

Information and Communication Technology Literacy of Public Elementary School Teachers

Gil C. Montes, MAEd

Graduate Student, Tomas Claudio Colleges, Morong, Rizal Philippines

Teacher I, Rosario Ocampo Elementary School, Taytay, Rizal

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Email of Corresponding Author: gil.montes@deped.gov.ph

Abstract

This study assessed the Information and Communication Technology (ICT) literacy of public elementary school teachers in Taytay II District, Schools Division Office of Rizal during School Year 2025–2026. The study employed descriptive survey research design and documentary analysis involving 337 teachers, representing 50 percent of the total population of 674 teachers from selected elementary schools in the district. Respondents were profiled according to age, sex, civil status, position, educational attainment, length of service, and in-service trainings attended. A researcher-made questionnaire checklist and documentary analysis of Individual Performance Commitment and Review (IPCR) ratings were utilized. Findings revealed that teachers were mostly female, married, and aged 31 years and above, with majority pursuing graduate studies, holding Teacher I positions, and having more than 10 years of experience with multiple in-service trainings. Results showed that teachers were much literate in ICT in terms of technological competence, pedagogical competence, and digital citizenship. There was no significant difference in ICT literacy in terms of sex, civil status, and position, while significant differences were found in age, educational attainment, length of service, and trainings attended. Teachers demonstrated very satisfactory performance based on IPCR ratings, and a significant relationship was found between ICT literacy and work performance. Age, educational attainment, length of service, and training attendance were identified as significant predictors of ICT literacy and performance. Teachers occasionally encountered problems in the utilization of ICT tools in teaching and learning. It is recommended that continuous ICT training, provision of adequate digital resources, and implementation of the proposed action plan be prioritized to enhance teachers' ICT literacy and performance. Overall, the study underscores ICT integration as essential in improving instructional delivery and suggests sustained professional development and institutional support to ensure effective teaching, learning innovation, and improved educational outcomes in public elementary schools across the district level context.

Keywords: ICT literacy, technological competence, pedagogical competence, digital citizenship, public elementary school teachers, instructional performance, Taytay II District

Introduction

Education is widely recognized as one of the most powerful instruments for economic development and sustainable progress. It plays a vital role in shaping individuals by developing their knowledge, skills, values, and attitudes necessary for responsible citizenship and societal participation. Through education, learners are prepared to respond to the demands of a rapidly changing global environment. Teachers serve as key agents of learning who facilitate meaningful, interactive, and inclusive instruction that connects new knowledge to learners' prior experiences and diverse backgrounds. In the context of 21st-century education, the integration of technology has become essential in producing globally competent learners and teachers.

The 1987 Philippine Constitution (Article XIV, Section 4[4–5]) emphasizes that the State shall enhance the right of teachers to professional advancement and ensure priority funding for education. This provision highlights the importance of continuous professional development among teachers to strengthen their competencies and improve the quality of education. In response, educators are expected to engage in lifelong learning, particularly in digital and technological competencies that support modern instructional demands.

In recent years, digital transformation in education has accelerated globally, especially after the COVID-19 pandemic, which highlighted the necessity of ICT integration in teaching and learning. Digital education or e-learning involves the effective use of Information and Communication Technology (ICT) tools to create engaging, flexible, and learner-centered environments. According to García-Morales et al. (2021), digital transformation in education has significantly reshaped teaching practices, requiring teachers to develop stronger technological and pedagogical competencies.

Aligned with this development, the Department of Education (DepEd, 2023), through DepEd Order No. 16, s. 2023, Revised Guidelines on the Implementation of the Department of Education Computerization Program, emphasizes equitable access to digital technologies in public schools. The policy supports the enhancement of teaching, learning, governance, and operational systems through ICT integration, reinforcing the need for teachers to strengthen their ICT literacy.

