



Technological Competence of Tenured Mathematics Teachers in Integrating Digital Tools in Instruction

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Abstract

This study assessed the technological competence of tenured mathematics teachers in integrating digital tools in instruction within Tabuelan District. It specifically looked into their demographic profile—age, sex, educational attainment, years of teaching experience, and number of technology-related trainings attended. It also measured their competence across four areas: digital literacy, instructional application, technology-based problem-solving, and classroom implementation. Additionally, it determined whether a significant relationship exists between their profile and their technological competence. The research used a descriptive-correlational design, involving 35 tenured mathematics teachers selected via purposive sampling. Data were collected using a researcher-made questionnaire and analyzed through descriptive statistics, normality tests, variance tests, and correlation analyses. Results showed that respondents were mostly middle-aged females with master's degree units, 12–13 years of teaching experience, and multiple technology training exposures. Their overall competence was rated “Very Good,” with digital literacy as the strongest area. However, skills in instructional application and problem-solving using technology needed further enhancement. Statistical analysis revealed no significant link between their demographic characteristics and their competence level. The study concludes that tenured mathematics teachers possess strong technological competence regardless of their background, and recommends continuous professional development to strengthen their classroom technology integration.

Keywords: descriptive-correlational design, digital tools, mathematics teachers, Tabuelan District, technological competence, technology integration

Introduction

The integration of digital technologies in education has significantly reshaped classroom instruction, particularly in mathematics, where abstract concepts can be enhanced through visualization, simulation, and interactive tools. However, the effectiveness of technology integration does not depend merely on access or availability but also on teachers' technological competence in integrating digital tools, which include their ability to select, apply, and align digital tools with appropriate pedagogical strategies to support meaningful mathematical learning (Zou et al., 2025). This aligns with Sustainable Development Goal (SDG) 4: Quality Education, which promotes inclusive and equitable quality education and emphasizes the importance of effective teaching practices supported by digital innovation to improve learning outcomes. In mathematics classrooms, such technological competence is crucial because the subject requires clear conceptual understanding, problem-solving skills, and structured instructional delivery.

In the Philippine educational context, several issues continue to affect students' academic performance in mathematics. Learners often demonstrate difficulties in understanding abstract mathematical concepts, low engagement during lessons, and limited opportunities for interactive learning experiences. These challenges are further intensified by the inconsistent integration of technology in classroom instruction, where digital tools are sometimes underutilized or used only for presentation rather than for deepening mathematical understanding. Such conditions



highlight the need for teachers to go beyond basic technology use and develop technological competence in integrating digital tools effectively into actual classroom instruction (Mahajan, 2022). The United Nations (UN) Philippines, through the launch of UNESCO's Global Education Monitoring (GEM) Report entitled "Inclusion and Education: All Means All," emphasized that inclusive and equitable quality education requires removing barriers to learning and ensuring that all learners have access to meaningful educational opportunities. The report emphasized the growing digital divide in the Philippines and underscored the importance of maximizing affordable digital platforms and distance learning modalities to support quality education for all learners (UN Philippines, 2020). These concerns reinforce the need for teachers to possess strong technological competence to ensure that technology is utilized effectively and inclusively in the teaching and learning process.

In Tabuelan District, tenured mathematics teachers encounter specific challenges in adapting to technology-enhanced teaching. Despite their extensive teaching experience, many of them have difficulty integrating digital tools into their daily classroom instruction due to limited training, time constraints, and unfamiliarity with newer technologies. While policies such as Department of Education Order No. 016, s. 2023 mandates the use of ICT in teaching; the focus is not only on compliance but on developing teachers' technological competence to use technology meaningfully in delivering mathematics lessons. This situation creates a gap between policy expectations and actual classroom practices.

Although previous studies have examined technology use in education, there remains limited research focusing specifically on the technological competence and integration of digital tools in instruction of tenured mathematics teachers and how this competence influences classroom instruction. Many studies emphasize access, tools, or general teaching practices, rather than how tenured teachers integrate technology within the context of mathematics teaching. This gap underscores the need to explore how these teachers can effectively adapt their instructional strategies to enhance student learning outcomes.

This study aims to investigate the technological competence of tenured mathematics teachers in integrating digital tools in instruction. By focusing on competence rather than mere usage, and on mathematics instruction rather than general teaching, this study seeks to provide a better understanding that can support proposing an in-service training on technological integration of digital tools in instruction.

Theoretical and Conceptual Framework

Technological Pedagogical Content Knowledge

Technological Pedagogical Content Knowledge (TPACK) Theory by Mishra & Koehler (2006). The Technological Pedagogical Content Knowledge, developed by Punya Mishra and Matthew J. Koehler explain that effective technology integration in teaching requires the interaction among technological, pedagogical, and content knowledge, rather than treating these domains independently. In mathematics education, this framework is particularly important because it guides how teachers make instructional decisions when using digital tools to present abstract concepts and support problem-solving skills. Earlier studies, such as Niess et al. (2020), demonstrated that teachers with higher levels of TPACK are more capable of designing engaging and meaningful STEM lessons.

Likewise, Tinmaz and Lee (2021) reported that structured professional learning interventions significantly improve mathematics teachers' confidence and instructional practices in using digital tools, while Kılıç and Yildirim (2023) found that stronger TPACK among secondary mathematics teachers is associated with more effective and consistent classroom use of technology.

Recent studies further reinforce the relevance of TPACK in enhancing teaching competence. Irwanto (2021) noted that TPACK continues to serve as a central framework in understanding how teachers integrate technology into instruction, emphasizing that teachers with well-developed technological, pedagogical, and content knowledge are better able to design lessons that improve student engagement and understanding. Similarly, Lee et al. (2022) highlighted that the increasing global attention to TPACK reflects its importance in education, stressing that effective technology integration depends not merely on access to tools but on the teacher's ability to align these tools with



appropriate pedagogy and subject content, an essential requirement in mathematics instruction. Moreover, Jiménez Sierra et al. (2023) emphasized that teachers' TPACK can be strengthened through collaborative and reflective practices such as lesson study, which enhance their ability to integrate technology in ways that promote deeper learning.

Taken together, these studies affirm that TPACK is a critical framework for examining teachers' competence in integrating technology into mathematics classroom instruction. In the present study, TPACK serves as the foundation for analyzing how experienced mathematics teachers apply technological, pedagogical, and content knowledge to deliver effective and meaningful instruction.

Constructivist Learning Theory

Another theory that anchors this study is the Constructivist Learning Theory by Jean Piaget (1972). Constructivist Learning Theory emphasizes that learners actively construct knowledge through interaction with their environment and reflection on experiences. In mathematics classrooms, this means using instructional strategies and digital tools in ways that encourage students to explore, manipulate, and make sense of mathematical concepts rather than passively receiving information.

Recent educational literature continues to support constructivist principles in improving teaching and learning. Schunk (2021) explains that learning becomes more effective when students are actively engaged in constructing meaning instead of merely memorizing information. He emphasizes that constructivist learning promotes deeper understanding by allowing learners to interpret, process, and apply knowledge in meaningful contexts, which is especially important in mathematics, where conceptual understanding is essential for problem-solving and critical thinking. In addition, Kirschner and Hendrick (2021) stress that although constructivist approaches highlight active learning, their effective implementation requires structured guidance from teachers. They explain that students learn best when instruction balances exploration with clear direction, ensuring that cognitive load is managed while still promoting meaningful engagement and knowledge construction.

Supporting these ideas, HersHKovitz and Nachmias (2020) found that the use of dynamic geometry software in secondary mathematics classrooms enhances students' active mathematical reasoning and leads to deeper conceptual understanding when used in inquiry-based tasks. Similarly, Gülbahar and Kalelioglu (2021) reported that virtual simulation environments support reflection and collaboration among learners, strengthening constructivist learning processes. Lin and Lai (2024) further documented that interactive mathematics games promote student-centered problem-solving and reduce learning anxiety, making mathematics more engaging and accessible.

