

ICT Landscape and Digital Literacy Skills of Basic Education Teachers

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Abstract. In today's digital age, integrating Information and Communication Technology (ICT) in education is crucial, yet many teachers struggle with digital literacy due to institutional and personal barriers. This study examined the digital literacy skills of teachers and the ICT landscape in basic education. It explores teachers' profiles, including age, gender, position, years of service, ICT-related training, educational attainment, and the ICT resources available in their schools. Using a quantitative research design, data were collected through a validated questionnaire from 174 teachers across 16 schools with the majority (70%) aged between 26 to 45 years, predominantly female (82%), and holding positions mainly as Teacher I (42%) and Teacher III (42%). Many teachers lack formal ICT training, and factors such as training attendance, years in service, age, and position significantly influence their digital literacy. Significant barriers to ICT integration include inadequate infrastructure, limited equipment, lack of stable internet connection (3.89), licensed software tools (3.56), access to computer hardware (3.53), and training in ICT use (3.66). Additional concerns included a lack of technical support, limited expertise, and insufficient time for ICT integration, leading to an overall mean barrier rating of 3.335, categorized as serious. To address these challenges, the study recommends comprehensive training programs and improved ICT resources to support teachers in enhancing their digital skills.

Keywords: Digital competency; Digital literacy; Educational technology; ICT challenges; ICT integration.

1.0 Introduction

In modern education, digital literacy has become essential for elementary school teachers to enhance students' learning experiences. The rapid advancement of 21st-century technology has transformed teaching methodologies, requiring educators to effectively integrate Information and Communication Technology (ICT) into their daily instructional practices. Technological innovations provide various tools to improve the learning process, but their successful implementation depends on teachers' ability to use them effectively (Warden et al., 2020). Recognizing this, DepEd Order No. 016, series of 2023, aims to equip schools with quality ICT infrastructure, ensuring teachers access necessary digital tools. However, achieving meaningful technology integration remains challenging, particularly in developing countries where access to digital resources is often limited (Bedir, 2019).

Recent studies emphasize the role of continuous professional development in enhancing teachers' digital competencies. Dragana (2024) emphasizes that teachers need ongoing education in digital literacy, enabling educators to impart necessary knowledge to their students effectively. This was supported by the study of Napitupulu et al. (2024), which found that effective training programs should combine hands-on experience with

pedagogical strategies, collaboration, and ongoing support. Mpuangnan (2024) further identifies factors such as age, qualifications, and professional experience as influential in technology adoption while acknowledging challenges like infrastructure limitations and resistance to change. Moreover, Kibirige (2023) found that infrastructure and internet connectivity are among the obstacles that hinder teachers' capacity in ICT integration. Despite efforts to enhance digital literacy, primary school teachers in the Philippines face difficulties due to inadequate ICT resources and training opportunities (Teye & Duah, 2022).

Given these challenges, this study aimed to examine the level of digital literacy among elementary school teachers and its impact on classroom performance. It seeks to identify barriers to effective ICT integration and explore factors influencing teachers' ability to utilize digital tools. Understanding these aspects will help design better technology integration strategies in basic education. Future research may build on these findings to improve the use of emerging technologies in teaching and learning.

2.0 Methodology

2.1 Research Design

This study employed a quantitative research approach to assess teachers' digital literacy skills and the information and communication technology (ICT) landscape in basic education. A descriptive-correlational design was utilized to examine the relationships between various factors influencing digital literacy among teachers. The study gathered data through a structured survey questionnaire and analyzed the responses using statistical methods to determine trends, relationships, and patterns.

2.2 Research Participants

The study was conducted in all public elementary schools within the Talacogon West District, Division of Agusan del Sur, Philippines. The district comprises sixteen (16) primary schools, and all teachers from these schools were invited to participate. The study ensured inclusivity by incorporating respondents from diverse backgrounds, teaching experiences, and educational levels. This helped capture a comprehensive perspective on teachers' digital literacy skills and the ICT landscape in basic education.

