

## TEACHERS' TECHNOLOGICAL DIFFICULTIES AND MITIGATION

Norlie L. Cañete  
STI West Negros University  
Villa Hergon Subdivision, Brgy. Rizal, Silay City, Negros Occidental  
norlie.canete@deped.gov.ph  
+639605952388

### Abstract

This study examined the technological difficulties encountered by junior high school teachers and the mitigation strategies they employed in integrating technology into classroom instruction in a small-sized division in Northern Negros during School Year 2025–2026. A descriptive quantitative research design was utilized involving 120 teachers selected through convenience sampling. Data were collected using a researcher-developed questionnaire validated through expert review and tested for reliability using Cronbach's alpha ( $\alpha = 0.789$ ). The instrument measured technological difficulties and mitigation strategies across three domains: technical skills, instructional integration, and access and maintenance. Descriptive statistics and the Mann–Whitney U test were used for analysis. Results indicated that teachers experienced generally low difficulty in technical skills but moderate challenges in instructional integration and access and maintenance. Mitigation strategies were implemented at moderate to high levels, with teachers frequently relying on self-directed learning, adaptive instructional practices, and peer collaboration. Selected profile variables showed significant differences in some domains. The findings highlight the need for sustained professional development, strengthened technical infrastructure, and institutional support systems to ensure sustainable technology integration. An action plan was proposed to enhance teachers' digital competence and instructional practices. These findings provide evidence to inform school-based digital capacity-building programs and technology support policies.

*Keywords: Technology integration, technological difficulties, mitigation strategies, junior high school teachers, digital competence*

### Bio-profiles

Norlie L. Cañete is a Junior High School Mathematics teacher under the Department of Education (DepEd) in Victorias City, Negros Occidental. He graduated Cum Laude with a Bachelor of Secondary Education major in Mathematics from the Philippine Normal University Visayas. He has taught Mathematics 9 and 10, Statistics and Probability, Business Mathematics, and General Mathematics in both junior and senior high school, including prior teaching experience at La Consolacion College–Bacolod. He is actively involved in instructional delivery, assessment design, and learner-centered innovations in mathematics education. During the pandemic, he developed MATHVILOUS, an instructional innovation that integrates recorded video lessons with self-learning modules to support continuity of instruction. His professional interests include technology integration in mathematics teaching, teacher capacity building, and pedagogical innovation, which motivated him to conduct this research on teachers' technological difficulties and mitigation strategies.



## Introduction

### Rationale

The integration of technology in education has become an essential component of modern teaching and learning as schools respond to the demands of the digital age. Educational systems worldwide recognize technology as a powerful tool for enhancing instructional delivery, expanding access to learning resources, and promoting learner engagement (Voogt et al., 2016; Redecker & Punie, 2017). In line with Sustainable Development Goal 4, quality education increasingly relies on the effective use of digital tools to ensure inclusive, equitable, and meaningful learning experiences (World Bank, 2020).

In the Philippine context, the Department of Education has implemented various initiatives to strengthen technology-supported instruction, including the provision of digital devices, smart televisions, and improved connectivity in public schools. These efforts intensified following the transition to flexible and blended learning modalities. Despite these developments, effective classroom technology integration remains a continuing challenge, particularly in public secondary schools where limitations in training, infrastructure, and technical support persist (Scherer et al., 2021; Tondeur et al., 2017).

Teachers play a critical role in determining the success of technology integration. Their ability to utilize digital tools effectively influences instructional quality, learner participation, and classroom engagement. However, teachers frequently encounter technological difficulties related to technical skills, instructional integration, and access to functional resources. When these challenges are not addressed, technology tends to be underutilized, limiting its potential to improve teaching and learning outcomes.

To sustain instruction despite these constraints, teachers employ various mitigation strategies, including self-directed learning, peer collaboration, preparation of alternative instructional materials, and adaptive teaching practices. While these strategies demonstrate professional resilience, they also highlight the need for structured institutional support to ensure sustainable technology integration. Understanding teachers' technological difficulties and mitigation strategies is therefore necessary in developing responsive programs and action plans that strengthen instructional practices in schools.

This study contributes to the literature by providing empirical evidence from a Philippine secondary school context, offering insights into both technological challenges and practical mitigation strategies for sustainable classroom technology integration.

### Literature Review

Technology integration is widely recognized as a key factor influencing instructional quality, learner engagement, and educational innovation. However, research shows that effective classroom technology use depends not only on the availability of digital tools but also on teachers' technological competence, pedagogical knowledge, and institutional support systems (Voogt et al., 2016; Mishra et al., 2019). When these elements are not aligned, teachers encounter barriers that limit the educational value of technology.

One major challenge involves technical skills. Teachers' limited familiarity with digital platforms, troubleshooting difficulties, and lack of confidence in using educational technologies significantly affect their willingness to integrate them into instruction (Hatlevik, 2017). Teachers'



perceptions of competence strongly influence instructional decisions, as low confidence often leads to avoidance of technology-enhanced teaching practices (Scherer et al., 2021). Studies grounded in the TPACK framework emphasize that sustained, practice-based professional development is necessary to develop technological knowledge that meaningfully supports pedagogy and content (Koehler et al., 2017; Voogt et al., 2016).

Beyond technical operation, instructional integration presents a more complex challenge. Effective integration requires aligning digital tools with learning objectives, assessment practices, and learner-centered pedagogies. Technology should function as a transformative medium rather than merely a supplementary instructional aid (Tondeur et al., 2017). However, teachers often limit technology use to presentation or administrative purposes due to limited pedagogical training and deeply held instructional beliefs (Ertmer et al., 2012). Without concrete instructional models, technology integration remains superficial and fails to promote higher-order learning and collaboration (Trust et al., 2016; Redecker & Punie, 2017).