For this study, Constructivist Learning Theory serves as a guiding framework in understanding how tenured mathematics teachers use technology in classroom instruction. It emphasizes that digital tools should not be used merely for presentation but to promote student exploration, collaboration, and deeper engagement with mathematical concepts.

Cognitive Load Theory

Moreover, Cognitive Load Theory by John Sweller (1988) explains that instructional design should minimize unnecessary mental effort so that learners' working memory can focus on essential learning processes. In mathematics education, particularly with the use of technology, this theory helps evaluate whether digital tools enhance or hinder students' cognitive processing. For instance, Mayer and Fiorella (2020) found that well-designed multimedia instruction in algebra, which reduces extraneous cognitive load, leads to improved problem-solving performance among learners. Similarly, de Jong et al. (2021) emphasized that adaptive learning systems, which adjust task difficulty based on learners' cognitive capacity, significantly enhance understanding of mathematical concepts such as fractions and ratios. In the same way, Keehner et al. (2023) highlighted that digital worked examples help novice learners focus on key procedural steps without being overwhelmed by unnecessary information. Moreover, Ouwehand et al. (2025) explain that Cognitive Load Theory continues to evolve in technology-enhanced and personalized learning environments, emphasizing the need for instructional design that manages cognitive load while effectively integrating digital tools. Overall, this theory strengthens the present study by highlighting that technological competence involves



not only using digital tools but also applying them in ways that support cognitive efficiency and meaningful mathematics learning.

Diffusion of Innovation Theory

Lastly, Diffusion of Innovations Theory, Everett Rogers (2003). Diffusion of Innovations Theory explains how new ideas and technologies spread within communities over time, influenced by characteristics such as perceived advantage, compatibility, and social support. In studies of teacher technology adoption, this theory helps explain why some educators adopt digital teaching practices earlier or more effectively than others. Teo (2021) investigated factors influencing mathematics teachers' intentions to adopt technology and found that perceived usefulness and supportive school environments predicted stronger adoption. Ertmer and Ottenbreit-Leftwich (2022) showed that teachers who perceive greater institutional support and collaboration are more likely to integrate technology meaningfully. Sherer et al. (2024) examined professional learning communities and found that collaborative networks accelerate the spread of successful instructional technologies. In this study, Diffusion of Innovations anchors the examination of how tenured mathematics teachers adopt and sustain technology use, including the social and contextual factors that influence their competence.

These four theories, TPACK, Constructivist Learning, Cognitive Load, and Diffusion of Innovations, help explain how tenured mathematics teachers can use technology effectively in teaching. TPACK focuses on combining content knowledge, teaching methods, and technology. Constructivist Learning encourages students to explore and learn actively. Cognitive Load Theory guides teachers to use technology in ways that help students learn without getting overwhelmed. Diffusion of Innovations shows how teachers adopt and continue using digital tools depending on support from colleagues and the school. Together, these theories guide this study in understanding how teachers develop the skills to integrate technology meaningfully in mathematics instruction.

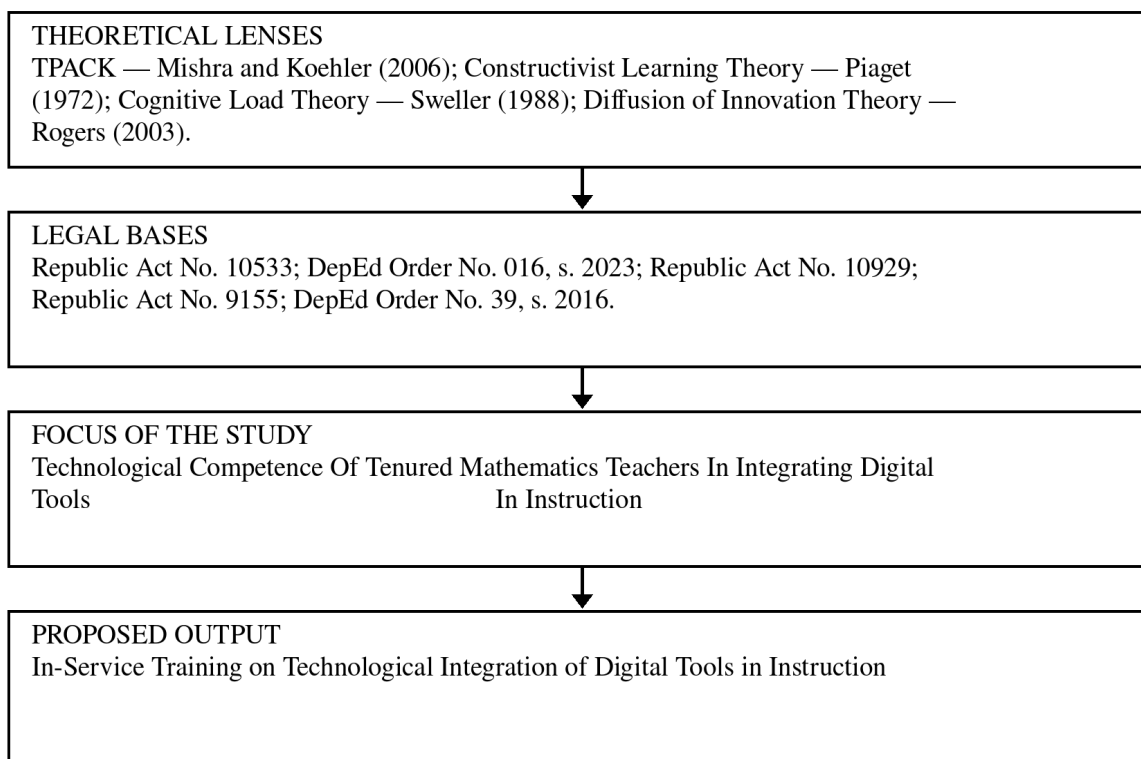


Figure 1
Theoretical and Conceptual Lenses of the Study



Legal Bases

Legally and institutionally, this study is anchored on several educational policies and national mandates that guide the teachers in the use of technology in their instruction. These are Republic Act No. 10533 or the Enhanced Basic Education Act of 2013, Department of Education (DepEd) Order No. 16, s. 2023 or the Policy on the Use of ICT in Teaching and Learning, Republic Act No. 10929 or the Free Internet Access in Public Places Act, and Republic Act No. 9155 or the Governance of Basic Education Act of 2001

Republic Act No. 10533 or the Enhanced Basic Education Act of 2013. Republic Act No. 10533, known as the Enhanced Basic Education Act of 2013, extended the basic education program in the Philippines to include kindergarten and 12 years of schooling. One of its main goals is to improve the quality of education by encouraging the use of modern teaching strategies, including technology integration in classrooms. The law emphasizes that students should be prepared with 21st-century skills such as critical thinking, problem-solving, and digital literacy. In relation to this study, this legal basis provides a foundation for investigating tenured mathematics teachers' technological and pedagogical competence. It underscores the need for teachers to be able to integrate digital tools effectively in their lessons so that students can learn mathematics meaningfully while developing skills necessary for the modern world.

DepEd Order No. 16, s. 2023 or the Policy on the Use of ICT in Teaching and Learning. DepEd Order No. 16, s. 2023 specifically addresses the use of information and communication technology (ICT) in teaching and learning. It provides clear guidelines and expectations for teachers to incorporate digital tools in lesson planning, classroom instruction, and student engagement. This policy recognizes that technology is an essential part of modern education and encourages teachers to use ICT not just for presentation but as a means to enhance learning outcomes. For this study, the policy strengthens the purpose of the study by giving an official framework for evaluating how tenured mathematics teachers implement technology in their teaching. It justifies examining their skills, knowledge, and practices in integrating digital tools to meet the standards set by the Department of Education.

