

Digital Literacy Competencies and Research Productivity: A Comparative Study of Research Scholars in School of Physical Sciences at Mizoram University (MZU) and North Eastern Hill University (NEHU)

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Abstract

This study investigates the digital literacy competencies of research scholars in the School of Physical Sciences at Mizoram University (MZU) and North Eastern Hill University (NEHU), against the backdrop of growing digital demands in academic research. With the digital transformation accelerated by the COVID-19 pandemic, scholars increasingly rely on digital tools for communication, content creation, and data analysis. A structured questionnaire was administered to all research scholars across relevant departments in both institutions using a census sampling technique. Data were analyzed quantitatively through SPSS, employing descriptive and comparative statistical methods. Results reveal a high level of proficiency in foundational digital tools such as email, internet browsing, and social media. The study highlights the need for institution-led, discipline-specific digital training programs and continuous professional development for both scholars and educators. It also highlights the importance of policy interventions to ensure equitable access to evolving digital tools and resources, ultimately aiming to cultivate a digitally competent academic workforce.

Keyword: Digital literacy; Digital competency; Digital skill; Academic productivity; Advanced digital tools.

1. Introduction

Digital literacy competency is continuously recognized as a vital skill in today's digital society, influencing personal, academic, and professional spheres. It involves the ability to access, create, evaluate, and manage information using digital tools, while also encompassing skills in online communication, ethical digital engagement, and critical thinking (Reddy et al., 2022; Rahman et al., 2021; Quraishi et al., 2024; Yang, 2023). The COVID-19 pandemic sped up the global digital transformation, further focusing the need for widespread digital literacy (Tejedor et al., 2020; Abiddin et al., 2022; Endrayanto et al., 2022). Beyond technical proficiency, digital literacy requires navigating complex digital environments responsibly and effectively (Reddy et al., 2022; Yang, 2023). As a result, education systems globally are merging digital literacy into curricula to prepare students for both professional and academic

demands in a technology-driven economy (Susanty, 2024; Marisa & Djulia, 2022; Chen, 2024). However, differences in access and competency persist among socio-economic groups, necessitating targeted policy interventions (Susanty, 2024; Abiddin et al., 2022). It is essential that educators are equipped with the necessary digital skills themselves, as their proficiency directly influences their effectiveness in fostering students' competencies (Adewumi & Oladele, 2023; (Marin & Castaneda, 2022). Furthermore, digital literacy varies across disciplines, with field-specific competencies enhancing learning outcomes (Kustini et al., 2020; Muntu et al., 2023). Conceptual frameworks emphasize the multifaceted nature of digital literacy, integrating technical, informational, and socio-emotional dimensions (Yang, 2023; Mega et al., 2022). These evolving frameworks reflect the ever-changing nature of digital literacy and highlight its collective responsibility within educational and societal contexts (Marin & Castaneda, 2022; Tejedor et al., 2020).

2. Literature Review

Digital literacy is vital for research scholars' academic and professional development in today's digitized landscape. It extends beyond technical skills to include accessing, managing, evaluating, and creating information using digital technologies (Akhyar et al., 2021; Grosseck et al., 2023). Scholars must apply critical thinking and ethical practices in digital contexts (Grosseck et al., 2023). However, the digital divide leads to unequal literacy levels, limiting access to resources (Halim et al., 2024; Mardiana, 2024). Addressing these disparities is essential for equitable education, especially as the COVID-19 pandemic highlighted the need for enhanced digital skills (Fathia et al., 2022; Irpan et al., 2023). Higher digital literacy correlates with better adaptation and academic outcomes (Li et al., 2024; Chairunisa & Hasibuan, 2024). Engagement with digital tools boosts motivation, research quality, and collaboration (Wulandari et al., 2024; Tezer et al., 2024). Integrating digital literacy into research also strengthens critical thinking and source evaluation in the face of misinformation (Hidayanthi et al., 2024). Educators play a pivotal role in fostering digital skills (Kailani et al., 2021), and their preparedness to use technology greatly impacts literacy initiatives (Kailani et al., 2021; Althubaiti et al., 2022). A well-designed curriculum can equip scholars with discipline-specific digital competencies (Deursen, 2020; Karnoe et al., 2018). Thus, academic institutions must support faculty development to build digital capabilities (Dorris et al., 2021). Given the ever-evolving nature of digital literacy, educational strategies must adapt continuously. Conceptual frameworks that integrate technical, informational, and socio-emotional aspects offer a holistic approach (Saleh & Solihin, 2023; Yang et al., 2021), enabling institutions to cultivate a shared culture of digital literacy among scholars and educators (Gjelaj et al., 2020).