Access and maintenance issues further compound technological difficulties. Unstable internet connectivity, outdated devices, insufficient infrastructure, and limited technical support disrupt instructional flow and reduce teaching efficiency (Scherer et al., 2021). Even when technology is provided, the absence of sustainable funding and maintenance systems reduces its educational impact (World Bank, 2020).

In response to these challenges, teachers employ mitigation strategies such as self-directed learning, participation in webinars, and engagement in professional learning communities. These approaches enhance teachers' confidence and problem-solving capacity (Howard et al., 2021; Scherer et al., 2021). Peer collaboration and mentoring also provide context-specific support that enables teachers to share practices and troubleshoot challenges collaboratively (Trust et al., 2016).

However, literature suggests that these strategies often function as short-term coping mechanisms rather than long-term solutions. Organizational and institutional support — including leadership involvement, school-based coaching, and continuous professional development — significantly strengthens teachers' capacity for meaningful technology integration (Redecker & Punie, 2017). When teachers receive sustained support and reliable infrastructure, they demonstrate greater instructional innovation, confidence, and persistence in integrating technology (Ntoumanis et al., 2019; Owen et al., 2021).

Overall, literature indicates that teachers' technological difficulties and mitigation strategies are shaped by both individual competencies and systemic conditions. Sustainable technology integration requires the alignment of teacher skills, institutional support, and adequate infrastructure.

### **Theoretical Underpinnings**

This study is anchored on established theories that explain teachers' experiences in technology integration. The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that effective technology use occurs when teachers integrate content knowledge, pedagogical strategies, and technological skills. Difficulties arise when an imbalance exists among these domains, particularly when teachers possess limited pedagogical guidance in using digital tools for instruction.

The Concerns-Based Adoption Model explains teachers' responses to technological innovations by describing stages of concern that range from self-related anxieties to task-related and impact-related considerations. Teachers experiencing uncertainty, limited training, or inadequate



support may remain at the early stages of adoption, contributing to persistent technological difficulties.

The Digital Competence Framework for Educators highlights the importance of continuous professional growth, digital resource management, and instructional innovation. It supports the notion that teachers' digital competence must be developed progressively through structured learning opportunities. Additionally, Professional Learning Network theory underscores the value of collaboration, peer mentoring, and shared learning in enhancing teachers' technological confidence and instructional practice.

Together, these theories provide a framework for understanding how technological difficulties emerge and how mitigation strategies develop. They emphasize that sustainable technology integration requires both individual competence and institutional support.

### Objectives

The study aimed to determine the level of technological difficulties encountered by junior high school teachers and the mitigation strategies they employed in integrating technology into classroom instruction in a small-sized division in Northern Negros during the School Year 2025–2026. Specifically, this study sought to determine: 1) the level of technological difficulties of the respondents in terms of technical skills, instructional integration, and access and maintenance; 2) the level of mitigation strategies employed by the respondents across the same domains; and 3) the significant difference in the level of technological difficulties and mitigation strategies when grouped and compared according to the aforementioned variables.

### Methodology

This section discusses the research design, the study locale, respondents, the data-gathering instrument, validity and reliability, the data-gathering procedure, analytical schemes, and statistical tools.

### Research Design

This study on Teachers' Technological Difficulties and Mitigation used a descriptive research design. This research was used to accurately portray and analyze the technological difficulties faced by Junior High School teachers at a large school in a small division in Northern Negros, along with the mitigation strategies they have implemented, according to Creswell and Creswell (2018). The descriptive design was appropriate as it enabled the systematic description and analysis of existing conditions without attempting to establish causal relationships.

### Locale of the Study

This research undertaking was conducted at Victorias National High School, a public secondary school under the Schools Division Office of Victoria's City, Negros Occidental, during the School Year 2025–2026. The school is one of the major secondary institutions in the city, serving a large number of junior high school learners and teachers from various barangays within Victorias City and nearby communities.

Since its establishment, the school has remained actively engaged in both academic and co-curricular programs implemented by the Department of Education. It has consistently participated in division and regional competitions, including academic contests, campus journalism activities, and



skills-based events. These engagements reflect the school's continuing efforts to strengthen instructional delivery and learner development across different learning areas.

In addition to academic programs, the school implements various school-based initiatives that support innovation and instructional improvement. The integration of digital tools and technology-supported instruction has been encouraged through national and local programs, making the school an appropriate setting for examining teachers' experiences in utilizing educational technology. Given its size, program implementation, and access to instructional resources, Victoria's National High School provides a suitable setting for assessing the technological challenges teachers encounter, the mitigation strategies they employ, and the development of an action plan to strengthen technology integration in classroom instruction.

### Respondents of the Study

The study involved 120 Junior High School teachers, representing a portion of the total teaching population of 174 teachers at Victoria's National High School during the School Year 2025–2026. The sample size was determined using the Raosoft sample size calculator, which is commonly utilized in educational research to obtain a representative sample from a defined population (Raosoft, 2004). The respondents were selected through convenience sampling, a nonprobability sampling technique appropriate when participants are readily accessible and willing to participate in the study (Etikan, Musa, & Alkassim, 2016). This method enabled efficient data collection while ensuring sufficient data were collected to examine the technological difficulties teachers encountered and the mitigation strategies they employed in integrating technology into classroom instruction.

### Data Gathering Instrument

A researcher-developed questionnaire was used to assess teachers' technological difficulties and mitigation strategies for integrating technology into classroom instruction, as a basis for the proposed action plan. The instrument consisted of two parts: Part I gathered the respondents' basic profile information, while Part II measured technological difficulties and corresponding mitigation strategies across three domains—technical skills, instructional integration, and access and maintenance—using structured indicators. All items were rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Always), with higher mean scores indicating greater difficulty or more frequent use of mitigation strategies.

