TECHNOLOGY INTEGRATION OF TEACHERS IN THE DIVISION OF NORTHERN SAMAR

ABSTRACT

This study aimed to determine the technology-related profile of teachers in the Division of Northern Samar and examine its relationship with their degree of technology integration. It focused on variables such as computer ownership, use of productivity and communication tools, computer training courses, and experience with hardware and software. The degree of technology integration was assessed in terms of technological knowledge, technological pedagogical knowledge, technological content knowledge, and technological pedagogical content knowledge.

Employing a descriptive-correlational research design, this study gathered data from 252 public secondary school teachers selected through proportional sampling across geographically diverse municipalities. The investigation focused on teachers' technology-related profiles, specifically their computer ownership, types of applications used, training background, and experience with both software and hardware. To assess their level of technological self-efficacy, the study utilized the Technological Pedagogical Content Knowledge (TPACK) framework, which examined four key domains: information and data literacy, communication and collaboration, digital content creation, and digital safety.

Findings showed that many teachers own computers and frequently use productivity tools like Google Workspace and communication platforms such as Zoom. TESDA National Certificates were the most commonly acquired training. Overall, teachers demonstrated a high degree of technology integration. Significant relationships were found between technology-related profiles and certain areas of technology integration. Specifically, technological knowledge and pedagogical knowledge were significantly associated with technology profiles, while content-related knowledge areas were not. Productivity tool usage was significantly linked to technological knowledge, whereas communication tools and computer ownership were not. Training courses significantly correlated with both technological content and pedagogical content knowledge. Hardware experience related to technological knowledge, and software experience showed strong associations with most areas of technology integration. These findings underscore the importance of targeted training and software experience in enhancing effective technology integration in education.

Keywords: *Technology Integration, Technological Pedagogical Content Knowledge (TPACK), ICT in Education*

1. INTRODUCTION

In today's digital age, the integration of technology in education has become a fundamental component of effective teaching and learning. Globally, educational systems are continuously evolving to equip learners with 21st-century skills, and technology plays a central role in this transformation. In the Philippines, the Department of Education (DepEd) has reinforced this direction through various policies and programs aimed at promoting digital literacy and classroom innovation.

One of the most notable initiatives is the DepEd Computerization Program (DCP), which seeks to provide public schools with ICT equipment and training to enhance both teaching and administrative efficiency [1]. Alongside this, DepEd Order No. 24, s. 2022 provides clear standards for integrating educational technology into the curriculum, underscoring the importance of contextualized, learner-centered, and pedagogically sound use of digital tools [2]. More recently, DepEd Memorandum No. 62, s. 2025 emphasized the integration of emerging technologies in teaching and learning, advocating for the continuous upskilling of teachers to meet evolving digital demands [3].

Research has shown that technology integration is influenced by several factors, including teachers' access to digital tools, training, and self-efficacy. According to Cantutay and Taganas (2024), teachers who participated in upskilling programs demonstrated significantly higher technological literacy, particularly in productivity and communication tools [4]. However, technology use remains uneven, especially in geographically isolated and disadvantaged areas like Northern Samar, where access and training opportunities are limited [5].

To measure meaningful technology integration, the Technological Pedagogical Content Knowledge (TPACK) framework provides a useful model that examines the intersection of teachers' technological knowledge, pedagogical skills, and subject content expertise [6]. This framework helps distinguish between mere usage of digital tools and the pedagogically effective integration of technology into instruction.

Furthermore, DepEd's commitment to improving ICT integration is reflected in DepEd Order No. 012, s. 2025, which institutionalizes technical assistance to schools in the area of teaching and learning, particularly digital instruction [7]. DepEd Order No. 013, s. 2025, establishing the Center for Artificial Intelligence Research, and DepEd Order No. 014, s. 2025, amending existing ICT development plans, signify a strategic shift towards future-ready education [8][9]. Still, despite these advancements, studies continue to reveal gaps in digital content creation and programming skills among teachers, which are critical for learner engagement and innovation [10].

Given this context, this study seeks to determine the technology-related profile and the degree of technology integration among public secondary school teachers in the Division of Northern Samar. Specifically, it aims to assess their access to digital resources (e.g., computer ownership, applications used), training experiences, and hardware/software competence. It also investigates the extent of technology integration using the TPACK framework and examines the relationship between teacher profiles and their level of integration. Insights from this study can serve as a basis for policy recommendations and capacity-building programs that foster inclusive and effective technology use in public education.

