive role in students' adaptability and learning effectiveness in online education systems. Prasad and Joshi (2021) ^[11] further emphasized that digital infrastructure combined with adequate digital skills positively influenced learning outcomes. Yadav, Meena, and Kumar (2022) ^[17] reported that higher digital readiness among agricultural students was associated with improved use of e-learning platforms and academic technologies. International literature corroborates these findings. Ng (2012) ^[9] conceptualized digital literacy as a combination of technical, cognitive, and social-emotional dimensions, stressing that higher-order cognitive skills are essential for academic success in digital learning environments. Scherer *et al.* (2021) ^[12] reported that students with medium to high digital literacy exhibited greater confidence and readiness for online learning in higher education institutions. Similarly, Hämäläinen *et al.* (2021) ^[4] found that digital competence positively influenced student engagement and learning outcomes in virtual learning settings. Further, Al-Azawei, Serenelli, and Lundqvist (2020) ^[1] highlighted that digital literacy supports autonomous learning and critical evaluation of online information. Selwyn (2016) ^[13] emphasized the importance of digital literacy in promoting ethical, responsible, and reflective use of technology in education. At the policy level, OECD (2020) ^[10] underscored that digital literacy is essential for ensuring equity, effectiveness, and sustainability of online education systems worldwide.

Overall, the reviewed studies indicate that while students generally possess foundational digital skills, gaps persist in advanced competencies such as information processing, technical problem-solving, and digital safety. These findings

strongly justify the present study's focus on digital literacy as a key independent variable influencing postgraduate students' competency, attitude, and engagement in online education.

3. Materials and Methods

The present study was conducted at Chaudhary Charan Singh Haryana Agricultural University (CCS HAU), Hisar, Haryana. The study population comprised postgraduate students who were attending online classes. A proportionate sample of 120 students was selected, including 60 students each from the I.C. College of Home Sciences (COHS) and the College of Agriculture (COA). Simple random sampling technique was used for the final selection of respondents to ensure adequate representation and minimize sampling bias. Digital literacy was operationally defined as the ability of students to effectively access, evaluate, interpret, and utilize digital tools for academic and learning purposes. The level of digital literacy was assessed using eight core digital skills, namely typing skills, writing skills, reading and comprehensibility skills, web searching skills, information processing skills, computer literacy, internet literacy, and e-safety and security. Responses were recorded on a three-point continuum categorized as Good (3), Fair (2), and Poor (1). Weighted mean scores were computed for each skill, and the overall digital literacy level was classified into low (8–13), medium (14–19), and high (20–24) categories. The collected data were analyzed using descriptive statistical tools such as frequency, percentage, mean score, and weighted mean score. Comparative analysis between students of COHS and COA was carried out to identify variations in digital literacy skills. This classification facilitated the identification of skill gaps and provided insights into students' digital preparedness and readiness for online learning environments.

4. Results

The analysis of postgraduate students' digital literacy across eight specific skills revealed a varied proficiency profile. As indicated in Table 1, students demonstrated good competency in reading and comprehensibility skills (WMS = 2.60 for both COHS and COA) and web searching skills (WMS = 2.76 for COHS, 2.53 for COA), highlighting strong capabilities in understanding digital content and retrieving information effectively from online sources. The remaining six skills *i.e.* typing, writing, information processing, computer literacy, internet literacy, and e-safety/security were rated as fair (WMS ranging from 2.03 to 2.33). This suggests that while students possess adequate foundational digital skills, there is room for enhancement in practical and technical competencies, particularly in areas such as efficient typing, data processing, and online security practices. Importantly, none of the respondents fell into the poor category, indicating that all students had at least a basic working knowledge of digital tools. Comparing the two colleges, COHS students generally scored slightly higher on web searching and reading skills, whereas COA students had comparable scores in writing and information processing skills, reflecting minor disciplinary variations in digital literacy. Overall, the findings imply that postgraduate students have a solid foundational digital competence, with strengths in information comprehension and retrieval, but would benefit from targeted training to strengthen technical, processing, and security-related skills for effective

engagement in online academic and research activities.

