

ICT Integration in Pedagogy Among Teachers in Technical-Vocational Schools

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Abstract— This study investigates the integration of Information and Communication Technology (ICT) in pedagogy among secondary school teachers at Sumoroy Agro-Industrial School, Palapag, Northern Samar. Using a descriptive-correlational research design, the study explores the relationship between teacher demographics, types of gadgets used, and platforms employed in relation to ICT integration in teaching. The research involved a survey of 148 teachers, gathering data on their ICT tools, platforms, and integration practices. Results indicated that while ICT access is present, its use is generally at an average level. Laptops and cellphones were the most commonly used gadgets, while digital platforms like Google Classroom and Zoom were underutilized. Key findings highlight that subject specialization significantly influences teachers' competence and student engagement with ICT, while other variables, such as age and years of experience, showed no significant correlation with ICT integration. The study suggests a need for targeted professional development to enhance ICT usage, particularly through more focused training on digital platforms and fostering leadership among teachers.

Keywords — *ICT Integration, Pedagogy, Teacher Demographics, Technology in Education, Professional Development*

I. Introduction

The rapid evolution of Information and Communication Technologies (ICTs) has significantly transformed educational practices, compelling educators to integrate these tools into their teaching methods. As technology increasingly transforms education, traditional teaching methods are being augmented with digital tools, which reshape how educators deliver instruction and how students engage with learning materials (Comninaki, 2024). Despite the evident benefits of ICT in fostering interactive and personalized learning experiences, there remains a significant gap in teachers' preparedness to effectively integrate these technologies into their pedagogical strategies.

The integration of technology into the classroom has led to notable changes in teaching methodologies and educational practices. Traditional methods, which heavily relied on textbooks, chalkboards, and face-to-face interactions, are increasingly being supplemented or replaced by digital tools and resources. This evolution has encouraged teachers to adapt their instructional

materials and pedagogical strategies to incorporate gadgets such as tablets, laptops, and interactive whiteboards. The shift from traditional learning materials to technology-based approaches has not only altered the dynamics of teaching but has also influenced the way students engage with and absorb information.

Recognizing the role of digital technologies in education seeks to guarantee inclusive and high-quality education for everyone (Haleem et al., 2022). In the context of ICT integration, this concept emphasizes the necessity for educators to effectively harness digital tools to enhance their teaching practices. The integration of ICT can bridge gaps in access to resources, facilitate personalized learning and create greater student engagement. This is particularly relevant in technical-vocational settings, where practical skills and real-world applications are essential.

However, despite the recognized benefits of technology in education, there is a notable gap in understanding how prepared teachers are to integrate these digital tools effectively, particularly in technical-vocational schools. Falloon (2020) highlights the necessity for teachers to develop strong digital literacy skills to optimize technology's potential in classrooms. Moreover, research by Savov et al. (2017) underscores the positive impact of multimedia resources on student engagement and motivation, suggesting that digital integration can improve learning outcomes. Nevertheless, disparities in digital readiness among educators can limit the effectiveness of technology, especially when sufficient training and support are lacking.

In the Philippines, the integration of technology in education has become increasingly critical, especially in light of the challenges posed by the COVID-19 pandemic. The sudden shift to remote learning highlighted the crucial role of technology in maintaining educational continuity. According to a report by Inquirer (2021), a Social Weather Station survey revealed that 58% of enrolled Filipino students utilized devices for distance learning, while 42% did not have access to such devices. This statistic underscores the significant digital divide within the country, impacting students' ability to participate in online learning.

This study aims to address these needs by exploring the integration of Information and Communication Technology (ICT) in pedagogy among teachers at Sumoroy Agro-Industrial School, Palapag I District, Schools Division of Northern Samar. Based on Sumoroy Agro-Industrial School EBEIS 2023 Report, most of the teachers or about 56.08% have gadgets or laptops used in teaching, and 18.81% of them are moderately utilizing the gadget for teaching. Thus, these gaps prompt the researchers to delve into the impact of these technologies on teaching pedagogies. The study investigates the critical role of Information and Communication Technology (ICT) in enhancing educational practices within technical-vocational institutions. Assessing the current landscape of technology utilization and identifying the specific training needs of teachers, this research aims to inform the development of a training program to enhance educational quality and prepare students for the demands of the digital age.