2.3 Research Instrument

The primary instrument used for data collection was a self-constructed survey questionnaire. The questionnaire measured teachers' digital literacy skills, access to ICT resources, challenges in ICT integration, and perceptions of ICT's impact on instructional competence. Educational research and ICT experts validated the instrument to ensure its reliability and appropriateness. A pilot test was conducted on 25 teachers from a non-participating school to assess reliability and usability. Cronbach's alpha was calculated to determine internal consistency, with acceptable values above 0.84; no revisions were made based on pilot results.

2.4 Data Gathering Procedure

The researcher first sought approval from the Dean of the Graduate School to conduct the study. After securing initial approval, a formal request was sent to the Office of the Division Superintendent of Agusan del Sur, requesting permission to conduct research within the identified district. Upon receiving authorization, the researcher presented the approval letter to the District Supervisor of Talacogon West District and the respective school heads of the sixteen participating schools.

Following administrative approval, the researcher distributed printed copies of the survey questionnaire to the teachers. The researcher personally visited each school to facilitate data collection, ensuring that respondents fully understood the purpose and instructions of the survey. Teachers were given ample time to complete the questionnaire, and responses were collected immediately. To enhance the reliability of the findings, data collection occurred at multiple time points to account for variations in ICT usage and integration over time. Ethical approval for this study was obtained from the Institutional Research Ethics Committee of North Eastern Mindanao State University-Tandag Campus. All participants were provided with an informed consent form outlining the study's purpose, procedures, voluntary nature of participation, and data confidentiality. Only those who provided signed consent were included in the study.

2.5 Statistical Treatment

The collected data were recorded, analyzed, and interpreted using appropriate statistical treatments to ensure objective and meaningful results, such as: a) Frequency Counts and Percentages were used to summarize respondents' demographic profiles, including age, gender, position, years of service, training attended, and educational attainment. This statistical technique provided a clear overview of the participants' characteristics, b) Measures of Central Tendency, particularly the mean, were employed to evaluate the level of teachers' digital literacy skills and the perceived barriers to ICT integration, c) Weighted Mean was used to assess the severity of issues related to digital literacy among teachers, and d) Analysis of Variance (ANOVA) was applied to examine differences in teachers' digital literacy skills based on key demographic factors, including age, position, years of service, training, and educational attainment. ANOVA determined whether these variables significantly influenced teachers' proficiency in digital technology usage, operational skills, and self-efficacy in ICT integration. The computed F-values and corresponding p-values were used to decide whether to reject or fail to reject the null hypothesis, ensuring an objective assessment of significant relationships.

3.0 Results and Discussion

3.1 Profile of the Respondents

Table 1 presents the study respondents, focusing on their age, gender, position, years in service, training related to ICT, educational attainment, and the respondents' school, which focuses on ICT equipment and ICT infrastructure.

Table 1. Profile of the Respondents		
Age Bracket	Frequency	Percentage
Age		
Below 26 years old	17	10.00%
26 -45 years old	122	70.00%
46 to 55 years old	21	12.00%
56 years old or above	14	8.00%
Gender		
Male	31	18.00%
Female	143	82.00%
Position		
Teacher I	73	42.00%
Teacher II	16	9.00%
Teacher III	73	42.00%
Master Teacher I	10	6.00%
Master Teacher II	1	1.00%
Master teacher III	0	0.00%
Others	1	1.00%
Years in Service		
1-5 years	53	31.00%
6-10 years	58	33.00%
11-15 years	26	15.00%
16 years above	37	21.00%
Training Related to ICT		
With training attended	34	20.00%
No training attended	140	80.00%
Educational Attainment		
Bachelors Degree	159	91.00%
Masters Degree	13	7.00%
Doctorate Degree	2	1.00%
ICT Equipment		
Laptop	49	28.00%
Television	51	29.00%
Tablet	21	12.00%
Printer	116	67.00%

Seventy percent of the respondents are educators in the middle of their careers, aged 26 to 45. This age distribution points to a workforce that combines flexibility and experience, which is advantageous for incorporating contemporary teaching methods like data and digital literacy (Cui & Zhang, 2022). Only 20% of people are over 45, consistent with stories of early retirements from work-related stressors (Basiron, 2024). This could present long-term difficulties for institutional knowledge retention.