2. MATERIALS AND METHODS

This study was conducted in the Division of Northern Samar utilizing a descriptive-correlational research design. Proportional sampling was employed to ensure representation across the geographically diverse and contextually distinct teaching environments within the province. Selected municipalities were categorized based on their geographical characteristics. In the Balicuatro area, the sample included Capul (an island municipality), San Isidro (an entry point along the carlines), and Lavezares (a coastal exit point). For the central region, the sample comprised Catarman (the provincial capital), Lope de Vega (an upland municipality), and Mondragon (located along the carlines but with limited mobile and data connectivity). From the Pacific zone and Catubig Valley, participating municipalities included Pambujan (home to a large secondary school), Lapinig (the farthest town), and Catubig. A total of 252 public secondary school teachers were selected from a population of 654. Data were gathered using an adapted research instrument based on the Technological Pedagogical Content Knowledge (TPACK) framework developed by Schmidt et al. [11].

3. RESULTS AND DISCUSSION

Technology-Related Profile of Teachers in terms of Computer Ownership

Table 1 reveals that a majority of teachers personally own their computers, with 159 out of 252 respondents (63%) indicating individual ownership. This reflects a relatively high level of digital accessibility and user autonomy regarding hardware utilization. In contrast, 75 teachers (30%) reported relying on borrowed devices, suggesting that a significant proportion depend on shared or temporary access to technology—potentially limiting continuous and personalized use. Only 6 respondents (2%) stated that their computers were government-issued, highlighting the limited institutional provision of digital resources. Additionally, 12 teachers (5%) indicated they rent computers, which may point to financial limitations or temporary access arrangements. These findings emphasize the need to strengthen equitable access to technology by addressing the digital divide, particularly for the 37% of teachers who lack personal computer ownership. Such efforts are vital to fostering inclusive and sustained technology integration in teaching and learning environments.

Table 1. Technology-related Profile of Teachers in terms of Computer Ownership

Computer Ownership	Frequency	Percentage
Owned	159	63
Borrowed	75	30
Government issued	6	2
Rented	12	5
Total	**252**	**100**

Technology-Related Profile of Teachers in terms of Applications Used

Table 2 shows the technology-related profile of teachers in terms of applications used, revealing a strong preference for mainstream productivity and communication platforms, particularly those developed by Microsoft and Google. In the category of office suites, Microsoft Office emerges as the most utilized suite with 142 users, followed by Google Workspace with 102 users. This pattern reflects teachers' reliance on widely recognized productivity tools for document creation, collaboration, and instruction. Similarly, Microsoft Word (142) and Google Docs (133) dominate word processing tasks, while alternative platforms such as LibreOffice Writer and Apple Pages see minimal adoption.

For spreadsheet functions, Microsoft Excel (135) and Google Sheets (109) are the preferred tools, suggesting familiarity and ease of use. Microsoft PowerPoint is the most extensively used presentation software (158), while Google Slides (84) serves as a secondary tool. The limited use of Prezi and Apple Keynote indicates that more innovative or less traditional presentation tools have not yet been widely integrated into teaching practices.

In the area of database management, Microsoft Access leads with 139 users, although a significant number of respondents (71) did not indicate any use of database software, possibly suggesting limited application in everyday teaching. Email and communication platforms are dominated by Gmail (183), while Yahoo Mail (56) holds a distant second. Microsoft Outlook and Thunderbird have very low usage rates, reflecting a strong inclination toward more accessible or familiar services.

For note-taking and organization, Microsoft OneNote (106), Google Keep (88), and Evernote (83) are the top platforms, showing a trend toward digital organization tools that support planning and instructional management. In terms of project management software, Asana (109) and Trello (94) are the most widely used, while more advanced platforms like Monday.com, ClickUp, and Jira are less commonly known or utilized.

Google Calendar stands out as the primary time management tool, used by 184 teachers. Microsoft Outlook Calendar and Apple Calendar follow with considerably fewer users, indicating Google's dominance in scheduling and event coordination. For cloud storage, Google Drive is nearly universally adopted (198), underscoring its central role in document storage and file sharing. Dropbox and Microsoft OneDrive are less commonly used, and iCloud has very limited adoption.

In the graphic design and multimedia category, Canva (148) is the most frequently used tool, demonstrating a preference for intuitive, web-based design applications. Adobe Photoshop (58) and Microsoft Publisher (24) are also used, though less extensively. In terms of video conferencing, Zoom (104) is the platform of choice, followed by Google Meet (53) and Skype (44). Microsoft Teams (35) remains less popular, and 38 respondents reported no usage, which may reflect limited internet access or teaching assignments not requiring virtual instruction.