Literature Review

The concept of this study is grounded on the Department of Education (DepEd) mandates through DepEd Order No. 016, S. 2023 or the Revised Guidelines on the Implementation of the DEPED Computerization Program (DCP). In line with the Department of Education's (DepEd) MATATAG: *Bansang Makabata, Batang Makabansa* Framework, the Department is continuously taking appropriate steps to make education accessible to all and to accelerate delivery of basic education facilities and services (DepEd, 2023).

This is also supported by Bonifacio (2013), who emphasized that integrating Information and Communication Technology or ICT into teaching and learning has become a great concern for many educators in developing countries like the Philippines. ICT must be used and taught in powerful and meaningful ways. With its rapid development, educators should find ways to integrate technology in the learning process. ICT should not drive education; rather, educational goals and needs must drive its use in schools.

Akram et al. (2022) emphasize that teachers generally hold favorable perceptions of ICT integration, acknowledging its potential to enhance teaching effectiveness, foster student engagement, and create more interactive learning environments. Despite this, several challenges impede the full integration of ICTs in classrooms. These include inadequate infrastructure, unreliable internet connectivity, insufficient training opportunities, and a lack of experience with online teaching. As a result, the integration process remains partial in many settings.

In examining the role of ICT integration within the Technological Pedagogical Content Knowledge (TPACK) framework, one investigation focuses on Vocational High School teachers, specifically in the Computer and Network Engineering Department. The findings reveal that integrating ICT into the teaching process significantly improves teachers' ability to tackle challenges associated with online learning, assess student skills, and ultimately enhance learning outcomes (Istiningsih, n.d.).

A scoping review by König et al. (2022) synthesizes findings from 16 empirical investigations conducted across nine countries on three continents. This review focuses on how teachers integrate ICT into their lesson plans as part of their professional competence. The review highlights that ICT integration in lesson plans is closely linked to teachers' knowledge, beliefs, and competencies, and can predict observable teaching performance. Furthermore, intervention studies demonstrate that ICT integration in lesson planning can be significantly improved through targeted learning opportunities during both initial teacher education and ongoing professional development programs.

According to Backfisch et al. (2021), in the 21st century, technology integration in the classroom is considered a crucial educational innovation that enhances teaching and learning processes. Teacher motivation is seen as a critical requirement for successful technology integration in the classroom, especially in the early stages of educational innovation. In addition,

according to Ahmadi (2018), the use of technology plays a crucial role in the learning process both inside and outside the school.

Moreover, Wahab and Ali (2022) highlighted the importance of Information and Communication Technology (ICT) integration in Technical and Vocational Education and Training (TVET), emphasizing its role in adapting education to the rapidly evolving demands of the globalized workforce. Despite extensive studies on ICT application in education, research focused on effective ICT integration in TVET is limited, underscoring a need for deeper analysis of TVET-specific requirements for ICT.

The global spread of COVID-19 had a swift impact on the education system, leading to remote studying for students and the implementation of online classes by teachers. The research conducted by Lestiyawanawati (2020) aimed to identify and describe the strategies used and challenges faced by teachers in conducting e-learning during the COVID-19 outbreak. The results revealed that teachers employed three main teaching strategies: utilizing only online chat, using video conferences, and combining both online chat and video conferences for the e-learning process.

The study conducted by Klapproth et al. (2020) to gauge the levels of stress experienced by teachers during the lockdown revealed that they faced medium to high levels of stress. Specifically, teachers from secondary grammar schools devoted a significant amount of time to remote teaching and identified technical issues as a major impediment. However, most teachers expressed confidence in their ability to manage stress.