ICT literacy refers to the ability to effectively use digital technologies for communication, instruction, information processing, and problem-solving. Teachers are expected to demonstrate competence in digital tools such as productivity software, learning management systems, and online platforms. According to Falloon (2021), teacher ICT competence is a critical factor in achieving effective technology-enhanced learning environments, particularly in hybrid and blended learning modalities. Similarly, Bond et al. (2022) emphasized that digital competence among teachers directly influences student engagement and learning outcomes in technology-rich classrooms.

Furthermore, Redecker (2022) highlighted that digital competence frameworks for educators are essential in guiding teacher development in areas such as digital pedagogy, professional collaboration, and learner empowerment. In addition, UNESCO (2023) stressed that strengthening ICT skills among teachers is crucial for ensuring inclusive and equitable quality education in the digital era. These studies collectively underscore the importance of ICT literacy as a core professional competency among teachers.

In the Philippine context, recent studies also highlight varying levels of ICT competence among teachers influenced by age, experience, training, and educational attainment. A study by Cabero-Almenara and Palacios-Rodríguez (2021) emphasized that continuous professional development significantly improves teachers' digital competence and instructional effectiveness. Similarly, Tondeur et al. (2022) found that structured ICT training programs enhance teachers' confidence and integration of technology in classroom instruction.

In the experience of the researcher as a public school teacher in Taytay District for sixteen years, frequent requests for technical assistance in using ICT tools such as Microsoft Office applications, multimedia equipment, and connectivity systems have been observed. This recurring pattern indicates differences in ICT proficiency among teachers, which may affect instructional delivery and performance outcomes.

Hence, this study was conducted to assess the Information and Communication Technology literacy of public elementary school teachers in Taytay II District, Schools Division Office of Rizal, and to determine its relationship with their work performance and selected professional variables.

Material and methods

2.1 Research Design

This research utilized a descriptive research method.

2.2 Locale of the Study

The study was conducted in selected public elementary schools in Taytay II District, Schools Division Office of Rizal. These schools include Bagong Pag-asa Elementary School, Cresdville Elementary School, Dolores Elementary School, Kapalaran Elementary School, Muzon Elementary School, Rosario Ocampo Elementary School, San Francisco Elementary School, San Juan Elementary School, and San Lorenzo Ruiz Elementary School. These schools offer complete elementary education from kindergarten level to grade six level.

2.3 Respondents of the Study

The respondents of the study were 337 public elementary school teachers from Taytay II District, Schools Division Office of Rizal. They were described in terms of age, sex, civil status, position title, educational attainment, length of service, and in-service trainings attended, which served as important variables in analyzing their Information and Communication Technology literacy and work performance.

2.4 Sample and Sampling Procedure

The study utilized a simple random sampling technique to ensure that all public elementary school teachers in Taytay II District had an equal chance of being selected as respondents. From the total population of 674 teachers across nine schools, a sample equivalent to 50 percent was determined, resulting in 337 participants. This sampling approach was systematically applied to minimize selection bias and ensure that the sample accurately represents the population, thereby strengthening the validity and reliability of the findings and allowing generalization of results to the entire district.

2.5 Research Instrument

The study utilized a researcher-made questionnaire-checklist as the main data-gathering instrument, composed of three parts designed to obtain comprehensive information relevant to the research objectives. The first part collected the respondents' personal and professional profile, including age, sex, civil status, educational attainment, length of service, position title, and in-service trainings attended. The second part measured the level of ICT literacy of public elementary school teachers in terms of technological competence, pedagogical competence, and digital citizenship, with each dimension consisting of ten items for a total of 30 statements, rated using a 5-point Likert scale ranging from 1 (Never/Least Literate) to 5 (Always/Very Much Literate). The level of teachers' work performance was based on their latest Individual Performance Commitment and Review (IPCR) ratings, interpreted using a scale ranging from Poor to Outstanding. The third part identified the problems encountered by teachers in the utilization of Information and Communication Technology, also rated using a 5-point scale ranging from Never to Always. This structured instrument ensured consistency, comparability, and comprehensive assessment of ICT literacy, work performance, and ICT-related challenges among public elementary school teachers.