Republic Act No. 10929 – Free Internet Access in Public Places Act. Republic Act No. 10929, also called the Free Internet Access in Public Places Act, ensures that public areas, including schools, have access to free internet. This enables teachers and students to use online learning resources, applications, and digital platforms, which are essential for effective teaching and learning in the digital age. In this study, this law supports the investigation of technological competence because it provides teachers with the opportunity to access online tools necessary for mathematics instruction. It highlights that teachers are legally supported in using digital resources, which is crucial for understanding how they integrate technology into their pedagogical practices to improve student learning.

Republic Act No. 9155 – Governance of Basic Education Act of 2001. Republic Act No. 9155, or the Governance of Basic Education Act of 2001, focuses on improving teacher professional development, accountability, and the overall governance of schools. It encourages continuous training and growth for educators to enhance the quality of teaching and learning. This law is relevant to the study because it recognizes that teachers need ongoing support and opportunities to develop their skills, including the integration of technology in their instruction. It strengthens the study by showing that evaluating the technological and pedagogical competence of tenured mathematics teachers aligns with legal mandates for professional development, ensuring that teachers are equipped to provide effective, modern, and technology-enhanced mathematics education.

This study is further anchored on DepEd Order No. 39, s. 2016, otherwise known as the Basic Education Research Agenda (BERA), which serves as the Department of Education's framework for generating evidence-based solutions to challenges in basic education. The agenda identifies Teaching and Learning as one of its priority research themes, emphasizing the need to investigate factors that influence instructional effectiveness, teacher competence, and student achievement. In line with this priority area, the present study examines the digital integration skills of tenured mathematics teachers and their role in mathematics instruction. As technology continues to transform educational practices, understanding teachers' competence in integrating digital tools into instruction becomes essential in ensuring quality learning experiences and improved learner outcomes. Furthermore, BERA encourages research that can inform policy development, capacity-building programs, and evidence-based interventions within the education sector. By determining the level of digital integration skills of tenured mathematics teachers and identifying factors



associated with these skills, the study provides empirical data that can guide school leaders, district supervisors, and policymakers in designing relevant professional development programs. The findings may also contribute to the development of targeted ICT-related training initiatives that address the specific needs of experienced mathematics teachers, thereby strengthening instructional delivery and supporting the Department of Education's goal of enhancing teaching quality through research-informed practices.

Related Studies

According to Mariscal et al. (2023), teachers' ability to use technology in the classroom is important for creating effective learning. The study found that while many teachers have positive attitudes and some skills in using educational technology, their ability to design lessons that match students' learning and technology skills is not always the same. This shows that training and professional development are needed to help teachers, including tenured mathematics teachers, improve their teaching with digital tools and make learning more meaningful for students. Similarly, Zhang (2022) emphasized that technology plays an important role in improving teaching and learning, and teacher professional development is essential for using technology effectively in the classroom. The study noted that without proper training, teachers often rely on informal learning and peer collaboration to improve their technology skills, emphasizing the need for structured professional development programs to help mathematics teachers strengthen their instructional practices.

In addition, Manaban et al. (2025) examined the ICT skills of elementary mathematics teachers and the challenges they face in using digital tools in class. They found that teachers were proficient in using technology and following ethical practices, but were only moderate in applying technology to teaching and professional tasks. Poor internet connectivity and limited resources were the main barriers, while lack of training, time, technical support, and resistance to change were minor issues. Younger teachers and those with more ICT training showed higher skills, emphasizing the importance of continuous training and support to improve the effective use of digital tools. Similarly, Pasayloon (2023) studied the technological capability and teaching proficiency of 40 mathematics teachers in ICT-based instruction. The results showed that teachers had a high level of technological skills and were generally proficient in using technology for teaching. Although the relationship between technological capability and teaching proficiency was weakly positive, younger teachers exhibited higher technological capability than older teachers, indicating a need for professional development programs, particularly for more experienced educators, to enhance technology integration in teaching.

Furthermore, Saliao and Cajandig (2025) investigated how technology integration and digital pedagogy influence Grade 8 students' learning engagement and achievement in mathematics. Their study found that teachers' use of technology and digital pedagogy was high, which increased student engagement, although student achievement was only average. Positive relationships between teachers' technology use and student engagement, as well as between digital pedagogy and student achievement, suggest that effective use of technology combined with strong teaching practices can improve learning outcomes. In line with this, Kiianovska (2025) highlighted the need to update professional development for mathematics educators, including modern tools like cloud platforms, artificial intelligence, and immersive technologies, and aligned with DigCompEdu and UNESCO ICT standards. This approach ensures teachers have the skills needed to support effective teaching and enhance student learning outcomes.

Moreover, Buenaventura (2026) examined the digital competence of elementary teachers in Zambales, finding moderately high digital skills, but most teachers relied on self-directed learning due to a lack of formal training. Factors such as age, teaching experience, and prior training significantly influenced digital competence, while access to infrastructure and tools moderately affected it. This emphasizes the importance of structured training programs and mentoring to help teachers use technology effectively. According to Padilla-Escorcía et al. (2025), mathematics teachers require specific knowledge to use digital technologies effectively. Their study, using the TPCSK instrument, highlighted the integration of technology, pedagogy, and mathematics content, showing that evaluating the technological and pedagogical competence of tenured mathematics teachers is crucial for effective lesson design and student engagement.

In addition, Alieto et al. (2024) found that teachers' attitudes and technological skills are important for using digital tools in the classroom. Most teachers in the study had positive attitudes and good technological competence, while



access to technology influenced their ability to integrate digital tools. Similarly, Ayunar et al. (2024) emphasized that ICT competency is essential for creating interactive and effective learning environments. The study showed that teachers with higher education levels had stronger digital skills, whereas longer teaching experience was linked to lower ICT proficiency. Both studies highlight the need to support tenured mathematics teachers with professional development and resources to enhance their technological and pedagogical competence.

Finally, Miran and Dela Cruz (2025) examined Araling Panlipunan teachers in Tantaran District, finding that teachers generally had high digital competence but faced difficulties in creating original content and adapting instructional materials. Teachers with longer years of service tended to have lower digital skills, although age, gender, and educational attainment did not significantly affect competence. The study found a strong positive relationship between digital competence and instructional practices, reinforcing the need for professional development programs to help teachers, including tenured mathematics teachers, improve their use of technology to deliver more effective instruction.

Synthesis. the reviewed studies show that teachers' ability to use technology in the classroom is closely linked to their pedagogical skills, attitudes, and access to digital resources. While many teachers demonstrate positive attitudes and moderate to high digital competence, gaps remain in designing lessons that effectively integrate technology with student learning needs. Factors such as professional development, age, years of service, infrastructure, and access to tools influence how well teachers use technology, with younger and more trained teachers often performing better. The findings consistently emphasize that structured training, mentoring, and support are essential for enhancing teachers' technological and pedagogical competence. For tenured mathematics teachers, these insights underline the importance of ongoing professional development and access to resources to design engaging, technology-enhanced lessons that improve student learning outcomes.

THE PROBLEM

This study aimed to determine the technology integration competence of tenured mathematics teachers in classroom instruction in Tabuelan District for the school year 2025-2026. Specifically, this study sought to answer the following questions:

What is the demographic profile of tenured mathematics teachers in terms of:

Age and Sex;
Educational attainment;
Number of years of teaching experience; and
Number of trainings attended on ICT-technology integration?

What is the level of technology integration competence of tenured mathematics teachers in terms of:

2.1 Digital literacy;
2.2 Instructional application;
2.3 Problem-solving with technology; and
2.4 Classroom implementation of technology?

Is there a significant relationship between the demographic profile of tenured mathematics teachers and their technological integration competence in integrating digital tools in instruction?

Based on the findings of the study, what proposed in-service training on technological integration of digital tools in instruction can be proposed?

Statement of the Null Hypothesis

Based on the objectives of the study, the null hypothesis was tested at a 0.05 level of significance:

H₀: There is no significant relationship between the demographic profile of tenured mathematics teachers and their technological integration competence in integrating digital tools in instruction.