Educators have been steadily adapting their teaching practices to incorporate technology. While some teachers have become proficient in using technology, others continue to struggle and lack the confidence to integrate it into the classroom (Martin, 2015). It is necessary to enhance teachers' ICT skills as part of professional development and that institutions invest in capacity building to promote ICT-based pedagogy (Mwangi et al., 2023).

The study conducted by Chisango et al. (2019) delved into the perspectives of teachers regarding the incorporation of ICTs into teaching and learning at various secondary schools. The findings indicated that while teachers were open to embracing technologies in their teaching, they lacked the necessary ICT skills. There is a strong positive correlation between pedagogical readiness and successful ICT integration, indicating that instructors' preparedness directly influences their ability to utilize technology in teaching (The Pedagogical Readiness of Instructors Towards Achieving Integration of ICTs in TVET Institutions in Kenya, 2016).

The widespread use of Information and Communication Technologies (ICTs) in the digital age has transformed learners into digital learners. Consequently, it requires teachers to incorporate these technologies as a medium for teaching. The study conducted by Akram et al. (2022) investigates teachers' perceptions of technology integration in teaching and learning at all

educational levels. According to the findings, the integration of technology in teaching has a positive impact on teachers.

ICT integration significantly enhances both teaching and learning, with well-equipped teachers and access to ICT tools being key factors for success (Ghavifekr & Rosdy, n.d.). Additionally, professional development training for teachers was identified as crucial for improving student learning outcomes. ICT use was limited to basic and demonstrative purposes, with underuse of ICT for tasks that promote experience, discovery, and experimentation (Aslan & Zhu, n.d.).

Technostress is a significant concern for teachers. They often experience stress when they have to integrate new technologies into their teaching methods, which happens frequently with digital technologies (Kim & Lee, 2021). Moreover, technology-related stress, or the psychological struggle to handle IT effectively, affects educators due to challenges posed by new situations and excessive information (Huddle, 2020). The study conducted by Kristiawan & Muhaimin (2019) investigates the challenges faced by teachers in using Information and Communication Technology (ICT) for educational purposes. The study found two primary issues related to teacher capabilities and ICT infrastructure. Firstly, teachers' inability to effectively use ICT is due to their lack of proficiency in computer operations, as 75% of them admitted they are not skilled in using technology-based media.

With the advent of Education 4.0 and the VUCAD era, the integration of technology in teaching has been optimized to its full potential. The study conducted by Paje et al. (2021) investigates the utilization of computer-based technology in science instruction by teachers. The findings show that employing computer-based technology (CBT) in science education has become a prevalent approach in 21st-century learning strategies.

Given the growing importance of digital literacy in contemporary education, Panela (2025c) emphasizes the need for comprehensive evaluation of teachers' skills and competencies, particularly in remote regions of the Philippines. This perspective aligns with the current study's focus on understanding ICT integration capabilities among technical-vocational teachers, highlighting the broader context of educational technology implementation in Philippine schools.

II. Methodology

This study used descriptive-correlational research design. This aimed to describe the relationship between two or more variables without making claims about cause and effect. In descriptive correlational research, researchers collected data to explain the variables of interest and figure out how they relate. The main goal was to give a full account of the variables and how they are related without changing them or assuming that one thing causes another (Bhat, 2023). In this study, the researchers used this design to determine the extent to which the profile of respondents,

types of gadgets used, and platforms employed relate to the level of ICT integration to teaching among secondary school teachers.

Participants

The respondents of this study were the teachers of Sumoroy Agro-Industrial School in Palapag I District, Division of Northern Samar. The study included a total population of 148 teachers from both the Junior High School and Senior High School Department. Using total population for this study is essential for several reasons. The entire population ensures comprehensive data collection to allow researchers for a thorough understanding of ICT integration practices across both Junior High School and Senior High School departments.