Overall, the data suggest that teachers heavily rely on widely available and user-friendly digital tools to support their professional activities, with Microsoft and Google applications forming the core of their digital ecosystem.

Table 2 . Technology-related Profile of Teachers in terms of Applications Used

Applications Used		
Office Suites	**Frequency**	**Rank**
• Microsoft Office (Word, Excel, PowerPoint, Outlook)	142	1
• Google Workspace (Docs, Sheets, Slides, Gmail)	102	2
• LibreOffice (Writer, Calc, Impress)	5	3
• Apple iWork (Pages, Numbers, Keynote)	4	4
Word Processing Software	**Frequency**	**Rank**
• Microsoft Word	142	1
• Google Docs	133	2
• LibreOffice Writer	7	3
• Apple Pages	4	4
Spreadsheet Software	**Frequency**	**Rank**
• Microsoft Excel	135	1
• Google Sheets	109	2
• LibreOffice Calc	7	3
• Apple Numbers	1	4
Presentation Software	**Frequency**	**Rank**
• Microsoft PowerPoint	158	1
• Google Slides	84	2
• LibreOffice Impress	6	3
• Apple Keynote	2	4.5
• Prezi	2	4.5
Database Management Software	**Frequency**	**Rank**
• Microsoft Access	139	1
• MySQL	6	3
• PostgreSQL	3	4
• Google Cloud Firestore	32	2
• Oracle Database	1	5
• No response	71	
Email and Communication Software	**Frequency**	**Rank**
• Microsoft Outlook	11	3

	Frequency	Rank
• Gmail	183	1
• Yahoo Mail	56	2
• Thunderbird	2	4
Note-Taking and Organization Software	**Frequency**	**Rank**
• Evernote	83	3
• Microsoft OneNote	106	1
• Google Keep	88	2
• Notion	2	4
• Trello (for task management)	1	5
Project Management Software	**Frequency**	**Rank**
• Asana	109	1
• Trello	94	2
• Monday.com	20	3
• ClickUp	7	4
• Jira	2	5
• No response	20	
Time Management and Scheduling Software	**Frequency**	**Rank**
• Google Calendar	184	1
• Microsoft Outlook Calendar	39	2
• Apple Calendar	12	3
• Todoist	3	4
• No response	34	
Cloud Storage and File Management	**Frequency**	**Rank**
• Google Drive	198	1
• Dropbox	43	2
• Microsoft OneDrive	5	3
• iCloud Drive	2	4
• No response	28	
Graphic Design and Multimedia Software	**Frequency**	**Rank**
• Adobe Photoshop (Image Editing)	58	2
• Canva (Graphic Design)	148	1
• GIMP (Free Image Editing)	22	4
• Microsoft Publisher (Desktop Publishing)	24	3
• Adobe Illustrator (Vector Graphics)	8	5
• No response	11	
Video Conferencing Software	**Frequency**	**Rank**
• Zoom	104	1
• Microsoft Teams	35	4
• Google Meet	53	2
• Skype	44	3
• No response	38	

Technology-Related Profile of Teachers in terms of Computer Training Course

Table .3 presents the computer training background of teachers, revealing that the most prevalent form of training is the TESDA National Certificate program, cited by 122 respondents. This finding underscores the significant role of competency-based and skills-oriented training in equipping teachers with practical digital proficiencies that are nationally recognized. Such programs are often accessible and tailored to immediate workforce demands, making them an appealing option for educators seeking hands-on ICT skills.

School-based trainings and seminars were the second most frequently reported form of training, with 98 teachers indicating participation. This suggests that in-service training initiatives organized at the school or division level continue to be a critical mechanism for upskilling teachers in digital literacy, especially in response to emerging educational technologies or policy shifts.

However, a smaller proportion of teachers reported having more formal academic backgrounds in ICT. Only 32 teachers completed a diploma course (rank 3), while a mere 18 respondents indicated holding a bachelor's degree in information technology or a related field (rank 4). Furthermore, 38 teachers did not indicate any training, which could imply either a lack of exposure to formal ICT instruction or a gap in survey response completion.

These findings highlight a clear preference among teachers for practical, short-term, and accessible training formats over formal academic pathways. While such training fulfills immediate professional needs, the relatively low number of formally trained teachers in ICT-related degrees suggests a potential gap in sustained and deep integration of technology in pedagogy. To foster long-term digital competence, there is a need for policy-driven efforts to promote not only technical training but also formal and continuous professional development that enhances technological pedagogical content knowledge (TPACK).