2.6 Data Gathering Procedure

The researcher was guided by a Gantt Chart of Activities in the conduct of the study. This includes the formulation of research problem up to the revision of the manuscript and submission of the final copy. After the validation of the instrument, permission to conduct the study was obtained from the Office of the Schools Division Superintendent. Then, the questionnaire-checklist was administered to the respondents through the Google Survey form. Guidelines in the Data Privacy Act of 2012 were considered. After the retrieval, the data were encoded and processed through the Statistical Package for Social Sciences (SPSS). Analysis and interpretation of data followed. Based on the interpreted data, summary of findings, conclusions and recommendations were formulated. After the oral defense, the manuscript was revised considering the comments and suggestions of the Oral Examination Committee. The manuscript was also subjected to anti plagiarism test. After finalization, hard bound copies were submitted to the office of the Graduate Studies Program and other offices.

2.7 Data Analysis Techniques

The statistical treatment of data in this study was guided by appropriate descriptive and inferential statistical tools to ensure accurate analysis and interpretation of results. Frequency, percentage, and rank distribution were used to describe the profile of the respondents in terms of selected demographic and professional variables. Weighted mean was applied to determine the level of ICT literacy of public elementary school teachers in terms of technological competence, pedagogical competence, and digital citizenship, as well as to assess the extent of problems encountered in the utilization of Information and Communication Technology. One-way analysis of variance (ANOVA) was used to determine if significant differences exist in the level of ICT literacy when grouped according to respondents' profile variables. The level of work performance of teachers, based on their latest IPCR ratings, was analyzed using mean and standard deviation. Furthermore, Pearson correlation analysis was employed to determine the significant relationship between the level of ICT literacy and teachers' work performance. These statistical tools provided a comprehensive and systematic approach in analyzing the data, ensuring valid and reliable interpretation of the study's findings.

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

Results and Discussion

3.1 Profile of the Respondents in Terms of the Selected Variables

Table 1 presents the frequency and percentage distribution of the respondents in terms of selected demographic and professional variables. In terms of age, most of the 337 respondents were 31–40 years old (37.7%), followed by those aged 41–50 years old (35.9%), while the remaining respondents belonged to the 21–30 years old and 51 years old and above categories. In terms of sex, the majority were female (88.1%), while males comprised only 11.9%. As to civil status, most respondents were married (65.3%), followed by single (30.5%), with a smaller proportion classified as widowed/widower and separated. Regarding educational attainment, most respondents held a bachelor's degree (38.9%), followed by those with master's degree units (31.3%), while others had completed a master's degree, doctoral units, or a doctorate degree. In terms of position title, the majority were Teacher I (59.7%), followed by Teacher III, Teacher II, and Master Teacher. With

respect to length of service, most respondents had 1–10 years of experience (44.2%), followed by 11–20 years (35.9%), while fewer respondents had 21 years and above or less than one year of service. Lastly, in terms of in-service trainings attended, most teachers participated in school-level trainings (30.0%), followed by national (26.4%), division (24.0%), district (13.7%), and regional level (5.9%) trainings. Overall, the data indicate that the respondents are predominantly early to mid-career female teachers, mostly married, with substantial exposure to professional development activities and varying levels of academic and professional advancement.