Methodology

Research Design

This study utilized a descriptive–correlational research design, which was appropriate because it allowed the researcher to describe variables as they naturally occurred and determine the relationships between them without manipulation of conditions. According to Creswell and Creswell (2018), descriptive–correlational designs are commonly used in educational research to identify patterns and relationships among variables as they exist in real-life settings.

The descriptive component of the design was used to present the demographic profile of tenured mathematics teachers in Tabuelan District in terms of age, sex, educational attainment, number of years of teaching experience, and number of ICT-related trainings attended. It also determined their level of technological integration competence in instruction, specifically in terms of digital literacy, instructional application, problem-solving with technology, and classroom implementation of technology.

On the other hand, the correlational component of the design was used to determine whether there was a significant relationship between the teachers' demographic profile and their level of technological integration competence in integrating digital tools in instruction. Through appropriate statistical analysis, the study examined whether variables such as age, sex, educational attainment, teaching experience, and ICT training were significantly related to their competence in using technology in mathematics instruction.

Input–Process–Output Model

This study followed a systematic process using the Input–Process–Output (IPO) model to ensure a clear and organized flow of the research. The IPO model was appropriate for this study as it presented how the necessary data were identified, collected, and transformed into meaningful outcomes that addressed the research objectives. It provided a structured framework in examining the technological integration competence of tenured mathematics teachers and its relationship to classroom instruction.

The input of the study included the key variables such as the demographic profile of tenured mathematics teachers in terms of age and sex, educational attainment, number of years of teaching experience, and number of trainings attended on ICT-technology integration. It also covered the level of technological integration competence of tenured mathematics teachers in integrating digital tools in instruction, specifically in terms of digital literacy, instructional application, problem-solving with technology, and classroom implementation of technology.

The process of the study involved the use of a quantitative descriptive–correlational research design, which allowed the researcher to describe the variables and determine relationships among them without manipulation. According to Creswell and Creswell (2018), this design was appropriate for identifying patterns and relationships among variables in real-life educational settings. The data gathering procedure started with securing approval from the concerned authorities, followed by seeking informed consent from the respondents. Afterward, the questionnaire was administered to the respondents, and the completed questionnaires are retrieved for data analysis.

Finally, the output of the study was the development of a proposed in-service training on the technological integration of digital tools in instruction. This output was intended to enhance the technological integration competence of tenured mathematics teachers and improve the quality of classroom instruction.

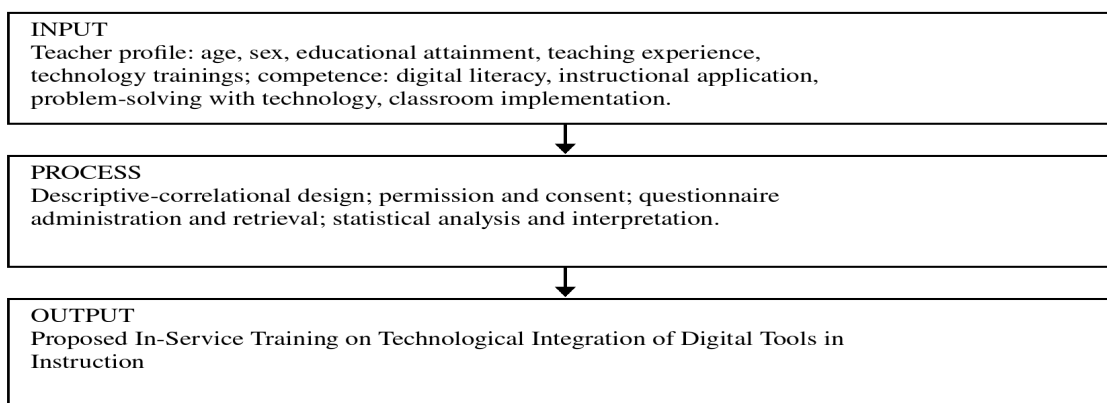


Figure 2

Input–Process–Output Model of the Study

Research Environment

This study was conducted in the Tabuelan District, which included several public secondary and elementary schools. The Tabuelan District is located in the municipality of Tabuelan, a coastal and rural area in the northwestern part of Cebu, composed of schools serving learners from diverse barangays.



Figure 3

Location Map of the Research Environment



Respondents and Sampling

The respondents of this study consisted of thirty-five (35) tenured mathematics teachers who had been teaching for more than seven (7) years and were 45 years old and above. These teachers were assigned in different public schools within Tabuelan District. They were selected because their long teaching experience provided valuable insights into their technological and pedagogical competence in mathematics instruction.

The study used universal sampling. Universal sampling meant that all members of the identified population were included in the study rather than selecting only a portion of them. This approach was appropriate when the population size was small and manageable. In this research, all tenured mathematics teachers in Tabuelan District who met the criteria were included as participants. Using universal sampling ensured that every qualified teacher's perspective was represented, which strengthened the reliability and completeness of the data gathered in the study.

Table 1
Distribution of Teacher-Respondents by School

School	Frequency (f)	Percentage (%)
Juan Pamplona National High School	7	20.00
Mabunao National High School	2	5.71
Casiano Gerona D. National High School	1	2.86
Kanluma Integrated School	2	5.71
Kantubaon Integrated School	2	5.71
Dalid Integrated School	2	5.71
Kabalawan Integrated School	2	5.71
Tabuelan Central Elementary School	3	8.57
Tabunok Elementary School	2	5.71
Olivo Elementary School	2	5.71
Tigbawan Elementary School	2	5.71
Maravilla Elementary School	2	5.71
Kansaguibo Elementary School	2	5.71
Kanluhangon Elementary School	2	5.71
Mabunao Elementary School	1	2.86
Villahermosa Elementary School	1	2.86
TOTAL	35	100

Research Instrument and Validation

The instrument used in this study was a researcher-made questionnaire which can be found in the appendices. This was designed to gather relevant data on the profile and digital integration skills of tenured mathematics teachers in mathematics instruction. The questionnaire was developed based on related literature and studies on technology integration and teacher digital competence and was aligned with the objectives of the study.

The questionnaire consisted of two parts. Part I focused on the demographic profile of the respondents, including age, sex, years of teaching experience, educational attainment, and number of ICT-related training sessions attended. This part contained five (5) items intended to gather background information about the respondents.

Part II measured the respondents' level of digital integration skills in mathematics instruction. It consisted of ten (10) items covering the domains of digital literacy, instructional application, and problem-solving with technology. Respondents were asked to indicate the extent to which each statement described their practices and competencies in integrating digital tools into mathematics instruction. Responses were rated using a five-point Likert scale: 5 – Excellent, 4 – Very Good, 3 – Good, 2 – Fair, and 1 – Poor.



To accomplish the questionnaire, respondents were instructed to read each statement carefully and select the response that best reflected their actual level of competence and instructional practices. Clear instructions were provided at the beginning of the questionnaire to ensure consistency in responding. The estimated completion time for the instrument was approximately 10–15 minutes.

Since the instrument was researcher-made, it underwent validation and reliability testing before the actual data collection. The content validity of the questionnaire was evaluated by three experts: two Master Teachers and one Doctor of Philosophy major in IT Management. They assessed the instrument in terms of clarity, relevance, appropriateness, and alignment with the research objectives. Their comments and recommendations were incorporated in the revision of the questionnaire.

The questionnaire was pilot-tested with six mathematics teachers from San Remegio District 1. The reported Cronbach's alpha was 0.60.

Data Collection and Analysis

Once the instrument was validated and tested for reliability, the researcher identified the respondents based on the inclusion criteria, which included tenured mathematics teachers who had been teaching for more than seven years and were aged 45 years and above in the Tabuelan District. After identifying the potential respondents, the researcher prepared a transmittal letter requesting permission to conduct the study, which was submitted to the Schools Division Superintendent, followed by the Public Schools District Supervisor, and the School Heads of the participating schools. Upon approval, the identified respondents were formally informed about the study and were provided with an informed consent form before participating in the research.