There is an apparent disparity in the gender distribution: 82% of teachers are female. This supports worries about the dearth of male role models in primary education, even though it parallels nationwide trends in the teaching profession (Sebastian et al., 2022). While intermediate and advanced designations, such as Teacher II (9%) and Master Teacher roles (combined 7%), are substantially underrepresented, Teacher I and Teacher III hold the majority of teaching posts in terms of rank (42% each). Despite Executive Order No. 174 (2022) introducing the Expanded Career Progression System, this discrepancy indicates promotion bottlenecks. These results suggest that in order to promote professional development and retention, advancement pathways need to be made more transparent and easily accessible. Although the profession seems to have a high admission rate, mid-career attrition may occur, since 64% of teachers have served for 10 years or fewer. Frequent turnover has been shown to impair student learning and financially strain educational institutions (Learning Policy Institute, 2024).

Despite the growing demand for digital education, it is concerning that only 20% of respondents said they have attended ICT-related training. Lack of access, institutional support, or a low priority for technology in professional development are probably obstacles (Haarala-Muhonen et al., 2023). There is an urgent need for structured training programs since ICT integration improves participation and teamwork (Timotheou et al., 2022). There are disparities in access to ICT equipment. Although 67% of people have access to printers, just 28% have laptops, or 12% have tablets, essential tools for engaging, dynamic instruction. Even in high-income nations, there is a general worldwide trend toward less technology use in classrooms (UNESCO GEM Report, 2023). These infrastructure and training deficiencies severely hampered the successful incorporation of technology in the classroom.

3.2 Digital Literacy

The evaluation of teachers' digital literacy, based on UNESCO's core competencies, reveals a generally favorable self-assessment (see Tables 2 and 3), with an overall mean score of 3.858, classified as "Agree". This suggests that educators view themselves as capable in various aspects of digital engagement. Notably, social use of technology scored the highest (4.021), indicating strong confidence in using digital tools for communication, collaboration, and engagement—increasingly essential skills in modern classrooms. However, the lowest score was in information navigation skills (3.676), which exposes a critical weakness: the ability to locate, evaluate, and effectively apply digital information. This shortfall points to a gap in higher-order digital literacy skills, where teachers may be proficient users but lack the evaluative skills needed for discerning credible, relevant, and pedagogically sound content. This gap is particularly concerning in the current digital landscape, where misinformation and an overload of content can hinder instructional quality and student learning.

Table 2. *Digital Literacy Skills of Teachers*

Indicators	Mean	Adjectival Rating
Access to Digital Technologies	3.83	Agree
Familiarity with Technological Concept	3.87	Agree
Utilization of Digital Technology	3.94	Agree
Operational Skills	3.86	Agree
Information Navigation Skills	3.67	Agree
Social Use of Technology	4.02	Agree
Content Creation Skills	3.83	Agree
Self-Efficacy and Technology Integration	3.82	Agree
Overall Mean	3.85	Agree

The findings align with recent research. Temirkhanova et al. (2024) emphasize the evolving complexity of digital literacy and the need for continuous, targeted professional development to keep pace with technological shifts. Similarly, Jung et al. (2024) identified significant struggles among elementary school teachers in effectively navigating digital resources during remote instruction, highlighting the persistent challenges even in digitally mediated environments. These insights underscore that while operational and technical competencies are reasonably well-developed, critical and evaluative digital skills remain underdeveloped. This calls for systematic, context-specific training programs beyond tool usage to address strategic, informed, and ethical use of digital technologies in teaching. Empowering teachers in this way can ensure digital participation, but meaningful integration of ICT that enhances student learning outcomes.

Table 3. *Level of Implementation of the UNESCO Framework on Digital Literacy Skills*

Indicators	Mean	Adjectival Rating
Information and Data Literacy	4.14	Agree
Communication and Collaboration	4.04	Agree
Digital Content Creation	3.92	Agree
Safety	4.36	Strongly Agree
Problem-Solving	3.88	Agree
Overall Mean	4.07	Agree

These results are consistent with recent studies emphasizing the necessity of instructors possessing a wide range of digital competencies. Teachers in Southern Mindanao showed excellent levels of digital literacy, pedagogy, and research abilities, which greatly enhanced their professional efficiency, according to Disonglo and Limpot (2023). According to Abella and Rosa (2023), pre-service training, having access to ICT resources, and having a favorable attitude toward technology use all contributed to the higher levels of digital literacy displayed by instructors with less than ten years of experience. In order to guarantee relevant and successful technology integration in the classroom, these studies highlight the significance of ongoing professional development, especially in underdeveloped areas like information navigation.