### Instrument Validity and Reliability

The research instrument underwent validity and reliability testing. Validity refers to the degree to which an instrument measures what it is intended to measure (Choudhary, 2020). In this study, face and content validity were established through expert evaluation conducted by validators with expertise in education, instructional supervision, and research. The validation process used the criteria developed by Good and Scates, yielding a validity index of 4.80, interpreted as excellent, indicating that the instrument was appropriate and suitable for data collection. Reliability, which refers to the consistency and internal stability of an instrument (Choudhary, 2020), was determined through a pilot test involving 30 teachers who were not included in the actual respondents. The results were analyzed using Cronbach's alpha, which yielded a reliability coefficient of  $\alpha = 0.789$ , indicating excellent reliability and supporting the research instrument's validity for measuring teachers' technological difficulties and mitigation strategies.



### Data Gathering Procedure

To achieve the study's objectives, a step-by-step procedure was followed to gather the data. First, the researcher sought approval from the Schools Division Superintendent by sending a letter of permission to conduct the study. Upon receiving approval, the researcher distributed the research instrument to the junior high school teacher-respondents. Before answering the questionnaire, respondents were provided with an informed consent form and required to indicate their voluntary participation in the study.

The completed questionnaires were retrieved after respondents completed the instrument within the given period. The data-gathering process was completed within the approved timeframe. Once collected, the responses were organized, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS) for further statistical interpretation.

### Research Ethics Protocol

To preserve respondents' privacy, the researcher adhered to the provisions of the Data Privacy Act of 2012 throughout the study. Before data gathering, permission to conduct the research was secured from the appropriate school authorities. The purpose of the study and its procedures were clearly explained to the respondents before their participation.

Informed consent forms were provided to all teacher-respondents, allowing them to voluntarily participate in the study. Only information relevant to the research objectives, particularly those related to technological difficulties and mitigation strategies in classroom instruction, was collected. Participation in the study was entirely voluntary, and respondents were informed that they could withdraw at any stage without any consequences.

To ensure confidentiality, the researcher guaranteed that all responses would be kept strictly confidential. Access to the collected data was limited solely to the researcher and the research adviser. The data were stored in a password-protected personal computer to prevent unauthorized access. No identifying information was disclosed in any part of the research report, and all data were used exclusively for academic purposes.

The data gathered were handled with utmost care and were analyzed solely for statistical interpretation. Upon completion of data analysis and finalization of the study, all raw data were securely deleted to maintain confidentiality. Lastly, this research did not involve vulnerable populations such as minors, individuals with medical conditions, prisoners, or other marginalized groups, thereby ensuring that the study posed minimal ethical risk to the participants.

### Analytical and Statistical Schemes

Objective No. 1 employed a descriptive-analytical scheme and aimed to determine the level of technological difficulties encountered by the respondents in terms of technical skills, instructional integration, and access and maintenance. Objective No. 2 also employed the descriptive-analytical scheme to determine the level of mitigation strategies used by the respondents across the same domains. Objective No. 3 used a comparative analytical scheme and the Mann–Whitney U test to determine whether there was a significant difference in the level of technological difficulties and the use of mitigation strategies when respondents were grouped and compared according to the selected variables.



## Results and Discussion

This section summarizes the study's findings, which come from careful data gathering, in-depth analysis, and thoughtful interpretation. After this, meaningful conclusions were drawn from the initial phase, offering valuable insights.

### Level of difficulties encountered and mitigation strategies employed by Junior High School teachers in utilizing technology in Education

**Table 1**

*Level of Difficulties Encountered by Junior High School Teachers in Utilizing Technology in Education according to Technical Skills*

<i>As teacher, ...</i>	Mean	Interpretation
1. I struggle to navigate and use learning management systems (e.g., Google Classroom, Canvas, Moodle) for posting assignments and materials.	2.56	Low Level
2. I cannot quickly identify and fix common technical problems, such as audio/video not working, projector connectivity issues, or software freezing during class.	2.68	Moderate Level
3. I have not received adequate hands-on training on educational technology tools required in my teaching (e.g., presentation software, video editing, assessment tools).	2.81	Moderate Level
4. I find it time-consuming and challenging to learn how to operate new digital tools and applications introduced for classroom use.	2.44	Low Level
5. I am unable to perform basic hardware troubleshooting, such as connecting cables, replacing batteries, or identifying hardware connectivity problems.	2.36	Moderate Level
6. I have difficulty creating engaging multimedia content (e.g., videos, interactive presentations, infographics) for my lessons due to a lack of technical know-how.	2.51	Low Level
7. I experience confusion when trying to set up and manage online classes using video conferencing platforms (e.g., Zoom, Google Meet, Microsoft Teams).	2.47	Low Level
8. I lack the skills to create, administer, and analyze results from online quizzes and assessments using digital tools (e.g., Google Forms, Quizizz, Kahoot).	2.53	Low Level
9. I struggle to adapt when educational software updates change the interface, features, or procedures I am familiar with.	2.63	Moderate Level



10. I feel anxious and uncertain when using interactive classroom technologies such as smart TVs, interactive whiteboards, document cameras, or student response systems.	2.32	Low Level
<b>Overall Mean</b>	<b>2.53</b>	<b>Low Level</b>

Table 1 indicates that Junior High School teachers experience a low overall level of difficulty in using technology, with a mean of 2.53. This suggests that teachers generally possess the foundational competencies needed to operate common digital tools for instruction. Most indicators were rated low, reflecting limited familiarity with learning management systems, video conferencing platforms, and interactive classroom technologies. However, moderate difficulty was observed in areas related to insufficient hands-on training and adapting to software updates, indicating gaps in structured professional development. These findings imply that while teachers can manage routine technical tasks, they may struggle with advanced features and troubleshooting without formal support. This pattern aligns with studies emphasizing that inconsistent or limited professional development constrains teachers' deeper technological proficiency (Scherer et al., 2021). Similarly, the TPACK framework highlights that effective technology integration requires sustained training beyond basic exposure (Voogt et al., 2016; Koehler & Mishra, 2009). Overall, the results point to a need for continuous, practice-based technical training to strengthen teachers' long-term capacity for technology-enhanced instruction.