Data Gathering Stage. The questionnaire was administered to all 35 teacher-respondents of Tabuelan District. Before answering, respondents were oriented about the purpose of the study and the importance of providing honest and accurate responses. The questionnaire was divided into two parts. Part I focused on the demographic profile of tenured mathematics teachers in terms of age, sex, number of years of teaching experience, educational attainment, and number of trainings attended on technology. Part II covered the level of technological competence of tenured mathematics teachers in integrating digital tools in instruction in terms of digital literacy, instructional application, and problem-solving with technology.

Post-Data Gathering Stage. After the data were collected, all responses were carefully compiled, organized, and analyzed. Descriptive statistics, including frequency, percentage, weighted mean, and standard deviation, were used to summarize the respondents' profile and to determine the level of technological competence of tenured mathematics teachers in integrating digital tools in instruction.

The weighted mean was used to interpret the respondents' level of competence based on the Likert scale responses, while the standard deviation indicated the consistency of their answers. To test the significant relationship between the respondents' demographic and professional profile and their technological competence, inferential statistics such as Spearman's Rank-Order Correlation and appropriate non-parametric or parametric tests were applied, depending on the normality and distribution of the data.

Frequency, percentage, mean, and standard deviation summarized the profile and competence ratings. Spearman's rank-order correlation tested relationships between profile variables and technological competence. The source reports Shapiro-Wilk and Levene's tests in selecting the statistical approach.

Competence ratings used the source scale: 4.20–5.00, Excellent; 3.40–4.19, Very Good; 2.60–3.39, Good; 1.80–2.59, Fair; and 1.00–1.79, Poor. The four domain scoring rubrics appear in Appendix A.



Domain Scoring Rubrics

Table A1

Digital Literacy Scoring Rubric

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
5	4.20– 5.00	Excellent	The teacher strongly perceives that they demonstrate a very high level of digital literacy in integrating technology into instruction.
4	3.40 – 4.19	Very Good	The teacher perceives that they demonstrate a high level of digital literacy in integrating technology into instruction.
3	2.60 – 3.39	Good	The teacher perceives that they demonstrate a moderate level of digital literacy in integrating technology into instruction.
2	1.80 – 2.59	Fair	The teacher perceives that they demonstrate a low level of digital literacy in integrating technology into instruction.
1	1.00 – 1.79	Poor	The teacher perceives that they demonstrate a very low level of digital literacy in integrating technology into instruction.

Table A2

Instructional Application Scoring Rubric

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
5	4.20– 5.00	Excellent	The teacher strongly perceives that they consistently demonstrate a very high level of skill in applying digital tools effectively in instruction.
4	3.40 – 4.19	Very Good	The teacher perceives that they demonstrate a high level of skill in applying digital tools effectively in instruction.
3	2.60 – 3.39	Good	The teacher perceives that they demonstrate a moderate level of skill in applying digital tools effectively in instruction.
2	1.80 – 2.59	Fair	The teacher perceives that they demonstrate a low level of skill in applying digital tools effectively in instruction.
1	1.00 – 1.79	Poor	The teacher perceives that they demonstrate a very low level of skill in applying digital tools effectively in instruction.

Table A3

Problem-Solving with Technology Scoring Rubric

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
5	4.20– 5.00	Excellent	The teacher strongly perceives that they consistently demonstrate a very high level of competence in solving instructional problems using digital tools.
4	3.40 – 4.19	Very Good	The teacher perceives that they demonstrate a high level of competence in solving instructional problems using digital tools.
3	2.60 – 3.39	Good	The teacher perceives that they demonstrate a moderate level of competence in solving instructional problems using digital tools.
2	1.80 – 2.59	Fair	The teacher perceives that they demonstrate a low level of competence in solving instructional problems using digital tools.
1	1.00 – 1.79	Poor	The teacher perceives that they demonstrate a very low level of competence in solving instructional problems using digital tools.



Table A4

Classroom Implementation of Technology Scoring Rubric

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
5	4.20– 5.00	Excellent	Technology is consistently and effectively implemented in all aspects of classroom instruction.
4	3.40 – 4.19	Very Good	Technology is frequently and effectively implemented with minimal difficulty.
3	2.60 – 3.39	Good	Technology is adequately implemented but with some areas needing improvement.
2	1.80 – 2.59	Fair	Technology is occasionally implemented but with noticeable limitations and inconsistencies.
1	1.00 – 1.79	Poor	Technology is rarely or not effectively implemented in classroom instruction.

Ethical Considerations

This study underwent review and approval by the Research Advisory Committee of the Graduate School, Cebu Technological University, before its conduct. Ethical standards were strictly observed throughout the research process to ensure the protection, rights, and well-being of all participants.

All participants were fully informed about the purpose, objectives, procedures, benefits, and possible risks of the study before their participation. An Informed Consent Form was provided to each participant and was clearly explained to ensure full understanding. Participation in the study was completely voluntary, and participants had the right to refuse participation or withdraw at any time without any penalty or negative consequence.

The researcher ensured the confidentiality and anonymity of all participants. To maintain confidentiality, respondents were not required to indicate their names or any identifying information in the questionnaire. All collected data were coded and stored securely in a password-protected digital file and/or locked storage, accessible only to the researcher. Data were used strictly for academic purposes and were not shared with unauthorized individuals.

Findings

Demographic and Professional Profile

Table 2

Age and Sex of the Respondents

Age group	Female	Female	Male	Male	Total	Total
Age Group	f	%	f	%	f	%
55 to 59 years old	1	2.86	0	0.00	1	2.86
50 to 54 years old	8	22.86	1	2.86	9	25.71
45 to 49 years old	19	54.29	6	17.14	25	71.43
Sub-Total	28	80.00	7	20.00	35	100.00

Note. Mean age = 48.20 years.

The study revealed that the tenured mathematics teachers were predominantly in the age range of 45 to 49 years old, mostly female, and generally middle-aged with a mean age of 48.20 years. In terms of educational attainment, most of the respondents had earned units in their Master's Degree, while only a few had completed graduate programs. The majority of the teachers had 12 to 13 years of teaching experience, indicating that they are highly experienced professionals in mathematics instruction. In addition, most respondents had attended three to four technology-related trainings, suggesting moderate exposure to professional development programs focused on digital tools. Overall, the profile indicates that the respondents are experienced educators with ongoing engagement in professional growth and technology-related training.



Table 3

Highest Educational Attainment

Category	F	%
Doctorate Degree (units only)	3	8.57
Master's Degree (graduate)	1	2.86
Master's Degree (units only)	28	80.00
Bachelor's Degree	3	8.57
Total	35	100.00

Table 4

Years of Teaching Experience

Category	f	%
14 to 15 years	5	14.29
12 to 13 years	18	51.43
10 to 11 years	12	34.29
Total	35	100.00

Note. Mean teaching experience = 11.94 years.

Table 5

Technology-Related Trainings Attended

Category	f	%
4 training attended	17	48.57
3 training attended	13	37.14
2 training attended	5	14.29
Total	35	100.00

Note. Mean number of trainings = 3.34.

Technological Competence

Table 6

Digital Literacy

S/ N	Indicators	Mean	SD	Interpretation
1	I am confident in using computers and laptops for teaching mathematics.	3.60	0.50	Very Good
2	I effectively use educational software and math apps.	2.71	0.67	Good
3	I understand how to search and evaluate online resources for math lessons.	4.29	0.46	Excellent
4	I create digital learning materials, such as presentations or worksheets.	4.14	0.73	Very Good
5	I use spreadsheets or other tools to analyze math data.	3.63	0.49	Very Good
6	I am familiar with basic troubleshooting of digital devices used in teaching.	3.17	0.38	Good
7	I use digital communication tools (email, chat, video conferencing) for teaching purposes.	4.57	0.50	Excellent
8	I am aware of safe and ethical use of technology in the classroom.	4.83	0.38	Excellent
9	I adapt to new digital tools or software quickly.	3.29	0.46	Good
10	I integrate multiple digital tools simultaneously during math instruction.	3.06	0.54	Good
	Overall Rating	3.73	0.84	Very Good

Note. SD = standard deviation. Rating bands are defined in Methodology and Appendix A.