Table 3. Technology-related Profile of Teachers in terms of Computer Training Course

Computer Trainings/Course	Frequency	Rank
• School Training/Seminars	98	2
• Diploma course	32	3
• Bachelor's degree in IT or computer-related course	18	4
• TESDA National Certificate	122	1
• No response	38	

Note: multiple response

Technology-Related Profile of Teachers in terms of Computer Software Experience

Table 4 reveals that teachers possess a "much extensive" level of experience in computer software use, with an overall weighted mean of 3.42. Among the nine evaluated categories, teachers demonstrated the highest proficiency in productivity software, internet and web browsing, and communication and collaboration tools, highlighting the centrality of these applications in their instructional routines.

Within the domain of operating system usage, respondents reported strong familiarity with tasks such as configuring system settings (4.29), installing and updating software (3.87), and managing files and folders (3.81). Interestingly, while teachers showed competence in using mobile operating systems (3.72) and Linux-based environments (3.57), their experience with more widely adopted platforms like Windows (2.46) and macOS (2.37) was rated less extensive. This disparity points to potential gaps in training or exposure to standard desktop operating systems.

In terms of productivity software, teachers reported the highest level of proficiency (4.35), particularly in word processing (4.16), spreadsheets (3.76), presentation tools (3.72), and note-taking apps (3.81). These tools are evidently embedded in daily teaching tasks, contributing to lesson planning, content delivery, and student assessment.

Similarly, the teachers demonstrated strong capability in internet and web browsing, with high ratings in browser use (4.00), search engine navigation (4.00), and awareness of online safety practices (4.09). Their familiarity with browser settings and bookmarks (4.01) further confirms their regular, confident use of online resources for academic purposes.

The domain of communication and collaboration software also showed high engagement, as reflected in the use of email services (4.34), video conferencing tools (4.29), and messaging applications (4.19). The widespread adoption of cloud-based collaboration platforms (3.84) like Google Drive and Dropbox indicates a shift toward digital file sharing and remote teamwork in instructional settings.

However, areas such as multimedia and graphics software reflected only "extensive" experience. Teachers had moderate familiarity with tools like Canva, Photoshop (3.39), and basic video/audio editing applications (ranging from 2.94 to 3.12). This suggests that multimedia content creation remains underutilized, potentially due to lack of training or perceived complexity.

Similarly, engagement with e-learning platforms and interactive educational software (e.g., Google Classroom, Moodle, Kahoot) yielded average scores (2.86–3.29), implying that while these tools are in use, they have yet to be fully integrated into pedagogy.

The lowest ratings were observed in programming and development software, where tasks such as writing code (2.50), using IDEs (2.38), web development (2.44), and database management (2.63) were marked as "less extensive." These findings reflect limited engagement with technical computing skills, which may hinder innovation in instructional technology or digital content customization.

In areas related to cybersecurity and system utilities, teachers reported "extensive" experience, with strengths in file recovery (3.40) and managing software updates (3.19). However, more specialized competencies, such as file encryption (2.92) and cybersecurity protocols, appear to be underdeveloped.

Overall, the data indicates that while teachers are competent and confident in general-purpose digital tools, there is a need for targeted training in technical, creative, and pedagogical applications to support deeper technology integration in the classroom.

Table 4. Technology-related Profile of Teachers in terms of Computer Software Experience

Software Experience	Weighted Mean	Interpretation
1. Operating Systems (OS) Usage		
• Understanding and navigating different operating systems:	3.54	Much extensive
• **Windows** (e.g., Windows 10, Windows 11)	2.46	Less extensive
• **macOS** (e.g., Monterey, Ventura)	2.37	Less extensive
• **Linux** (e.g., Ubuntu, Fedora)	3.57	Much extensive
• **Mobile OS** (Android, iOS)	3.72	Much extensive
• Managing files and folders using File Explorer (Windows) or Finder (Mac)	3.81	Much extensive
• Installing, updating, and uninstalling software	3.87	Much extensive
• Configuring system settings (display, network, security, etc.)	4.29	Very much extensive
2. Productivity Software		
• Using office applications for professional and academic work:	4.35	Very much extensive
• **Word Processing** (Microsoft Word, Google Docs, LibreOffice Writer)	4.16	Much extensive
• **Spreadsheets** (Microsoft Excel, Google Sheets, LibreOffice Calc)	3.76	Much extensive
• **Presentation Software** (Microsoft PowerPoint, Google Slides, Prezi)	3.72	Much extensive
• **Note-taking Apps** (OneNote, Evernote, Notion)	3.81	Much extensive