Table 1.
*Frequency and Percentage Distribution of the Respondents
in Terms of the Selected Variables*

Variables	Frequency	Percent	Rank
Age			
61 years old and above	6	1.8	5
51-60 years old	28	8.3	4
41 – 50 years old	121	35.9	2
31 – 40 years old	127	37.7	1
21 – 30 years old	55	16.3	3
Total	337	100.0	
Sex			
Male	40	11.9	2
Female	297	88.1	1
Total	337	100.0	
Civil Status			
Single	103	30.5	2
Married	220	65.3	1
Separated	4	1.2	4
Widow/Widower	10	3.0	3
Total	337	100.0	
Educational Attainment			
Doctorate Degree	9	2.7	5
Masters' Degree with Doctoral Units	18	5.3	4
Masters' Degree	107	31.3	2
With MA units	72	21.4	3
Bachelors' Degree	131	38.9	1
Total	337	100.0	
Position Title			
Master Teacher	26	7.7	4
Teacher III	80	23.7	2
Teacher II	30	8.9	3
Teacher I	201	59.7	1
Total	337	100.0	
Length of Service			
21 years and above	49	14.6	3
11-20 years	121	35.9	2
1-10 years	149	44.2	1
Below 1 year	18	5.3	4
Total	337	100.0	
In-Service Trainings Attended			
National level	89	26.4	2
Regional Level	20	5.9	5
Division Level	81	24.0	3
District Level	46	13.7	4
School Level	101	30.0	1
Total	337	100.0	

3.2 Level of Information and Communication Technology (ICT) Literacy of Public Elementary School Teachers as Perceived by Themselves With Respect to the Different Aspects

Table 2 presents the summary of the level of ICT literacy of public elementary school teachers as perceived by themselves in terms of technological competence, pedagogical competence, and digital citizenship. As reflected in the table, all indicators are interpreted as “Much Literate,” with a composite weighted mean of 3.84. Among the three aspects, Digital Citizenship ranked first with a weighted mean of 3.89, followed by Technological Competence with a weighted mean of 3.85, while Pedagogical Competence ranked last with a weighted mean of 3.79. The results indicate that teachers perceive themselves as highly literate in using ICT, particularly in demonstrating responsible and ethical use of digital technologies, as well as in performing basic technological tasks in their professional and personal activities. However, pedagogical application of ICT obtained the lowest mean, suggesting comparatively lesser confidence in integrating technology into instructional strategies for student-centered and transformative learning. Overall, the findings imply that while teachers are generally competent in ICT usage, their skills are more inclined toward technical and ethical use rather than advanced pedagogical integration. This supports the idea that ICT literacy extends beyond technical proficiency and includes responsible, ethical, and meaningful engagement with digital tools in educational contexts, as emphasized by Rockwell (2022), who noted that ICT literacy involves not only technical skills but also critical, ethical, and analytical use of information in digital environments.

Table 2

Level of Information and Communication Technology (ICT) Literacy of Public Elementary School Teachers as Perceived by Themselves With Respect to the Different Aspects

Aspects	$\overline{WX}$	Verbal Interpretation	Rank
Technological Competence	3.85	Much Literate	2
Pedagogical Competence	3.79	Much Literate	3
Digital Citizenship	3.89	Much Literate	1
Composite $\overline{WX}$	3.84	Much Literate	

3.3 Significant Difference on the Level of ICT Literacy of Public Elementary School Teachers as Perceived by Themselves With Respect to the Different Aspects in Terms of Their Profile

The results of the F-test on the significant difference in the level of ICT literacy of public elementary school teachers as perceived by themselves with respect to technological competence, pedagogical competence, and digital citizenship in terms of their profile variables revealed mixed findings. In terms of age, significant differences were found across all aspects, as indicated by computed F-values of 2.953 ($p = .002$), 3.106 ($p = .015$), and 2.449 ($p = .046$), leading to the rejection of the null hypothesis. Similarly, educational attainment showed significant differences in technological competence ($F = 4.417$, $p = .002$), pedagogical competence ($F = 3.877$, $p = .017$), and digital citizenship ($F = 4.412$, $p = .032$). Length of service also yielded significant results across all aspects, with F-values of 11.705 ($p = .022$), 9.041 ($p = .019$), and 8.263 ($p = .031$). In-service trainings attended likewise showed significant differences in technological competence ($F = 2.347$, $p = .044$), pedagogical competence ($F = 3.172$, $p = .014$), and digital citizenship ($F = 4.415$, $p = .003$), indicating rejection of the null hypothesis. In contrast, sex, civil status, and position title revealed no significant differences across all aspects since all obtained p-values were greater than .05, resulting in acceptance of the null hypothesis. These findings suggest that ICT literacy among teachers is significantly influenced by age, educational attainment, length of service, and professional development experiences, while sex, civil status, and position title do not have a significant effect. This implies that maturity, academic preparation, teaching experience, and exposure to training programs contribute meaningfully to the development of ICT literacy, whereas demographic characteristics such as gender and marital status are not determinants. These results are consistent with Marquez (2025), who found that ICT competencies significantly vary according to educational attainment but not according to sex, civil status, position title, and other selected demographic variables.