Table 7

Instructional Application

S/ N	Indicators	Mean	SD	Interpretation
1	I incorporate digital tools to explain mathematical concepts effectively.	3.54	0.61	Very Good
2	I use technology to make lessons more engaging for students.	3.69	0.53	Very Good
3	I integrate multimedia resources (videos, simulations, games) into math instruction.	4.20	0.72	Excellent
4	I design digital activities to reinforce math skills and practice.	3.06	0.48	Good
5	I use technology to differentiate instruction according to students' needs.	3.46	0.51	Very Good
6	I guide students to use digital tools for solving math problems.	3.37	0.60	Good
7	I provide timely feedback to students through digital platforms.	2.86	0.94	Good
8	I plan math lessons that integrate technology as part of the learning process.	2.91	0.28	Good
9	I encourage students to explore and learn math concepts independently using technology.	3.83	0.38	Very Good
10	I integrate technology to enhance collaboration among students in math activities.	3.34	0.48	Good
	Overall Rating	3.43	0.70	Very Good

Note. SD = standard deviation. Rating bands are defined in Methodology and Appendix A.

Table 8

Problem-Solving with Technology

S/ N	Indicators	Mean	SD	Interpretation
1	I use digital tools to address students' difficulties in understanding math concepts.	3.34	0.48	Good
2	I solve classroom management issues using technology effectively.	3.43	0.50	Very Good
3	I troubleshoot technical problems that occur during digital lessons.	2.60	0.50	Good
4	I adapt my teaching strategies when technology does not work as planned.	4.69	0.63	Excellent
5	I use technology to create alternative approaches to teaching difficult math topics.	3.71	0.46	Very Good
6	I analyze students' performance using digital assessment tools.	3.69	0.53	Very Good
7	I use digital resources to design interventions for struggling learners.	4.54	0.74	Excellent
8	I seek online solutions or resources to improve my math instruction when challenges arise.	4.69	0.53	Excellent
9	I integrate multiple problem-solving strategies using technology in teaching math.	3.66	0.48	Very Good
10	I reflect on and improve my technology use based on students' learning outcomes.	4.66	0.59	Excellent
	Overall Rating	3.43	0.87	Very Good

Note. SD = standard deviation. Rating bands are defined in Methodology and Appendix A.

Table 9

Classroom Implementation of Technology

S/ N	Indicators	Mean	SD	Interpretation
1	I present mathematical concepts using engaging digital methods.	4.00	0.54	Very Good



S/ N	Indicators	Mean	SD	Interpretation
2	I use multimedia (videos, simulations) to support understanding.	3.83	0.71	Very Good
3	I facilitate student participation using technology.	3.91	0.61	Very Good
4	I use digital platforms for instructions, assignments, and feedback.	3.29	0.46	Good
5	I manage classroom activities effectively when using technology.	3.77	0.43	Very Good
6	I ensure technology aligns with lesson objectives.	3.97	0.57	Very Good
7	I monitor student engagement when using digital tools.	3.37	0.73	Good
8	I promote responsible use of technology among students.	4.69	0.47	Excellent
9	I evaluate the effectiveness of technology integration in lessons.	4.74	0.44	Excellent
10	I present mathematical concepts using engaging digital methods.	3.54	0.56	Very Good
	Overall Rating	3.56	0.72	Very Good

Note. SD = standard deviation. Rating bands are defined in Methodology and Appendix A.

Table 10

Summary of Technological Competence

No	Domains	Mean	SD	VD
1	Digital Literacy	3.73	0.84	Very Good
2	Instructional Application	3.43	0.70	Very Good
3	Problem-solving with Technology	3.43	0.87	Very Good
4	Classroom Implementation of Technology	3.56	0.72	Very Good
	Overall Rating	3.54	0.81	Very Good

Furthermore, the findings showed that tenured mathematics teachers demonstrated a generally strong level of technological competence in integrating digital tools in instruction, with an overall mean of 3.54 interpreted as “Very Good.” Among the domains, digital literacy obtained the highest mean, followed by classroom implementation of technology, while instructional application and problem-solving with technology obtained the same moderate “Very Good” rating. This indicates that the teachers are most competent in understanding and using digital tools, while still showing adequate ability in applying technology in instruction, addressing classroom needs, and solving instructional challenges using digital tools. However, there are still areas that require enhancement to further strengthen their overall competence in technology integration.

Relationship Between Profile and Technological Competence

Table 11

Spearman Correlation Results

Variables Paired with Technological Competence	Comp. rho	Strength of Correlation	p-value	Decision	Remarks
Age and Technological Competence	0.135	Very weak	0.439	Fail to reject Ho	No significant relationship
Sex (at birth) and Technological Competence	-0.203	Weak	0.242	Fail to reject Ho	No significant relationship
Educational Attainment and Technological Competence	-0.117	Very weak	0.501	Fail to reject Ho	No significant relationship
Years of Teaching Experience and Technological Competence	0.021	Very weak	0.904	Fail to reject Ho	No significant relationship



Variables Paired with Technological Competence	Comp. rho	Strength of Correlation	p-value	Decision	Remarks
Number of Training Attended and Technological Competence	0.207	Weak	0.234	Fail to reject Ho	No significant relationship

In addition, the results revealed that there was no significant relationship between the profile variables of tenured mathematics teachers and their technological competence in integrating digital tools in instruction. All variables, including age, sex, educational attainment, years of teaching experience, and number of trainings attended, yielded p-values greater than 0.05, indicating no significant relationship. The correlation results were all very weak to weak, suggesting that technological competence is not strongly influenced by demographic or professional characteristics. Instead, this implies that other factors such as institutional support, access to digital resources, personal motivation, and continuous self-learning may play a more important role in developing teachers' technological competence.

Output of the Study

The findings of the study revealed that tenured mathematics teachers demonstrated a "Very Good" level of technological competence in integrating digital tools in instruction. However, the results also showed areas that still require improvement, particularly in instructional application, troubleshooting technical problems, integrating multiple digital tools, and maximizing digital platforms for classroom engagement and assessment. These findings indicate the need for continuous enhancement of teachers' technological integration skills.

In response to these findings, the researcher proposes an In-Service Training on Technological Integration of Digital Tools in Instruction. The proposed training aims to strengthen teachers' digital literacy, instructional application, problem-solving with technology, and classroom implementation skills through relevant workshops and hands-on activities. Ultimately, the proposed output is expected to improve teachers' competence and promote more effective and technology-enhanced mathematics instruction.

Objectives of the Proposed Training

To enhance the digital literacy skills of tenured mathematics teachers in using digital tools and educational technologies for mathematics instruction.

To strengthen the instructional application and classroom implementation of digital tools in lesson delivery, assessment, and student engagement.

To improve the problem-solving skills of tenured mathematics teachers in addressing technical and instructional challenges encountered during technology integration in mathematics instruction.