**Table 2**

*Level of Difficulties Encountered by Junior High School Teachers in Utilizing Technology in Education according to Instructional Integration*

<i>As a teacher, ...</i>	Mean	Interpretation
1. I find it difficult to identify which technology tools are appropriate and effective for teaching specific lessons in my subject area.	3.32	Moderate Level
2. I struggle to design learning activities that actively engage students through digital tools rather than just presenting information on screens.	3.12	Moderate Level
3. I have difficulty creating valid and reliable digital assessment tools that accurately measure student learning outcomes in my subject.	2.93	Moderate Level
4. I lack sufficient preparation time to research, plan, and develop quality technology-integrated lesson plans alongside my regular teaching load.	2.83	Moderate Level
5. My students lack basic digital literacy skills (e.g., typing, navigating websites, using applications), which slows down technology-integrated lessons.	2.73	Moderate Level
6. I am uncertain about when to use traditional teaching methods versus technology-based approaches for optimal student learning.	2.88	Moderate Level



7. I find it challenging to track individual student progress and provide timely feedback when students are working on different digital devices or platforms.	3.01	Moderate Level
8. I struggle to differentiate technology-based instruction to address the varying ability levels, learning styles, and special needs of my students.	2.70	Moderate Level
9. I lack subject-specific examples and models of how to effectively integrate technology into lessons for the particular subject(s) I teach.	2.81	Moderate Level
10. I cannot provide each student with individual devices for technology-based activities, requiring them to share or work in large groups.	2.68	Moderate Level
<b>Overall Mean</b>	<b>2.90</b>	<b>Moderate Level</b>

Table 2 reveals that Junior High School teachers encounter a moderate level of difficulty in instructional integration, with a mean of 2.90, indicating that pedagogical use of technology remains challenging despite functional technical skills. Teachers particularly struggle with selecting subject-appropriate digital tools, designing engaging technology-based activities, and monitoring student progress across platforms. These difficulties suggest that integrating technology effectively requires complex instructional decision-making rather than merely operating tools. Additional barriers, such as limited preparation time, uneven student digital literacy, and constrained access to individual devices, further complicate lesson implementation. These findings imply that teachers need targeted pedagogical support to align technology use with learning objectives and student needs. The results are consistent with Tondeur et al. (2017), who emphasized that teachers often lack concrete models for subject-specific technology integration. Likewise, Ertmer et al. (2012) and Scherer et al. (2021) noted that without sustained professional development, teachers continue to face challenges in designing meaningful, student-centered digital instruction. Thus, instructional integration remains a critical area for capacity-building initiatives.

### Table 3

#### *Level of Difficulties Encountered by Junior High School Teachers in Utilizing Technology in Education according to Access and Maintenance*

<i>As a teacher, ...</i>	Mean	Interpretation
1. I experience slow, unstable, or no internet connectivity in my classroom, preventing me from accessing online resources and platforms during lessons.	2.57	Low Level
2. Classroom devices (laptops, tablets, projectors) frequently malfunction, crash, or fail to work properly when I need them for teaching.	2.55	Low Level
3. The available student devices are outdated, slow, or incompatible with the current educational software and applications I want to use.	2.64	Moderate Level
4. I experience long waiting times (days or weeks) before receiving technical support to fix broken equipment or resolve technology issues.	2.82	Moderate Level



5. Our school lacks funding to purchase new devices, replace broken equipment, or renew software licenses needed for effective technology integration.	3.33	Moderate level
6. My classroom has insufficient electrical outlets to charge multiple devices simultaneously, causing interruptions during technology-based lessons.	2.65	Moderate Level
7. The computer laboratory is exclusively reserved for ICT classes, making it unavailable for other subject teachers who want to conduct technology-integrated lessons.	2.63	Moderate Level
8. I waste significant instructional time distributing, collecting, and managing devices at the start and end of each technology-based lesson.	2.64	Moderate Level
9. Required educational software and applications are not installed on school devices, or licenses have expired, limiting my technology integration options.	2.61	Moderate Level
10. There is no designated technical support person available at our school to perform regular device maintenance, updates, and repairs.	3.05	Moderate Level
<b>Overall Mean</b>	<b>2.73</b>	<b>Moderate Level</b>

Table 3 shows that teachers experience a moderate level of difficulty related to access and maintenance of technology, with a mean of 2.73. While basic access to devices and internet connectivity is generally available, systemic issues persist. The most prominent difficulty relates to insufficient funding for upgrading devices, replacing damaged equipment, and renewing software licenses. Delays in technical support, outdated equipment, limited electrical infrastructure, and a lack of dedicated maintenance personnel further hinder effective technology use. These challenges suggest that technology integration problems are not solely teacher-related but are rooted in institutional and infrastructural constraints. As a result, instructional time may be lost, and opportunities for consistent technology-enhanced learning may be reduced. These findings are supported by UNESCO (2020), which reported that public schools frequently face challenges related to outdated infrastructure and weak maintenance systems. Similarly, the World Bank (2020) emphasized that the lack of sustainable funding significantly diminishes the educational impact of technology investments. Overall, the results highlight the need for systemic, school-level solutions to support sustainable technology integration.