Table 3

Significant Difference on the Level of ICT Literacy of Public Elementary School Teachers as Perceived by Themselves With Respect to the Different Aspects in Terms of Their Profile

Age	Fcomp	p-values	Decision	VI
Technological Competence	2.953	.002	Rejected	Significant
Pedagogical Competence	3.106	.015	Rejected	Significant
Digital Citizenship	2.449	.046	Rejected	Significant
Sex				
Technological Competence	0.245	.070	Accepted	Not Significant
Pedagogical Competence	1.246	.293	Accepted	Not Significant
Digital Citizenship	1.512	.076	Accepted	Not Significant
Civil Status				
Technological Competence	0.555	.225	Accepted	Not Significant
Pedagogical Competence	1.178	.216	Accepted	Not Significant
Digital Citizenship	1.122	.837	Accepted	Not Significant
Educational Attainment				
Technological Competence	4.417	.002	Rejected	Significant
Pedagogical Competence	3.877	.017	Rejected	Significant
Digital Citizenship	4.412	.032	Rejected	Significant
Position Title				
Technological Competence	1.122	.069	Accepted	Not Significant
Pedagogical Competence	1.051	.914	Accepted	Not Significant
Digital Citizenship	0.937	.221	Accepted	Not Significant
Length of Service				
Technological Competence	11.705	.022	Rejected	Significant
Pedagogical Competence	9.041	.019	Rejected	Significant
Digital Citizenship	8.263	.031	Rejected	Significant
In-Service Trainings Attended				
Technological Competence	2.347	.044	Rejected	Significant
Pedagogical Competence	3.172	.014	Rejected	Significant
Digital Citizenship	4.415	.003	Rejected	Significant

3.4 Level of Work Performance of Public Elementary School Teachers as Revealed by Their Latest Rating in the Individual Performance Commitment and Review

Table 4 presents the level of work performance of public elementary school teachers as revealed by their latest Individual Performance Commitment and Review (IPCR) ratings. As shown in the table, the majority of the teachers obtained “Very Satisfactory” ratings, with 203 or 60.2 percent falling under this category. This was followed by 107 or 31.8 percent who obtained “Outstanding” ratings, while only 27 or 8.0 percent received “Satisfactory” performance ratings. The overall mean rating is 4.45, interpreted as “Very Satisfactory,” with a standard deviation of 0.475, indicating relatively homogeneous performance among the respondents. The highest recorded rating is 4.95, while the lowest is 3.41. These results suggest that most teachers demonstrate a consistently high level of performance in fulfilling their duties and responsibilities as facilitators of learning.