3. Internet and Web Browsing		
• Navigating and using web browsers (Google Chrome, Mozilla Firefox, Microsoft Edge, Safari)	4.00	Much extensive
• Using search engines effectively (Google, Bing, DuckDuckGo)	4.00	Much extensive
• Managing bookmarks, tabs, and browser extensions	4.01	Much extensive
• Understanding safe browsing practices and avoiding phishing scams	4.09	Much extensive
4. Communication and Collaboration Software		
• Using email services (Gmail, Outlook, Yahoo Mail)	4.34	Very much extensive
• Video conferencing platforms (Zoom, Microsoft Teams, Google Meet)	4.29	Very much extensive
• Instant messaging apps (WhatsApp, Messenger, Slack)	4.19	Much extensive
• Cloud-based collaboration tools (Google Drive, Dropbox, OneDrive)	3.84	Much extensive
5. Multimedia and Graphics Software		
• Editing and managing images (Adobe Photoshop, Canva, GIMP)	3.39	Extensive
• Creating and editing videos (Adobe Premiere Pro, Filmora, iMovie)	3.12	Extensive
• Using audio recording and editing software (Audacity, GarageBand)	2.94	Extensive
• Playing and managing media files (VLC Media Player, Windows Media Player)	3.12	Extensive
6. Educational and E-Learning Software		
• Using Learning Management Systems (Google Classroom, Moodle, Blackboard)	3.29	Extensive
• Accessing online learning platforms (Coursera, Udemy, Khan Academy)	3.00	Extensive
• Engaging with interactive learning tools (Kahoot, Quizlet)	2.86	Extensive
7. Programming and Development Software		
• Basic coding and programming knowledge (Python, Java, C++)	2.50	Less extensive
• Using Integrated Development Environments (IDEs) (Visual Studio Code, Eclipse, PyCharm)	2.38	Less extensive
• Web development tools (WordPress, HTML/CSS, JavaScript frameworks)	2.44	Less extensive
• Database management (MySQL, Microsoft Access)	2.63	Extensive
8. Cybersecurity and Data Protection		
• Using antivirus and security software (Norton, McAfee, Windows Defender)	2.97	Extensive
• Understanding password management and two-factor authentication	3.02	Extensive
• Encrypting and securing sensitive files (VeraCrypt, BitLocker)	2.92	Extensive
9. Troubleshooting and System Utilities		
• Running system diagnostics and fixing common software errors	3.00	Extensive
• Using task manager to monitor system performance	3.13	Extensive

• Managing software updates and patches	3.19	Extensive
• Recovering lost or deleted files using recovery software	3.40	Much extensive
Overall	**3.42**	**Much extensive**

Technology-Related Profile of Teachers in terms of Computer Hardware Experience

Table 5 illustrates that teachers exhibit a "much extensive" level of experience in computer hardware use and handling, with an overall weighted mean of 3.58. Teachers demonstrated the highest proficiency in basic hardware operations, such as properly turning computers on and off (4.81), identifying different types of devices (4.65), and recognizing standard components like monitors, keyboards, and CPUs (4.60). These high ratings affirm that foundational skills in handling commonly used computer hardware are well-established among the respondents.

Additionally, teachers showed very much extensive experience in managing peripherals and accessories, including connecting input devices (4.45), managing output equipment like projectors and printers (4.59), and using external storage devices (4.48). These tools are frequently encountered in both instructional and administrative settings, indicating that teachers are confident and capable when handling essential peripheral hardware.

When it comes to internal components, teachers reported a much extensive understanding of hardware such as CPUs (3.70), RAM (3.64), hard drives (3.55), and motherboards (3.63). Although these ratings are slightly lower than those for basic and external components, they still suggest a solid grasp of internal computer architecture. Similarly, their ability to assemble desktop computers (3.83), connect components correctly (3.87), and install or replace internal parts (3.41) underscores a functional proficiency in moderate-level hardware tasks.

However, the data also reveal areas where teachers have relatively less experience. In maintenance and troubleshooting, teachers rated themselves lower, particularly in diagnosing hardware issues (3.13), interpreting BIOS/UEFI error codes (2.87), and updating or installing drivers (3.10). This implies a need for deeper training in resolving technical problems, especially those requiring advanced diagnostic skills.

In the domain of network and connectivity, teachers reported "extensive" experience with setting up wired and wireless networks (3.39) and understanding basic networking devices such as modems and routers (3.25). While this reflects moderate familiarity, it also suggests room for growth in developing stronger ICT networking competencies.

Experience in hardware-based security and data protection was also moderate. Ratings for safeguarding devices against physical damage (3.10), using surge protectors and UPS systems (2.95), and understanding hardware security like biometric scanners (2.87) fell into the "extensive" but lower tier of responses. These findings indicate a partial awareness of hardware security protocols, which is critical for ensuring safe and sustainable device use.