3. Objectives of the Study

- To examine the level of familiarity with various digital skills, tools, and software applications among research scholars at MZU and NEHU.
- To evaluate the perceived impact of digital literacy on the research scholars' work productivity and quality of academic output.
- To analyze the frequency and attitude of research scholars in seeking out new digital tools and techniques to enhance their skills.
- To compare the extent to which research scholars stay updated with the latest developments in digital tools and techniques.

4. Research Methodology

The research employed a quantitative design using a structured questionnaire distributed across all departments, with data analyzed using SPSS software and descriptive and comparative statistical tools. The study was conducted using the census sampling technique, ensuring the participation of all research scholars from the School of Physical Sciences at both institutions. The given table is the overview of questionnaire distributed and responses received from the various departments of physical science.

Table - 1: Overview of the questionnaire distributed

Dept.	MZU		NEHU		Total Questionnaire	
	Questionnaire				Distributed	Received
	Distributed (%)	Received (%)	Distributed (%)	Received (%)		
Phys	42	39 (38.53)	6	1 (8.21)	48	40
Chem	31	25 (28.44)	45	40 (61.65)	76	65
Math & CS	26	22 (23.85)	12	9 (16.44)	38	31
Ind. Chem	10	7 (9.18)	-	-	10	7
Stats	-	-	10	8 (13.70)	10	8
Total	109	93	73	58	182	151

Abbreviation: Physics (Phys), Chemistry (Chem), Mathematics (Math), Computer Science (CS), Industrial Chemistry (Ind. Chem), and Statistics (Stats).

5. Data Analysis

5.1 Gender-wise respondents

Table 2 reveals that at MZU, Physics had more female respondents (66.67%), while other departments were male-dominated. NEHU showed male majorities in Chemistry and Mathematics and Computer Science, with gender parity in Statistics and only one female in Physics. Notably, MZU does not have a Statistics department, while NEHU does not offer Industrial Chemistry. Overall, male respondents outnumbered females in most departments at both universities, with a few exceptions.

Table - 2: Gender-wise respondents

Univ.	Gender	Departments					Total (%)
		Phys (%)	Chem (%)	Math & CS (%)	Ind. Chem (%)	Stats (%)	
MZU	Male	26 (66.67)	13 (52)	14 (63.63)	4 (57.14)	-	57 (61.30)
	Female	13 (33.33)	12 (48)	8 (36.37)	3 (42.86)	-	36 (38.70)
Total		39 (100)	25 (100)	22 (100)	7 (100)	-	93 (100)

NEHU	Male	0 (0)	21 (52.5)	7 (77.8)	-	4 (50)	32 (55.18)
	Female	1 (1)	19 (47.5)	2 (22.2)	-	4 (50)	26 (44.82)
Total		1 (100)	40 (100)	9 (100)	-	8 (100)	58 (100)

5.2 Familiarity with the digital literacy skills

Table 3 highlights the digital skills familiarity among research scholars at MZU and NEHU. At MZU, all 93 respondents 100% are familiar with internet browsing, social media, and email. A majority are also familiar with data analysis 93.5% and basic computer troubleshooting 64.5%, while fewer 61.3% are familiar with online security practices. At NEHU, all 58 respondents 100% are familiar with internet browsing and email, while 96.6% are familiar with social media. A significant number are familiar with data analysis 86.2% and basic troubleshooting 74.1%, but only 63.8% are familiar with online security. Overall, both universities show strong familiarity with basic digital tools like browsing, email, and social media.