Table 12

Proposed Training Implementation Scheme

Phase	Activities/Procedures	Time Frame	Persons Involved	Resources Needed
Planning Phase	Conduct coordination meeting and preparation of the proposed in-service training program on technological integration of digital tools in instruction	Week 1	School Head, ICT Coordinator, Mathematics Teachers, Researcher	Training proposal, laptop, internet connection, meeting materials
Preparation Phase	Prepare training materials, digital resources, activity sheets, and schedule of activities	Week 2	ICT Coordinator, Trainers, Researcher	Modules, projector, laptops, digital applications, printed materials



Phase	Activities/Procedures	Time Frame	Persons Involved	Resources Needed
Implementation Phase	Conduct seminars and workshops on digital literacy, instructional application, problem-solving with technology, and classroom implementation of technology	Week 3	Trainers, Mathematics Teachers, ICT Coordinator	Computer projector, access, internet training, handouts
Workshop Phase	Facilitate hands-on activities, collaborative lesson planning, and demonstration teaching using digital tools	Week 4	Mathematics Teachers, Trainers, School Head	Laptops, multimedia devices, educational software, lesson templates
Monitoring and Evaluation Phase	Evaluate participants' learning, gather feedback, and assess effectiveness of the training program	Week 5	School Head, Researcher, Trainers	Evaluation forms, monitoring tools, survey questionnaires
Follow-up Phase	Conduct follow-up coaching, mentoring, and technical assistance for continuous improvement in technology integration	Continuous	School Head, ICT Coordinator, Mathematics Teachers	Coaching materials, communication platforms, monitoring checklist

Proposed Training Plan

Table 13

Digital Literacy Enhancement

Planning component	Source plan details
Objectives	To enhance teachers' digital literacy skills in using educational technologies and digital tools
Strategies/Activities	Conduct seminar-workshops on basic and advanced digital literacy skills, online resources, and digital communication platforms
Time Frame	Week 1
Resources Needed	Laptops, projector, internet connection, training materials
Persons Involved	School Head, ICT Coordinator, Mathematics Teachers, Researcher
Expected Outcome	Improved digital literacy skills among teachers
Success Indicators	90% of participants demonstrate improved digital literacy skills during training activities
Budget	₱5,000
Source of Fund	MOOE/School Fund

Table 14

Instructional Application of Technology

Planning component	Source plan details
Objectives	To strengthen teachers' ability to integrate digital tools in lesson planning and mathematics instruction
Strategies/Activities	Conduct hands-on workshops on multimedia integration, digital lesson planning, and technology-based assessment strategies
Time Frame	Week 2
Resources Needed	Multimedia tools, laptops, projector, educational software
Persons Involved	Trainers, ICT Coordinator, Mathematics Teachers
Expected Outcome	Enhanced instructional application of technology in mathematics teaching
Success Indicators	Submission of technology-integrated lesson plans and digital instructional materials
Budget	₱7,000
Source of Fund	MOOE/School Fund



Table 15

Problem-solving with Technology

Planning component	Source plan details
Objectives	To improve teachers' competence in troubleshooting and solving instructional challenges using technology
Strategies/Activities	Facilitate practical activities on troubleshooting, classroom technology management, and digital problem-solving strategies
Time Frame	Week 3
Resources Needed	ICT devices, troubleshooting guides, internet access
Persons Involved	ICT Coordinator, Trainers, Mathematics Teachers
Expected Outcome	Increased confidence in handling technology-related instructional challenges
Success Indicators	85% of participants successfully perform troubleshooting and problem-solving tasks
Budget	₱4,000
Source of Fund	MOOE/School Fund

Table 16

Classroom Implementation of Technology

Planning component	Source plan details
Objectives	To enhance classroom implementation of digital tools for student engagement and interactive learning
Strategies/Activities	Conduct demonstration teaching, peer mentoring, and collaborative technology integration activities
Time Frame	Week 4
Resources Needed	Projector, laptops, digital platforms, teaching guides
Persons Involved	School Head, Trainers, Mathematics Teachers
Expected Outcome	Improved classroom integration of digital tools in mathematics instruction
Success Indicators	Increased use of digital tools during classroom demonstrations and observations
Budget	₱6,000
Source of Fund	MOOE/School Fund

Table 17

Monitoring and Evaluation

Planning component	Source plan details
Objectives	To assess the effectiveness of the proposed in-service training program
Strategies/Activities	Conduct evaluation, feedback gathering, monitoring, and follow-up coaching sessions
Time Frame	Week 5
Resources Needed	Evaluation forms, monitoring tools, survey questionnaires
Persons Involved	School Head, Researcher, ICT Coordinator
Expected Outcome	Sustained improvement in teachers' technological competence
Success Indicators	Positive evaluation results and improved teacher performance in technology integration
Budget	₱3,000
Source of Fund	MOOE/School Fund

Discussion

Table 6 revealed the level of digital literacy of tenured mathematics teachers in integrating digital tools in instruction. The respondents obtained an overall mean of 3.73, interpreted as "Very Good." The highest three indicators were I am aware of safe and ethical use of technology in the classroom with a mean score of 4.83, followed by I use digital communication tools email chat video conferencing for teaching purposes with a mean score of 4.57, and I understand how to search and evaluate online resources for math lessons with a mean score of 4.29, all interpreted as "Excellent." On the other hand, the lowest three indicators were I effectively use educational software and math apps with a mean score of 2.71, followed by I integrate multiple digital tools simultaneously during math instruction with a mean score



of 3.06, and I am familiar with basic troubleshooting of digital devices used in teaching with a mean score of 3.17, all interpreted as “Good.”

The findings imply that tenured mathematics teachers demonstrate strong digital literacy, particularly in ethical awareness, digital communication, and the ability to locate and evaluate online learning resources, which are essential competencies in modern mathematics instruction. However, the lower ratings in using educational software, integrating multiple digital tools, and troubleshooting digital devices suggest that there are still areas requiring enhancement. This indicates that while teachers are generally competent in foundational digital skills, further training and capacity-building activities are needed to strengthen their proficiency in more advanced and technical aspects of technology integration to fully maximize digital tools in mathematics instruction.

These findings are supported by related literature emphasizing that digital literacy is a foundational requirement for effective technology integration in teaching. For instance, Padilla-Escorcía et al. (2025) highlighted that teachers need strong technological and pedagogical knowledge to effectively use digital tools in mathematics instruction, particularly in integrating multiple technologies for meaningful learning experiences. Similarly, Alieto et al. (2024) found that teachers generally demonstrate positive attitudes and adequate ICT skills, but gaps remain in the application of advanced digital tools, which affects instructional effectiveness. In addition, Kiianovska (2025) emphasized that modern digital competence frameworks require teachers to move beyond basic ICT use toward higher-level skills such as integration, innovation, and adaptive use of emerging technologies. These studies collectively support the present findings, suggesting that while tenured mathematics teachers possess strong foundational digital literacy, there remains a need for continuous upskilling to address gaps in advanced technological application and integration.

Table 7 revealed the level of instructional application of tenured mathematics teachers in integrating digital tools in instruction. The respondents obtained an overall mean of 3.43, interpreted as “Very Good.” The highest three indicators were I integrate multimedia resources videos simulations games into math instruction with a mean score of 4.20, I encourage students to explore and learn math concepts independently using technology with a mean score of 3.83, and I use technology to make lessons more engaging for students with a mean score of 3.69, all interpreted from “Very Good” to “Excellent.” On the other hand, the lowest three indicators were I provide timely feedback to students through digital platforms with a mean score of 2.86, I plan math lessons that integrate technology as part of the learning process with a mean score of 2.91, and I design digital activities to reinforce math skills and practice with a mean score of 3.06, all interpreted as “Good.”

The findings imply that tenured mathematics teachers demonstrate a generally strong level of instructional application of digital tools, particularly in using multimedia resources, enhancing student engagement, and promoting independent learning through technology. However, the lower ratings in providing digital feedback, lesson planning with technology integration, and designing structured digital activities suggest that teachers still face challenges in fully embedding technology into the core instructional design and assessment processes. This indicates that while teachers are capable of using technology as a supportive tool in instruction, there is still a need for targeted training to strengthen their capacity in integrating digital tools more systematically and strategically in lesson planning, assessment, and classroom management.

These findings are supported by related literature emphasizing that effective instructional application of technology requires not only digital skills but also pedagogical integration competence. For instance, Saliao and Cajandig (2025) found that while teachers’ technology use is high, gaps remain in translating digital tools into structured instructional design, particularly in assessment and learning evaluation processes. Similarly, Padilla-Escorcía et al. (2025) emphasized that technological pedagogical content knowledge is essential for ensuring that technology is meaningfully integrated into lesson planning and classroom delivery rather than used only as a supplementary tool. In addition, Kiianovska (2025) stressed that modern ICT competency frameworks highlight the importance of aligning technology with pedagogy to improve instructional effectiveness and learner outcomes. These studies collectively support the present findings, indicating that while tenured mathematics teachers demonstrate strong instructional application in general, further development is needed to strengthen systematic and purposeful integration of digital tools in instruction.