Instrumentation

The main instrument of this study was a researcher-made survey questionnaire. The questionnaire contains four (4) parts. Part I covered the demographic profile of the respondents, which includes the age, sex, position, subject specialization, subject taught, years in teaching service, highest educational degree, years of teaching/administrative service, position/designation, and relevant seminars and trainings attended in ICT. Part II included the types of gadgets used by the teachers for teaching. Part III pertained to the platforms employed by teachers for teaching. Part IV covered the level of ICT integration to teaching among secondary school teachers. The following variables and indicators were evaluated through the use of a Likert scale, which has five descriptive and numerical values such as strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1).

To ensure the validity and reliability of the researcher-made survey instrument, it had undergone face and content validation by experts, including panel members and an adviser. Then, pilot testing was conducted at Cabatuan National High School. A twenty-seven (27) sample size of respondents was part of the pilot testing where they answered and responded to the questions in researcher-made survey instruments. The data from the pilot test was analyzed through Cronbach's alpha to evaluate instrument reliability.

The reliability statistics showed that the alpha values for ICT Access and Availability and Student Engagement and ICT use were greater than 0.9 described as excellent. The alpha for ICT Integration in Teaching was less than 0.9 but greater than 0.8, described as Good, while the alpha value for Teacher Competence and Confidence in ICT Use was greater than 0.7 but less than 0.8 described as acceptable.

Data Collection and Analysis

The data collection followed a systematic approach to ensure relevant information was gathered smoothly and clearly. Initially, before the conduct of the study, the researchers sent a formal request for permission to the Schools Division Superintendent of Northern Samar and the

school head, detailing the purpose and benefits of the study. After receiving approval, the researchers conducted a survey by administering questionnaires to teachers at Sumoroy Agro-Industrial School. The data processing for this study involved multiple analytical methods, primarily using frequency, percentage distributions, multiple response analysis, Spearman's rho, Chi-square, and Kruskal-Wallis tests to assess the relationships and differences between various teacher profiles and their level of ICT integration in teaching.

Ethical Considerations

Ethical considerations in this study include obtaining informed consent, ensuring confidentiality, and minimizing potential harm to participants. The researchers secured permission from relevant authorities and clarified the study's purpose to participants, ensuring voluntary participation. Respondents were assured that their identities would remain confidential, with data used solely for research purposes.

III. Results and Discussion

Profile of Teachers

The profile of the teachers reveals a diverse and moderately experienced workforce, with a majority of respondents aged 32 to 38 years (42.57%) and a strong female representation (69.59%). The data indicates a mix of early-career teachers (18.92% with 1-5 years of experience) and more seasoned educators (47.30% with 6-10 years of experience), which may suggest a balance of fresh perspectives alongside established practices in the teaching profession.

The predominant position held by teachers is Teacher I (35.91%), with a significant portion also serving as Teacher III (35.14%), highlighting a range of teaching ranks, but also signaling potential limitations in career progression, given the small number of Master Teachers. Most teachers specialize in subjects outside the core options (37.84%), with a notable number teaching Technology and Livelihood Education (31.76%), suggesting a need for broader subject expertise.

Many teachers have pursued further education, with 63.51% having completed units for a master's degree, which underscores a commitment to professional development. Moreover, the fact that most teachers have attended relevant trainings (87.16%) implies that ongoing professional learning is a priority, reflecting a willingness to adapt to new educational trends and improve instructional practices.

Types of Gadgets and Platforms Used

The data reveals that laptops (34.12%) and cellphones (33.88%) are the most commonly used gadgets by teachers for instruction, reflecting the widespread accessibility and versatility of these devices. Laptops, being multi-functional, allow teachers to integrate a range of teaching

tools, from presentations to interactive online content, while cellphones provide portability and ease of use for quick access to educational apps and communication. The use of LED TVs (27.06%) further highlights the incorporation of multimedia resources, supporting visual learning and enhancing student engagement in the classroom.

However, the relatively low use of PC units (2.59%) and tablets (2.35%) suggests that these devices are not widely preferred for instruction, possibly due to their limited portability, higher costs, or insufficient training on their educational applications. This pattern indicates that teachers are leaning towards more mobile and adaptable technologies, emphasizing practicality and ease of integration into daily teaching routines.