Lastly, the lowest ratings were seen in hardware performance optimization, particularly in tasks like monitoring system performance through BIOS settings (2.66), upgrading components (2.67), and managing heat dissipation (2.86). These results suggest that advanced configuration and performance enhancement practices are not commonly performed by teachers, possibly due to lack of necessity, training, or access.

In summary, while teachers are highly proficient in basic and peripheral hardware operations, there is a clear need for targeted professional development in advanced troubleshooting, network setup, security measures, and performance optimization to further enhance their ICT competencies and promote robust technology integration in education.

Table 5. Technology-related Profile of Teachers in terms of Computer Hardware Experience

Hardware experience	Weighted Mean	Interpretation
1. Basic Hardware Operations		
• Turning computers on/off properly	4.81	Very much extensive
• Understanding different types of computers (desktop, laptop, tablet, etc.)	4.65	Very much extensive
• Identifying basic components (monitor, keyboard, mouse, CPU, etc.)	4.60	Very much extensive
2. Internal Components Knowledge		
• Understanding and identifying key internal parts:	3.81	Much extensive
• **Central Processing Unit (CPU)** – The brain of the computer	3.70	Much extensive
• **Random Access Memory (RAM)** – Temporary memory storage	3.64	Much extensive
• **Hard Drive (HDD/SSD)** – Permanent storage for files and software	3.55	Much extensive
• **Motherboard** – The main circuit board connecting all components	3.63	Much extensive
• **Power Supply Unit (PSU)** – Provides power to the computer	3.58	Much extensive
• **Graphics Processing Unit (GPU)** – Handles graphics and display processing		
3. Peripherals and Accessories Handling		
• Using and connecting input devices (keyboard, mouse, scanner, webcam, etc.)	4.45	Very much extensive
• Handling output devices (monitor, printer, speakers, projectors, etc.)	4.59	Very much extensive
• Using external storage devices (USB flash drives, external hard drives, SD cards)	4.48	Very much extensive
4. Hardware Setup and Configuration		
• Assembling and setting up a desktop computer	3.83	Much extensive
• Connecting peripherals correctly (e.g., printers, monitors, external drives)	3.87	Much extensive
• Installing and replacing internal components (RAM, HDD/SSD, graphics card)	3.41	Much extensive
5. Maintenance and Troubleshooting		
• Performing basic computer cleaning and maintenance	3.51	Much extensive
• Diagnosing and fixing hardware-related issues (overheating, boot failure, beeping sounds)	3.13	Extensive
• Understanding error codes and troubleshooting using BIOS/UEFI	2.87	Extensive
• Updating and installing drivers for different hardware components	3.10	Extensive
6. Network and Connectivity		
• Setting up and configuring wired and wireless connections	3.39	Extensive
• Understanding networking hardware (routers, modems, network cables)	3.25	Extensive

• Troubleshooting internet and connectivity issues	3.19	Extensive
7. Security and Data Protection		
• Safeguarding hardware against physical damage and power surges	3.10	Extensive
• Using surge protectors and uninterruptible power supplies (UPS)	2.95	Extensive
• Understanding hardware-based security (e.g., biometric scanners, encryption hardware)	2.87	Extensive
8. Hardware Performance Optimization		
• Monitoring system performance using task manager and BIOS settings	2.66	Extensive
• Upgrading components to improve performance (RAM, SSD, GPU)	2.67	Extensive
• Managing heat dissipation using cooling systems (fans, thermal paste, liquid cooling)	2.86	Extensive
Overall	**3.58**	**Much extensive**

Teachers' Degree of Technology Integration

Table 6 presents the degree of technology integration among public secondary school teachers in the Division of Northern Samar, categorized under four major domains: Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPACK). The overall mean score is 3.87, interpreted as a high degree of technology integration. This reflects that, generally, teachers are confident and capable of incorporating technology into their teaching practices across various dimensions.

In the domain of Technological Knowledge (TK), the sub-mean is 3.62, which still falls under the high degree category, though it is the lowest among the four domains. Among the items, teachers rated highest in effectively using a variety of technological tools (3.89) and familiarity with a wide range of technologies (3.84). However, the ability to troubleshoot technical problems scored noticeably lower at 3.14, indicating a moderate degree of confidence in resolving basic technical issues such as internet connectivity or hardware malfunctions. This gap suggests that while teachers are comfortable using technology, they may require additional support or training in the technical maintenance and troubleshooting aspects.