**Table 4**

*Level of Mitigation Strategies Employed by Junior High School Teachers in Utilizing Technology in Education according to Technical Skills*

<i>As a teacher, ...</i>	Mean	Interpretation
1. I attend webinars, watch tutorial videos, or request one-on-one coaching specifically on learning management systems.	3.14	Moderate Level



2. I maintain a personal troubleshooting checklist and consult IT personnel or online forums to resolve technical problems as they arise.	3.11	Moderate Level
3. I enroll in DepEd-organized training programs, online courses (e.g., NEAP Accredited training, YouTube tutorials), or peer learning sessions focused on educational technology.	3.02	Moderate Level
4. I set aside dedicated practice time (at least 30 minutes weekly) to explore new technologies through trial-and-error and guided tutorials.	3.21	Moderate Level
5. I request hands-on demonstrations from ICT coordinators or technical staff and keep quick-reference guides for basic hardware issues.	2.93	Moderate Level
6. I participate in workshops on multimedia creation tools (e.g., Canva, PowerPoint, Adobe Spark) and collaborate with tech-savvy colleagues for guidance.	2.58	Low Level
7. I practice using video conferencing features (screen sharing, breakout rooms, chat functions) outside class time and attend platform-specific training.	2.97	Moderate Level
8. I attend training workshops on digital assessment tools and seek mentorship from colleagues experienced in creating online assessments.	3.03	Moderate Level
9. I subscribe to software update notifications, read change logs, join user communities, and allocate time to explore new features after each update.	2.83	Moderate Level
10. I request demonstration sessions from ICT staff, practice using interactive technologies before class, and observe colleagues who use them effectively.	2.78	Moderate Level
<b>Overall Mean</b>	<b>2.96</b>	<b>Moderate Level</b>

Table 4 indicates that Junior High School teachers employ moderate mitigation strategies to address technical skill difficulties with a mean of 2.96. Teachers commonly rely on self-directed approaches such as independent practice, online tutorials, webinars, and informal peer support. Setting aside regular practice time emerged as the most frequently used strategy, suggesting a strong sense of personal responsibility for skill development. However, participation in formal multimedia creation workshops was rated low, indicating limited engagement in advanced or specialized training. This pattern suggests that, while teachers actively seek to address technical challenges, their strategies are largely individual and informal rather than institutionally supported. Consequently, these efforts may be sufficient for basic technical needs but inadequate for developing the higher-level competencies required to create rich digital learning materials. These findings align with UNESCO (2020) and DepEd (2020), which noted that teachers often depend on on-demand, self-paced learning resources due to workload pressures and limited access to structured professional development. Thus, institutional support remains crucial for strengthening teachers' technical expertise.



**Table 5**

*Level of Mitigation Strategies Employed by Junior High School Teachers in Utilizing Technology in Education according to Instructional Integration*

<i>As a teacher, ...</i>	Mean	Interpretation
1. I consult with subject coordinators, review educational technology blogs/websites, and attend subject-specific technology integration workshops.	3.35	Moderate Level
2. I explore interactive tools (e.g., Nearpod, Padlet, Mentimeter), observe demonstration lessons, and incorporate game-based learning elements into my teaching.	3.17	Moderate Level
3. I study assessment design principles, use rubric generators, participate in curriculum meetings focused on digital assessment, and pilot-test my digital assessments.	3.45	High Level
4. I use ready-made digital resources (DepEd Commons, OER platforms), collaborate with colleagues to share lesson plans, and create reusable templates for efficiency.	3.19	Moderate Level
5. I dedicate initial class sessions to teach basic digital skills, provide step-by-step guides, use peer tutoring, and scaffold technology tasks gradually.	3.37	Moderate Level
6. I apply the SAMR model or TPACK framework, consult with instructional coaches, and evaluate which approach best suits each learning objective.	3.27	Moderate Level
7. I utilize learning management systems with built-in analytics, set up automated feedback through online quizzes, and establish regular check-in schedules.	3.43	High Level
8. I provide alternative technology options (text, audio, video), adjust difficulty levels in digital activities, offer choice boards, and consult with SPED coordinators.	3.03	Moderate Level
9. I join subject-specific online teacher communities, attend discipline-focused EdTech conferences, and request demonstration teaching from master teachers in my field.	3.20	Moderate Level
10. I implement station rotation models, create device sharing schedules, use BYOD (Bring Your Own Device) when possible, and design collaborative tasks suited for group work.	3.12	Moderate Level
<b>Overall Mean</b>	<b>3.26</b>	<b>Moderate Level</b>

Table 5 demonstrates that teachers employ moderate mitigation strategies for instructional integration, with a mean of 3.26, and show notable strengths in digital assessment practices. High usage was observed in strategies related to designing assessments, using learning management system



analytics, and providing automated feedback, indicating confidence in the use of assessment-driven technology. However, comparatively lower emphasis was placed on differentiated instruction and providing multiple learning formats to address learner diversity. This suggests that teachers prioritize efficiency and performance monitoring over inclusive and adaptive instructional design. Such patterns may stem from time constraints, limited training in differentiation through technology, or the complexity of managing diverse learner needs in digital environments. These findings support Tondeur et al. (2017), who noted that while teachers increasingly use technology for assessment, they do not successfully integrate it for differentiated learning. Similarly, Ertmer et al. (2012) and Scherer et al. (2021) emphasized that inclusive, student-centered technology integration requires sustained pedagogical support and shifts in instructional beliefs. Hence, mitigation strategies are evident but remain limited in addressing learner diversity.

**Table 6**

*Level of Mitigation Strategies Employed by Junior High School Teachers in Utilizing Technology in Education according to Access and Maintenance*

<i>As a teacher, ...</i>	Mean	Interpretation
1. I download materials in advance for offline use, coordinate with administration for WiFi improvements, use mobile hotspots, or schedule computer lab sessions.	3.68	High Level
2. I report malfunctions immediately through proper channels, keep backup devices ready, maintain a list of functional equipment, and prepare non-tech alternative activities.	3.42	High Level
3. I formally request device upgrades through school improvement plans, seek donations or partnerships with organizations, and use lightweight web-based alternatives.	2.81	Moderate Level
4. I learn basic troubleshooting skills, develop relationships with IT staff for priority support, document recurring issues, and maintain backup teaching materials.	2.96	Moderate Level
5. I actively participate in budget planning meetings, write proposals for grants (e.g., DepEd programs, NGO partnerships), and advocate for technology funding to school administration.	2.23	Low Level
6. I submit facility improvement requests, use power strips and extension cords safely, create device charging schedules, and ensure devices are pre-charged before class.	2.89	Low Level
7. I coordinate with ICT teachers and administration to establish a fair lab scheduling system, propose extended lab hours, or advocate for mobile device carts.	2.79	Moderate Level