Table - 3: Familiarity with the digital literacy skills

Options	Familiarity					
	MZU			NEHU		
	Yes (%)	No (%)	Total (%)	Yes (%)	No (%)	Total (%)
Internet Browsing	93 (100)	0 (0)	93 (100)	58 (100)	0 (0)	58 (100)
Social Media Usage	93 (100)	0 (0)	93 (100)	56 (96.6)	2 (3.4)	58 (100)
Email	93 (100)	0 (0)	93 (100)	58 (100)	0 (0)	58 (100)
Online Security Practices	57 (61.3)	36 (38.7)	93 (100)	37 (63.8)	21 (36.2)	58 (100)
Basic Computer Troubleshooting	60 (64.5)	33 (33.5)	93 (100)	43 (74.1)	15 (25.9)	58 (100)
Data Analysis and Interpretation	87 (93.5)	6 (6.5)	93 (100)	50 (86.2)	8 (13.8)	58 (100)

5.3 Improvement through digital literacy

Table 4 compares the views of research scholars at MZU and NEHU on the improvements in various aspects of their daily lives due to digital literacy. At MZU, most respondents agreed that digital literacy had enhanced communication, information access, professional opportunities, and critical evaluation of online content, with agreement ranging from 63.4% to 68.8%. Digital security, privacy understanding, and competence in digital platforms were similarly recognized positively. Awareness of digital information reliability showed slightly lower agreement at 72%. At NEHU, improvements in communication, information access, and professional opportunities were also widely acknowledged, with 43.1% to 48.3% strongly agreeing. NEHU respondents also reported stronger agreement on critical evaluation, digital security, and competence in digital platforms. Thus, both universities show similar

trends in recognizing digital literacy improvements, with NEHU respondents generally reporting slightly higher levels of strong agreement across most areas.

Table - 4: Improvement through digital literacy

Options	MZU					NEHU				
	SA (%)	A (%)	UD (%)	DA (%)	Total (%)	SA (%)	A (%)	UD (%)	DA (%)	Total (%)
Improved communication and information access	28 (30.1)	59 (63.4)	6 (6.5)	0 (0)	93 (100)	26 (44.8)	28 (48.3)	4 (6.9)	0 (0)	58 (100)
Enhanced professional and educational opportunities	33 (35.5)	57 (61.3)	3 (3.2)	0 (0)	93 (100)	25 (43.1)	33 (56.9)	0 (0)	0 (0)	58 (100)
Enabled critical evaluation of online content	15 (16.1)	64 (68.8)	14 (15.1)	0 (0)	93 (100)	21 (36.2)	29 (50.0)	8 (13.8)	0 (0)	58 (100)
Understand digital security and privacy	15 (16.1)	59 (63.4)	12 (12.9)	7 (7.5)	93 (100)	17 (29.3)	37 (63.8)	4 (6.9)	0 (0)	58 (100)
Competence in various digital platforms	15 (16.1)	65 (69.9)	9 (9.7)	4 (4.3)	93 (100)	20 (34.5)	28 (48.3)	10 (17.2)	0 (0)	58 (100)
Awareness of digital information reliability	9 (9.7)	67 (72.0)	10 (10.8)	7 (7.5)	93 (100)	21 (36.2)	29 (50.0)	8 (13.8)	0 (0)	58 (100)

Abbreviation: Strongly Agree (SA), Agree (A), Undecided (UD) and Disagree (DA)

5.4 Frequency of seeking new digital tools

Table 5 reveals that the majority of research scholars from both MZU and NEHU actively seek out new digital tools and techniques at least occasionally to enhance their skills or work efficiency. At MZU, most respondents 71% reported doing so sometimes, while 16.1% did so frequently and 12.9% rarely. Similarly, at NEHU, 62.1% seek new tools sometimes, 29.3% frequently, and only 8.6% rarely. Significantly, all respondents reported using digital tools, reflecting a proactive approach to digital skill development, with NEHU scholars showing slightly higher engagement.