3.3 Digital Literacy among Teachers when Grouped According to their Profiles

Table 4 highlights significant differences in teachers' digital literacy levels based on age, years in service, position, and ICT training, while gender and educational attainment show no notable impact. Teachers with more years of service and training access digital tools more readily ($p = 0.046$; $p = 0.008$), and older, experienced, and trained educators show stronger familiarity with digital concepts ($p < 0.01$). Utilization of digital technologies is shaped by position, age, experience, and training ($p < 0.05$), reflecting how professional roles and sustained exposure influence effective tech use.

Table 4. *Level of Digital Literacy among Teachers when Grouped According to their Profiles*

Sources of Variations		F	p	Significance
Access to Digital Technologies	Gender	0.06	.814	Not Significant
	Position	0.28	.838	Not Significant
	Age	1.37	.253	Not Significant
	Years in Service	2.73	.046	Significant
	Trainings	7.23	.008	Significant
	Educational Attainment	0.51	.602	Not Significant
Familiarity with Technological Concept	Gender	0.02	.875	Not Significant
	Position	2.02	.113	Not Significant
	Age	4.32	.006	Significant
	Years in Service	7.02	.000	Significant
	Trainings	8.19	.000	Significant
	Educational Attainment	0.51	.604	Not Significant
Utilization of Digital Technologies	Gender	0.00	.989	Not Significant
	Position	3.44	.018	Significant
	Age	5.63	.001	Significant
	Years in Service	6.27	.000	Significant
	Trainings	10.92	.001	Significant
	Educational Attainment	0.18	.835	Not Significant
Operational Skills	Gender	0.91	.343	Not Significant
	Position	2.58	.055	Not Significant
	Age	5.77	.001	Significant
	Years in Service	2.23	.000	Significant
	Trainings	10.22	.002	Significant
	Educational Attainment	0.00	.741	Not Significant
Information Navigation Skills	Gender	0.13	.720	Not Significant
	Position	1.85	.140	Not Significant
	Age	5.82	.001	Significant
	Years in Service	6.42	.000	Significant
	Trainings	7.89	.006	Significant
	Educational Attainment	0.11	.896	Not Significant
Social use of Technology	Gender	0.36	.548	Not Significant
	Position	3.41	.019	Significant
	Age	7.89	.000	Significant

Content Creation Skills	Years in Service	6.42	.000	Significant
	Trainings	10.62	.001	Significant
	Educational Attainment	0.50	.610	Not Significant
	Gender	0.17	.682	Not Significant
	Position	1.49	.219	Not Significant
Self-Efficacy and Technology Integration	Age	3.83	.011	Significant
	Years in Service	9.22	.000	Significant
	Trainings	6.87	.010	Significant
	Educational Attainment	0.17	.842	Not Significant
	Gender	0.39	.531	Not Significant
	Position	3.30	.022	Significant
	Age	5.77	.001	Significant
	Years in Service	10.34	.000	Significant
	Trainings	5.59	.019	Significant
	Educational Attainment	0.26	.770	Not Significant

Operational and information navigation skills are similarly impacted by age, experience, and training, supporting findings from the Journal of Digital Learning in Teacher Education (2022), which stress the role of experience and continuous learning in enhancing online information evaluation. Teachers in leadership roles or with more training also excel in social use of technology ($p < 0.05$), suggesting that professional advancement is linked to digital collaboration skills. Content creation and tech integration confidence are likewise influenced by age, experience, and training ($p < 0.05$), reinforcing evidence from the International Journal of Educational Technology (2024) that ongoing professional development fosters meaningful digital integration. Overall, these findings affirm UNESCO's (2023) call for strategic, targeted up-skilling to close gaps in digital literacy and promote effective technology adoption in education.