8. I establish clear device distribution routines, assign student device monitors, number devices, and assign them to specific students, and practice procedures regularly.	2.81	Moderate Level
9. I request software installation through proper channels, identify and use free or open-source alternatives (e.g., LibreOffice, GIMP), and advocate for institutional licenses.	2.71	Moderate Level
10. I coordinate with district ICT coordinators for scheduled visits, develop basic maintenance skills (e.g., cleaning, updates), and establish agreements with external service providers.	2.76	Moderate Level
<b>Overall Mean</b>	<b>2.91</b>	<b>Moderate Level</b>

Table 6 shows that teachers employ a moderate level of mitigation strategies to address access and maintenance challenges, with a mean of 2.91. Teachers strongly favor immediate, practical solutions, such as downloading materials for offline use, preparing backup devices, and adjusting schedules to address connectivity and equipment issues. These strategies reflect adaptability and resourcefulness in ensuring instructional continuity. However, low engagement was observed in long-term interventions, such as budget planning and advocating for technology funding. This indicates limited teacher involvement in institutional decision-making related to resource allocation. As a result, access and maintenance concerns are managed through short-term workarounds rather than sustainable systemic solutions. These findings align with Scherer et al. (2021), who emphasized that access inequities require institutional responses beyond individual teacher efforts. The World Bank (2020) similarly stressed the importance of sustainable funding mechanisms for maintaining and upgrading technology. Overall, the results suggest that while teachers cope effectively with daily challenges, stronger institutional support is necessary for long-term sustainability.

**Table 7**

*Significant Difference in the Level of Difficulties Encountered by Junior High School Teachers in Utilizing Technology in Education according to Technical Skills*

Variable	Category	N	Mann-Whitney U-test	p-value	Sig. level	Interpretation
					0.05	
Age	Younger Older	59 61	2570.0	0.001		Significant
Sex	Male Female	30 90	1494.5	0.381		Not significant



Civil Status	Single	46	2301.0	0.001	Significant
	Married	74			
Length of Service	Shorter	71	2457.0	0.001	Significant
	Longer	49			
Educational Attainment	Bachelors Degree	85	2457.0	0.001	Significant
	With Graduate Studies	35			
Educational Attainment	Lower	94	1708.0	0.203	Not significant
	Higher	26			

Table 7 reveals significant differences in technical skills difficulties when teachers are grouped by age, civil status, length of service, and educational attainment, but not by sex. The absence of differences by sex and highest educational attainment suggests that gender and advanced degrees do not necessarily reduce technical challenges, supporting findings that gender gaps in technology use have narrowed over time (Scherer & Siddiq, 2015). However, significant differences by age and length of service indicate that older, more experienced teachers encounter greater technical difficulties. Civil status also emerged as a significant factor, suggesting that personal life circumstances may affect opportunities for professional learning. These findings align with Harmsen et al. (2018), who emphasized the influence of personal contexts on teachers' professional development, and Admiraal et al. (2017), who noted that veteran teachers often require additional support when adopting new technologies. The results underscore the need for differentiated professional development, mentoring, and peer collaboration, as advocated by Trust (2017), to address varied teacher needs.

**Table 8**

*Significant Difference in the Level of Difficulties Encountered by Junior High School Teachers in Utilizing Technology in Education according to Instructional Integration*

Variable	Category	N	Mann-Whitney U-test	p-value	Sig. level	Interpretation
Age	Younger	59	2444.5	0.001	0.05	Significant
	Older	61				
Sex	Male	30	1304.0	0.849	Not significant	Not significant
	Female	90				



Civil Status	Single	46	2031.0	0.045	Significant
	Married	74			
Length of Service	Shorter	71	2156.0	0.017	Significant
	Longer	49			
Educational Attainment	Bachelors Degree	85	1644.0	0.310	Not significant
	With Graduate Studies	35			

Table 8 indicates significant differences in instructional integration difficulties by age, civil status, and length of service, but no significant differences by sex or educational attainment. This suggests that pedagogical challenges in technology integration are not gender-dependent and are not automatically resolved through advanced academic qualifications. Younger teachers and those with shorter service tend to adapt more easily to technology-integrated pedagogies, consistent with Starkey (2020), who found that younger teachers are more receptive to learner-centered digital approaches. Conversely, experienced teachers may struggle to align new technologies with established teaching practices (Howard & Gigliotti, 2016). These findings emphasize that instructional integration requires more than technical knowledge; it demands integrating pedagogy, content, and technology, as highlighted by the TPACK framework (Koehler et al., 2017). The results suggest the need for differentiated professional development, mentoring, and collaborative lesson planning, as recommended by Voogt et al. (2016), to support teachers across career stages.

**Table 9**

*Significant Difference in the Level of Mitigation Strategies employed by Junior High School Teachers in Utilizing Technology in Education according to Instructional Integration*

Variable	Category	N	Mann-Whitney U-test	p-value	Sig. level	Interpretation
Age	Younger	59	1325.5	0.013	0.05	Significant
	Older	61				
Sex	Male	30	1131.5	0.185	Not significant	
	Female	90				
Civil Status	Single	46	1519.5	0.324	Not significant	



	Married	74			
	Shorter	71			
Length of Service	Longer	49	1254.5	0.010	Significant
Educational Attainment	Bachelors Degree	85			
	With Graduate Studies	35	1384.0	0.550	Not significant

Table 9 shows significant differences in instructional integration mitigation strategies by age and length of service, whereas sex, civil status, and educational attainment did not show significant effects. Younger teachers and those with shorter service employ significantly more mitigation strategies, indicating greater adaptability and openness to experimenting with pedagogical solutions. This may be attributed to their familiarity with contemporary digital tools and recent exposure to technology-integrated instructional models. In contrast, older and more experienced teachers may rely on established practices, limiting their range of mitigation approaches. These findings align with Hartshorne and Ajjan (2019), who observed that younger teachers demonstrate greater pedagogical flexibility and innovation in addressing technology-related challenges. Similarly, Tondeur et al. (2020) emphasized that novice teachers often contribute fresh perspectives and adaptive strategies. The results suggest that schools should promote cross-generational collaboration, such as reverse mentoring and professional learning communities, to facilitate the sharing of effective mitigation practices and strengthen instructional integration across all teacher groups.