Table - 5: Frequency of seeking new digital tools

Options	MZU		NEHU	
	Frequency	Percentage	Frequency	Percentage
Frequently	15	16.1	17	29.3
Sometimes	66	71.0	36	62.1
Rarely	12	12.9	5	8.6
Never	0	0	0	0
Total	93	100	58	100

5.5 Familiarity with digital tools and software applications

Table 6 presents a comparative overview of digital tool and software familiarity among research scholars at MZU and NEHU. At both universities, Microsoft Office Suite and social media platforms are the most widely known tools, with nearly all respondents showing strong familiarity. At MZU, 100% of the 93 respondents are either familiar or very familiar with Microsoft Office, and over 96% are comfortable using social media platforms. Google Workspace also shows high usage, though slightly less than Microsoft Office. In contrast, tools like Adobe Creative Cloud, data analysis software, content management systems, programming languages, graphic design, and video editing software reflect lower familiarity levels. A significant portion of MZU respondents reported being unfamiliar with content management systems 65.6%, programming languages 62.4%, and graphic or video editing tools 82.8%. At NEHU, similar patterns are observed, with strong familiarity in Microsoft Office and Google Workspace. However, NEHU respondents show slightly better familiarity with tools like Adobe Creative Cloud, content management systems, and data analysis software compared to MZU. Overall, the data suggests that while basic digital tools are well integrated into the academic workflows of research scholars at both universities, there is a need to improve competency in specialized and advanced digital tools to enhance research productivity and digital literacy.

Table - 6: Familiarity with digital tools and software applications

Options	MZU				
	Very Familiar (%)	Familiar (%)	Somewhat Familiar (%)	Unfamiliar (%)	Total (%)
Microsoft Office Suite	27 (29.0)	66 (71.0)	0 (0)	0 (0)	93 (100)
Adobe Creative Cloud	6 (6.5)	56 (60.2)	16 (17.2)	15 (16.1)	93 (100)
Google Workspace	6 (6.5)	72 (77.4)	6 (6.5)	9 (9.7)	93 (100)
Social media platforms	69 (74.2)	21 (22.6)	3 (3.2)	0 (0)	93 (100)
Content management systems	10 (10.8)	22 (23.7)	0 (0)	61 (65.6)	93 (100)
Data analysis tools	3 (3.2)	52 (55.9)	23 (24.7)	15 (16.1)	93 (100)
Programming languages	21 (22.6)	14 (15.1)	0 (0)	58 (62.4)	93 (100)
Graphic design software	0 (0)	6 (6.5)	10 (10.8)	77 (82.8)	93 (100)
Video editing software	0 (0)	6 (6.5)	10 (10.8)	77 (82.8)	93 (100)
Options	NEHU				
	Very Familiar	Familiar	Somewhat Familiar	Unfamiliar	Total
Microsoft Office Suite	17 (29.3)	39 (67.2)	2 (3.4)	0 (0)	58 (100)
Adobe Creative Cloud	9 (15.5)	28 (48.3)	13 (22.4)	8 (13.8)	58 (100)

Google Workspace	18 (31.0)	33 (56.9)	5 (8.6)	2 (3.4)	58 (100)
Social media platforms	34 (58.6)	22 (37.9)	2 (3.4)	0 (0)	58 (100)
Content management systems	0 (0)	10 (17.2)	22 (37.9)	26 (44.8)	58 (100)
Data analysis tools	0 (0)	27 (46.6)	22 (37.9)	9 (15.5)	58 (100)
Programming languages	0 (0)	7 (12.1)	24 (41.4)	27 (46.6)	58 (100)
Graphic design software	0 (0)	9 (15.5)	22 (37.9)	27 (46.6)	58 (100)
Video editing software	0 (0)	8 (13.8)	23 (39.7)	27 (46.6)	58 (100)

5.6 Frequency on updates in the digital tools and techniques

Table 7 highlights differences in how research scholars at MZU and NEHU stay updated on digital tools and techniques. At MZU, most respondents prefer online tutorials and documentation, with 46.2% using them frequently and 47.3% sometimes. Social media groups are also widely used (54.8% frequently), while participation in webinars, publications, and peer networking is comparatively lower. In contrast, NEHU scholars show higher engagement with webinars and online workshops, with 72.4% participating frequently. Though online tutorials remain popular (41.4% frequently), social media usage is slightly less than at MZU (48.3%). NEHU respondents also report more frequent use of publications and networking. These findings suggest differing strategies, with MZU leaning on self-guided learning and NEHU responding formal and peer-supported updates.