For Technological Pedagogical Knowledge (TPK), teachers reported the highest sub-mean among the domains at 4.00, indicating a strong capability in using technology to support pedagogical strategies. The highest individual rating in this domain was for the ability to integrate digital tools into teaching to increase student engagement and learning outcomes (4.03), followed closely by familiarity with online learning platforms (4.00) and using technology to support teaching strategies (3.98). These results suggest that teachers are not only equipped with the tools but also understand how to apply them effectively to enhance instructional delivery.

In terms of Technological Content Knowledge (TCK), the sub-mean was 3.97, also reflecting a high degree of integration. Teachers rated equally high (4.00) in using technology to deliver subject content and in sourcing digital materials that support content learning. The slightly lower score of 3.92 was given for modifying content delivery based on the limitations and strengths of technology. This indicates that while teachers are resourceful in integrating content and technology, some may still be developing the ability to flexibly adapt their instructional methods based on technological constraints.

Under Technological Pedagogical Content Knowledge (TPACK), which synthesizes content, pedagogy, and technology, the sub-mean was 3.91, maintaining the high degree classification. Teachers reported being able to evaluate the effectiveness of their technology use (3.93), select appropriate technological tools (3.91), and integrate all three elements to design meaningful learning experiences (3.88). These results reflect a mature understanding of holistic technology integration—one that aligns content mastery with teaching methods and digital tools.

Overall, the grand mean of 3.87 confirms that teachers in the Division of Northern Samar possess a commendable level of technology integration across domains. However, the relatively lower score in troubleshooting under TK highlights an area for targeted professional development. Emphasis should also be placed on building adaptive strategies in response to technological limitations, especially in more dynamic teaching environments.

Table 6. Degree of Technology Integration of Teachers

Technological Knowledge (TK)	Weighted Mean	Interpretation
• I can effectively use a variety of technological tools (e.g., educational software, digital devices).	3.89	High degree
• I am familiar with a wide range of technologies to enhance teaching and learning.	3.84	High degree
• I am confident in my ability to troubleshoot common technical problems (e.g., internet connection issues, hardware failures).	3.14	Moderate degree
Sub-mean	**3.62**	**High degree**
Technological Pedagogical Knowledge (TPK)		
• I know how to use technology to support my teaching strategies (e.g., using interactive tools, multimedia).	3.98	High degree
• I can integrate digital tools into my teaching methods to increase student engagement and learning outcomes.	4.03	High degree
• I am familiar with online learning platforms that enhance my teaching practices.	4.00	High degree
Sub-mean	**4.00**	**High degree**
Technological Content Knowledge (TCK)		
• I can use technology to enhance the delivery of content in my subject area.	4.00	High degree
• I can find and use digital resources that support content learning in my subject area.	4.00	High degree
• I am able to modify content delivery based on the capabilities and limitations of various technologies.	3.92	High degree
Sub-mean	**3.97**	**High degree**
Technological Pedagogical Content Knowledge (TPACK)		
• I can integrate content, pedagogy, and technology to design meaningful learning experiences for my students.	3.88	High degree
• I am capable of selecting appropriate technological tools to enhance both the teaching process and students' understanding of content.	3.91	High degree
• I am able to evaluate the effectiveness of my use of technology in supporting student learning.	3.93	High degree
Sub-mean	**3.91**	**High degree**
Overall mean	**3.87**	**High degree**

Relationship between the Technology-Related Profile and Technology Integration

Table 7 presents the results of a correlational analysis between teachers' technology-related profiles and their degree of technology integration across four dimensions: Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and

Technological Pedagogical Content Knowledge (TPACK). The findings show that some elements of the technology-related profile significantly influence certain aspects of technology integration, while others do not.

Firstly, a significant positive correlation was found between the overall technology-related profile and both TK (r = .191, p = .016) and TPK (r = .198, p = .012), suggesting that more robust engagement with technology-related experiences correlates with higher confidence and ability in using technology for teaching and pedagogy. However, no significant relationship was observed with TCK and TPACK, indicating that broader integration of content with technology and pedagogy may require more than just general technological exposure.

Interestingly, computer ownership did not show a significant correlation with any of the four domains of technology integration, suggesting that merely owning a device does not guarantee its pedagogical application or mastery. Similarly, the use of communication tools was not significantly associated with any dimension, implying that frequent digital interaction does not necessarily lead to deeper instructional technology use.

On the other hand, the use of productivity tools was significantly associated with TK (r = .172, p = .041), indicating that those who utilize tools like Microsoft Office or Google Workspace are more likely to develop strong foundational technology skills. Computer training courses showed a significant relationship with both TCK (r = .167, p = .042) and TPACK (r = .185, p = .023), underscoring the importance of formal training in equipping teachers to integrate content and pedagogy with technology effectively.