Table 1: Digital literacy level of the respondents N=120

D L skills	COHS n= 60		COA n=60	
	MS	WMS	MS	WMS
Typing skills	133	2.21	122	2.03
Writing skills	139	2.31	140	2.33
Reading and comprehensibility skills	156	2.60	156	2.60
Web searching skill	166	2.76	152	2.53
Information processing skills	130	2.16	138	2.30
Computer literacy	130	2.16	128	2.13
Internet literacy	130	2.16	132	2.20
E- safety and security	139	2.31	130	2.16
Good= (2.34-3.00), Fair= (1.67-2.33), Poor = (1-1.66)				

The overall digital literacy of postgraduate students, summarized in Table 2, indicates that a majority of students possess moderate digital competency. Specifically, 57.5% of respondents were classified under the medium digital literacy category (14–19), while 40% demonstrated high digital literacy (20–24). Only a small proportion, 2.5%, fell in the low category (8–13), highlighting that nearly all students had an adequate foundation of digital skills. The total mean score of 18.5, with scores ranging from a minimum of 13 to a maximum of 23, reflects a generally satisfactory level of digital literacy across both colleges.

Minor variations were observed between the two institutions: COHS students showed a slightly higher proportion in the high category, whereas COA students had a slightly larger share in the medium category, indicating slight disciplinary differences in overall digital competency.

Table 2: Overall digital literacy level of the respondents N=120

Categories	COHS n= 60	COA n=60	Total N= 120
	F (%)	F (%)	F (%)
Low (8-13)	2 (3.33)	1 (1.66)	3 (2.50)
Medium (14-19)	32 (53.34)	37 (61.67)	69 (57.50)
High (20-24)	26 (43.33)	22 (36.67)	48 (40.00)
Total mean score = 18.5, Minimum obtained score = 13, Maximum obtained score =23			

These findings suggest that while students are capable of handling basic and some advanced digital tasks, there is scope for further improvement to enhance digital literacy, particularly in areas such as typing efficiency, information processing, and e-safety awareness. Strengthening these skills is crucial for promoting effective online learning, independent research, and professional readiness in increasingly technology-driven academic and professional environments.

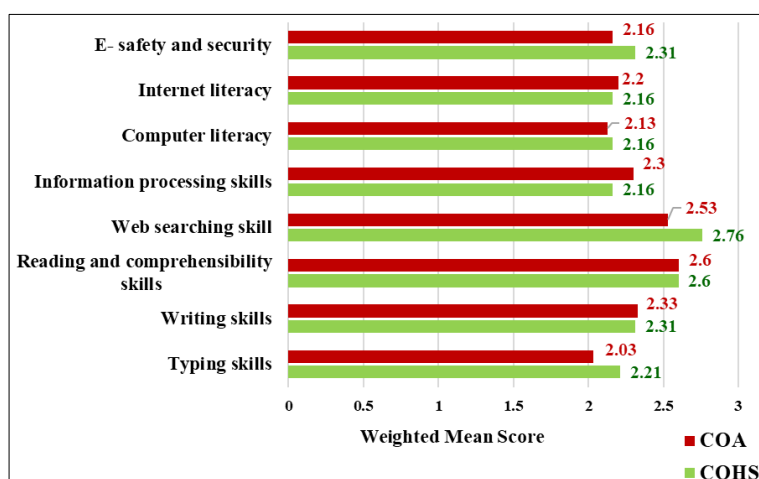


Fig 1: Digital literacy level of the respondents

Figure 1 illustrates the digital literacy profile of postgraduate students from I.C. College of Home Sciences (COHS) and the College of Agriculture (COA) and provides a visual summary of the digital literacy levels presented in Tables 1 and 2. Students from both colleges demonstrated comparatively higher proficiency in reading and comprehension and web searching skills, indicating a strong ability to access and understand digital academic content. COHS students showed slightly better performance in web searching, typing, and e-safety skills, whereas COA students exhibited marginally higher competence in writing, information processing, and internet literacy. Overall, students from both colleges predominantly fell within the medium to high digital literacy range, reflecting comparable levels of digital preparedness. The figure reinforces that while foundational digital skills are well established across both colleges, focused enhancement of technical, processing, and safety-related skills is essential to ensure balanced and advanced digital competence among postgraduate students.

5. Discussion

Digital literacy is increasingly recognized as a foundational skill for navigating modern online education environments. The present study revealed a mixed digital skill profile among postgraduate students: strong reading and comprehension and web searching skills, but only fair proficiency in several other dimensions such as typing, information processing, computer literacy, internet literacy, and e-safety/security. Additionally, while a substantial proportion of students exhibited medium to high overall digital literacy, a noteworthy segment remained at the medium level, suggesting gaps in advanced digital competencies.