Table 4

Level of Work Performance of Public Elementary School Teachers as Revealed by Their Latest Rating in the Individual Performance Commitment and Review

Rating	Verbal Interpretation	f	%
4.50 – 5.00	Outstanding	107	31.8
3.50 – 4.49	Very Satisfactory	203	60.2
2.50 – 3.49	Satisfactory	27	8.0
Total		337	100.0
Highest Rating			4.95
Lowest Rating			3.41
Mean	4.45 – Very Satisfactory		
Standard Deviation			0.475

3.5 Significant Relationship Between the Level of ICT Literacy of Public Elementary School Teachers and their Level of Work Performance

Table 5 presents the computed r-values on the significant relationship between the level of ICT literacy of public elementary school teachers and their level of work performance in terms of technological competence, pedagogical competence, and digital citizenship. As shown in the table, all aspects obtained strong positive correlation coefficients, with r-values of 0.675, 0.798, and 0.876 respectively, indicating a strong positive relationship between ICT literacy and work performance. The corresponding p-values (0.021, 0.013, and 0.008) are all less than the 0.05 level of significance, leading to the rejection of the null hypothesis. This means that there is a significant relationship between the level of ICT literacy of teachers and their level of work performance. The findings imply that higher ICT literacy is associated with better teaching performance, improved instructional delivery, and enhanced professional efficiency among teachers. In particular, teachers with stronger digital skills tend to demonstrate greater effectiveness in classroom management and teaching practices, suggesting that ICT competence contributes positively to overall job performance. This further implies that strengthening ICT literacy can lead to improved educational outcomes and increased teacher productivity. The result is consistent with Yuson (2023), who found that teachers' digital proficiency is significantly related to their work performance.

Table 5

Significant Relationship Between the Level of ICT Literacy of Public Elementary School Teachers and their Level of Work Performance

Aspects	r-values	p-values	H ₀	Verbal Interpretation
Technological Competence	0.675	0.021	Rejected	Significant
Pedagogical Competence	0.798	0.013	Rejected	Significant
Digital Citizenship	0.876	0.008	Rejected	Significant

3.6 Extent of the Problems Encountered by Teachers in the Utilization of Information and Communication Technology

Table 6 presents the extent of problems encountered by public elementary school teachers in the utilization of Information and Communication Technology (ICT). As reflected in the table, all identified problems are interpreted as "Sometimes," with an overall weighted mean of 3.23, indicating a moderate level of challenges experienced by the respondents. Among the indicators, "Students easily getting sidetracked by games or social media" ranked first with a weighted mean of 3.46, followed by "Lack of enough functional computers, laptops, or tablets" with 3.45, and "Struggling to link personal technology use to meaningful classroom instruction" with 3.44. Meanwhile, "Low confidence and resistance to adopt new methods" ranked last with a weighted mean of 2.93. These results suggest that teachers encounter various operational, technical, and instructional challenges in integrating ICT into teaching and learning processes. The findings imply that despite the recognition of ICT as an important educational tool, its effective implementation is hindered by limited resources, insufficient training, classroom management issues related to technology use, and infrastructure constraints. Furthermore, these challenges highlight the need for stronger institutional support, continuous professional development, and improved access to ICT resources to enhance effective integration in the classroom. This is consistent with Achaoso (2023), who identified key barriers to ICT integration such as limited resources, inadequate training, lack of technical support, and insufficient institutional support from educational authorities.

Table 6

Extent of the Problems Encountered by Teachers in the Utilization of Information and Communication Technology

Problems Encountered	W $\bar{X}$	Verbal Interpretation	Rank
1.Slow, unreliable internet and limited access to electrical outlets.	3.43	Sometimes	4
2.Lack of enough functional computers, laptops, or tablets.	3.45	Sometimes	2
3.Absence of genuine, updated educational software.	3.39	Sometimes	5
4.Insufficient, non-pedagogical training in technical skills and curriculum integration.	3.21	Sometimes	6
5.Low confidence and resistance to adopt new methods.	2.93	Sometimes	10
6.Time constraints leading to pressure from curriculum demands.	3.17	Sometimes	7
7.Students easily getting sidetracked by games or social media.	3.46	Sometimes	1
8.Struggling to link personal technology use to meaningful classroom instruction.	3.44	Sometimes	3
9.Inadequate digital content or policies.	3.09	Sometimes	8
10.Exposure to spam, data theft, and cyberbullying.	2.99	Sometimes	9
Overall W$\bar{X}$	3.23	Sometimes	