Hardware experience had a significant relationship only with TK (r = .172, p = .041), suggesting that hands-on familiarity with equipment builds technical competence but does not necessarily translate into instructional integration. Software experience, however, had strong and significant correlations with TK (r = .348, p = .003), TPK (r = .391, p = .007), and TCK (r = .514, p = .004), emphasizing that software fluency is a key predictor of comprehensive technology integration, particularly in content delivery and pedagogical application.

Overall, the data suggest that while ownership and basic tool use offer limited insights into integration levels, structured training and extensive experience with software applications are critical factors in fostering meaningful technology use in education.

Table 7. Relationship between the Technology-Related Profile and Degree of Technology Integration

		Technology Integration			
Profile	Parameters	Technological knowledge	Technological pedagogical knowledge	Technological content knowledge	Technological pedagogical content knowledge
Technology related profile	Pearson r	**.191***	**.198***	0.017	0.05
	Sig. (2-tailed)	**0.016**	**0.012**	0.832	0.532
	Interpretation	**Significant**	**Significant**	Not significant	Not significant
Computer ownership	Pearson r	0.083	0.051	0.04	0.011
	Sig. (2-tailed)	0.306	0.53	0.62	0.893
	Interpretation	Not significant	Not significant	Not significant	Not significant
Applications Used					
	Pearson r	**.172***	0.076	0.072	0.038
-Productivity tools	Sig. (2-tailed)	**0.041**	0.371	0.397	0.653
	Interpretation	**Significant**	Not significant	Not significant	Not significant

-Communication tools	Pearson r	0.084	0.031	-0.055	-0.075
	Sig. (2-tailed)	0.312	0.711	0.504	0.365
	Interpretation	Not significant	Not significant	Not significant	Not significant
Computer training course	Pearson r	0.065	0.016	**.167***	**.185***
	Sig. (2-tailed)	0.428	0.845	**0.042**	**0.023**
	Interpretation	149	149	**Significant**	**Significant**
Computer Experience					
Hardware	Pearson r	**.172***	0.076	0.072	0.038
	Sig. (2-tailed)	**0.041**	0.371	0.397	0.653
	Interpretation	**Significant**	Not significant	Not significant	Not significant
Software	Pearson r	**.348****	**0.391****	**.514****	-0.075
	Sig. (2-tailed)	**0.003**	**0.007**	**0.004**	0.365
	Interpretation	**Significant**	**Significant**	**Significant**	Not significant

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

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

4. CONCLUSION

The majority of teachers own their personal computers and frequently utilize mainstream productivity and communication tools, especially from Microsoft and Google. Their most common form of training is through TESDA National Certificate programs, while formal degrees in ICT remain limited. Teachers report “much extensive” experience in using computer software and hardware, especially in basic operations and productivity applications. This implies that some teachers rely on borrowed, rented, or government-issued devices. This calls for more equitable distribution of ICT resources to ensure all educators have consistent access to reliable hardware.

In terms of technology integration, teachers demonstrated a high degree of technological knowledge, pedagogical application of technology, content delivery using digital tools, and integrated use of technology in instruction. Notably, the highest scores were recorded in the domains of Technological Pedagogical Knowledge (TPK) and Technological Content Knowledge (TCK), while slightly lower proficiency was observed in Technological Knowledge (TK), particularly in troubleshooting skills. This implies that professional development efforts have effectively supported teachers in aligning technology with pedagogy and curriculum. However, the slightly lower proficiency in Technological Knowledge (TK), especially in troubleshooting and technical problem-solving, highlights a critical area for improvement. This gap implies the need for targeted training that builds foundational ICT skills, ensuring teachers can independently manage and resolve basic technical issues. By addressing this shortfall, schools can reduce instructional downtime and increase teacher confidence, thereby promoting more seamless and sustainable integration of technology in classroom practices.

Correlation analysis revealed that software experience, computer training, and certain applications like productivity tools significantly influenced teachers’ ability to integrate technology. However, mere computer ownership or frequent use of communication tools did not guarantee better integration outcomes. Notably, software experience emerged as a key predictor across three of the four integration domains, underscoring the value of hands-on digital engagement in enhancing educational practices. This implies that a mere access or basic usage does not equate to pedagogical competence. These findings imply that capacity-building efforts should prioritize experiential, skills-based ICT training, rather than solely focusing on access to devices or general tool usage. Empowering teachers with deeper software fluency is essential for meaningful and sustainable technology integration in education.

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