Consistent with the present study, several Indian investigations have identified similar patterns of digital skill development among higher education learners. For example, Kaur and Verma (2022) [6] found that postgraduate students demonstrated confidence in basic digital tasks such as online searching and content comprehension but were comparatively weaker in advanced ICT skills like secure

digital practices and analytical applications. Similarly, Yadav, Meena, and Kumar (2022) ^[17] reported that agricultural university students excelled in information retrieval but required improvement in structured data handling and content creation. Bansal and Aggarwal (2021) ^[2] highlighted that while Indian students frequently use digital devices for academic purposes, formal training in advanced digital skills is often lacking, resulting in uneven digital literacy profiles. This is echoed by Sharma and Kumar (2021) ^[14], who noted that students' exposure to basic ICT functions does not guarantee proficiency in complex tasks such as digital security or professional software use. In a study of home science students, Gupta *et al.* (2020) ^[3] observed that digital literacy levels were generally moderate, with strengths in accessing online resources but limitations in usage of digital tools for rigorous academic tasks. Similarly, Singh and Chawla (2018) ^[15] documented that disciplinary differences affected digital competencies, with students from certain academic streams showing stronger foundational skills while others lagged in advanced applications. Prasad and Joshi (2021) ^[11] emphasized that access to ICT infrastructure does not automatically translate into digital literacy; higher competency requires intentional pedagogical support.

International research corroborates these observations and provides broader theoretical context. Ng (2012) ^[9] conceptualized digital literacy as multi-dimensional, involving technical, cognitive, and socio-emotional competencies. In this framework, strengths in comprehension and searching reflect cognitive literacy, while gaps in typing and information processing suggest areas where technical and critical skills need strengthening. OECD (2020) analyzed digital competence across higher education globally and found that many students demonstrate functional digital skills but lack advanced abilities required for complex problem-solving and ethical digital participation. This aligns with the present finding that foundational competencies are widespread, but advanced digital skills are uneven. Hämäläinen *et al.* (2021) ^[4] reported that students with higher digital literacy exhibited greater confidence and active engagement in online learning. In contrast, medium-level digital literacy was associated with cautious or moderate use of digital tools, suggesting that skill levels influence behavioural responses and attitudes in digital environments. Al-Azawei, Serenelli, and Lundqvist (2020) ^[1] found that advanced digital competencies, such as data analysis and secure technology use, significantly enhanced students' problem-solving capacities and research productivity. The present study's observation of fair-level proficiency in information processing and e-safety suggests areas where students may struggle with sophisticated academic responsibilities. Scherer *et al.* (2021) ^[12] reported that "digital readiness" which includes both skills and psychological preparedness varies significantly among students and influences their capacity to engage with online learning effectively. This supports the idea that digital literacy should be considered both as a skill set and a behavioural resource. Hew and Brush (2007) ^[5] emphasized that digital skills are mediated by institutional support and training opportunities; without structured guidance, students may develop only superficial competencies. Likewise, Van Dijk (2005) ^[16] argued that digital literacy comprises access, skills, and usage patterns, and deficits in any component can limit effective

engagement. This framework helps explain why students in the present study show strengths in some areas but not others. Selwyn (2016) ^[13] critiqued simplistic notions of digital natives, highlighting that mere exposure to technology does not guarantee deep digital competence. This resonates with the present findings, where students show familiarity with basic tasks but require further development in advanced digital domains.

The pattern observed in this study good performance in comprehension and searching, fair performance in technical areas has important behavioural implications. Students proficient in understanding and locating online information are likely to engage more confidently with digital academic content (supporting positive attitudes toward online education). However, limitations in advanced skills can hinder their ability to use digital tools for deeper learning, professional tasks, or digital research activities. From an educational standpoint, these results underscore the need for holistic digital literacy development that goes beyond basic usage. Institutions must recognize that digital literacy is not merely an operational skill but a learning competency that influences students' engagement, self-efficacy, and long-term academic trajectories.

6. Conclusion

The study establishes digital literacy as a key determinant of postgraduate students' competency, attitude, and engagement in online education. Students demonstrated strong proficiency in reading, comprehension, and web searching skills, while other competencies such as typing, information processing, computer and internet literacy, and e-safety were observed at a fair level. Overall, a majority of respondents possessed medium digital literacy, followed by a substantial proportion with high competence, indicating adequate but uneven digital preparedness. These findings suggest that while basic digital skills support participation in online learning, strengthening advanced digital competencies is essential for effective technology use, independent learning, and professional readiness. The study offers important insights for higher education institutions to strategically enhance digital skill development, thereby preparing postgraduate students for technology-driven academic and professional environments.

7. Recommendations

- Organize focused capacity-building programmes to strengthen advanced digital skills, particularly information processing, e-safety, and professional software use.
- Integrate practical digital literacy components into postgraduate curricula to promote effective and responsible ICT use.
- Improve digital infrastructure and institutional support systems to enhance students' confidence and competence in online learning environments.

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