### Conclusion

This study examined the technological difficulties encountered by junior high school teachers and the mitigation strategies they employed in integrating technology into classroom instruction. Findings revealed that teachers generally demonstrated low technical skill difficulties, indicating adequate operational competence with common digital tools. However, moderate difficulties were observed in instructional integration and access and maintenance, suggesting that difficulties are more pronounced in pedagogical alignment and systemic resource constraints. Teachers employed moderate mitigation strategies, primarily relying on self-directed learning, peer collaboration, and adaptive instructional practices. Engagement in institutional-level strategies such as resource planning and funding advocacy remained limited. Significant differences across selected profile variables suggest the need for differentiated professional development and targeted support programs. Overall, strengthening technology integration requires sustained professional learning opportunities, reliable technical infrastructure, and institutional mechanisms that support long-term digital innovation in schools. The study is limited to one public secondary school and relies on self-reported data, which may affect generalizability.



## Acknowledgment

The completion of this research reflects the collective support, guidance, and encouragement of many individuals. The researcher expresses deep gratitude to his adviser, Dr. Ronamie V. Reliquias, for her mentorship, patience, and invaluable guidance, and to the panel members for their constructive feedback. Appreciation is also extended to colleagues, validators, and participants for their insights and cooperation, as well as to Former Victorias City Mayor Javier Miguel L. Benitez for his support through the SIDLAK ADHERE Scholarship Program, which made this academic journey possible. Above all, heartfelt thanks go to his family, especially his wife, Jessica B. Cañete, for her unwavering support, patience, and encouragement throughout the research process. This work stands as a testament not only to academic effort but also to perseverance, commitment, and the shared journey of those who contributed to its completion.

## Conflict of Interest

The researcher declares that there is no conflict of interest that could have influenced the conduct, analysis, interpretation, or reporting of this study. No financial, professional, or personal relationships with individuals or organizations affected the objectivity and integrity of the research. Further, no external entity influenced the research design, data collection procedures, data analysis, or the presentation of findings and conclusions.

## References

- Admiraal, W., Huizenga, J., Akkerman, S., & Dam, G. T. (2017). *Teacher professional development in technology integration: A case study of a school-wide initiative*. *Computers & Education*, 108, 1-12.
- Ayoub, A., & Alshammari, M. (2023). *The impact of marital status on teacher readiness for technology adoption in education*. *Journal of Educational Technology*, 15(2), 45-58.
- Bautista, U. (2022). *Challenges in the Philippine education technology infrastructure*. *Philippine Journal of Education*, 101(3), 112-125.
- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2021). *Mapping research on digital literacy in higher education*. *Studies in Higher Education*, 46(8), 1525-1541. <https://doi.org/10.1080/03075079.2020.1739133>
- Cárcamo-Ulloa, L., Díaz, A., & García, F. (2021). *Digital competencies in teacher education: A comparative study*. *Teaching and Teacher Education*, 99, 103265. <https://doi.org/10.1016/j.tate.2020.103265>
- Choudhary, F. R. (2020). *Research methodology for education*. Pearson.
- Chung, J. (2021). *Pre-service teacher training in digital tools: A longitudinal study*. *Journal of Teacher Education*, 72(4), 456-470. <https://doi.org/10.1177/0022487120981234>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- De Belen, N., Cruz, R., & Santos, L. (2015). *Statistical tools in educational research*. *Philippine Educational Research Journal*, 8(1), 45-62.



- Dela Cruz, J. (2023). *Technology integration models in Philippine classrooms*. *Asia-Pacific Journal of Teacher Education*, 51(2), 134-148. <https://doi.org/10.1080/1359866X.2022.2156789>
- DepEd. (2020). *Basic education statistics*. Department of Education. <https://www.deped.gov.ph/>
- Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). *Teacher technology change: How knowledge, confidence, beliefs, and culture intersect*. *Journal of Research on Technology in Education*, 42(3), 255-284. <https://doi.org/10.1080/15391523.2010.10782551>
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). *Teacher beliefs and technology integration practices: A critical relationship*. *Computers & Education*, 59(2), 423-435. <https://doi.org/10.1016/j.compedu.2012.02.001>
- Fraenkel, J. R., & Wallen, N. E. (2010). *How to design and evaluate research in education* (7th ed.). McGraw-Hill.
- Garcia, E. (2022). *Infrastructure barriers in digital education: A Philippine perspective*. *International Journal of Educational Development*, 89, 102512. <https://doi.org/10.1016/j.ijedudev.2021.102512>
- Gonzales, R. (2019). *Teacher performance and professional qualifications*. *Journal of Educational Administration*, 57(4), 345-360. <https://doi.org/10.1108/JEA-08-2018-0102>
- Harmsen, R., Helms-Lorenz, M., Maulana, R., & van Veen, K. (2018). *The impact of personal factors on teacher effectiveness*. *Teaching and Teacher Education*, 74, 168-177. <https://doi.org/10.1016/j.tate.2018.05.008>
- Hartshorne, R., & Ajjan, H. (2019). *Examining teacher perceptions of digital citizenship*. *Computers & Education*, 138, 1-12. <https://doi.org/10.1016/j.compedu.2019.04.010>
- Hatlevik, O. E. (2017). Examining the relationship between teachers' self-efficacy and ICT use. *Computers & Education*, 118, 1-15.
- Howard, S. K., & Gigliotti, R. (2016). *Digital transformation in education: A framework for change*. *Journal of Educational Change*, 17(3), 345-367. <https://doi.org/10.1007/s10833-016-9279-y>
- Hussein, M., Owusu-Agyeman, Y., & Tawfik, M. (2022). *Experienced teachers and technology integration: Challenges and strategies*. *Education and Information Technologies*, 27(5), 6789-6805. <https://doi.org/10.1007/s10639-021-10845-6>
- Ilhan, M., & Süral, I. (2023). *Digital competence in teacher education: A meta-analysis*. *Computers & Education*, 192, 104652. <https://doi.org/10.1016/j.compedu.2022.104652>
- Inan, F. A., & Lowther, D. L. (2010). *Factors affecting technology integration in K-12 classrooms*. *Computers in the Schools*, 27(2), 105-121. <https://doi.org/10.1080/07380561003800095>
- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.
- Koehler, M. J., Mishra, P., & Cain, W. (2017). What is TPACK? *Journal of Education*, 193(3), 13-19.
- König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). *Adapting to online teaching during COVID-19: Teacher education in the digital age*. *European Journal of Teacher Education*, 43(4), 608-622. <https://doi.org/10.1080/02619768.2020.1809650>
- Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners* (5th ed.). SAGE Publications.