3.4 UNESCO Framework Digital Literacy Skills when Grouped According to Profile

Table 5 shows the relationship between the level of implementation of the UNESCO framework and digital literacy skills when grouped according to profile. The analysis of variations in digital literacy skills based on the UNESCO framework highlights the impact of key demographic and professional factors on teachers' competencies. The findings indicate that gender and educational attainment do not significantly influence digital literacy across all indicators, as their p-values exceed the 0.05 threshold. This aligns with OECD (2022), which emphasizes that access to digital education and training opportunities plays a more critical role in ICT proficiency than inherent demographic characteristics. However, position, age, years in service, and training significantly affect multiple indicators, suggesting that professional experience and exposure to digital training programs are key determinants of teachers' digital literacy levels.

Significant variations in digital literacy skills across the UNESCO framework were observed based on position, age, years in service, and training. For Information and Data Literacy, these factors ($p < 0.05$) highlight how experience enhances data-handling skills, though structured training remains essential (UNESCO, 2023). Similarly, Communication and Collaboration skills improve with experience and role ($p < 0.05$), affirming that professional exposure, supported by targeted training, fosters effective digital interaction (Rajasekaran et al., 2024).

In Digital Content Creation, differences tied to the same variables reinforce the value of ongoing ICT-based professional development, echoing ISTE (2023) findings that trained, experienced educators produce more dynamic content. For Safety, significant results across age, service years, and training reflect how exposure and formal instruction enhance digital security awareness (OECD, 2022).

Interestingly, Problem-Solving skills were significantly shaped by experience (position, age, years in service) but not by training ($p = 0.063$), suggesting these abilities evolve more through practice than instruction (European Commission, 2022). Overall, the findings underscore the critical need for continuous, role-specific ICT training to complement experiential learning, particularly in areas like data literacy, content creation, and digital safety, as UNESCO's 2023 Global Education Monitoring Report advocates.

Table 5. UNESCO Framework on Digital Literacy Skills when Grouped According to Demographic Profile

Sources of Variations		F	p	Significance
Information and Data Literacy	Gender	0.47	.494	Not Significant
	Position	2.87	.039	Significant
	Age	4.04	.008	Significant
	Years in Service	24.48	.000	Significant
	Training	12.16	.001	Significant
	Educational Attainment	0.14	.869	Not Significant
Communication and Collaboration	Gender	1.43	.234	Not Significant
	Position	3.87	.010	Significant
	Age	3.54	.023	Significant
	Years in Service	8.79	.000	Significant
	Training	8.41	.004	Significant
	Educational Attainment	0.08	.925	Not Significant
Digital Content Creation	Gender	1.82	.179	Not Significant
	Position	3.08	.029	Significant
	Age	3.83	.011	Significant
	Years in Service	7.95	.000	Significant
	Training	8.71	.004	Significant
	Educational Attainment	0.28	.753	Not Significant
Safety	Gender	0.74	.390	Not Significant
	Position	1.93	.126	Not Significant
	Age	3.04	.031	Significant
	Years in Service	4.61	.004	Significant
	Training	13.73	.000	Significant
	Educational Attainment	0.23	.794	Not Significant
Problem Solving	Gender	0.27	.607	Not Significant
	Position	4.24	.006	Significant
	Age	5.09	.002	Significant
	Years in Service	8.44	.000	Significant
	Trainings	3.49	.063	Not Significant
	Educational Attainment	1.35	.262	Not Significant

3.5 Challenges Encountered

Table 6 highlights teachers' significant challenges in integrating ICT into instruction, with an overall mean of 3.335, indicating a serious level of concern. The most pressing issues are unstable internet connectivity (3.890) and limited access to the internet (3.870), both rated as very serious, pointing to persistent infrastructural deficits. These findings echo UNESCO (2023), identifying connectivity as a significant barrier to ICT integration in developing regions. Other critical obstacles include the lack of genuine or licensed software (3.560) and limited access to computer hardware (3.530), emphasizing that the digital divide extends beyond connectivity to include the quality and availability of essential ICT tools. This supports OECD (2022), underscoring that effective digital integration requires robust infrastructure and adequate technological resources. Addressing these challenges is vital for equitable and meaningful technology use in education.