Table - 7: Frequency on updates in the digital tools and techniques

Options	MZU				
	Frequently (%)	Sometimes (%)	Rarely (%)	Never (%)	Total (%)
Online tutorials	43 (46.2)	44 (47.3)	6 (6.5)	0 (0)	93 (100)
Webinars and online work-shops	19 (20.4)	50 (53.8)	24 (25.8)	0 (0)	93 (100)
Publications and websites	31 (33.3)	44 (47.3)	18 (19.4)	0 (0)	93 (100)
Networking with peers	13 (14.0)	27 (29.0)	53 (57.0)	0 (0)	93 (100)
Social media groups or forums	51 (54.8)	30 (32.3)	12 (12.9)	0 (0)	93 (100)
Options	NEHU				
	Frequently (%)	Sometimes (%)	Rarely (%)	Never (%)	Total (%)
Online tutorials	24 (41.4)	31 (53.4)	3 (5.2)	0 (0)	58 (100)
Webinars and online work-shops	42 (72.4)	12 (20.7)	4 (6.9)	0 (0)	58 (100)

Publications and websites	27 (46.6)	12 (20.7)	19 (32.8)	0 (0)	58 (100)
Networking with peers	28 (48.3)	15 (25.9)	11 (19.0)	4 (6.9)	58 (100)
Social media groups or forums	28 (48.3)	19 (32.7)	11 (19.0)	0 (0)	58 (100)

5.7 Impact of digital tools and techniques

Table 8 shows the impact of digital tools on productivity and work quality among respondents from MZU and NEHU. The majority of participants from both institutions reported positive outcomes. At MZU, 44.1% of respondents felt that digital tools had a “very positive” impact, while 47.3% considered the impact “positive”, and 8.6% were “neutral”. Similarly, at NEHU, 44.8% rated the impact as “very positive” another 44.8% as “positive”, and 10.3% remained neutral. Overall, the data indicates that digital tools are widely viewed as beneficial in improving both productivity and work quality.

Table - 8: Impact of digital tools and techniques

Options	MZU		NEHU	
	Frequency	Percentage	Frequency	Percentage
Very positively	41	44.1	26	44.8
Positively	44	47.3	26	44.8
Neutral	8	8.6	6	10.3
Negatively	0	0	0	0
Very negatively	0	0	0	0
Total	93	100	58	100

6. Major Findings and Discussion

The findings highlight distinct patterns in digital literacy and tool usage among research scholars at MZU and NEHU. Both universities exhibit high familiarity with essential digital tools such as internet browsing, email, and social media, underscoring their centrality in academic and daily tasks. However, disparities emerge in the use of specialized tools. MZU scholars show lower familiarity with advanced digital applications like data analysis software, content management systems, and graphic or video editing tools, whereas NEHU respondents report slightly greater engagement with these resources. This suggests that while both institutions address basic digital literacy, there remains a need for targeted strategies to enhance specialized tool proficiency, which is vital for research productivity and innovation. Moreover, improvements in digital literacy have positively influenced communication, information access, and professional opportunities across both institutions. NEHU scholars, however, appear more proactive in professional development, frequently engaging with webinars, industry publications, and peer networks. Conversely, MZU scholars tend to rely on online tutorials and social media, potentially indicating limited access to structured training opportunities. Overall, regular use of digital tools correlates with enhanced productivity and academic quality. These findings advocate for integrating advanced digital literacy training into academic programs and call for policy-level support to bridge the gap between foundational and specialized digital competencies in research environments.

7. Conclusion and Future Research

This study examined the digital literacy competencies of research scholars within the School of Physical Sciences at MZU and NEHU, revealing a high level of proficiency in basic digital tools, yet limited engagement with advanced software and programming platforms. The findings highlight the positive correlation between digital literacy and enhanced research quality, communication, and academic growth. However, differences in tool familiarity, gender representation, and institutional support indicate the need for targeted interventions. To address existing gaps, higher education institutions must implement structured, discipline-specific digital training, foster continuous faculty development, and ensure sustained access to evolving digital resources. Such efforts are essential to nurture digitally competent scholars capable of contributing effectively in a knowledge-driven academic environment. In advancing digital literacy competency among research scholars is not only an academic necessity but a critical component for future success in an interconnected and rapidly changing global environment. Addressing differences in digital literacy and actively supporting educational practices that integrate this competency into research training will prepare scholars to thrive amid the complexities of the digital age. For future research should explore interdisciplinary comparisons, include qualitative perspectives, and assess the longitudinal effects of digital literacy on scholarly productivity and innovation.

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