Regarding platforms employed for teaching, traditional tools like the blackboard (41.01%) and PowerPoint (40.06%) remain the most commonly employed platforms for teaching, reflecting the ongoing reliance on conventional methods for lesson delivery. However, the relatively low usage of digital platforms such as Google Classroom (5.99%), Microsoft Teams (3.79%), Zoom (3.47%), and others suggests that while digital tools are available, their integration into daily teaching practices is still limited. This may be due to factors such as insufficient training, lack of infrastructure, or a preference for face-to-face teaching methods. The challenges faced by teachers in adopting digital platforms align with findings from Panela (2025d), who documented similar barriers in teachers' experiences with educational technology implementation during the COVID-19 pandemic, emphasizing the need for sustained support and capacity-building initiatives.

Level of ICT Integration

The summary of the level of ICT integration among secondary school teachers reveals an overall "average" level of integration across four key areas, each with a median score of 3.00. The findings suggest that while ICT access and availability, teacher competence and confidence in using ICT, and its integration into teaching practices are all rated as average, there is still significant room for improvement.

Table 1
Summary of the Level of ICT Integration Among Secondary School Teachers

Items	\bar{x}	Interpretation
ICT Access and Availability	3.00	Average
ICT Integration in Teaching Practices	3.00	Average
Teacher Competence and Confidence in ICT Use	3.00	Average
Student Engagement and ICT Use	3.00	Average

Legend:

- 5 – Excellent (E)
- 4 – Above Average (A)
- 3 – Average (A)
- 2 – Below Average/Poor (BA/P)
- 1 – Very Poor (VP)

The average score reflects a balanced yet somewhat limited adoption of ICT tools in the classroom, indicating that while teachers have access to technology and use it to some extent, they may not be fully leveraging its potential. Additionally, the average rating for student engagement with ICT suggests that while students are exposed to technology, their active participation in ICT-based learning could be further encouraged.

Specifically, the analysis revealed that teacher-respondents agree that ICT skills are essential for modern teaching practices (median = 4.00) and that students collaborate more effectively when using digital tools in group activities (median = 4.00). However, most other aspects of ICT integration remained neutral, suggesting moderate implementation levels.

Relationships and Differences

The statistical analysis revealed significant relationships between certain teacher profile variables and ICT integration levels. Subject specialization showed highly significant relationships with teacher competence and confidence in ICT use ($p = 0.005$) and student engagement with ICT ($p < 0.001$). This indicates that teachers specializing in certain subjects may have greater confidence in using ICT tools and are more likely to engage their students with technology.

Table 2

Relationships Between the Profile of Teachers and the Level of ICT Integration to Teaching Among Secondary School Teachers in Terms of Subject Taught, Years in Teaching Service, Highest Educational Attainment, and Years of Teaching Service

Variables	Subject Taught		Years in Teaching Service		Highest Educational Attainment		Relevant Seminars and Trainings Attended	
	X ²	p-value	r _s	p-value	r _s	p-value	r _s	p-value
ICT Access and Availability	102.484*	0.046	0.036	0.666	-0.112	0.178	0.107	0.195
ICT Integration in Teaching Practices	102.302*	0.047	-0.100	0.224	-0.112	0.175	-0.052	0.529
Teacher Competence and Confidence in ICT Use	126.280**	<0.001	-0.085	0.305	-0.131	0.114	-0.046	0.582
Student Engagement and ICT Use	194.292**	<0.001	-0.133	0.106	-0.059	0.479	-0.010	0.902

** Correlation is highly significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Similarly, the subject taught had highly significant relationships with teacher competence and confidence in ICT use ($p < 0.001$) and student engagement with ICT ($p < 0.001$), highlighting

that the type of subject taught may impact how teachers use ICT in the classroom. Teachers with different positions also showed different levels of ICT integration in terms of ICT Integration in Teaching Practices, Teacher Competence and Confidence in ICT Use, and Student Engagement and ICT Use.