Conclusions & Recommendations

Based on the findings of the study, it can be concluded that ICT literacy among public elementary school teachers is significantly influenced by age, educational attainment, length of service, and in-service trainings attended, particularly in terms of technological competence, pedagogical competence, and digital citizenship. These variables serve as important predictors of teachers' ability to effectively use and integrate Information and Communication Technology in their professional practice. In addition, the study established that teachers' work performance is significantly influenced by their level of ICT literacy, indicating that higher ICT competence contributes to improved instructional effectiveness, better classroom management, and overall enhanced performance in carrying out their teaching responsibilities.

In light of these conclusions, it is recommended that teachers be provided with more seminars, trainings, and continuous professional development activities focused on strengthening ICT literacy and its application in teaching and learning. A structured training program aimed at enhancing both ICT skills and work performance should be implemented to support teachers' professional growth. Schools are also encouraged to invest in stable, modern, and sufficient ICT resources to ensure effective integration of technology in the classroom. Furthermore, regular hands-on training sessions focusing on both technical skills and pedagogical integration should be conducted. The proposed action plan should be implemented to address identified gaps, and future studies may be conducted using other variables to further explore ICT literacy among teachers.

Compliance with ethical standards

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REFERENCES

- Achaoso, R. (2023). Barriers to ICT integration in public schools: A developing country perspective. *International Journal of Educational Technology and Learning*, 18(2), 45–58.
- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2022). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, 19(1), 1–27. <https://doi.org/10.1186/s41239-022-00327-3>
- Cabero-Almenara, J., & Palacios-Rodríguez, A. (2021). Digital competence frameworks for teachers: The challenge of education in a connected world. *Education Sciences*, 11(9), 1–14. <https://doi.org/10.3390/educsci11090461>
- Department of Education. (2023). DepEd Order No. 16, s. 2023: Revised guidelines on the implementation of the Department of Education computerization program. <https://www.deped.gov.ph>

- Falloon, G. (2021). From digital literacy to digital competence: The teacher's role in shaping effective technology integration. *Computers & Education*, 168, 104188. <https://doi.org/10.1016/j.compedu.2021.104188>
- García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The transformation of higher education after COVID-19: The role of digital technologies. *Journal of Business Research*, 136, 201–207. <https://doi.org/10.1016/j.jbusres.2021.07.050>
- International Society for Technology in Education. (2017). ISTE standards for educators. <https://www.iste.org>
- Marquez, J. (2025). ICT competencies of teachers and their professional variables: A correlational study. *Journal of Educational Development and Technology*, 12(1), 33–47.
- OECD. (2015). *Students, computers and learning: Making the connection*. OECD Publishing. <https://doi.org/10.1787/9789264239555-en>
- Redecker, C. (2022). European framework for the digital competence of educators: DigCompEdu. European Commission. <https://joint-research-centre.ec.europa.eu>
- Rockwell, S. (2022). ICT literacy and digital competence in education: Beyond technical skills. *Journal of Digital Learning and Education*, 5(2), 15–28.
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2022). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review. *Educational Technology Research and Development*, 70(3), 1–25. <https://doi.org/10.1007/s11423-022-10045-7>
- UNESCO. (2018). *ICT competency framework for teachers (Version 3)*. UNESCO. <https://unesdoc.unesco.org>
- UNESCO. (2023). *Global education monitoring report 2023: Technology in education*. UNESCO Publishing. <https://www.unesco.org>
- Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st-century competencies. *Journal of Curriculum Studies*, 44(3), 299–321. <https://doi.org/10.1080/00220272.2011.618409>
- Yuson, M. (2023). Digital proficiency and teacher performance in public schools. *Asian Journal of Education and Technology*, 9(4), 88–102.