Table 8 revealed the level of problem-solving with technology of tenured mathematics teachers in integrating digital tools in instruction. The respondents obtained an overall mean of 3.43, interpreted as “Very Good.” The highest three indicators were I adapt my teaching strategies when technology does not work as planned with a mean score of 4.69, I seek online solutions or resources to improve my math instruction when challenges arise with a mean score of 4.69, and I reflect on and improve my technology use based on students’ learning outcomes with a mean score of 4.66, all interpreted as “Excellent.” On the other hand, the lowest three indicators were I troubleshoot technical problems that occur during digital lessons with a mean score of 2.60, I use digital tools to address students’ difficulties in understanding math concepts with a mean score of 3.34, and I solve classroom management issues using technology effectively with a mean score of 3.43, interpreted from “Good” to “Very Good.”

The findings imply that tenured mathematics teachers demonstrate strong adaptability and reflective practice in using technology for problem-solving in instruction, particularly in adjusting teaching strategies when technical issues arise, seeking online resources for instructional improvement, and evaluating their own use of technology based on learner outcomes. However, the lower results in troubleshooting technical problems and using digital tools for direct classroom and conceptual problem-solving suggest that some teachers still experience limitations in the technical and operational aspects of technology use. This indicates that while teachers are highly capable of adapting and reflecting in technology-enhanced environments, further training and hands-on technical support are needed to strengthen their confidence and competence in resolving real-time technical issues and applying digital tools more effectively in addressing students’ learning difficulties.

These findings are supported by related literature emphasizing that teacher competence in technology-enhanced problem-solving is shaped by both adaptability and technical proficiency. For instance, Manaban et al. (2025) found that while teachers demonstrate strong ethical and functional use of ICT, their application in complex instructional problem-solving remains moderate, particularly when technical barriers arise. Similarly, Buenaventura (2026) emphasized that teachers often rely on self-directed learning when formal training in troubleshooting and advanced ICT use is limited, which affects their confidence in handling technical issues during instruction. In addition, Kiianovska (2025) emphasized that modern digital competence frameworks emphasize the need for continuous upskilling in adaptive problem-solving using emerging technologies to ensure effective classroom integration. These studies collectively support the present findings, suggesting that while tenured mathematics teachers are highly adaptive and reflective in their use of technology, there remains a need for stronger technical support and structured training to enhance their problem-solving competence in real classroom situations.

Table 9 revealed the level of classroom implementation of technology of tenured mathematics teachers in integrating digital tools in instruction. The respondents obtained an overall mean of 3.56, interpreted as “Very Good.” The highest three indicators were, I evaluate the effectiveness of technology integration in lessons with a mean score of 4.74, I promote responsible use of technology among students with a mean score of 4.69, and I ensure technology aligns with lesson objectives with a mean score of 3.97, interpreted from “Very Good” to “Excellent.” On the other hand, the lowest three indicators were, I use digital platforms for instructions assignments and feedback with a mean score of 3.29, I monitor student engagement when using digital tools with a mean score of 3.37, and I present mathematical concepts using engaging digital methods with a mean score of 3.54, interpreted as “Good” to “Very Good.”

The findings imply that tenured mathematics teachers demonstrate a strong level of classroom implementation of technology, particularly in promoting responsible use of digital tools, evaluating the effectiveness of technology integration, and ensuring alignment of technology with lesson objectives. However, the lower ratings in using digital platforms for instructional processes, monitoring student engagement, and consistently delivering engaging digital presentations suggest that some aspects of classroom-level implementation still need strengthening. This indicates that while teachers are highly aware of the importance of technology integration and demonstrate strong evaluative and managerial practices, there is still a need for further enhancement in maximizing digital platforms for daily instructional delivery and improving real-time classroom engagement strategies using technology.

These findings are supported by related literature emphasizing that effective classroom implementation of technology depends on both pedagogical planning and sustained digital competence. For instance, Saliao and Cajandig (2025) found that teachers often demonstrate strong evaluative use of technology but experience gaps in consistent classroom-level integration, particularly in student engagement and instructional delivery using digital platforms. Similarly,



Padilla-Escorcio et al. (2025) emphasized that effective technology integration requires strong alignment between pedagogy, content, and digital tools, ensuring that technology is not only used but purposefully embedded in daily instruction. In addition, Alieto et al. (2024) emphasized that while teachers generally possess positive attitudes toward ICT integration, actual classroom implementation is often influenced by access to resources and the depth of technological training. These studies collectively support the present findings, suggesting that although tenured mathematics teachers demonstrate strong classroom implementation skills, continued professional development and improved access to digital resources are necessary to fully optimize technology integration in mathematics instruction.

Summary for Level of Technological Competence of Tenured Mathematics Teachers in Integrating Digital Tools in Instruction

The summary of the level of technological competence of tenured mathematics teachers in integrating digital tools in instruction was included in this study to provide an overall interpretation of the teachers' competence across all identified dimensions, namely digital literacy, instructional application, problem-solving with technology, and classroom implementation of technology. This consolidated result is essential in determining the general preparedness and effectiveness of teachers in utilizing digital tools in mathematics instruction, rather than examining each component in isolation. By presenting the overall level of competence, the study is able to establish a comprehensive picture of how tenured mathematics teachers perform in technology integration and identify whether their competencies are generally strong or require further enhancement. Presented in the succeeding statistical table are the combined weighted mean scores and descriptive interpretations of the four domains, which serve as the basis for the overall assessment of their technological competence in integrating digital tools in instruction.

Conclusion

In conclusion, the study revealed that tenured mathematics teachers possess a generally strong level of technological competence in integrating digital tools in instruction, particularly in digital literacy and classroom implementation of technology, while instructional application and problem-solving with technology still require further enhancement. The respondents were predominantly middle-aged, highly experienced, and engaged in graduate studies and technology-related trainings, indicating continuous professional growth. However, the results of the inferential analysis showed that age, sex, educational attainment, years of teaching experience, and number of trainings attended have no significant relationship with their technological competence. This implies that technological competence among tenured mathematics teachers is not determined by their demographic and professional profile, but is more likely influenced by other contextual and personal factors such as institutional support, access to technology, motivation, and continuous self-directed learning.

Recommendations

Since the teachers are predominantly middle-aged, hold master's units, possess extensive teaching experience, and have attended only a moderate number of technology-related trainings, it is recommended that the Schools Division Office and school administrators provide support for further academic advancement. This may include offering scholarship grants, flexible class schedules, and tuition assistance to encourage teachers to complete their graduate studies. Additionally, professional development programs should be designed to suit their learning pace, using practical and hands-on approaches rather than overly technical content. Regular and progressive training sessions should also be organized to build upon their existing knowledge, ensuring continuous growth in technology integration skills.

Although the teachers demonstrated a "Very Good" level of competence, with digital literacy as their strongest domain, there is still a need to enhance their skills in instructional application and problem-solving using technology. Therefore, specialized workshops and training focused on using digital tools to explain abstract mathematical concepts and solve instructional problems should be conducted. It is also advisable to establish peer-mentoring programs where experienced teachers can share effective strategies and demonstrate actual classroom applications. Furthermore, schools should ensure that functional facilities, digital laboratories, and relevant learning resources are available to give teachers sufficient opportunities to practice and apply what they have learned.



Given that demographic and professional characteristics did not significantly influence technological competence, it is recommended that focus be shifted toward improving institutional support and learning conditions. School heads and district officials should prioritize providing reliable internet connectivity, adequate devices, and well-maintained digital resources to remove barriers to effective technology use. The quality and relevance of training programs should be reviewed, placing more emphasis on actual classroom application rather than just the number of sessions attended. Creating a motivating environment and offering recognition for innovative practices will also help encourage teachers to engage in self-directed learning and continuous improvement, regardless of their background or length of service.

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