Table 6. Challenges encountered by the teachers

Indicators	Mean	Adjectival Rating
1. Teacher lacks expertise in integrating ICTs	2.94	Serious
2. Teacher lacks technical support	3.36	Serious
3. Teacher lacks genuine/licensed ICT Software tools	3.56	Much Serious
4. Teacher lacks a stable internet connection	3.89	Much Serious
5. Teacher lacks internet connection	3.87	Much Serious
6. Teacher lacks time to integrate ICT into classroom teaching	3.14	Serious
7. Teacher lacks confidence in using ICT in classroom teaching	2.82	Serious
8. Teacher lacks training in using ICT in classroom teaching	3.66	Much Serious
9. Teacher lacks interest in using ICT in the classroom	2.58	Less Serious
10. Teacher lacks availability of access to computer hardware	3.53	Much Serious
Overall Mean	3.33	Serious

The data reveal a critical gap in professional development, with a lack of ICT training (3.660, Much Serious) emerging as a significant barrier. This underscores the World Bank's (2024) call for structured, ongoing training to build teachers' digital competencies. Additional challenges include limited technical support (3.360) and time

constraints (3.140), both rated Serious, suggesting that external factors, rather than willingness, limit effective ICT use. Teacher confidence remains a concern (2.820), aligning with ISTE (2024), highlighting digital self-efficacy as key to technology adoption. Positively, low concern over teacher interest (2.580, Less Serious) suggests a strong willingness to integrate ICT. However, the lack of expertise (2.940, Serious) indicates a skills gap in applying technology effectively in pedagogy. Addressing these issues demands a holistic strategy—improving infrastructure, ensuring access to quality software, expanding training, and offering technical support. As emphasized in UNESCO's 2023 Global Education Monitoring Report, digital transformation hinges on access and equipping educators to leverage technology fully.

4.0 Conclusion

The findings of this study contribute to the field of education by emphasizing the critical role of ICT in modern teaching and the existing gaps in teachers' digital literacy. The study highlights that while most educators are within a productive age range and have substantial teaching experience, many lack formal ICT training. This gap hinders their ability to effectively integrate digital tools into instruction, limiting the potential benefits of technology in the classroom. The research also reveals that while teachers excel in social technology use and safety awareness, they struggle with information navigation skills, underscoring the need for targeted skill development. Key determinants of digital literacy, such as training attendance, years in service, age, and position, reaffirm the importance of continuous professional development. The study aligns with prior research, confirming that inadequate ICT resources, poor internet access, and insufficient training opportunities remain significant barriers to effective technology integration. Addressing these challenges requires policy-driven interventions, including expanding ICT training programs, improving access to digital tools, and enhancing technical support to empower educators.

For future research, longitudinal studies should assess the long-term impact of ICT training programs on teaching effectiveness and student outcomes. Additionally, evaluating policy initiatives aimed at improving digital literacy among educators could provide valuable insights into the most effective strategies for bridging the digital divide in education. By implementing these recommendations, the education sector can move toward a more adaptive, technology-driven learning environment that enhances teaching and student engagement.

5.0 Contributions of Authors

The authors of this research worked collaboratively to ensure its accuracy, completeness, and integrity, each contributing their expertise throughout the process. Dr. Jane C. Oropa, as the research adviser, played a pivotal role in shaping the study's conceptual framework and methodology, ensuring its feasibility and academic rigor. She provided critical guidance on refining research questions, selecting statistical methods, and structuring the study. Additionally, she supervised data analysis, reviewed interpretations for accuracy, and meticulously edited the manuscript to enhance clarity, coherence, and scholarly quality. She also ensured ethical compliance by overseeing research protocols, maintaining participant confidentiality, and upholding academic integrity.

As the primary researcher, Rocelino C. Magtoltol was responsible for fieldwork, including the distribution and retrieval of survey instruments, ensuring accurate and comprehensive data collection. He conducted statistical analysis, organized findings into meaningful insights, and transcribed the gathered data. He also drafted key sections of the manuscript, aligning the narrative with the analysed data and adhering to academic writing standards. Furthermore, he ensured ethical implementation by securing necessary permissions, obtaining participant consent, and maintaining data confidentiality.

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As the author of this manuscript, we hereby declare the following information regarding any potential conflicts of interest that may have influenced or could be perceived to influence the research, analysis, and conclusions presented in this work:

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Personal Relationships: Disclose any personal or professional relationships that could influence the research, such as familial relationships with individuals in the field, collaborations that may create bias, or personal rivalries.

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