In contrast, age, sex, and years of teaching service did not show significant relationships with ICT integration variables, as their p-values were greater than 0.05. These findings suggest that factors such as years of experience and educational qualifications, while important, do not necessarily correlate with higher levels of ICT integration among secondary school teachers.

The research findings demonstrate variability in ICT integration success, which mirrors the experiences documented by Panela (2025a, 2025b) regarding the differential impacts of technology adoption during educational disruptions, suggesting that individual teacher characteristics may play crucial roles in determining integration outcomes.

The findings of this study reveal several important insights about ICT integration in technical-vocational education settings. The predominance of laptop and cellphone usage among teachers indicates a preference for portable and versatile technologies that can be easily integrated into existing teaching practices. This preference aligns with the practical constraints often faced in educational settings, where mobility and ease of use are prioritized over more sophisticated but less accessible technologies.

Table 3

Differences Between the Profile of Teachers and the Level of ICT Integration to Teaching Among Secondary School Teachers in Terms of Age, Sex, Position, and Subject Specialization

Variables	Age		Sex		Position		Subject Specialization	
	<i>H</i>	p-value	<i>U</i>	p-value	<i>H</i>	p-value	<i>H</i>	p-value
ICT Access and Availability	7.269	0.122	1961.000	0.128	5.586	0.349	15.881*	0.026
ICT Integration in Teaching Practices	1.577	0.813	2304.000	0.954	18.282**	0.003	21.721**	0.003
Teacher Competence and Confidence in ICT Use	1.266	0.867	2274.000	0.855	29.927**	<0.001	37.590**	<0.001
Student Engagement and ICT Use	4.893	0.298	2427.000	0.641	27.004**	<0.001	63.473**	<0.001

** Difference is highly significant at the 0.01 level (2-tailed)

* Difference is significant at the 0.05 level (2-tailed)

The underutilization of digital platforms such as Google Classroom, Microsoft Teams, and Zoom, despite their proven effectiveness during the pandemic, suggests significant gaps in teacher training and institutional support. This finding is consistent with previous research highlighting the importance of comprehensive professional development programs in facilitating successful technology integration (Akram et al., 2022).

The average level of ICT integration across all measured dimensions indicates that while teachers have access to technology and recognize its importance, they may lack the confidence or skills necessary to fully leverage its educational potential. This situation is particularly concerning in technical-vocational settings, where technology skills are often directly relevant to student career preparation.

The significant relationship between subject specialization and ICT integration levels suggests that teachers' content area expertise influences their comfort and effectiveness with technology integration. This finding underscores the importance of subject-specific professional development approaches rather than generic technology training programs.

The lack of significant relationships between demographic variables (age, sex, years of experience) and ICT integration levels challenges common assumptions about technology adoption patterns. This suggests that successful ICT integration may be more dependent on factors such as training, institutional support, and subject-specific requirements rather than personal characteristics.

IV. Conclusion

The study reveals that while ICT tools are accessible to teachers at Sumoroy Agro-Industrial School, there remains significant room for improvement in their integration into teaching practices. The predominant use of laptops and cellphones reflects practical preferences for portable and versatile technologies, while the underutilization of digital platforms indicates gaps in training and institutional support. The average level of ICT integration across all measured dimensions suggests that teachers recognize the importance of technology but may lack the confidence or skills to fully leverage its potential. Subject specialization emerges as a significant factor influencing ICT integration success, while traditional demographic variables show no significant impact.

The findings highlight the critical need for targeted professional development programs that address both technical skills and pedagogical integration strategies. The study's results provide valuable insights for educational administrators and policymakers seeking to enhance technology integration in technical-vocational education settings. These findings contribute to the broader understanding of educational technology implementation challenges in developing countries, particularly in specialized educational contexts such as technical-vocational schools. The study's

recommendations for professional development and institutional support align with global best practices for successful ICT integration in education.

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