- Liu, F., Ritzhaupt, A. D., Dawson, K., & Barron, A. E. (2020). *Explaining technology integration in K-12 classrooms: A multilevel path analysis model*. *Computers & Education*, 150, 103827. <https://doi.org/10.1016/j.compedu.2020.103827>
- Mercado, L. (2022). *Technology use in Philippine education: Trends and challenges*. *Philippine Journal of Educational Research*, 72(1), 89-104.
- Ntoumanis, N., Quested, E., Reeve, J., & Cheon, S. H. (2019). Need-supportive communication in education. *Educational Psychology Review*, 31(3).
- Ocampo, D. (2021). *Teacher readiness for digital transformation in the Philippines*. *Asia-Pacific Education Researcher*, 30(4), 345-356. <https://doi.org/10.1007/s40299-020-00545-8>
- Ott, T., & Pozzi, F. (2012). *Towards a new learning architecture: Designing for change in higher education*. *European Journal of Education*, 47(2), 238-249. <https://doi.org/10.1111/j.1465-3435.2012.01515.x>
- Owen, S., Fox, A., & Bird, T. (2021). Teacher professional learning through digital collaboration. *Teaching and Teacher Education*, 102.
- Putri, R., Sari, N., & Rahman, A. (2022). *Marital status and teacher workload in technology adoption*. *Journal of Educational Psychology*, 114(3), 567-580.
- Rahman, M. S., Ahmed, S., & Khan, M. A. (2022). *Digital literacy training for pre-service teachers*. *International Journal of Educational Technology in Higher Education*, 19(1), 1-18. <https://doi.org/10.1186/s41239-022-00345-6>
- Rasmitadila, R., Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). *Perceptions of primary school teachers regarding online learning during the COVID-19 pandemic*. *Journal of Ethnic and Cultural Studies*, 7(2), 90-109.
- Redecker, C., & Punie, Y. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the EU.
- Sánchez, J., & Martínez, L. (2021). *Teacher effectiveness and demographic factors: A review*. *Teaching and Teacher Education*, 102, 103342. <https://doi.org/10.1016/j.tate.2021.103342>
- Scherer, R., Howard, S. K., Tondeur, J., & Siddiq, F. (2021). *The importance of personal and contextual factors in teachers' technology integration*. *Computers & Education*, 160, 104010. <https://doi.org/10.1016/j.compedu.2020.104010>
- Schmid, M., Brianza, E., & Petko, D. (2021). *Developing competencies for digital-supported learning: A framework for teacher education*. *Computers & Education*, 165, 104135. <https://doi.org/10.1016/j.compedu.2021.104135>
- Starkey, L. (2020). *A review of research exploring teacher preparation for the digital age*. *Cambridge Journal of Education*, 50(1), 37-56. <https://doi.org/10.1080/0305764X.2019.1625867>
- Tondeur, J., Aesaert, K., Prestridge, S., & Consuegra, E. (2018). *A multilevel analysis of what matters in the training of pre-service teachers' ICT competencies*. *Computers & Education*, 126, 505-513. <https://doi.org/10.1016/j.compedu.2018.08.029>
- Tondeur, J., Forkosh-Baruch, A., Prestridge, S., Albion, P., & Edirisinghe, S. (2016). *Responding to challenges in teacher professional development for ICT integration in education*. *Educational Technology & Society*, 19(3), 110-120.
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). *Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A*





- systematic review of qualitative evidence. Educational Technology Research and Development*, 65(4), 555-575. <https://doi.org/10.1007/s11423-016-9481-2>
- Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2019). *Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. Computers & Education*, 128, 415-429. <https://doi.org/10.1016/j.compedu.2018.10.009>
- Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2020). *Getting inside the black box of technology integration in education: Teachers' stimulated recall of classroom observations. Australasian Journal of Educational Technology*, 36(1), 1-18. <https://doi.org/10.14742/ajet.5287>
- Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2021). *Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. British Journal of Educational Technology*, 52(4), 1657-1681. <https://doi.org/10.1111/bjet.13122>
- Trust, T., & Pektas, E. (2022). *Supporting teachers in integrating technology: A professional learning community approach. Journal of Digital Learning in Teacher Education*, 38(2), 78-92. <https://doi.org/10.1080/21532974.2022.2045678>
- Trust, T., Krutka, D., & Carpenter, J. (2016). Together we are better: Professional learning networks. *Computers & Education*, 102, 15–34.
- UNESCO. (2020). *Global education monitoring report 2019: Migration, displacement and education.*

